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Maternal Nutrition and Health Care Program

**BETTER HEALTH FOR WOMEN:
RESEARCH RESULTS FROM THE
MATERNAL NUTRITION AND
HEALTH CARE PROGRAM**

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Abbreviations

ICRW	International Center for Research on Women
MNHC	Maternal nutrition and health care
PAHO	Pan American Health Organization
TAG	Technical Advisory Group
U.N.	United Nations
USAID	United States Agency for International Development
WHO	World Health Organization

INTRODUCTION

From August 1987 to June 1990, the International Center for Research on Women (ICRW) conducted a research program, the Maternal Nutrition and Health Care (MNHC) Program through a cooperative agreement (number DAN-1010-A-00-7061-00) with the U.S. Agency for International Development (USAID), Office of Nutrition and Office of Health. The MNHC Program provided research grants totaling almost \$1.2 million to 20 research teams investigating some aspect of maternal nutrition or health care in developing countries. The size of the grants awarded ranged from \$5,000 to \$158,000, with an average grant size of \$58,000. The research projects took place over the course of 18 months (excluding final report preparation time) in 13 countries: Bangladesh, Benin, Guatemala, Indonesia, Jamaica, Malawi, Mexico, Peru, the Philippines, Sri Lanka, Swaziland, Thailand, and Zaire.

The topics researched under the MNHC Program ranged from very specific, as in the study of a novel delayed-release iron formulation in Jamaica, to the more general, as in the descriptive study of women's health and nutritional status on tea plantations in Sri Lanka. Methodologies used in the MNHC research included purely ethnographic methods, as in the study of adolescents' knowledge of and attitudes toward prenatal care in Guatemala, as well as quantitative methods, such as the multiple regression analysis used to isolate the determinants of prenatal care use in Peru.

Despite their wide range of topics and methodologies, most of the MNHC Program projects can be categorized as, primarily, studies of maternal nutrition, prenatal care use, or prenatal care use by adolescents. Adolescents' use of prenatal care services is discussed separately because of their unique health care needs.

Ten projects examined issues related to maternal nutrition, including the energy balance during pregnancy and lactation, the effects of work on maternal nutritional status, the effects of repeated reproductive cycles and lactation on maternal nutritional status, and the effectiveness of various innovative nutritional programs. Six projects studied prenatal care, examining the patterns of prenatal care use (such as the frequency and timing of prenatal care visits and the type of care sought) and the demand and supply factors that affect the use of both traditional and formal prenatal care services. The findings of two other projects that focussed primarily on nutrition also had implications for prenatal care.

Two projects focused on adolescents and their use of prenatal services. Both studies analyzed adolescents' attitudes and beliefs with respect to pregnancy and prenatal care and their views of existing prenatal care services.

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Two of the MNHC projects investigated other issues that did not readily fit into the three categories mentioned above. One compared the pregnancy outcomes following two different surgical strategies for dealing with obstructed labor at the time of delivery (see Hermann and Duale, *A Follow-Up Study of Pregnancy Outcome in Women with Symphysiotomy versus Cesarean Section*, MNHC Program Research Report Series, number 15). The second focused on breastfeeding education (see Roman-Perez, *The Effects of an Educational Program on Lactating Mothers in Mexico*, MNHC Program Research Report Series, number 17). These projects, along with all the other projects in the program, are summarized in appendix A.

This synthesis paper is intended to:

- provide information on the design and management of the MNHC Program, which worked to elicit research proposals, to generate research results, and to build research capacity in developing countries;
- present the most salient findings of the program's 20 research projects in a format useful for program planners and policymakers so that they may readily take account of the findings in their maternal nutrition and health programs and strategies;
- identify priority areas for future research on maternal nutrition and health in developing countries.

Chapter 1 discusses the design and management of the MNHC Program, highlighting the key components that contributed to the program's success. Chapters 2 through 4 discuss the main results of the research supported under the program. Chapter 2 focuses on results related to maternal nutrition, chapter 3 focuses on results related to prenatal care, and chapter 4 presents results related particularly to prenatal care for adolescents. Each chapter briefly reviews key issues in the research area under discussion, presents findings pertinent to these issues, and discusses the research and policy implications of the findings. The review of key issues is not intended to be a comprehensive literature review on any topic. References to the literature merely provide a context for the research results. Chapter 5 draws on results across MNHC projects to discuss priorities for further research on maternal health and nutrition interventions for women in developing countries.

In addition to the project summaries found in appendix A, a separate final report of each project that describes its methodology and results in detail is available from ICRW (MNHC Program Research Report Series).

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1. THE MNHC PROGRAM MODEL

The development community's recent emphasis on improving child survival in developing countries has had the valuable side effect of highlighting the importance of women's health for the survival and health of their children. A focus on promoting health services for women, including prenatal, delivery, and postnatal care and nutrition programs, can greatly improve women's health during and following pregnancy, and dramatically decrease infant mortality and morbidity. Yet in most developing countries, women's access to and use of these services is limited. As a result, the typically high rates of mortality, morbidity, and malnutrition associated with childbearing in the developing world persist. The MNHC Program was designed to help address these problems by contributing to knowledge about maternal mortality, morbidity, and malnutrition and exploring innovative approaches to improve nutrition and health care for mothers and infants in the developing world. More specifically, the MNHC Program was designed to provide research results useful for further USAID programs on maternal and perinatal health and nutrition, such as the recently initiated MotherCare Program, funded by the USAID's Office of Health.

The model used for the MNHC Program succeeded both in generating new and pertinent information on women's health and in strengthening research capacity in the developing world. It is described in detail here with the hope that it may serve as a useful example for other research efforts. The program's key components included two research grants competitions; reliance on a Technical Advisory Group (TAG); careful technical monitoring and program management; and dissemination of the program's findings by producing a series of research reports, preparing three issues papers to complement the program's research efforts, writing this synthesis paper, and holding a final conference.

The Grants Competitions

Two grants competitions were held under the MNHC Program. The first took place in the initial two months of the program and considered unsolicited proposals submitted to either the Office of Nutrition or the Office of Health of A.I.D. (see appendix B for the MNHC Program timetable). In this competition, 12 proposals were received and reviewed by the MNHC Program's Technical Advisory Group. The proposals came predominantly from large U.S. universities and research institutions, and had proposed project budgets of \$100,000 or more. The majority focused on secondary data analysis and were high-quality proposals that suggested research relevant to the program's goals. However, to reserve a significant portion of the available research funds for an open grants competition and to encourage research initiated in the developing world, the TAG recommended that only 5 of the 12 proposals be funded.

The second (open) -grants competition solicited proposals through an announcement. Over 120 proposals were submitted in response; a number far larger than anticipated. Approximately half the proposals were from developing country research teams, and most of the rest were from teams composed of both developed and developing country researchers. The quality of the proposals was very high, and ICRW and USAID reviewers determined that at least 40 of the proposals should be considered for funding. The TAG reviewed these proposals and, given limitations on the research funds available, ICRW awarded grants to the 15 top-ranked projects.

Thus, a total of 20 projects were selected for funding. These projects represented not only a wide variety of topics within the subject area of maternal nutrition and health care, but also a broad sampling of methodologies for researching these issues.

In recognition of the quality of the proposals received in the open grants competition, ICRW staff provided technical comments to all those who had submitted proposals and suggested alternative sources of funding. ICRW also sent some proposals directly to other funding agencies such as the Ford Foundation, the USAID regional bureaus, and the Safe Motherhood Initiative program sponsored by the World Health Organization (WHO), the World Bank, and the United Nations Population Fund (UNFPA). Several of the proposals submitted to ICRW were eventually funded by one of these other sources.

A number of factors contributed to the program's success in attracting so many high-quality proposals, largely from developing countries. These include the wording and wide distribution of the announcement, the few restrictions on submissions, the size of the grants available, the nature of the organization implementing the program (ICRW), and the program's broad research area.

The wording of the announcement, jointly prepared by ICRW and USAID, was brief and straightforward (see appendix C for a copy of the announcement). It included a clear and simple guide for the format of submissions. No other eligibility requirements were given; the competition was open to public and private groups in the United States and abroad, and there were no restrictions on possible research methodologies. The announcement encouraged both developing country research teams and collaborative teams of U.S. and developing country researchers to apply. The announcement did not specify the exact research questions to be addressed, although it did provide examples of areas of particular interest. The size of the grants available was clearly stated (\$20,000 to \$50,000), and this limitation on funding may have encouraged smaller groups, groups new to research in this field, and developing country groups to apply.

ICRW relied heavily on its own mailing list for the distribution of the grants competition announcement. This mailing list includes numerous developing country research groups that ICRW

has worked with in the past. Many of these groups do not work principally in the areas of maternal nutrition and health, which may, in part, account for the large number of unique and interdisciplinary studies proposed. At the TAG's suggestion, ICRW also sent the announcement to universities in developing countries, the field offices of public and private organizations involved in international development (such as the InterAmerican Foundation, the Population Council, and the Ford Foundation), and when possible, individual researchers in developing countries. Announcements of the competition appeared in several international health bulletins and newsletters, such as "Mothers and Children". A summary of the competition announcement was cabled to all USAID missions and copies of the entire announcement were sent to the health, population, and nutrition officers of all USAID missions. The announcement was distributed in English, French, and Spanish, and proposals were accepted in these languages and Portuguese.

As the announcement came from ICRW, a small nongovernmental organization, some researchers may have applied in the expectation that the competition would not be highly bureaucratic, that it was not targeted exclusively to large U.S. research organizations, and that they might actually be able to win a grant. The nature of the implementing organization and the small size of the grants did not, however, discourage the larger U.S. organizations from applying.

Finally, the importance and popularity of the broad research area may have contributed to the large number of proposals received. Many researchers are interested in some aspect of maternal nutrition and health, and the fact that particular topics for research were not specified in the announcement may have encouraged applications from researchers who might otherwise have expected their area of interest to be overlooked.

The Technical Advisory Group

The TAG played a crucial role in the success of the MNHC Program. The TAG was initially composed of 11 professionals (2 more joined later) with different fields of expertise who shared an interest in women's health in the developing world. They represented such disciplines as nutrition, public health, medicine, economics, and anthropology, and such institutions as U.S. universities, U.S. governmental agencies, multilateral and bilateral aid organizations, and nongovernmental organizations (see appendix D for a list of the TAG members and their institutional affiliations). The TAG's major responsibilities included reviewing the research proposals received through the grants competitions and making recommendations for funding and assisting with the technical monitoring of the projects selected for funding. The TAG also provided ICRW staff with advice and assistance on information dissemination efforts.

The TAG members met four times during the course of the MNHC Program (see appendix B, program timetable). At their first one-day meeting, held shortly after the program's initiation, TAG

members familiarized themselves with the program's goals and structure and their own role. They also reviewed the 12 unsolicited research proposals referred to earlier, and recommended that the MNHC Program support 5 of them. The TAG members also advised ICRW staff on how best to disseminate the announcement of the open research grants competition, suitable topics for the first two MNHC issues papers, and an appropriate process for technical and administrative monitoring of MNHC research projects.

At their second meeting five months later, TAG members considered the 40 best proposals received through the open grants competition (ICRW and USAID staff members had selected these from among the 120 proposals received). After individually reviewing proposals, the TAG spent two days together reviewing and discussing the 40 proposals, and ranked them in priority order for funding. The program funded the 15 top-ranked proposals.

A third TAG meeting was held mid-way through the program to review the progress of all the research projects. Several researchers attended and made presentations on their progress and preliminary findings. At this two-day meeting, TAG members helped ICRW staff provide technical comments and advice to the researchers.

The fourth TAG meeting was held near the completion of the program. The TAG was asked to review and comment on the first drafts of research reports from each project, as well as ICRW's plans for the third MNHC issues paper, this synthesis paper, and the program's final conference.

The TAG proved very helpful in guiding the MNHC Program. The TAG helped ICRW focus on the importance of capacity building in the developing world and encouraged the funding of groups other than major U.S. universities and research organizations, even although this was not an explicit goal of the program. As a result, the program was able to accomplish its goal of producing high-quality research results while at the same time increasing research capacity in developing countries. The "risk" of funding smaller and less well-known groups yielded a high return.

The TAG also encouraged ICRW to focus on the importance of disseminating research results, and suggested such strategies as translating the research reports into local languages and encouraging researchers to publish articles in local as well as international peer review journals.

Finally, the TAG helped the program maintain its continuity. When the original MNHC program director left ICRW, she joined the TAG and continued to provide advice and "institutional memory" for the program. Similarly, when the original USAID program officer took another position within the organization, she was able to join the TAG and continue to contribute to the program.

The MNHC Program benefited greatly from a TAG that was an active and crucial part of the program. The TAG's success was no doubt largely due to the unique characteristics of its members and their effective interaction. However, ICRW made special efforts to ensure the TAG's active participation, which also contributed to its success.

ICRW was careful to select TAG members who were senior professionals interested in the program's focus. Members with different professional backgrounds were selected to form an interdisciplinary group with complementary areas of expertise. ICRW staff also tried to use TAG members' time and expertise efficiently by keeping meetings as brief as possible and by sending pertinent information well in advance of meetings. TAG members were paid appropriate honoraria for their participation.

TAG members were not expected to review all the research proposals and reports. Instead, in reviewing proposals, each member was assigned a few proposals as the first reviewer and certain other proposals as the second reviewer. Each member thus focused on a limited number of proposals, and each proposal was guaranteed careful scrutiny by at least two TAG members. Similarly, each TAG member was assigned to help ICRW monitor one or two of the funded research projects throughout their duration. The TAG members were consulted about the appropriate "match" of projects with their professional interests and expertise. All TAG members reviewed the quarterly progress reports on their assigned projects, reported on them at TAG meetings, and provided ICRW staff with technical comments on the research as it proceeded. The TAG members were also very involved in the review of their assigned projects' final research reports. This system of assigning each TAG member the responsibility for several projects worked very well and helped ICRW ensure the quality of the research.

The most significant factor contributing to the TAG's success was probably the willingness of ICRW and USAID staff to follow the TAG's advice. The TAG's advice was used to decide disagreements or uncertainties about several major decisions, such as how to allocate the research funds, whether or not to emphasize capacity building and fund a high proportion of developing country research teams, and how best to disseminate the program's findings. This made it clear to the TAG that their role was important and their advice was valued.

Technical Monitoring and Program Management

ICRW used several innovative techniques to monitor the 20 research projects under the MNHC Program. Because of limited funding, ICRW staff could not rely on trips to the field to provide technical assistance to researchers or monitor the progress of projects. Instead, ICRW required quarterly technical and financial progress reports from each research team. TAG members reviewed the technical sections of these reports and helped ICRW staff prepare written comments, which were sent to the researchers. ICRW staff also relied on telephone conversations with researchers to discuss

unanticipated implementation problems and potential obstacles to the progress of the research projects. In a number of instances, ICRW staff performed literature reviews for researchers who had limited access to recent publications, and sometimes sent pertinent documents to the researchers to help them with their work. This assistance was time consuming, but inexpensive compared to field visits. In most cases it was sufficient to assure high-quality research results.

ICRW's contractual agreements with each grant recipient were based on the standard USAID cooperative agreement. The funded research proposal and any amendments constituted an agreement's scope of work. Standard financial reporting was required of each research project. As the quarterly financial reports often revealed useful information about the progress of the research projects, both financial and technical progress reports were considered in ICRW's on-going review of the projects.

The ICRW program staff originally included a program director (one-third time), a program administrator (full time), a senior researcher (one-half time), a research assistant (one-half time), a secretary (three-fourths time), and ICRW senior management (approximately one-eighth time). In the final phase of the program, this configuration was changed to permit more effective management. Two co-directors were assigned to the program full time, not only to manage it, but to provide technical monitoring, to organize the final conference, and to prepare the research report series and this synthesis paper. They were assisted by a senior researcher (approximately one-fourth time) and the rest of the research and secretarial team as noted above. Given the program's complexity, particularly in the initial and final phases, its staff was relatively small throughout. The effective use of a small staff contributed to ICRW's success in directing a high percentage of the MNHC Program's funds to the research projects rather than to administrative or managerial costs.

Although the staff time devoted to this program was relatively small, the program staff had a high degree of access to ICRW senior management and could rely upon well-developed internal management systems and operating procedures. The use of specially designed spreadsheet and data base files to monitor the program's budget and the individual research projects' budgets significantly facilitated the financial management of the program.

Dissemination of MNHC Program Findings

The information dissemination component of the MNHC Program focused on the preparation of three issues papers, an MNHC Program Research Report Series, and this synthesis paper; and on the program's final conference. These activities were undertaken to accomplish two objectives. First, ICRW wanted to ensure that important MNHC research results would be shared both among MNHC Program researchers and with other researchers interested in health and nutrition. Such exchange of information is important to avoid the duplication of research efforts, particularly given the limited

funding available for research on development issues. Second, ICRW hoped to reach out to policymakers and program planners, thereby encouraging the critical linkage between research and policy or action. Throughout the MNHC Program, dissemination efforts focused on reaching appropriate audiences in both developed and developing countries.

In consultation with USAID and the TAG, ICRW produced three issues papers on topics that complement the themes of the 20 research projects supported under the MNHC Program. These papers were written by ICRW staff members or consultants and underwent review by ICRW senior management, USAID staff, and TAG members prior to distribution.

Drs. Joanne Leslie and Geeta Rao Gupta wrote the first paper, *Utilization of Formal Services for Maternal Nutrition and Health Care in the Third World*. By means of an extensive literature review, this paper explores both the service and user factors that affect the use of services such as prenatal care, delivery care, and nutrition programs.

Drs. Barbara Pillsbury, Ann Brownlee, and Judith Timyan wrote the second issues paper, *Understanding and Evaluating Traditional Practices: A Guide for Improving Maternal Care in the Developing World*. This paper proposes a framework for understanding traditional care practices, evaluating their positive or negative effects on health, and using the information gained through such an evaluation to improve both formal and traditional maternal care.

Ms. Ellen Kramer, Dr. Nina Schlossman, and Dr. Geeta Rao Gupta wrote the third paper, entitled *Improving Nutrition Interventions for Women*. This paper highlights the importance of developing maternal and child nutrition programs that can be effective in reaching women despite the constraints on women's use of these services.

ICRW's production of the MNHC Program Research Report Series was an important aspect of efforts to disseminate the program's research findings. The series consists of the final research report of each project. Production of the series required a thorough review of each project's draft research report by ICRW, USAID, and the TAG; revisions by the authors; translation as necessary; and professional editing. Individual research reports or the entire series are available from ICRW.

As mentioned earlier, this synthesis paper presents information on the design and implementation of the MNHC Program, discusses the salient findings of the program, and identifies priority areas for future research on maternal health and nutrition.

Copies of the issues papers, research reports, and synthesis paper have been sent to USAID missions and selected health planners and policymakers who could not attend the final conference. In

addition, ICRW has requested that each MNHC Program researcher recommend ten developing country health professionals who could benefit from receiving the research reports. ICRW will also publicize the availability of these documents in international health and development journals and newsletters.

Finally, to promote further dissemination of the program's results, ICRW will continue to encourage and offer assistance to those researchers interested in publishing their research in local and international professional journals. ICRW staff will help review researchers' drafts, arrange for translation, and assist in the identification of appropriate international and developing country journals. Almost every research team has produced or will produce at least one article for submission to a journal. Fifteen articles documenting MNHC research projects have been submitted to journals to date, and at least five have already been published.

The final conference of the MNHC Program (February 28-March 1, 1990) provided an important mechanism for pursuing the program's dissemination efforts. Over 100 health researchers and other health professionals attended this two-day conference in Washington, D.C., at which all the researchers supported under the MNHC Program presented their findings.

The conference was intended to encourage an exchange of ideas between researchers from developed and developing countries who might not otherwise have had the opportunity to interact. Topics slated for discussion included MNHC research results and methodologies and future directions and priorities for maternal nutrition and health care research.

The format of the conference was designed to facilitate the discussion and comparison of MNHC research results by relying on panel presentations, grouped under common research themes, with moderators who helped to summarize, compare, and contrast the researchers' presentations. Closing sessions on both days focused on highlighting the potential policy implications of key research findings.

The final conference was complemented by a day of workshops on research methods and issues. Open only to program staff (including the TAG) and the researchers, ICRW staff and MNHC researchers conducted workshops on four topics:

- qualitative and quantitative research methodologies for nutrition and health research;
- strategies for moving from research to policy and advocacy;

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- methodological issues in nutritional assessment;
- health service delivery from a woman's perspective.

The conference schedule is presented in appendix E.

Impact and Other Applications of the MNHC Program Model

In less than three years, with a relatively modest budget of \$2.5 million, the MNHC Program identified and supported 20 high-quality research projects that have made significant contributions to knowledge about maternal nutrition and health care in developing countries. The MNHC model was quite efficient in funding and obtaining quality results from small research grants that would have been too costly administratively to fund through large bureaucratic organizations. Awarding small grants is advantageous for obtaining a variety of perspectives on a particular research issue or initiating research in a relatively new area. The program also produced several informative issues papers, encouraged the publication of valuable journal articles, and facilitated the dissemination of research findings and policy recommendations on a number of issues related to women's nutrition and health care.

Perhaps the most important impact, however, is that the MNHC model was effective in building research capacity in developing countries, although this was not the program's primary goal. Technical assistance from ICRW was an important contribution to capacity building, but the feature of the program most valuable for strengthening research capabilities was simply making funds available to research groups in developing countries. Small grants such as those provided through the program allow mid-level and junior researchers to hone their research skills and to train students and others interested in becoming researchers. Working with the developing country research groups funded by the program involved no more technical or administrative problems than did working with the program's collaborative teams, and the quality of their research results is at least as high as the quality of results obtained by the collaborative teams, which were often led by senior U.S. researchers.

Both the quality of the research results obtained through the MNHC Program and its effectiveness in capacity building have led to a great deal of discussion among ICRW staff as to how a similar model could be used to promote research in other areas of interest to ICRW. During the next year, ICRW will be formulating and seeking funding for applications of the model in such research areas as women's roles in environmental protection, the impacts of structural adjustment programs, and key issues in sustainable agriculture. Several ICRW projects have already adopted some aspects of the model in promoting research on women's response to the recession in Latin America, and women's work and health in West Africa. The MNHC Program has thus had the unanticipated effect of contributing to a reorientation of ICRW's research strategy.

The MNHC model is relatively flexible and is likely to be suitable for use with basic scientific research programs as well as with operations research programs, with small and medium sized grants, and with both narrowly focused and broad research topics in virtually any area of interest for researchers and policymakers. In the opinion of ICRW staff, however, one area of limited flexibility is the size of grants. Grants ranging from \$50,000 to \$100,000 seem to have been the ideal size, permitting researchers to undertake reasonably ambitious research projects and yielding quality research results in return for a solid, but not unreasonable, amount of technical monitoring and administration.

ICRW has two recommendations for improving this model in future applications. First, the time period for undertaking such a program should be longer than two and one-half years (the MNHC Program period) to allow more time for the grants competition, the actual research phase, and the preparation of final research reports. An extension of the program's time frame would allow program activities to take place over a longer period of time, but need not increase either the actual amount of staff time devoted to them or the program's cost. At least nine months should be allowed for the initiation of the grants competitions and the receipt of proposals, especially if the program seeks to attract proposals from the developing world. The length of time necessary for the research phase depends on the type of research funded (that is, primary data collection and analysis versus secondary data analysis). ICRW found that for the types of research supported under the MNHC Program, an 18- to 24-month research period would have been more appropriate than the 12 to 18 months actually allowed. Another nine months should be allotted for producing the final program documents and planning and executing the final conference. Thus, the ideal program would require a total of 18 months plus the number of months allocated for the research phase.

Second, the development of research capacity should be an explicit goal of such programs, and the grants competition announcement should state that the program seeks to fund mid-level and junior researchers from the developing world. This would allow the implementing organization and the TAG to use developing country status and the participation of junior researchers as selection criteria for proposals and would provide an important justification for the use of program funds to provide training and technical assistance to the researchers.

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2. MATERNAL NUTRITIONAL STATUS AND DIETARY ENERGY INTAKE

To date, most research on maternal nutrition and health has focused on children's welfare. Only recently have researchers recognized women's nutrition and health as a priority in its own right. Women, like children, are particularly vulnerable to developing nutritional problems. Most women have multiple roles within their family and community. They are often pregnant or lactating with little time to recuperate before the next pregnancy. They prepare food, shop, clean, obtain health care, and care for children and others. They also perform productive activities in agriculture, in the marketplace, in a factory, or elsewhere. The numerous demands on women's time and energy under conditions of poverty can lead to nutritional stress and poor maternal nutritional status.

There are many gaps in knowledge about maternal nutrition, even on such basic issues as: how to measure anthropometrically the nutritional status of adult women in the most appropriate way during times of rapid tissue change such as pregnancy and lactation; how to assess the prevalence of undernutrition of women; and what the measurable functional outcomes of chronic undernutrition are. However, many of the crucial environmental determinants of poor nutritional status and dietary intake of children living in poor communities have been identified and much of this knowledge will be useful in investigating the determinants of poor nutrition in women. Likewise, researchers have explored the relationship between maternal nutritional status and health outcomes for the child, particularly birthweight, growth, and mortality. These data also will be useful in examining the determinants of maternal nutrition.

The two outcome variables measured in these projects were maternal nutritional status and maternal dietary energy intake. Background information on these variables is provided in the next two sections. Ten of the twenty projects funded by the MNHC Program focused on maternal nutrition. Results from these projects are described in the following sections: Determinants of Maternal Nutrition, and Program Issues Regarding Maternal Nutrition.

Nutritional Status

Attention to maternal nutritional status as an outcome variable is relatively new. Thus, the discussion that follows concerns the measurement of maternal nutritional status as an outcome variable, which differs from maternal nutritional status as a determinant of outcomes related to the child (for example, birthweight, breastmilk intake, growth). Figure 1 shows some important factors that influence maternal nutritional status. Several of the MNHC Program researchers investigated the proximal determinants (frequent reproductive cycling, lactation, and maternal activities and energy expenditure) of maternal nutritional status as illustrated in the figure. Other

MNHC investigators examined distal determinants (work, income, social status, and seasonality) not shown in the figure.

Nutritional status can be assessed from biochemical levels and stores of vitamins, minerals, and amino acids; from clinical signs of deficiency; and from anthropometric measures of body tissue stores of energy and protein. This chapter emphasizes the latter.

Weight and height usually are the minimal anthropometric measures used to assess a person's nutritional status. However, for a pregnant woman, weight is not a good indicator of underlying nutritional status because weight is composed of fetal tissue, as well as maternal tissue. Measures of limb circumferences and fatfolds avoid the problem of including fetal components and give information specifically about maternal body composition, but have not been used extensively in investigations of maternal nutritional status. Fatfold thicknesses are not easy to measure reliably; standardizing measurement techniques and training anthropometrists require time and expertise. The magnitude of changes in the measures are small, therefore imprecisions can easily obscure meaningful relationships.

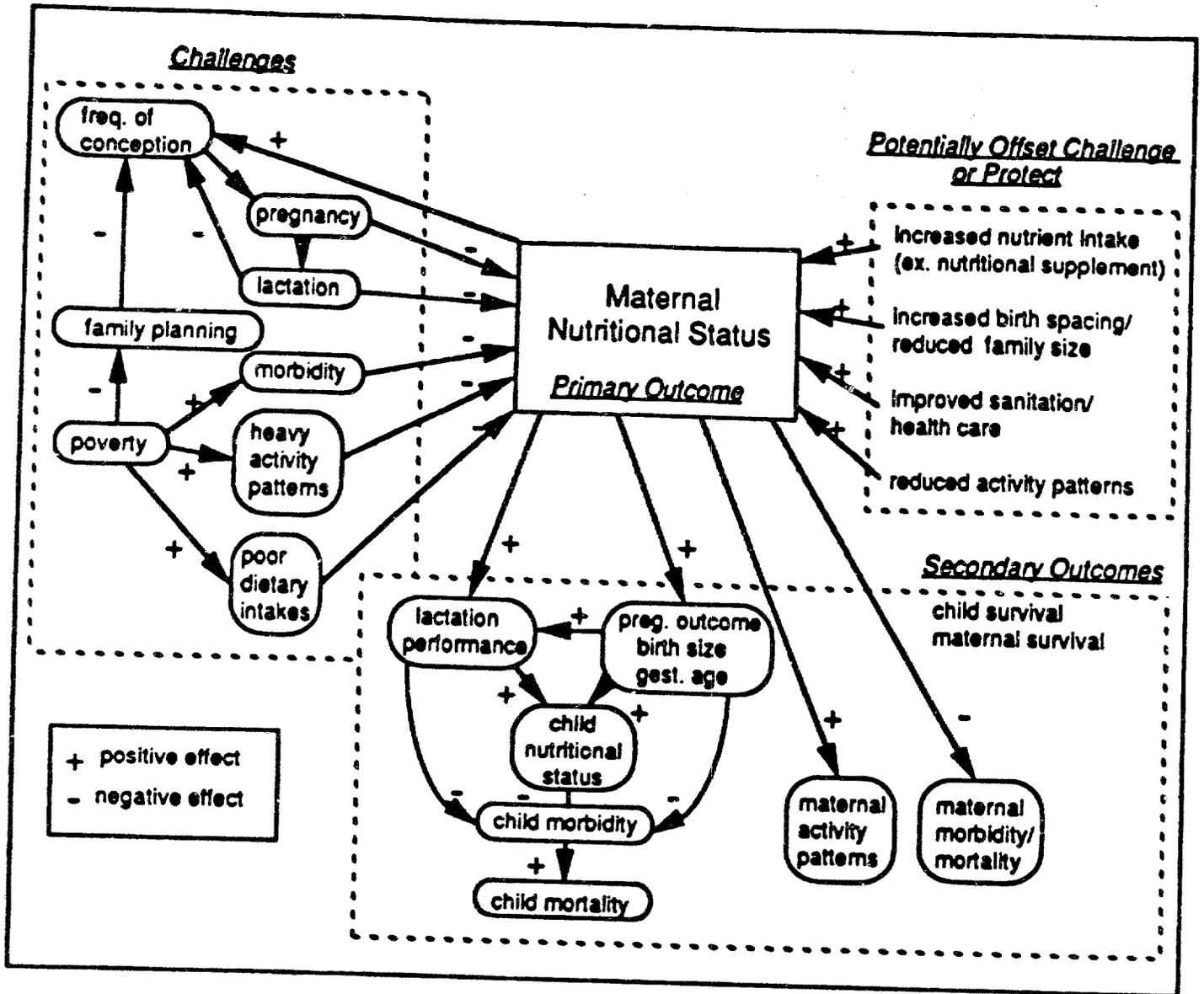
Reference data for fatfold measurement sites and methods for estimating total body fat from fatfolds have not been developed for pregnant women. Thus, investigators have applied reference data and methods of body fat estimation for nonpregnant, nonlactating women to pregnant women, despite indications that body fat distribution is altered during pregnancy. Most of the MNHC investigators measured height, weight, triceps fatfold, and mid-upper arm circumference, although two also assessed iron status, and one focused on thigh fatfold.

Dietary Energy Intake

Dietary energy intake is a crucial component of energy balance and determinant of nutritional status, therefore it was an important outcome in many of the research projects. All the MNHC researchers who assessed women's dietary energy intake used the 24-hour recall method except Tucker and Lamba, who used the individual weighing method for two consecutive days of observation.

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Figure 1. Factors Influencing Maternal Nutritional Status



Adapted with permission from Merchant and Martorell, 1988.

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Dietary intake is most commonly assessed using the 24-hour recall method. This method is considered to give a reasonably accurate estimate of the intake of populations, though not of individuals. Because it is based on what people remember eating instead of what investigators observed them eating, it is considered less accurate than the weighed food intake method (Sanjur 1982; Pekkarinen 1970). However, the 24-hour recall method is less expensive, less invasive, and less likely to bias consumption than the weighed food intake method. Brown and his colleagues confirmed the accuracy of data from 24-hour recall interviews with data from the weighed food intake method on a subsample.

Tucker and Lamba used the weighed food intake method because some cultural groups in Malawi consider that only the staple and relish are food, and may report that no food has been prepared or eaten if these are missing. In addition, most households eat from a common pot, making recall of portion size difficult. Thus, the researchers thought direct observation was the appropriate method of measurement in Malawi.

Of the ten MNHC Program projects that focused on nutrition, six investigated one or more potential determinants of maternal nutritional status or maternal energy intake, and four investigated program issues. Research results pertinent to these issues are discussed below. Appendix A contains summaries of each of the projects.

Determinants of Maternal Nutrition

The determinants of maternal nutritional status or maternal energy intake that the MNHC Program research projects considered were frequent reproductive cycling, lactation, high energy expenditure, work and income, women's social status, and seasonality.

Frequent reproductive cycling

Women in developing countries are pregnant, lactating, or both during large portions of their reproductive years, possibly with detrimental effects on their nutritional status. Some researchers have used the term "maternal depletion syndrome" to refer to these repercussions on maternal health (Jelliffe and Maddocks 1964), but others question whether this characterization is appropriate (Winikoff and Castle 1987; Winikoff, 1983; Careal 1978). In the nutritionally-based model of maternal depletion, investigators hypothesize that the greater energetic and nutrient demand on the mother during pregnancy and lactation compromises her nutritional status when she undergoes many cycles of pregnancy and lactation within a short timeframe under conditions of relatively poor dietary intake (Jelliffe and Jelliffe 1978). Social and environmental stress due to the increase in family size that results from frequent reproductive cycling may accompany the increased biological stress on the mother. Specifically, the increase in family size further limits

the mother's time and money resources, potentially reducing the quality of care of the children while increasing the mother's burdens.

Biological systems will attempt to compensate for the energetic stresses imposed by reproduction through various strategies, such as increasing intake, mobilizing stores, metabolizing food more efficiently, and/or decreasing physical activity. Some researchers have even suggested that stores are acquired early (during pregnancy) in anticipation of later need (late gestation and lactation). This suggests a high level of organization and control in the biological system.

Only when this system of coordinated nutrient flow is particularly stressed are depleting effects likely to be observable. Therefore, in the study of maternal nutritional depletion, considering situations of particularly high stress is important. Frequent reproductive cycling in a context of poverty is one such situation. One important aspect of frequent reproductive cycling is close birth spacing. This shortens the recuperative (nonpregnant nonlactating) interval in a reproductive cycle. In some cases the recuperative interval may be eliminated entirely when breastfeeding the previous child continues into a subsequent pregnancy. The project conducted by Merchant and her colleagues focused on the energetic stresses of lactation concurrent with pregnancy.

Merchant and her team used a longitudinal data set from a supplementation trial conducted in four Guatemalan villages from 1969 to 1971 to examine the prevalence of and responses to lactation concurrent with pregnancy and short recuperative intervals. The team found a high prevalence of overlap of lactation with pregnancy: 50.2 percent, or 253 of the 504 Guatemalan women studied. The mean supplement intake of women who experienced the overlap of lactation with pregnancy was higher than that of women who did not experience overlap. These differences persisted when examined across pregnancies in the same woman and after controlling for the short birth interval in the analyses. In addition, overlap seemed to affect fat stores negatively. By pairing consecutive pregnancies within women, the researchers could control for inherent characteristics of the mothers that could confound the relationships of interest. Their results indicate that overlap is the most stressful, short recuperative interval follows, and long recuperative interval is the least energetically stressful on the mother.

These data provide some evidence of the chronic effects of frequent reproductive cycling. Women with long recuperative intervals (six months to eight years between the end of lactation and the beginning of the next pregnancy, with a mean of almost four years) had measurably higher fat stores than women with short recuperative intervals. In addition, women who experienced long recuperative intervals had significantly lower supplement intakes than women

who had short recuperative intervals. These differences persisted across consecutive pregnancies in individuals.

The Guatemalan supplementation trial made food supplements available *ad libitum* for the entire eight years of the study period. Supplementation centers in each village served the supplement drink twice daily between meals. All villagers were free to consume as much of the supplement drink as they wished. Yet despite this, the stress of frequent reproductive cycling was demonstrated.

Lactation

Lactation imposes metabolic energy demands on women who choose to breastfeed. Women are expected to meet these demands both by increasing their dietary energy intake (500 kcal above nonpregnant, nonlactating women according to the 1985 FAO/WHO/UNU recommendation, and 200 kcal above the recommendation for pregnant women) and by mobilizing fat stores laid down during pregnancy. Accordingly, women are expected to lose weight during lactation, returning gradually to their preconception weight. If women have adequate prepregnant nutritional status and do not lose more weight during lactation than they gained during pregnancy, then lactation will not compromise maternal nutritional status.

However, women whose nutritional status was poor before and/or during pregnancy often do not meet the metabolic energy demands of lactation. They may not increase their dietary energy intake during lactation and may not have gained much weight during pregnancy that contributed to their fat stores (Durnin et al. 1987). Thus, despite the known positive effects of lactation on child health and survival and on length of birth intervals, lactation may be a determinant of poor nutritional status during this part of a woman's reproductive cycle. Little information is available to judge the extent of this possible negative effect of lactation on maternal nutritional status.

An important potential confounding factor of the relationship between lactation and maternal nutritional status postpartum could be maternal nutritional status at parturition. Studies in which this initial status cannot be adjusted for in the analysis, for example, cross-sectional studies, would not be adequate to assess the effect of lactation on maternal nutritional status. However, the three MNHC studies described below that addressed this issue had longitudinal designs and could adjust for initial differences in maternal nutritional status.

The study by Adair and her colleagues addressed the potential negative effect of lactation on maternal nutritional status among women from 33 urban and rural villages in the Metropolitan Cebu region of the Philippines. The team followed 3,080 women from the third trimester of pregnancy until 24 months postpartum. Dietary intake was estimated once during the third

trimester and at 2, 6, and 14 months postpartum using 24-hour recall interviews. Anthropometric indicators (weight, height, triceps skinfold thickness, and mid-upper arm circumference) were measured bimonthly throughout the study. Women were identified as fully breastfeeding, partially breastfeeding, or not breastfeeding according to the week the mother introduced supplemental foods to the breastfeeding child and the week she ceased breastfeeding respectively.

The majority of women (89 percent) breastfed their infants. In the urban villages, 2,003 women breastfed while only 299 did not, and in the rural villages, 686 women breastfed while only 30 did not. (Nonlactating women were those who never initiated breastfeeding or who breastfed only up to seven days.) Women in the whole sample had an average age of 26 years and had the following average anthropometric measurements at parturition: weight 50 kg, height 150 cm, body mass index (BMI) 22 kg/m², and triceps skinfold 12 mm. In the urban areas, nonlactating women were heavier and taller than lactating women ($p < 0.01$), though BMI values were not significantly different between nonlactating and lactating women.

Adair and her colleagues found that lactation contributed to maternal weight loss postpartum, after controlling statistically for initial weight differences between lactating and nonlactating women and for other variables. This effect of lactation was different for urban and rural women. For urban women, those who lactated lost significantly more weight (2.3 kg) than those who did not lactate, regardless of length of lactation. Furthermore, those urban women who lactated for more than 12 months lost 3.1 kg more than urban women who did not lactate. Also, the negative effect of full lactation on weight among urban women was greater than the negative effect of partial lactation.

Rural women tended to lose less weight during lactation than urban women, about 1.0 kg if they lactated for longer than 24 months. When data on the rural women were analyzed in the same way as those for urban women, the effects were not statistically significant. This suggests, overall, that lactation did not have a negative effect on maternal weight among the rural women, or at least not as large a negative effect as among the urban women.

Consistent with the negative effect of lactation on maternal weight, the researchers found that lactation did not significantly affect women's dietary energy intake, both in the urban and rural areas. Lactating women did not have higher energy intakes than nonlactating women. The higher energy demands of lactation were met in part by mobilizing energy from maternal fat stores.

Results from the study by Merchant and her colleagues on rural Guatemalan women are consistent with those of Adair's team. They found that the Guatemalan sample had worse

nutritional status during a subsequent pregnancy if they had recuperated for a shorter time from the previous pregnancy and lactation. This suggests that lactation can be a negative determinant of maternal nutritional status if dietary energy intake (or other compensation) is inadequate to meet the energy demands of breastmilk production.

Results from the study by Brown and his colleagues on rural Bangladeshi women, though incomplete and therefore not discussed here in detail, suggest that this group managed to gain a small amount of weight during the course of lactation. They managed this by maintaining a level of energy intake (2,135 kcal/day) close to that recommended for lactating women of their size. Thus, whether lactation is a determinant of poor maternal nutritional status may vary among and within populations, depending on the ability of women to compensate for the increased energy demands of lactation.

Energy expenditure

Energy expenditure for physical activities and work is a significant component of energy balance for poor women in many developing countries, especially rural women. Obtaining household necessities such as water and fuel is generally arduous and usually the responsibility of women.

The energetic cost of physical activity is difficult to measure accurately over time in a natural setting without altering normal activity. Largely for this reason, it is the most neglected component of energy balance in nutritional research. This is an important weakness in situations where the physical demands are high. The most common approach to measurement has been to record activity through diaries or activity recall. The researchers then compare the time spent on various activities between groups and individuals, or between physiological states of interest. For example, investigators have examined the change in activity patterns associated with various stages of pregnancy and/or postpartum.

The study by Tucker and Lamba addressed issues of time use and energy expenditure among Malawian female subsistence farmers. Their first objective was to investigate the impact of work patterns and the extent of physical exertion on the third trimester and postpartum nutritional status of pregnant mothers. The physically demanding lifestyle of the women makes Malawi an appropriate setting for this research. The double burden of physical labor and reproductive roles may jeopardize maternal nutritional status, particularly when dietary intake is inadequate. Tucker and Lamba describe two major mechanisms through which work and activity patterns may affect women's nutritional status: the heavy agricultural work raises her nutritional requirements, particularly during pregnancy, and the time constraints negatively affect her dietary practices and health-seeking behavior.

Tucker and Lamba observed activity patterns for two consecutive days at three points in time: approximately mid-pregnancy (25.3 weeks), late pregnancy (33.3 weeks), and following the delivery (8.8 weeks postpartum). They recorded the women's activities to the nearest minute, in an open-ended fashion. They used 63 categories of time use, allowing both for the specificity needed to assign energy expenditure factors and for regrouping by activity category. They also collected data on two days of food intake observation, anthropometry of the mother (mid-pregnancy, late pregnancy, and postpartum), and birthweight of the newborn. In addition, they administered general questionnaires and conducted several interviews. They have completed initial observations for 78 women, second observations for 57 women, and postpartum measures for 42 women, and data collection is continuing. Even though their work is not finished, the investigators have been able to tabulate extensive descriptive and summary statistics and provide much valuable information. They will test their hypotheses following further data collection.

Preliminary findings suggest that women's time use in 11 activity categories remained relatively constant across the three time periods of mid-pregnancy, late pregnancy, and postpartum. Other researchers have observed this lack of change in activity patterns during pregnancy and lactation in diverse settings (Jimenez and Newton 1979).

Converting the time use data to quantitative estimates of energy expenditure using previously published values (Lawrence et al. 1987; FAO/WHO/UNU 1985), the researchers estimated mean energy expenditures to be 2,485 kcal/day for mid-pregnancy, 2,477 kcal/day for late pregnancy, and 2,389 kcal/day at two months postpartum. These values include energy due to basal metabolic rates estimated on the basis of height and weight using previously published equations (FAO/WHO/UNU 1985). The mean values for basal metabolic rate were calculated to be 1,316, 1,316, and 1,307 kcal/day for mid-pregnancy, late pregnancy, and postpartum, respectively. Using an estimated energetic cost for feto-placental tissue or milk production (200 and 500 kcal/day, respectively, FAO/WHO/UNU 1985), Tucker and Lamba estimated total energy expenditure in this sample of women to be 2,685 kcal/day for mid-pregnancy, 2,677 kcal/day for late pregnancy, and 2,889 kcal/day at two months postpartum. These values are high relative to a sample of pregnant U.S. woman engaged in light occupations, including homemakers who use mechanical appliances. These show mean energy expenditures of 2,115 kcal/day for 20 to 28 weeks of gestation, 2,275 kcal/day for 29 to 36 weeks of gestation, and 1,852 kcal/day for 8 to 12 weeks postpartum lactating (Blackburn and Calloway 1976). Tucker and Lamba also observe that time use and energy expenditure vary by season, which is discussed later.

Work and income

Women's work and income can be hypothesized to have either positive or negative effects on maternal nutritional status and maternal dietary intakes. Income a woman earns, particularly if

she has control over how it is spent, may allow her to purchase and consume more food than if she has no income. Evidence from some cultures suggests that maternal income is more likely to be spent on family food consumption than paternal income (Safilios-Rothschile 1980; Guyer 1980). However, the income-generating work may require increased energy expenditure that exceeds any increase in energy intake, or long hours may mean that women do not have time to avail themselves of health services and nutrition programs. All these factors play a part in determining whether women's work and income has a positive or negative effect on maternal nutrition. Two MNHC projects investigated this topic.

Adair and her colleagues investigated the effects of work and income on maternal nutritional status and maternal dietary intake among women from the Metropolitan Cebu region of the Philippines. Work status was defined as whether or not a woman had worked for pay or in a family business during the previous week (a dichotomous variable). The team estimated weekly income, wages, and pay in kind during a four-month period and deflated them to a baseline index. They tested the effects of both work status and income on maternal nutritional status and maternal dietary intake, for both urban and rural women. Neither work nor income was significantly associated with maternal nutritional status among urban or rural women.

Among rural women, work had a greater effect on dietary energy intake than did the amount of income, suggesting that rural income might not vary enough to affect women's dietary energy intake differentially. By contrast, among urban women, the amount of income was a stronger determinant of dietary energy intake than whether or not the women worked.

For urban women the effect of income was positive: an additional 200 pesos (US\$10) per week was associated with an increased intake of about 250 kcal/day. The researchers suggest that the increased earnings must have been accompanied by women's ability to control their income in such a way that they could obtain additional food. For rural women, however, the effect of work was negative: working women consumed about 250 kcal/day less than nonworking women. The researchers suggest that the negative effect of work on energy intake may be related to the kind of work performed. The amount of income rural women earned may not have been adequate in terms of extra purchasing power of food for them to compensate for either the increased energy expenditure or the long hours worked.

Results from the study by Samarasinghe and her colleagues among Indian Tamil female tea plantation workers in Sri Lanka in part concur with the positive effect of women's income on maternal dietary intake found by Adair and her team among urban women in the Philippines. Although all the women in the Sri Lankan study worked and most had marginal nutritional status

and dietary energy intake, women with slightly higher incomes reported being involved in more decisions about expenditures than women with lower incomes.

Women's social status

A woman's status, both as she perceives it and as it is perceived within the household and the community, may be negative, and within the context of poverty, may contribute to her poor nutritional status. This might occur, despite the opportunity to work and earn an income, in a variety of ways: she may not have any say in her workplace; she may not exert any control over income she earns; she may not be involved in decisionmaking in the household; she may not perceive that she has even limited control over her own health and nutritional status; and within the household she may be considered the least important person to receive adequate meal portions. Many of these conditions are associated with little or no formal education. In the absence of poverty, negative social status might be experienced without undue effects on maternal nutritional status, but when food and other basic welfare items are insufficient on a continual basis and the bias against a woman's welfare occurs on a continual basis, her nutritional status may ultimately suffer.

As Samarasinghe and her colleagues argue, this was the situation among the Indian Tamil female tea plantation workers in central Sri Lanka, especially when they were pregnant or lactating. Poor nutritional status was a function of their poor social status, despite personal income levels above the poverty level and the availability of health care services. (Poor nutritional status of pregnant women also may be influenced by dietary intake purposefully limited according to the belief that the fetus will be smaller and the childbirth easier.)

The sample for the study was 411 female tea plantation workers from 22 plantations in Nuwara Eliya district in central Sri Lanka. From each plantation, the team recruited three or four Indian Tamils from the following categories: pregnant women, lactating women, unmarried young women, old women, and men. They also recruited five Sinhalese women, who were resident labor, from each plantation. The study was cross-sectional, with each participant measured and interviewed once. In addition to the tea workers, the researchers interviewed senior management personnel and health workers to ascertain the level of control women had over their incomes, the working conditions, the attitudes of management, and the availability and nature of health services.

The team estimated dietary intakes for the entire sample from 24-hour recall interviews. Results were reported as energy intake from cereals (rice, wheat flour, and breads) as a proportion of Sri Lankan recommendations. The dietary intake data reflected that the Indian Tamil pregnant and lactating women consumed less than the recommended amount of cereals (8.3 percent and 7.8

percent below, respectively), while the Indian Tamil young women, old women, men, and the Sinhalese women consumed more than the recommended amount of cereals (4.1 percent - 30.0 percent above). The pregnant women consumed less than the young and old women (nonpregnant and nonlactating), while the lactating women consumed only slightly more than the young and old women.

Nutritional status was assessed for all subjects on 10 of the 22 plantations with anthropometric indicators (weight and height) and clinical examination of the eyes and tongue for anemia. The nutritional status data reflected that the Indian Tamil women were shorter and lighter than the Sinhalese women. Anemia was prevalent in all women except the young ones (15.4 percent of the total sample).

Samarasinghe's team concluded that the Indian Tamil female tea workers had insufficient diets compared to the Indian Tamil male tea workers and the Sinhalese female workers, and had poor nutritional status compared to the Sinhalese female workers. The researchers described qualitatively the factors that they believe affect the nutritional status of the Indian Tamil female tea workers: 1) they were not educated because they began work on the plantations at the age of 14, which meant they were illiterate and did not understand health care; 2) their earnings were controlled by (even paid to) male members of the household; 3) as Indian Tamils, they are culturally isolated and had lower status than other women with the same or lower incomes; 4) they have considerable time constraints, working long hours six days a week and having the major responsibility for household work, which leaves them little time to pursue their own health care; and 5) they do not buy the household's food because the food markets are too far from the plantations, which results in a nondiversified diet low in protein. Taking all these factors into account, Samarasinghe and her colleagues make a number of policy recommendations. Most relate to plantation management and administrative policies that would ease the burden on their female employees.

Seasonality

In developing countries, seasonality appears to be an important factor in food availability (Sahn 1989; Lawrence et al. 1987, Adair and Pollitt 1983; Prentice et al. 1981). This is true not only in the rural sector, which relies heavily on household production of food, but also in the periurban sector, where the price of food obtained in the marketplace varies with the season. Four of the MNHC Program studies examined the effect of seasonal patterns on women's energy intake, energy expenditure, and nutritional status.

Periods of greatest nutritional stress for rural women who perform agricultural work typically occur just before the harvest, when energy intake is at its lowest because household food supplies

are low and energy expenditure is at its highest because of preharvest agricultural labor. Periods of greatest nutritional stress for urban women typically occur when food prices are highest, which depends on marketing patterns as well as the timing of the harvests.

Fakambi's study in southern Benin describes the effects of seasonal changes in food availability on maternal nutritional status (especially weight and BMI) for both rural and periurban women. He found that food availability for rural women depended on the harvests and for periurban women depended on the prices of basic food items. This study was conducted among women who attended the Ouando Center for Horticulture and Nutrition. All the women included in his analysis on seasonality (366 from rural areas and 201 from a periurban area) had children up to three years old who participated in the growth monitoring program. The women included in the analysis were lactating, but none were pregnant.

Fakambi collected data on weight and BMI in November (Phase I) and again in May and June (Phase II). The average weight for all women was 54 kg and average BMI was 21.5 kg/m². The results showed that the rural women gained weight (25 percent gained more than 2 kg) and had increased BMI from Phase I to Phase II, whereas the periurban women lost weight (25 percent lost more than 2 kg) and had decreased BMI (though the decrease was not statistically significant).

The different effects of seasonal patterns explains why the rural women's nutritional status had improved and the periurban women's had decreased during the same month. For the rural women, Phase I (November) was the "famine month." The previous crop had been harvested four to five months previously (June-July), following the long rainy season (March-July). Although this was the larger of the two yearly harvests, much of the crop was sold because of storage problems during the intervening humid months, hence household stocks were low. Thus, during Phase I, rural women had low weight relative to other times in the year. In December the second crop was harvested following the short rainy season in October and November. Although this harvest was smaller, most of the crop was stored during the subsequent dry season (December-February), thus food was available until the next June-July harvest. Thus, during Phase II (May-June), rural women weighed more than during Phase I (November).

The pattern among periurban women was different. For them, household food availability depended on the prices of basic foods, which in turn depended on their relative supply in the market. During Phase I (November) food prices had been relatively low and supply high since the June-July harvest because of sales by rural people and supplies of middlemen. Thus, during Phase I (November), periurban women could afford to buy an adequate amount of food and had high weight relative to other times of the year. From November, food prices rose gradually to

their peak in April as the food supply from the June-July harvest was depleted. The second harvest had little bearing on food prices in the periurban market because the rural people stored most of this crop and kept it for home consumption. Thus, by Phase II (May-June), periurban women weighed less than in Phase I (November). Overall, Fakambi's study shows not only that seasonal patterns can have a biologically and statistically significant detrimental effect on maternal nutritional status, but that the seasonal effect can differ dramatically between rural and periurban women who depend on the same harvest.

Tucker and Lamba's study of pregnant subsistence farmers in Malawi also found that seasonal patterns had a detrimental effect on maternal nutritional status. They found that women expended the most energy during the rainy season prior to the single annual harvest: 2,600 to 2900 kcal/day depending on the term of pregnancy. This was also the period during which their energy intakes were the lowest: only 55 percent of standard requirements.

The study by Brown and his colleagues among periurban women in Bangladesh reports a seasonal pattern on women's dietary energy intake. Women consumed significantly less (250 kcal/day less) just before the harvest than during the postharvest months. Similarly, their weight showed the most negative change just before the harvest, although the difference between the seasons was not statistically significant. The change in arm circumference was the most negative in a slightly earlier period, and this change was marginally statistically significant ($p = 0.04$). Unlike Fakambi's results on periurban women, the energy intakes of Bangladeshi periurban women corresponded to the harvest in the same way as rural women. This suggests that the marketing pattern may be quicker or more direct in Bangladesh than in Benin. Thus, the effects of seasonality are location dependent.

The study by Adair's team found that rural women in the Philippines weighed significantly less during the wet season than during the dry season, which is consistent with the other studies. However, they did not find this seasonal effect among urban women, and no significant effect of seasonality on dietary energy intake was found for either rural or urban women.

Program Issues Regarding Maternal Nutrition

As mentioned earlier, three of the nutrition-related MNHC Program projects focused on program issues. Two of the projects used a research framework to evaluate innovative nutritional aspects of on-going programs. The other project used data from previous research to identify factors associated with compliance and participation in two very different nutritional supplementation trials, one conducted in Indonesia and the other in Guatemala.

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Innovative programs

The research project conducted by Huffman and her colleagues evaluated the effect of community kitchens (*comedores comunales*) on women's dietary intake and activity patterns within a Peruvian urban slum. Operationally, these investigators carrying out an evaluation with adequate sample sizes of women was difficult, particularly comparing the *comedor* community with a control group (*comedor* community N=22, control community N=13). In addition, the tremendous economic difficulties experienced by Peru during the study period (inflation over 100%/month) made conditions fluctuate so dramatically that drawing comparisons over time was extremely difficult. The researchers concluded that the effects of small-scale communal projects, such as the *comedor*, may be underestimated. In addition, because of difficulties in developing a computer program to convert foods into nutrient equivalents, preparation of the nutrient intake data is still going on and these data are not yet available for analysis.

Despite limitations, this project provides very useful information about the development and operation of *comedores* in urban slums of Lima, Peru. The *comedores* are sites where women take turns cooking food together. They can eat their food rations on site or take them home. Huffman and her colleagues report that the first *comedores* were created in 1979 when inflation was over 100 percent per year. During this period, diverse women's groups, especially mothers' clubs, were organized to receive donated commodities. Instead of dividing the ration to be taken to individual homes, these groups decided to combine the rations to cook together for families. The number of *comedores* has grown from 100 in 1981 to approximately 1,300 at the present time. In a large-scale sense, the spread of *comedores* demonstrates their popularity and their success in easing the slum dwellers' burden of poverty and inflation.

Within the community evaluated by Huffman's research team, between April 1988 and April 1989, participation in the community kitchen allowed women to save time on tasks related to meals. After one year of participation, women in the *comedor* community spent 0.6 fewer hours on meal tasks than they had at the beginning of the year, while women in the control community spent 0.2 hours on meal tasks. Assuming that the *comedor* and control communities were similar, so that without the *comedor*, women in the *comedor* community also would have spend 0.2 more hours on meal tasks after one year, the net savings in time on meal tasks to women in the *comedor* community after one year was 0.8 hours.

The investigators found evaluating the effects of the *comedores* difficult given Peru's economic situation at the time of the study. They report annual inflation rates of 114 percent in 1987, 1,700 percent in 1988, and 2,755 percent in 1989. Participation in the *comedores* decreased when food prices including rations from the *comedor* were increased dramatically throughout the

country, but participation increased when food prices dropped due to an increased supply of donated and subsidized food.

The researchers document that women were more likely to use the *comedor* than men or children, however, this is not surprising since women were responsible for its operation. Also, because women could purchase rations to take home and use in the evening meal, the higher use of the *comedor* by women did not necessarily imply a correspondingly higher dietary intake for women relative to men and children.

The researchers suggest that community based projects to improve maternal nutritional status may be more effective than clinic based services in reaching women because they can more easily overcome the barriers of access to formal care (distance, time, cost, acceptability, etc.). Additional factors likely to contribute to the success of this *comedor* project is that it was initiated and is controlled and maintained through community leadership and involvement. The researchers also suggest that this program can help improve the status of women because of the leadership roles created for women within the community. The *comedor* was managed and operated entirely by women in the study community. The investigators report that many of the *comedores* have organized training courses, literacy groups, and nutritional education sessions.

Another MNHC Program research project that studied an innovative nutrition program was conducted by Roesel and his colleagues in a Thai camp for Khmer and Vietnamese refugees. The refugee camp program is similar to the Peruvian community kitchen program in that the refugees themselves manage the camp's services, such as basic rations, a supplementary ration program, hospital and outpatient services, sanitary services, and educational programs.

Roesel's team used a quasi-experimental framework to test the effects of a nutrition education intervention aimed at increasing the weight gain during pregnancy of women in the camp. They perceived a need for improved education about adequate weight gain during pregnancy. They hypothesized that on-going education efforts were largely ineffective because of a lack of feedback and participant involvement. Pregnant women at five health centers were assigned to the control (N=486) or intervention (N=488) group. A substantially revised method of education that emphasized participation, counseling, and feedback was given to the intervention group. The control group received the previous education method with a few minor revisions.

One of the investigators' notable innovations is their use of focus groups to develop their educational intervention. By obtaining input from the recipients of the intervention (pregnant women and their husbands) in an open but structured framework, the investigators were able to

incorporate the suggestions of their target population effectively into the design of both the educational messages and the pedagogical approach.

The focus groups provided valuable information, both about current beliefs and behaviors and potential techniques for influencing change in detrimental beliefs and behaviors. For example, the focus groups indicated that a "good wife" is considered to be a woman who serves her husband first, followed by her elders and her children and only then herself. Only the husband can change the distribution pattern. They also revealed that credible information sources to women during pregnancy are first their husbands, then Western physicians and nutrition education teachers. Also, the women preferred more time for discussion in education sessions. The researchers made changes in the educational approach based on these insights.

The intervention group scored significantly higher than the control group on a test of knowledge about dietary intake during pregnancy. Exposure dependent effects were seen. The incidence of low birthweight was lower among those who had completed three or more months in the program. Women in the intervention group had significantly higher average weekly weight gains, however, a corresponding higher incidence of high birthweight infants (over 4,500 g) was not observed. The investigators conclude that with as little as one month of focus group investigations, testing of messages, and using feedback about the adequacy of weight gain, the impact on health can be significantly improved.

The authors evaluated the accomplishments of their intervention both in terms of impact on weight gain and incidence of low birthweight, and in terms of participants' reactions and opinions. It was not only the content and objectives of the education itself, but also the process used to develop the educational approach and materials which contributed to this innovative program.

Issues in program participation

Investigators recognize that drop-outs, nonrespondents, and nonparticipants can be important sources of bias in research. Generally researchers try to describe the reasons for such losses to characterize potential bias, yet little systematic effort has been devoted to minimizing nonparticipation. Certainly ad hoc efforts to improve the acceptability of the service or product being provided occur in the process of data collection and program implementation, but frequently these changes are made only in response to a problem as it occurs rather than through any anticipation or intentional effort to gain adequate knowledge about a target group's attitudes, behaviors, and concerns.

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Rasmussen's team conducted analyses of two data sets to contrast and compare compliance issues such as nonparticipation. The data sets were collected from two maternal supplementation trials: the Indonesian East Java Pregnancy Study (EJPS) and the Guatemalan community supplementation trial conducted by the Institute of Nutrition of Central America and Panama (INCAP). In both studies, supplementation was targeted to pregnant women though its distribution differed.

Data sets usually contain relatively little information about nonparticipants. Rasmussen's team found this to be an intractable problem in their efforts to identify the determinants of nonparticipation. A clear-cut conclusion from the experience of these investigators is that the crucial information needed to address questions of nonparticipation cannot be obtained in the usual course of a project, and therefore cannot be addressed adequately unless such questions are stated objectives within the study design and research protocol and information is gathered on nonparticipants.

However, within various levels of participation, Rasmussen and colleagues were able to identify some corresponding patterns of characteristics that were predictive of participation. Certain characteristics were predictive of participation in both studies, but with opposite relationships. For example, socioeconomic status was positively associated with participation in East Java but negatively associated with participation in Guatemala. In East Java, the wealthier, better-fed women were more likely to participate while in Guatemala, women who were of lower socioeconomic status and literacy levels were more likely to participate. This could be due to the different forms of recruitment into the study and delivery of the supplement. In the Guatemalan intervention trial, participation was encouraged for all members of the community, not just pregnant women. In addition, the food supplement was prepared and served twice daily in a village center in the form of a typical food or drink. In East Java, the supplement was presented as a healthful "tonic" specifically for pregnant women. To partake of this intervention, a woman may need or want to improve her condition. Women were recruited among those attending a prenatal clinic. Appetite was less likely to be the motivation for consumption of the supplement; therefore those better off socioeconomically and educationally may have been more receptive to participation. Those with greater appetites or need for convenient prepared food may have been more active participants in the Guatemalan case.

In East Java participation decreased with time and in Guatemala it increased. Again the explanation for this difference may lie in the characteristics of the intervention delivery methods, supplement type, and services provided rather than differences in population characteristics.

In addition to stimulating thought about the factors that influence participation, the investigators describe various conceptual frameworks that have been developed in a number of disciplines to explain the complex behavior that determines participation. This description reveals that participatory behavior is extremely complex and therefore still too poorly understood for any of the existing frameworks to be complete.

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Conclusions and Recommendations

The nutrition-related MNHC projects indicated that short birth spacing from frequent reproductive cycling, lactation, high energy expenditure and heavy workload, and seasonal fluctuations in food availability can all compromise maternal nutritional status. In all cases, maternal nutritional status is compromised only when maternal dietary energy intake is insufficient to balance maternal energy expenditure, as often occurs in the context of poverty. Several recommendations emerge from these findings.

In the short term, many women have an immediate need for additional food to supplement inadequate energy intakes. The MNHC studies highlight some of the particular times when women are in greatest need of supplemental food:

- when recuperative intervals between lactation and a subsequent pregnancy are short, or when they do not occur, as when lactation and the subsequent pregnancy overlap;
- during lactation, especially if mothers are losing weight after 6-12 months postpartum;
- when women's energy expenditure and workload are great, especially if women are losing weight;
- during seasons of low food availability (typically before the harvest in rural areas and when food prices are highest in the urban areas), which in rural areas often coincide with the season of highest energy expenditure for women who do agricultural work.

The variety of situations in which women experience nutritional stress suggests that women may need supplementation throughout their reproductive years, not only during pregnancy and lactation.

Many of the MNHC projects also stressed the importance of addressing indirect solutions to reducing malnutrition among women of reproductive age. First, improving women's social status can be an important precondition for improving women's nutritional status. As Samarasinghe and colleagues showed, women in Sri Lanka had adequate income, access to health care, and food available in the household; however, low social status limited their control of the income, utilization of the health care, and adequate consumption of the food. A fundamental way to improve women's social status may be through education. Roesel and his colleagues showed that

an innovative program of women's education, including counseling, feedback, and focus groups, resulted in improved maternal weight gain during pregnancy and lower incidence of low birthweight infants.

Second, as the project by Huffman and her colleagues stressed, community initiation and management of projects that are expected directly or indirectly to improve maternal nutrition have great potential for success. In addition to making more food available to participating women and possibly saving them time, community kitchens such as the ones in Peru might act as a vehicle for educating women and improving their social status. They also might act as a vehicle for channeling food supplementation provided by outside sources.

Third, birth spacing and family planning can improve maternal nutritional status. Experts often recommend birth spacing and family planning for the benefit of child growth and survival. Some of the MNHC projects suggest that women can also improve their nutritional status (and, by extension, their survival rates) if demands placed on them by pregnancy and lactation are reduced. In particular, Merchant and her colleagues showed that maternal nutritional status was higher among women with long recuperative intervals between lactation and the subsequent pregnancy than among women with short ones, and even higher than among women whose lactation and subsequent pregnancy overlapped.

Overall, the MNHC projects indicate that poor maternal nutritional status is a widespread problem. Some investigators assessed important determinants, and others innovatively addressed several program issues. Ultimately the rest of the family, particularly young children, are likely to suffer from an undernourished mother, but more importantly the woman herself suffers. Although progress is being made to shift more attention to research on the health of women in the context of poverty, clearly much work remains to be done both to understand the consequences of poor health and malnutrition among women and to design more effective approaches to alleviating these problems.

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3. THE USE OF PRENATAL CARE

Although prenatal care has often been included as a component of maternal care services in the developing world, no clear, universal definition of what constitutes prenatal care exists. To some the term prenatal care describes an inexact constellation of medical services to treat infections and other complications during pregnancy, while to others it means those services plus health education and nutritional services, and to still others it refers primarily to risk screening and periodic monitoring.

The usefulness of prenatal care as a preventive measure to safeguard the health of the mother and the newborn, however, has been well demonstrated. Many studies have shown a relationship between prenatal care and reduced maternal mortality rates. Llewellyn-Jones (1982), for example, found a ten-fold increase in the maternal mortality rate among Malaysian women who did not attend prenatal clinics. Harrison (1985) obtained even more dramatic results in Nigeria, while Janowitz and others (1984) found a strong negative relationship between the use of prenatal care and delivery complications in Ghana. Although these studies provide evidence that prenatal care can make an important contribution to the well-being of women, future research is needed to discern which aspects of prenatal care are critical to good outcomes and whether or not the difference between the groups of women who do use prenatal services and those who do not is confounded by poverty (Maine et al. 1986).

Despite the potential usefulness of appropriate, reliable prenatal care, Ebrahim (1982) has estimated that no more than one-third of pregnant women in developing countries receive any formal prenatal care, and other studies have found similar results (Akin et al. 1985; WHO 1985a). Even when women do receive prenatal care, they may do so infrequently, initiating care late in their pregnancies, and using a combination of sources that is less than ideal.

More information on the utilization and adequacy of prenatal care services is, therefore, a critical research need. Eight of the 20 projects funded by the MNHC Program focused, either directly or in the broader context of research on maternal care services, on issues related to the use of prenatal care. The projects examined the patterns of prenatal care use (that is, the frequency and timing of visits, and the source of care) and the factors that determine the use of both formal and traditional prenatal care services. Research results pertinent to these issues are discussed below. Two additional MNHC Program studies specifically examined adolescents' use of prenatal care services; their results are discussed separately in chapter 4. Appendix A summarizes all the research reports discussed in this chapter.

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Patterns of Prenatal Care Use

A first step in improving women's use of prenatal care and the adequacy of such services is to identify existing patterns of prenatal care use in developing countries. The three key elements in the patterns of prenatal care use are the number of times women seek prenatal care during a pregnancy, the timing of the first visit for prenatal care, and the source of prenatal care used (public, private, or traditional). Several MNHC Program studies added to the existing information available on the issues.

Number of visits

Both developed and developing country health systems have found realistic criteria of adequate prenatal care elusive. Adequate prenatal care is often defined as requiring 10 to 12 prenatal visits during an uncomplicated pregnancy (King 1966); an unrealistic standard given the scarce resources for health programs in most developing countries. By contrast, the WHO specifies a minimum of five prenatal visits during a normal pregnancy, and some research shows that as few as three prenatal visits (one in each trimester) can have a positive impact on birth outcomes (Guilkey et al. 1987; Wong et al. 1987). In general, where studies have been done, it has been reported that women in developing countries seek formal prenatal care two to four times in the course of a pregnancy (Guilkey et al. 1987).

Five MNHC Program research projects in Peru, Mexico, Jamaica, Swaziland, and Malawi collected data on the number of prenatal care visits made by women. Data from the study conducted by Scrimshaw et al. in Tijuana, Mexico, for example, reveal that approximately 68 percent of women surveyed used prenatal care services during their pregnancies. These women used formal prenatal care services from 1 to 8 times during a pregnancy, with 3.4 times being the average. During Rutabanzibwa-Ngaiza's seven-month study in Swaziland, however, only 38 percent of the pregnant women in the sample used formal prenatal services. Of the 34 women studied, only two made two prenatal care visits while all the rest made one visit each. These results are unlikely to be indicative of prenatal care use in rural Swaziland, however, since the sample size was small.

The analysis of data from Peru reveals that in 1984 approximately 58 percent of women received formal prenatal care (Locay, Sanderson, and Weeks). Data from Malawi indicate that 55 percent of women visited a health center and 9 percent visited a traditional healer or birth attendant for prenatal care (Tucker and Lamba). In Jamaica, Rawlins and Sargent found that more than half the women who responded to their survey visited a prenatal clinic three or more times. Curiously, women who attended the hospital clinic averaged more visits than women who attended the community clinic, even though visits to the hospital clinic took longer than did visits to the community clinic and involved interactions with health personnel who were often reported to be rude and uncaring.

Only one MNHC Program study found an exceptionally different pattern of use of prenatal services. In the Philippines, Villaroman-Bautista and her colleagues found that of 150 pregnant women interviewed, almost all (96 percent) were using prenatal care services. Approximately two-thirds of these women followed the ideal of monthly consultations during the first seven months of the pregnancy, fortnightly consultations in the eighth month, and weekly consultations in the ninth month. This is considerably higher than the figures cited by earlier studies in the Philippines such as the 1978 *Bicol Multipurpose Survey*, which reported an average of approximately two prenatal visits during a pregnancy (Popkin and Roco 1979). However, the rate reported by Villaroman-Bautista and her colleagues is not strictly comparable to the other studies because it takes account of visits to traditional health practitioners as well as visits to formal services.

Timing of the first visit

Contrary to trends in developed countries, women in developing countries rarely contact a prenatal care service to confirm a pregnancy. In most traditional societies, women do not even reveal their pregnancy until at least the fourth month because of cultural restrictions (Pillsbury, Brownlee, and Timyan 1990). It is not surprising, therefore, that the first prenatal care visit occurs only in the fourth month or later, and sometimes as late as in the seventh month (Popkin, Akin, and Wong 1986; Marshall 1985).

The results reported by Locay and his colleagues support this general trend. Their analysis reveals that in Peru, on average, prenatal care was initiated between the third and fourth month of pregnancy. Furthermore, when the investigators divided their sample into three groups based on the predicted probability of seeking care (high, average, or low), the analysis revealed that the low use group tended to initiate care in the fourth month, while the high use group started using prenatal services at the beginning of the third month.

Another related finding from the Peruvian study was that women who received care in a public institution had a lower probability of initiating care in the first trimester. The explanation the researchers offered is that women who experienced complications in their pregnancy were the ones most likely to seek care early, and they were also the ones who are most likely to seek care from a private clinic or facility because they perceived such facilities to be of better quality than public facilities. Thus, the researchers speculate that, on average, women who used public facilities were likely to have fewer complications, and therefore seek prenatal care later in their pregnancies.

In Malawi, on average, women initiated prenatal care in the fifth month of pregnancy (Tucker and Lamba). Similarly, in Jamaica 84 percent of the women in the sample sought prenatal care after the fourth month of pregnancy (Rawlins and Sargent). Over one third of the women sought their initial

care between the seventh and ninth month of pregnancy, with a significantly larger percentage of multiparas than primiparas making their first prenatal care contact after the seventh month.

A significantly larger percentage of the Jamaican women who chose to seek prenatal care from the community clinic sought care earlier than women who chose to go to the local hospital for such care. Upon further questioning, the women reported that attendance at the community clinic was not as stressful as attendance at the hospital clinic. To attend the hospital prenatal clinic women had to commit almost an entire working day and had to arrive at the hospital no later than 8:00 a.m. For their first prenatal care visit at the hospital clinic, women had to arrive even earlier than that.

In general, women in the Jamaican study seemed reluctant to seek early prenatal care. These women did not seem to feel the need for such care because they viewed pregnancy as a normal, natural process that did not require continuous medical monitoring. The researchers point out that among low-income Jamaican women, one of the key motives for seeking any prenatal care is to register or "book" for a hospital delivery. The maternal health care system in Jamaica is structured so that booking is essential for a hospital delivery. Thus, even though women do not recognize the importance of prenatal care, they are forced to seek such care to ensure a place in the local hospital for delivery. Therefore, women tend to seek such care late in the pregnancy rather than early.

In the study conducted in Mexico by Scrimshaw and her colleagues, 65 percent of women from a sample size of 444 women reported initiating prenatal care at or before the fourth month of pregnancy, while approximately 21 percent reported that they made their first prenatal care visit at five months or later. The remaining 14 percent did not use formal services at all during pregnancy. The researchers labeled these three groups early initiators, late initiators, and noninitiators, and compared their characteristics in order to identify the determinants of the timing of the first prenatal care visit. The results of these comparisons are discussed later in the section on the factors affecting prenatal care use.

Data from the study conducted by Villaroman-Bautista and her colleagues in the Philippines show, however, that approximately 37 percent of the women in that sample sought care for the first time during their first trimester, and almost 30 percent of the women went for a consultation as soon as they realized they were pregnant. Here again, the findings are not comparable to that of the other studies in part because both traditional and formal sources of care were included in the scope of the study.

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Source of prenatal care

Existing data on women's choice of health care provider (public, private, or traditional/informal) is not sufficiently consistent to detect a common trend. It is known, however, that women typically use combinations of care, formal and traditional, public and private (Kroeger 1983).

The results of the MNHC Program projects provide interesting insights into the determinants of the source of health care sought during pregnancy. The project that analyzed the data on the use of prenatal care services in Peru reports that the majority of women used public health services (a public hospital, a public health center, or a public health post) rather than private services, whether formal or traditional (Locay, Sanderson, and Weeks).

Unlike the data from the study conducted by Locay, Sanderson, and Weeks, data from the study by Scrimshaw and her colleagues in Tijuana, Mexico, did not show large differences in the use of private versus public services for prenatal care. This study revealed that 45 percent of the women sought care from a private physician while approximately 47 percent used the services of a variety of public facilities. The most popular public source of prenatal care was the social security facilities. As mentioned earlier, the women who initiated prenatal care after the fourth month of pregnancy used public, government run facilities more often than women who initiated care prior to the fourth month.

In general, the women in Tijuana used informal, traditional services significantly less often than formal services. The most popular source of informal prenatal care as reported by these women was the *sabadora* or massage therapist. Reliance on their mothers to provide prenatal care advice and information was also reported to be a fairly common practice.

The study conducted by Villaroman-Bautista and her colleagues examined the patterns of use of prenatal care provided by four types of health care providers--public doctors, private physicians, licensed midwives working in government health centers, and hilots (traditional care givers)--in the Ilocos Norte province of the Philippines. This study found that in general, the women in the sample preferred physicians to other types of health care providers, and that they consulted public physicians more often than private physicians. An interesting finding was that although the difference was not very great, women visited midwives more often than they visited private physicians (21 percent versus 17 percent). Only 8 percent of the sample reported going to the hilots for prenatal care. Another important finding was that a little over one-fourth of the sample visited more than one type of health care provider. The data revealed that the most popular combinations were the public physician and the midwife or the midwife and the hilot.

The most often cited reason for selecting the public physician was "convenience" (further questioning revealed that the respondents used the term convenience mainly to refer to low price and easy accessibility), while "professional competence" was the most commonly cited reason for choosing the private physicians (Villaroman-Bautista, Roldan, and Basco). "Recommendations by friends and relatives" was the most common reason for selecting a licensed midwife, and "recommendations by friends and relatives" and "professional competence" were the most often cited reasons for choosing a hilot. The data also show that midwives were popular because they made housecalls and were informal in their interactions. The researchers suggest that a preference for midwives may also be related to a woman's plans for delivery. Women who prefer to deliver at home know that midwives are readily available to assist with deliveries at home, while physicians are not.

As discussed earlier, Rawlins and Sargent's study in Jamaica showed that low-income women often chose public prenatal services because that was the only way to ensure access to delivery services at the public hospital. Booking for a hospital delivery is almost essential because self-delivery is the only other option open to low-income women.

Factors Affecting Use of Prenatal Care

The patterns of prenatal care use described above suggest that women's use of prenatal care services is determined by many interacting factors. MNHC Program studies explored a number of these factors, including quality of care, accessibility, and cost (service factors), and age and parity, socioeconomic conditions, and support and psychological factors (user factors).

Quality of care

Among the service factors, one of the most important determinants of prenatal care use is the quality of care available. Quality can be assessed in terms of the content of a prenatal care visit, the availability of essential supplies, training and attitudes of health personnel, and the nature of the interaction between the health personnel and the user. A review of existing research on the determinants of the use of maternal care services revealed, for example, that a shortage of supplies to conduct routine analyses of blood and urine was negatively associated with rates of utilization of prenatal care services (Leslie and Rao Gupta 1989). Similarly, a negative attitude towards clients by health personnel limits use (Attah 1986).

Locay, Sanderson, and Weeks reported that in Peru quality of care was reported to be a positive determinant of prenatal care use. Although the researchers do not define the components of quality, they repeatedly state that high-quality health services, such as those provided to women who were covered by the government insurance program, were used more often than other types of public care. The researchers even go so far as to say that if the Government of Peru could provide the same quality of health care services to all Peruvians as they have provided for some through the insurance

program, the predicted probability of use of prenatal care would rise to approximately 96 percent.

Using ethnographic methods to determine the obstacles to using prenatal care services in Tijuana, Mexico, Scrimshaw and her colleagues found that women preferred private services over public, government services, mainly because they perceive the former to be of higher quality. Among the public services, they consider the social security facilities to be of higher quality than other public clinics and health centers, and therefore use them more frequently.

The MNHC Program study from Swaziland also reported that poor quality of care was the major barrier to the use of maternal and child health services (Rutabanzibwa-Ngaiza). The researcher noted that the clinic run by local missionaries was more popular than the government clinics because the quality of care, as measured by the behavior and attitudes of health staff and by the availability of drugs and equipment, was better.

Quality of care was also a determinant of prenatal care use in the Hermann and Duale study in Zaire. In group discussions with trained traditional birth attendants (TBAs), the TBAs reported that women at high risk who were referred to the hospital often refused to comply because hospital personnel were known to be rude to patients. In addition, the hospital staff spoke a language that many patients could not understand.

Similarly, the study from the Philippines found women's perceptions of the quality of care offered by a particular kind of health care provider is one of the key reasons why women select the services offered by that health care provider (Villaroman-Bautista, Roldan, and Basco). The data suggest that a reputation for professional competence is a key criterion that women use to judge the quality of care offered by a health care provider. This sample of women also considered personalized consultations and home visits to be characteristics of high-quality care. However, while the subjective evaluation of quality was an important determinant of use, it was not the only determinant. Women chose a particular health care provider by weighing the benefits of quality care with the benefits of low monetary cost and accessibility. Thus, although they perceived private physicians as more professionally competent and caring than public physicians, they often chose the latter because they were less expensive and more accessible.

The poor quality of care offered to women in prenatal clinics and labor wards, and in particular, the staff's apathy and rudeness, was repeatedly mentioned in interviews with women in the MNHC Program study from Jamaica (Rawlins and Sargent). In addition, the researchers report an acute shortage of essential medical supplies at the local hospital. Inadequate remuneration, a high staff-patient ratio, and long work hours have all contributed to create dissatisfaction, low morale, and apathy among the hospital staff.

Each of the MNHC Program studies measured quality of care differently. While some (such as the studies conducted by Scrimshaw and her colleagues and by Rutabanzibwa-Ngaiza) measured only the users' subjective perception of quality of care, others (such as the studies conducted by Sargent and Rawlins and by Villaroman-Bautista, Roldan, and Basco) focussed on both the perceived and the actual quality of care. Regardless of these differences, the two components of quality that seem to be consistently important are the availability of supplies and staff attitudes towards clients.

Distance

Substantial evidence from a range of countries worldwide suggests that the distance clients must travel to obtain health services is a primary deterrent to the use of health care facilities (Duale et al. 1988; Schwartz, Akin, and Popkin 1986; Attah 1986; Potter 1985; Voorhoeve, Kars, and van Ginneken 1984). Clients seem less willing to travel long distances for preventive services than for curative care. Researchers have found that for the most part, people use preventive services only when they are available within a three- to five-kilometer walk of their homes (Favin, Bradford, and Cebula 1984), and that distance is a greater barrier to use in rural areas than in urban areas (Popkin, Akin, and Wong 1986). Most prenatal care services would be expected to follow the pattern of preventive services.

MNHC Program studies confirm these findings in Mexico, the Philippines, Swaziland, and Zaire. Scrimshaw and her colleagues found that the accessibility of health centers and clinics was a key determinant of the use of prenatal services. This study was conducted in Tijuana, Mexico, where the hilly terrain makes even short distances difficult to traverse. The women interviewed expressed concerns about walking up and down hillsides, particularly when pregnant, to reach main roads and transportation.

In the Philippines, Villaroman-Bautista and her colleagues found that the high use of the services provided by public physicians in Laoag City and the similarly high use of the services provided by licenced midwives in the municipalities of Sarrat and Dingras were related to the greater accessibility of these services. Distance was also found to be a barrier to the use of maternal health services in the studies from Swaziland (Rutabanzibwa-Ngaiza) and Zaire (Hermann and Duale).

Cost

Both monetary and time costs are often important factors in prenatal care use. No MNHC Program study directly investigated the impact of monetary cost on prenatal care use. Two studies do, however, provide insight into the effect of time costs on use, in particular waiting time.

Data from other studies on the effect of waiting time on service use are contradictory. While some studies have clearly shown a negative effect on use (Attah 1986; Ruffing and Smith 1984; Lasker 1981; Rahman 1981) others have reported no significant effect and sometimes even a positive effect on use (Akin et al. 1985; Heller 1982). The negative impact of waiting time on use is easily understood, particularly in the context of the time constraints faced by poor women in the Third World. A loss of time could represent a significant cost because of the problems of making child care arrangements and sacrificing time that could be used for economic or household production.

The MNHC Program study in Peru suggests that short waiting times at government social security facilities may be one reason for the higher rates of use of such services compared to other public health facilities (Locay, Sanderson, and Weeks). However, the services provided to women who are covered by the government insurance program are also popular because they are free and are perceived to be of high quality.

In the Rawlins and Sargent study in Jamaica, waiting time was clearly linked to limited use of prenatal services. Respondents cited time costs as the chief constraint to use of the hospital prenatal clinic, where women are expected to arrive at 8:00 a.m. and must often spend the entire day waiting to complete the prenatal consultation.

Age and parity

Many researchers have investigated the effects of the user factors, age and parity, on prenatal care use. Results regarding their impact differ. Some studies show that high parity, older women use prenatal care services less than low parity, younger women (Kwast et al. 1984). Other studies contradict this result, and show that maternal age is positively associated with the use of prenatal services and that women of low parity (one to three births) are significantly less likely to use prenatal care than are women of higher parity (four to six births) (Abbas and Walker 1986).

The MNHC Program study that examined 1984 data from Peru reports that the predicted probability of receiving prenatal care is greater for women over 35 than for younger women (Locay, Sanderson, and Weeks). However, the greater the number of pregnancies, the less likely a woman is to seek care early in her pregnancy.

The MNHC Program study in Jamaica hypothesized that younger mothers who are less experienced would seek prenatal care more frequently than older mothers (Rawlins and Sargent). The data, however, did not support this hypothesis. Instead, the researchers found that multiparous women made a significantly greater number of prenatal care visits than primipara women. Primipara women did, however, initiate prenatal care earlier than multiparous women. The data from the Philippines

study also found that women who had experienced previous pregnancies sought care later than primiparous women (Villaroman-Bautista, Roldan, and Basco).

The study in Tijuana, Mexico, however, found a slightly different pattern. Early initiators of prenatal care (that is, women who initiate care at or before the fourth month of pregnancy) were likely to have had one previous pregnancy, while both late initiators (that is, those who initiate care five months or later) and the noninitiators were likely to have two or more children.

Socioeconomic factors

Three socioeconomic factors, income, rural versus urban background, and education, play an important role in determining women's use of prenatal care services.

Income. Few studies have examined the relationship of income to the use of prenatal services. A study from Ethiopia concluded that as income increased, the use of formal health services for prenatal care increased significantly (Kwast et al. 1984). The MNHC Program study in the Philippines found a similar result (Villaroman-Bautista, Roldan, and Basco). This study also showed that income had a significant effect on the choice of health care provider. Women from the low-income groups generally chose to seek care from licenced midwives or, less frequently, hilot. Those from the middle socioeconomic groups generally went to public physicians and midwives. In contrast, a majority of the women from the upper income groups consulted public or private physicians.

The MNHC Program study in Peru (Locay, Sanderson, and Weeks) showed that although the husband's income was related to women's use of prenatal care, it accounted for only a small part of the variance between women who had a low predicted probability and an average predicted probability of using prenatal care. They also found that a woman's labor and nonlabor income did not have a significant influence on her use of prenatal care. The researchers suggest that this may reflect anomalies in the data since they suspect that both labor and nonlabor incomes were often underreported by rural women.

The study in Tijuana, Mexico found that income was correlated with the timing of the first visit (Scrimshaw et al.). The data indicated that early initiation of prenatal care was positively correlated with income and that late initiators were more likely to be unemployed than early initiators.

Urban versus rural background. Some research evidence indicates that rural women differ from urban women in their use of prenatal services. Akin et al. (1985) found that a smaller percentage of rural women than urban women use prenatal care services. They also report that poor

rural women who seek prenatal care make fewer visits, on average, to health care providers than do poor urban women.

This rural versus urban difference was noted in the only MNHC Program study that examined the relationship of rural and urban background to prenatal care use. Data from this study reveals that 82 percent of urban women and 35 percent of rural women in Peru received prenatal care (Locay, Sanderson, and Weeks). Two-thirds of rural women in this sample made less than four prenatal visits, while only one-fourth of urban women made so few visits. Forty percent of urban women made more than seven visits during a pregnancy, as compared to only 10 percent of rural women. Urban women were also more likely to initiate care in the first trimester than rural women: while 62 percent of the urban population began care in the first trimester, only 38 percent of rural women initiated care that early. The researchers note that, in general, the use of public care services was much less frequent in rural areas than in urban areas. This was mainly because public care was more readily available in urban areas.

Education. Unlike the research on waiting time, age, and parity, research has consistently shown that education is positively associated with the use of prenatal care (Monteith et al. 1987; Abbas and Walker 1986; Burton, Wallace, and Janowitz 1984; Kwast et al. 1984; Wolfe and Behrmann 1984). The research results of four of the MNHC Program projects contribute to our understanding of the relationship between education and use of prenatal care services.

The data from the project by Locay, Sanderson, and Weeks conducted in Peru revealed that in both urban and rural areas, the percentage of women who received prenatal care rose steadily with educational level until it reached 99 percent for women with a college education. Moreover, in comparing the characteristics of high, average, and low users in terms of the predicted probability of seeking care, the researchers found that in general, women with more education received more prenatal care than women with less education. Using regression analysis, the researchers found that in terms of the predicted probability of receiving care, approximately 41 percent of the difference between the low user and the average user groups was attributed to education. In other words, if all other characteristics of the low users are kept constant and their education level is increased by approximately 2.5 years, the predicted probability of using prenatal care would increase 7.4 percent for low users.

The MNHC Program study from the Philippines also found a distinct relationship between women's educational status and choice of health care provider (Villaroman-Bautista, Roldan, and Basco). In general, the data indicated that a greater number of women with a college education consulted public and private physicians for prenatal advice, while women with less education preferred midwives.

Education was also found to be related to the timing of the first prenatal care visit. The data from the study in Tijuana, Mexico, indicated a positive relationship between the level of educational attainment and early initiation of care (Scrimshaw et al.).

The only study conducted under the MNHC Program that failed to find a significant relationship between the use of prenatal care services and educational level was the study from Jamaica (Rawlins and Sargent). This may be because there was very little variance in the levels of education in the sample studied.

Support and psychological factors

Other user factors, such as users' attitudes and perceptions, have been researched much less in the context of the use of prenatal care services. In a recent review of the determinants of the use of maternal care services, Leslie and Rao Gupta (1989) point out that while such factors are extremely important, they may be more difficult for medical or health experts to investigate. Yet if the use of formal maternal care services in a community is to be maximized, that community's perceptions, beliefs, and practices regarding pregnancy and childbirth must be identified, understood, evaluated, and where possible incorporated (Pillsbury, Brownlee, and Timyan 1990). In general, the extent to which a formal health service is congruent with some of the more fundamental, traditional beliefs about maternal care will determine the level of its acceptability (Finerman 1984).

The research project sponsored by the MNHC Program in Tijuana, Mexico, sought to determine women's perceptions of and attitudes towards pregnancy, as well as their perception of the importance of prenatal care (Scrimshaw et al.). The researchers studied this as the first step in the process of developing educational materials to increase the use of prenatal care services. The researchers successfully used a combination of ethnographic and survey methods for collecting the data. One of the most important findings of the study was that the women in this community did not understand or use the term "trimesters" when describing the different stages of pregnancy. Instead they saw pregnancy as a process, with a beginning (usually the second month) and a final stage (usually the last month or two). Obviously then, educational messages that used the term "trimester" would not serve as effective messages for these women.

Similarly, the study found that the women of Tijuana did not understand the term "risk" in the context of pregnancy. "Risk" was thought of in terms of the birth itself while the Spanish term the women used to describe risk conditions during pregnancy was more akin to "danger." An interesting finding was that in this community pregnancy is traditionally recognized as a dangerous period that requires women to take some precautions such as to rest, eat well, and not engage in heavy activity. However, a large number of the women reported that they initiated prenatal care only if they did not feel well, and that they did not see the need to make a trip to the prenatal clinic if they felt well.

Women's beliefs and attitudes regarding home or hospital births also have important implications for their use of prenatal care services. Studies show that women in developing countries typically prefer home based childbirth to institutionalized or hospital delivery. Data from the MNHC Program study conducted in the Philippines suggest that women who prefer a home birth choose a midwife over a public or private physician for prenatal care services because physicians do not conduct home based deliveries (Villaroman-Bautista, Roldan, and Basco).

In many cultures the decision about the choice of health service is not made by the woman in isolation. The opinions of other family members, such as the husband or the mother-in-law, are often influential. Thus, the perceptions of other family members may also be important determinants of the decision to seek prenatal care.

The MNHC Program study in the Philippines by Villaroman-Bautista and her team found that the number of women who made the decision to seek prenatal care in consultation with their husbands or other family members was almost equal to the number of women who made the decision on their own. Approximately 30 percent of the women reported that older women in their family directly or indirectly influenced their decision. Of these, the majority were advised to seek care from a licenced midwife or from a public physician. Surprisingly, the hilot (traditional care giver) was recommended in only 9 percent of the cases. This finding seems contrary to the stereotype that older women prefer traditional methods of health care. The researchers hypothesize that the nonformal education promoted by health centers may be responsible for this effect. This study also found that women from the lower income groups more often made the decision to seek prenatal care on their own, while women from the middle and upper income groups more often consult their husbands. From the data it is not clear, however, whether the lower income women of this sample were more likely to be single mothers than the women from the middle and upper income groups.

Although not directly related to the use of prenatal services, two other MNHC Program results emphasize the importance of husbands' attitudes towards their wives' pregnancies. Scrimshaw and her colleagues report that women in the Tijuana, Mexico, study felt uncomfortable about gaining weight during pregnancy because their husbands did not like them to do so. Similarly, the study from Thailand, reported that women who did not gain sufficient weight during pregnancy cited their husbands' negative attitude towards weight gain as the reason (Roesel et al.). The latter study demonstrates that if prenatal nutritional education is to be effective, it must target both pregnant women and their husbands.

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Interaction of use factors

In general, the MNHC Program research results reveal not only that a variety of individual factors must be taken into account when considering how to improve the use of prenatal care, but also that their interactions may be key to understanding use. The analysis of the Peru data set (Locay, Sanderson, and Weeks), for example, indicated that the hypothesis that higher education and higher income are associated with greater use of private health care services, or that conversely, lower education and lower income are associated with higher use of public services, is too simplistic to explain the complex interaction between a multitude of variables that ultimately determine the source of health care chosen. A comparison of three categories of users selected on the basis of the predicted probability of prenatal care use (high users, average users, and low users) revealed that the low users were more likely to seek private care than women in the average user group. Given that the low user group was comprised mainly of women who were poorer than women in the average user group, and that private care is significantly more costly than public care, this finding is curious and needs explanation. The researchers suggest that the low use group of women who sought private care were those with serious complications, and that they sought prenatal care from private sources because they perceived them to be of better quality than public services. Thus, it appears that quality of care may be more important than monetary cost as a selection criterion for women with pregnancy complications.

Similarly, the difference between the use of public services by women from the average use group as compared to the low use group is another example of the complex dynamics that underlie such a decision. Here again, the lower education and income levels of the low use women seem to suggest that they would use public facilities more often than women from the average use group. However, the data indicate the opposite: women from the average use group use public facilities more often than women from the low use group. The two factors that can explain this seemingly contradictory finding are accessibility and price. The researchers found that the average users lived in areas where there were greater numbers of public facilities and where the cost of private health care was very high. Thus, the accessibility of public care and the price of private care acted to offset the effect of education and income on use.

The data from the Philippines provide yet another example of the complex dynamics underlying health care decision making. Villaroman-Bautista and her colleagues note that women did not necessarily choose the health care provider that they perceived to be the best. Thus, although private physicians were perceived to be professionally competent, the public physicians were used more often because unlike the private physicians, their services were free of cost and they were easily accessible. Cost and accessibility, therefore, were given higher priority than perceived quality of care.

Conclusions and Recommendations

The research results of the MNHC Program shed new light on the patterns and determinants of prenatal care use. With reference to the patterns of use, the results show that more urban than rural women use prenatal care services. Urban women also tend to use prenatal care services more often and to initiate care earlier than rural women. Part of the reason for this difference may be the lack of services or the lack of good quality services in rural areas as compared to urban areas. Thus, the expansion of services and alternative models of delivery should be considered as solutions to increase the availability of prenatal services in such areas. There is also a need to educate rural women about the preventive value of prenatal care and to motivate them to use such services. The Mexico study provides an excellent methodology for developing and designing educational materials with direct input from the users (Scrimshaw et al.). The use of focus group discussions with the target population, combined with in-depth interviews and observation to identify local concepts of pregnancy and prenatal care, has the potential to be replicated in other settings to develop appropriate and effective prenatal care messages.

The results on the frequency and timing of prenatal care visits indicated that on average, women made fewer than four prenatal care visits per pregnancy and generally initiated such care only in the third or fourth month of pregnancy. This is consistent with other evidence from the developing world (Guilkey et al. 1987). Whether or not this pattern of use is a cause for concern remains to be established. The appropriate number and timing of prenatal care visits for ensuring effective prenatal care must be much more rigorously tested before any definitive recommendations can be made for health care policy in the developing world. There is no doubt, however, that women with complications or who are at high risk should have earlier and more frequent prenatal care than women with normal pregnancies. Despite questions about the exact timing and frequency of prenatal care visits, the importance of prenatal care education for all women must be emphasized.

As far as the choice between public and private care is concerned, the data from the MNHC Program studies revealed that in general, women used public services more often, especially in urban areas. Of the public services, the most popular were those provided under government social security and insurance plans because women perceived the quality of such service to be higher and presumably also because the costs of such services were covered. This not only underlines the importance of improving the quality of all public health services, but also suggests that one way to increase utilization would be to extend the scope of government assisted insurance and social security programs to include more families, particularly in rural areas. The prediction by Locay's team that the use of prenatal care services would be almost 100 percent if the Government of Peru could provide to all Peruvians the quality of care that is provided by the insurance program is an intriguing proposition and its validity needs to be tested in other developing countries.

The results from the MNHC Program studies indicated that surprisingly large numbers of women selected midwives or traditional birth attendants to provide some or all of their prenatal care. Personalized interactions and the possibility of home visits, combined with professional competence, made them a popular source of prenatal care. This supports the position taken by proponents of the primary health care approach to broaden the roles of midwives and other traditional care givers so that they can be incorporated into the formal health care system. The personalized and supportive care that midwives and TBAs provide, when supplemented with technical training and a functioning referral network, would serve as an appropriate model for good quality prenatal care.

Care provided by midwives was also the most accessible because it was available within the community. Accessibility, and in particular distance, was the one service factor consistently identified as a key determinant of use in the MNHC Program research. Health care planners must ensure that appropriate and reliable transportation services to health care facilities are available to pregnant women. Similarly, use of local trained midwives and outreach programs that include home visits can substantially improve the use of prenatal care.

Although MNHC Program researchers found that individual service factors like quality of care and distance were important determinants of prenatal care use, their results also highlighted the complex interaction of factors that most often seem to determine use. For example, the data show that women often sacrifice quality care in favor of affordable and accessible care. In cases of serious complications, however, quality of care was most likely to be the key determinant regardless of cost or accessibility. Another interesting finding was that sometimes the underlying motive for seeking formal care is to ensure a hospital delivery, while the reason for choosing traditional care is to ensure a home delivery. If the use of adequate and appropriate prenatal services is to be improved, program and policy experts must understand the complex dynamics of such health care choices.

Consistent with existing research on user factors, the data from the studies conducted under the MNHC Program highlighted the role of formal education as a determinant of utilization. The data from the study by Locay and his colleagues in particular provides compelling evidence of the value of emphasizing female education in development programs that seek to improve the health status of women. There are many theories to explain why female education is an important determinant of the use of health services (Levine 1987; Caldwell and Caldwell 1985; Ware 1984). While some experts argue that female education is only a proxy for income, and that therefore, differences in the use of health care services may not reflect the effect of education per se (Akin et al. 1985), the MNHC Program studies, as well as other research, suggest that this is not the whole explanation.

The studies also underscored the importance of the attitude of and support provided by other family members, particularly in the nutritional aspects of prenatal care. This indicates the importance of

including family members, especially husbands and mothers-in-law, as critical target groups in health education programs.

Above all, the MNHC Program studies established the importance of understanding the user perspective in prenatal care use. Evaluations of existing prenatal care programs and the design and planning of new programs must take into consideration women's perceptions, attitudes, and beliefs with regard to pregnancy, prenatal care, and delivery.

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4. THE USE OF PRENATAL CARE BY ADOLESCENTS

Demographic realities such as the growing number of adolescents and the high rates of adolescent pregnancy in the developing world, combined with the increased health risks adolescents face during pregnancy and delivery, make maternal care for adolescents a high priority for the health sector (U.N. 1988a; U.N. 1988b; WHO 1989b). Adequate maternal care, prenatal care in particular, may reduce or counteract the risks of pregnancy for adolescents, especially for very young adolescents.

A great deal of evidence links prenatal care with improved maternal health and birth outcome (Guilkey et al. 1987; Wong et al. 1987; Faundes et al. 1982). A study of 22,000 Nigerian women found that the maternal mortality rate of females aged 14 or younger who received good prenatal care was 500 per 100,000, while the mortality rate of similar females who did not receive prenatal care was 4,300 per 100,000 live births (Population Information Program 1985). A 1978 study in Kenya found that preterm delivery and low birthweight was associated with poor prenatal care and young age of mothers (Senderowitz and Paxman 1985). Several other studies have found that with proper prenatal care, the obstetrical risks of pregnancy may be no greater for adolescents over age 15 than for older women (Senderowitz and Paxman 1985).

Adolescents, however, appear to be less likely to seek prenatal care than older women (WHO 1989b; Abbas and Walker 1986; WHO 1985b) and less likely to seek prenatal care early in their pregnancy (WHO 1989b; WHO 1985b). This is a critical obstacle to preventing or treating pregnancy-related problems in adolescents. Early initiation of preventive approaches and the early detection of problems are crucial to reducing the health risks of pregnancy to adolescents (Viegas et al. 1987; Litt and Mendosa 1987; WHO 1985b). Indeed, at least for older adolescents, at least, a main cause of their increased risk may be that they do not use prenatal care as effectively as adults.

Since use rates appear to be low, health care professionals need more information on how to increase prenatal care use by adolescents. The MNHC Program supported two studies that provide information on prenatal care use by adolescents and the factors that affect their care decisions. The studies investigated the knowledge, attitudes, and practices of adolescents regarding pregnancy and prenatal care. A study by Lundgren et al. in the Metropolitan Mexico City area collected interview data about prenatal care and nutrition during pregnancy from 300 pregnant adolescents aged 14 to 17 and from other key informants. The other study by Mendez-Dominguez was conducted in eight semirural communities in Guatemala and gathered data on the conceptualization of pregnancy and attitudes toward prenatal care from 282 pregnant Indian adolescents and from other key informants. Summaries of the two MNHC Program studies discussed in this chapter are in appendix A.

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Patterns of Prenatal Care Use by Adolescents

It is important to identify patterns of use of prenatal care by adolescents so that appropriate strategies can be developed to better meet their prenatal care needs. Three elements are key in describing use patterns: the number and frequency of prenatal care visits, the timing of care initiation, and the source of care used.

Number of visits

Adolescents tend to use health services less than either children or adults (WHO 1986). Similarly, adolescents tend to use family planning services significantly less than adults (WHO 1989b; Population Information Programs 1985; WHO 1977). Adolescents are particularly unlikely to use health services related to sexual behavior, the use of alcohol and drugs, or other socially sensitive areas (WHO 1986). There is, however, a significant lack of specific data on the number and frequency of prenatal care visits by adolescents.

The two MNHC Program studies that addressed prenatal care use by adolescents found that adolescents do not make many prenatal care visits. In the study conducted by Lundgren and her colleagues in Mexico, which followed adolescents through delivery, 12 percent of the adolescents interviewed did not receive any prenatal care, 49 percent of those attending a physician had three or fewer visits, and 64 percent of those attending a midwife had three or fewer visits. In the study conducted by Mendez-Dominguez in Guatemala, 42 percent of the adolescents interviewed had not received any prenatal care at the time of their interview. The researcher states that those adolescents who had received some type of prenatal care received an average of four visits (Alfredo Mendez-Dominguez, Personal Communication 1990). Information on the number of visits by provider is not available. Interestingly, he does note that once the first visit occurs, problems in ensuring subsequent (usually monthly) visits appear minimal, indicating that initiating prenatal care may be more difficult for adolescent girls than maintaining it.

Timing of the first visit

The timing of the first prenatal care visit is particularly important to address in the case of adolescents because adolescents are known to delay the first visit longer than do older women, and because adolescents are more likely to experience the kinds of problems that can be detected and treated early in pregnancy (Brown 1988).

Lundgren and her colleagues in Mexico found that of younger adolescents (ages 14 and 15) who received prenatal care from physicians, 60 percent received it in their first trimester, 30 percent in the second trimester, and 9 percent not until the third trimester. Of those who went to midwives, 40 percent went in the first trimester, 60 percent went in the second trimester, and none in the third. These patterns were similar among older adolescents (ages 16 and 17). When they saw physicians,

adolescents tended to initiate care earlier than when they saw midwives, though this trend was not statistically significant with the small sample size.

In the Mendez-Dominguez study, 31 percent of the Guatemalan Indian adolescents who received some prenatal care did not do so until the fifth month of pregnancy or later. Thus, both MNHC Program studies found that adolescents initiate prenatal care late.

Source of prenatal care

There are several possible sources for prenatal care, including midwives, public hospitals and health outposts, and private physicians. Some information is available on the care preferences of adult women, but less is available on adolescents' preferences. Although generalizing across different cultures is difficult, indications suggest that adolescents choose traditional care more often than adult women (WHO 1977). This may be due to the easier accessibility, increased cultural appropriateness, more individualized treatment, and greater privacy often characteristic of this source, as well as a lack of knowledge or misinformation about formal care services (WHO 1989b; WHO 1985b). Adults often use more than one source of prenatal care, but whether adolescents share this pattern is not known (Kroeger 1983).

Lundgren and her colleagues report that the sources of care available in Mexico City were from most expensive to least: midwives, private physicians, and public physicians. The research team found that of those adolescents who received care, 46 percent used one source, 33 percent used two sources of care and 9 percent used three or four sources of care. The first source of care was usually a public physician (66 percent), followed by a private physician (28 percent), and a midwife (6 percent). The most common pattern was to switch between public and private physicians, with almost equal numbers beginning with one and switching to the other. Care from a midwife was often used to supplement care from a physician.

Available sources of prenatal care in the Mendez-Dominguez study in Guatemala were, from most expensive to least: private physicians, private clinics, midwives, healers, and public health centers. In this study, decisions on the best source of prenatal care were difficult for the pregnant adolescent and those advising her. As in the Mexican context, the adolescents frequently used more than one source of care. Of those adolescents who attended some type of prenatal care, 60 percent went first to a midwife, 18 percent to a private physician, 18 percent to a health center, 3 percent to a private clinic, and 1 percent to a national (tertiary care) hospital. Although the midwife is consulted first in most cases, the health center often is consulted second, usually because the health centers offer free food supplements. If the adolescent develops health problems, the chances that she will visit a private physician increase.

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The two MNHC Program studies indicate that like adult women, adolescents often use more than one source of prenatal care. The data also indicate that adolescents choose midwives frequently.

Factors Affecting Use of Prenatal Care

An understanding of the factors that affect the use of prenatal care is essential for identifying actions that can improve the level of use. The factors that affect prenatal care use can be characterized as quality of care, accessibility, and cost (service related factors), and age, socioeconomic status, and support and psychological factors (user related factors).

Quality of Care

Care that is of high quality (assessed by objective health standards) is often an important service related factor affecting prenatal care use. Perhaps the most significant aspect of quality of care is the appropriateness of the care, yet this is least studied. Appropriate care is sensitive to its clients' culture, and is essential for the care to be used. (Pillsbury, Brownlee, and Timyan 1990; Leslie and Rao Gupta 1989).

Twenty percent of Mexican adolescents in the study by Lundgren and her colleagues stated that they selected physicians as prenatal care providers because they trusted physicians the most, and 28 percent stated that they chose midwives for the same reason. When asked specifically to rate the quality of the care they received, there was no significant difference between users of midwives and physicians in the Mexico study. For example, 80 percent of those using physicians felt that they received good medical care and 88 percent of those using midwives felt the same. The adolescents reported that they changed sources of care, due to a lack of follow-up, inability to develop trust, and frustration over receiving conflicting advice, all of which may be considered components of care quality (Lundgren et al. 1990).

The Lundgren team reports that 16 percent of the Mexican adolescents seeking care from midwives claimed that they did so because the midwives offered services not available from formal sources, such as massages to position the baby. Physicians and midwives appear to meet different needs and to be used as complements rather than as substitutes. Physicians are used primarily to confirm the pregnancy and to register for hospital delivery. Midwives are used primarily for massage and positioning the baby, moral support, and education on self-care during pregnancy.

In the Mendez-Dominguez study in Guatemala, 55 percent of the adult women stated that they felt the adolescent's health was more protected if care was given by a physician and 29 percent felt that the adolescent's health was more protected by a midwife.

Mendez-Dominguez also notes that 74 percent of the adolescents felt fear intensely. A common source was fear of harm to the mother or child from witchcraft. Since formal prenatal care services rarely address witchcraft, traditional services may be more appropriate at alleviating this fear.

Both studies indicate that the sample populations viewed formal care services to be of high quality, but they could not replace the need for traditional services. Traditional care services may be more culturally appropriate.

Distance

Distance is another service related factor that often affects prenatal care use. Existing data suggest that adolescents may be more sensitive to the distance and location of prenatal care services than adults. This is often due to their more limited experience with and understanding of various transportation options (Population Information Program 1985; WHO 1985b).

The Lundgren team study found that proximity was an important factor in the choice of a physician as a care provider. Nineteen percent of the adolescents stated that they chose a physician because the physician was close-by. Distance did not appear to be a barrier for any of those who used midwives, probably because midwives tended to live in the community and would often go to the adolescent's home.

Walking was the principle means of transport used in Mexico City: 52 percent of those who visited physicians walked and 72 percent of those who visited midwives either walked or were visited at home by the midwives. Travel to the service site required only 15 minutes or less for over half the adolescents questioned regardless of care provider used.

Cost

Another service-related factor is cost, including both monetary and time costs. Adolescents may be particularly sensitive to the monetary cost of a service because they generally have access to less income than adults (Chui 1985). Even when the family has a high income, adolescents usually do not have control of it. Adolescents may also avoid service use because they may think the service is expensive even though it is not.

Lundgren and her colleagues found that 41 percent of the adolescents in Mexico City reported that monetary cost was a barrier to seeking prenatal care and 16 percent of the adolescents who chose a public physician did so to save money compared to other care providers. The most commonly cited reason for not attending prenatal care, given by 29 percent of the adolescents who did not receive any care, was access problems (lack of transportation, time to attend care, or money to pay for the

care). However, adolescents may be misinformed about the monetary costs; most public health centers in Mexico City provide prenatal care free to low-income clients.

Socioeconomic factors

Many studies have found a positive relationship between low socioeconomic status and underuse of prenatal care (Population Information Program 1985; Kwast et al. 1984). The most commonly used indicator of socioeconomic status is income, but other common indicators include urban or rural residence or background and education.

Income. Since adolescents have less personal income and limited control over family income, they are more likely than adults to have access to financial resources. It follows, then, that they are at greater risk of receiving inadequate prenatal care (Chui 1985). Lundgren and her colleagues found that the Mexican adolescents who reported that they did not have difficulty paying for care were 1.67 times more likely to initiate formal prenatal care in the first trimester. Mendez-Dominguez found that higher income was associated with the use of private physicians by Guatemalan girls, whereas lower income was associated with attending a health center for prenatal care.

Urban versus rural residence. Several studies have found that urban residence is positively associated with prenatal care use. Rural residence may be associated with poverty or lack of education.

In the study by Lundgren and colleagues, rural and urban background of adolescents currently living in Mexico City were found to be significant factors affecting prenatal care use. Adolescents raised primarily in the urban area were almost twice (1.97 times) as likely to use prenatal care than those raised in rural areas. Similarly, those born in the Mexico City metropolitan area were 1.93 times more likely to receive formal care in the first trimester than those born in rural areas. Adolescents whose mothers were raised in urban areas were 1.82 times more likely to use formal care in the first trimester than those raised in rural areas. This may indicate that more urbanized areas have fewer barriers to care (such as lack of transportation or availability of services) and that there is an increased expectation that prenatal care should be used.

Education and information. A number of studies report that formal education and other information available to adolescents is positively related to prenatal care use (WHO 1989a; WHO 1989b; Population Information Program 1984, 1988; Monteith et al. 1987; Abbas and Walker 1986; Kwast et al. 1984). Some studies have positively linked early prenatal care initiation by adolescents to higher educational attainment (Population Information Program 1984). Misconceptions about health, reproductive health issues in particular, are common in this age group. This is probably

because many societies do not make reliable information on reproductive health care readily available, especially to adolescents (WHO 1985b, Senderowitz and Paxman 1985).

Sometimes adolescents do not know how pregnancy occurs and do not realize that if they engage in sexual intercourse they may become pregnant. Ignorance of the human reproductive process, ignorance about contraception and the signs of pregnancy, and denial of pregnancy can result in an adolescent not realizing or admitting that she is pregnant until the second or even third trimester of pregnancy. Health education is not a common component of prenatal care services in Mexico. Those who did receive health education generally received it from the formal education system. Of those younger pregnant adolescents in the Lundgren study who never received any prenatal care, 29 percent did not realize they were pregnant. Among older adolescents, 11 percent did not receive any prenatal care for the same reason.

In addition, the study in Mexico indicates that the adolescents' lack of information may be related to their lack of experience with the health care system. Seventy-eight percent had never or almost never had regular medical examinations before their pregnancy, while 65 percent had never or almost never sought treatment for an illness before their pregnancy.

The Lundgren team found that the educational attainment of the adolescent's mother and partner was a significant determinant of prenatal care use. If the mother had received at least a primary school education, the daughter was 1.75 times more likely to receive prenatal care. If the partner had finished at least a secondary education (through the eighth grade), the adolescent was 2.24 times more likely to initiate formal care in the first trimester. However, the education of the adolescent herself was not a significant factor in prenatal care use. This may be due to the similarity in educational attainment of the adolescents in the sample (Rebecka Lundgren, Personal Communication 1990).

Mendez-Dominguez reports that Guatemalan Indian adolescents also receive little information on reproductive health and pregnancy. He observed that the communities studied have strong social taboos against discussing sexual matters with adolescents. Pregnant adolescents learned about pregnancy only as they experienced it. For example, they knew very little about the possible complications of pregnancy (such as anemia) and could not mention any symptoms or characteristics of pregnancy other than those for the months that they had already experienced. Both MNHC Program studies indicate that a lack of adequate education and information on the reproductive process and the need for prenatal care during pregnancy is a key barrier to prenatal care use.

Support and psychological factors

Researchers have identified certain psychological characteristics, such as guilt, embarrassment, low self esteem, and culture-specific beliefs and attitudes as important in influencing prenatal care use

(Pillsbury, Brownlee, and Timyan 1990, WHO 1989; Senderowitz and Paxman 1985). Some of these characteristics are common in adolescents and may be the most significant causes of the low rates of prenatal care use by adolescents.

Guilt and embarrassment. Many societies and individual families discourage adolescent pregnancies or pregnancies outside of marriage. Since a higher percentage of adolescent pregnancies occur outside of marriage, adolescents in such societies are more frequently exposed to this disapproval than older women (WHO 1989b). Feelings of guilt, and low self-esteem, which are common among adolescents regardless of pregnancy status, lead to adolescents becoming embarrassed easily in such societies (WHO 1989a; Alvarez et al. 1987). The sensitivity to the opinions of others, which is also typical of adolescents can increase their feelings of guilt and lead them to deny that they are pregnant or hide the pregnancy from others for as long as possible. This has obvious negative effects on early prenatal care use (Senderowitz and Paxman 1985). Therefore, feelings of guilt and potential or actual embarrassment may be significant barriers to the initiation and continuation of prenatal care.

Mexican adolescents studied by Lundgren and colleagues who stated that they planned their pregnancy were 1.77 times more likely to initiate formal prenatal care in the first trimester than those who did not plan their pregnancy. Similarly, those who stated that they wanted to be pregnant were 1.96 times more likely to initiate formal prenatal care in the first trimester than those who did not want to be pregnant. This is consistent with the theory that those who do not plan or desire the pregnancy are more likely to feel guilty and deny that they are pregnant, resulting in delays in seeking prenatal care. Adolescents who attended church more frequently were less likely to receive any formal prenatal care. Twenty percent of the younger adolescents and 11 percent of the older adolescents cited embarrassment as a barrier to using prenatal care in the first trimester.

Mendez-Dominguez found that 50 percent of the adolescents in the Guatemalan study reported feeling intense shame related to pregnancy. Mendez-Dominguez states that this appears to be related to the strict sexual morals and prohibition of premarital sex typical of the culture. His study did not, however, relate these feelings to the use of prenatal care.

Low self-esteem. Low self-esteem appears to be common in pregnant adolescents and may affect their motivation to seek prenatal care. Lundgren and her team measured self-esteem by asking the adolescents how they rated their lives, themselves, and how others viewed them (on a scale of positive, negative, and neutral). Although 65 percent stated that they viewed their lives positively, only 42 percent viewed themselves positively. Even more striking, 64 percent felt that others viewed them negatively.

Attitudes and beliefs. Care may be underused because it contradicts or fails to acknowledge important cultural beliefs, making the care inappropriate (Pillsbury, Brownlee, and Timyan 1990). For example, in the Lundgren study, the belief that positioning the baby is important influences many Mexican adolescents to supplement the care of a physician with the care of a midwife.

The Mendez-Dominguez study focused on the conceptualization of pregnancy by Guatemalan Indian adolescents, and found that the selection of a health care provider was related to their conceptualization of pregnancy as a natural body state rather than as an illness. Although pregnancy had some conceptual similarities to illness, he found that prenatal care seeking behavior was not similar to care seeking behavior for common illnesses. Older women and adolescents attended a physician for illnesses associated with the blood and reproductive organs, went to health centers for illnesses of blood and skin, saw healers for problems of the soul, and saw midwives for illnesses of the "stomach" (uterus).

He also found that the source of care was related to the feelings that women or adolescents associated with pregnancy or common illnesses. He reports that physicians were consulted more frequently if the client experienced coldness and fear, health centers were most frequently used if the client associated her condition with pain, midwives were consulted more frequently if the client associated her condition with fear and sadness, and healers were most frequently used if the client experienced fear and pain.

The Mendez-Dominguez study also revealed that the adolescents' conceptualization of the relationship between the mother and child inhibited prenatal care use. The mother is simply a carrier of the baby. Pregnancy is also conceptualized as a waiting period. For these reasons many adolescents apparently did not perceive the need for prenatal care.

The MNHC Program studies indicate that services were used based on their agreement with the cultural beliefs of the care seeker. These findings support the contention that services tailored to specific cultural beliefs and needs of their target population are more likely to be used.

Perceived need. Another common belief of adolescents is that prenatal care is not necessary. Adolescents' perceived need for prenatal care has been found to be lower than adults' perceived need for such care (WHO 1986).

In the study by Lundgren and her colleagues, 21 percent of the older adolescents who received no prenatal care (N=28) stated that prenatal care was not important or that they felt fine so they did not need it. None of the younger ones who received no prenatal care (N=7) stated this same reason. Similarly, 40 percent of the pregnant adolescents (older and younger) who received some prenatal

care responded that they did not do so in the first trimester either because prenatal care was not important or because they felt fine. Mendez-Dominguez also found that the most commonly cited reason for delaying consultation with a health care provider was the adolescent's belief that if she feels well there is no need for the consultation.

Support system. Young people are sensitive to the opinions of others and rely heavily on the advice and support of others. This advice and support is particularly important during pregnancy because of adolescent's lack of experience and knowledge about health care and reproduction. Given adolescents' tendency to delay or neglect prenatal care, the advice and support of friends and family members could influence their use of prenatal care. Adolescents' sensitivity to outside pressures and lack of experience is complicated by their tendency to have more limited support systems and less ability to organize a support system than older women. For example, in some societies adolescents are more often unmarried when they become pregnant than adult women. Becoming pregnant before marriage can lead to the loss of support from family and peers in certain cultures (Alvarez 1987; Senderowitz and Paxman 1985).

In the Mexican study, adolescents most frequently cited personal recommendations as a factor in their decision of which care giver to use. Thirty-four percent of those who used physicians did so on the basis of recommendations and 53 percent of those who sought prenatal care from a midwife did so on the basis of recommendations. When the Mexican adolescents were asked to whom they went for advice and support after finding out that they were pregnant, 25 percent of older (ages 16 and 17) adolescents and 33 percent of younger adolescents (ages 14 and 15) reported that they went to their mothers. Three percent of the older adolescents and 6 percent of younger adolescents went to their mothers-in-law for support, while 40 percent of older adolescents and 20 percent of the younger adolescents sought support from their partners. Generally, older adolescents sought less support from relatives and friends and more from their partners, compared to younger adolescents, who relied most heavily on their mothers.

Lundgren and her colleagues found that family support was not always available for pregnant adolescents: 28 percent did not receive moral support from their mothers and 52 percent did not receive moral support from their fathers. Furthermore, approximately 30 percent did not receive either moral or economic support from their partner. Twelve percent of the mothers and mothers-in-law and 13 percent of partners recommended prenatal care. Sisters and sisters-in-laws most frequently recommended prenatal care (19 percent).

Marital status was not found to be a significant determinant of prenatal care use in the Mexico City area. Support from the adolescent's family or of the partner's family was a more important determinant of seeking prenatal care than the partner's support. According to the Lundgren team,

midwives offered more advice and support and were more trusted than physicians. This may help to explain why midwives were popular even when physicians also were consulted for care.

Mendez-Dominguez reported that in Guatemala the adolescent's mother-in-law is a significant influence on the use of prenatal care. Seventy-eight percent of the adolescents lived with their parents-in-law (in the same house or on the same plot of land) and 11 percent lived with their own parents. Of 77 adolescents questioned, 35 were accompanied by their mothers-in-law for their first prenatal care visit, and 32 were accompanied by both their mother and mother-in-law, demonstrating the importance of the mother-in-law as a source of support. Unfortunately, he found that the adolescents generally had a low degree of respect, affection, and trust for their mothers-in-law. He also found indications of poor communication between mothers-in-law and daughters-in-law, particularly in the area of sex and pregnancy.

Both of the studies supported under the MNHC Program highlight the importance of social support in determining prenatal care use by adolescents. This suggests that prenatal care education and information programs should not target only adolescents, but others who frequently advise adolescents.

Conclusions and Recommendations

The results of the new research in Mexico and Guatemala under the MNHC Program confirm that prenatal care coverage for adolescents is low and inadequate. Many do not receive care at all, and the majority receive fewer than three visits. Many also delay seeking care until the second or third trimester of pregnancy. This research also shows that adolescents often rely on more than one source for prenatal care, and lack of continuity may have negative consequences.

The research also sheds light on the determinants of underuse of prenatal care by Mexican and Guatemalan adolescents. The studies reveal that adolescents generally consider physicians safer than other prenatal care sources, which suggests that adolescents perceive formal care services to be of high quality, as has been shown among women of all ages in other studies. However, formal care services often do not address the emotional and spiritual needs particular to pregnant adolescents or acknowledge traditional beliefs about pregnancy. These findings indicate that to increase use, formal services should be made more culturally appropriate for pregnant adolescents.

Adolescents' attitudes towards and feelings and beliefs about pregnancy and prenatal care emerged as key factors in the underuse of prenatal care. As the Mexican and Guatemalan studies revealed, feelings such as guilt and embarrassment were common among pregnant adolescents and inhibited their use of prenatal care. Their perceived need for prenatal care was also very low. Failure to

consider and adapt to these beliefs and attitudes may contribute to low prenatal care use by adolescents.

Another significant finding common to both studies was that adolescents depend heavily on their family for support, advice, and information. The family was the most important source of information and advice, and the adolescents' mothers and mothers-in-law were consulted frequently.

A profile of those adolescents most at risk of obtaining inadequate prenatal care is those that are without family support, less educated, born or raised in rural areas, and that did not plan or want the pregnancy.

As documented in other research efforts among women of all ages, formal educational attainment and income were positively related to prenatal care use. Adolescents, however, have a severe lack of information about reproduction, pregnancy, and delivery; the need for prenatal care; and the availability of prenatal care. They were also unaware of the risks of early childbearing. Very few reliable sources of information were available to the adolescents in either study location. Therefore, there is a need for more emphasis on reproductive health education for adolescents. Educational messages should emphasize the importance of seeking prenatal care early.

These educational efforts should be transferred through informal mechanisms as well as through the formal education system because many adolescents leave the formal educational system early, especially in rural areas. Educational efforts directed to pregnant adolescents should acknowledge the physical, social, and emotional aspects of pregnancy and address the fear and shame adolescents may experience.

Education programs directed at adolescents should include older women and partners of adolescents because they influence adolescent behavior and decisionmaking. In societies where a considerable amount of shame and secrecy surround adolescent pregnancy, older women may be one of the few acceptable channels for transferring information on pregnancy and prenatal care to the adolescent girls.

Adolescents were attracted to midwives as care givers because the midwives offered moral support and comfort. This has been reported by women of all ages. The formal sector should seek to incorporate some of the midwives' qualities, such as friendliness, understanding, and moral support into their services to improve use. More attention should also be given to improving the midwives' skills and strengthening their capacity to educate all women including adolescents and those who influence them, about reproduction, pregnancy, and the importance of early and adequate prenatal care.

Professionals involved in health policy or program planning should note from this research that the educational, legal, socioeconomic, and psychological characteristics of adolescents are different from those of adult women. Designing services to meet the unique needs of adolescents would improve the appropriateness of care provided to them.

5. FUTURE DIRECTIONS IN MATERNAL NUTRITION AND HEALTH RESEARCH

The MNHC Program has contributed to efforts to make motherhood safer in developing countries by addressing important research questions and advancing knowledge of maternal nutrition and health care. The findings on maternal nutritional depletion, innovative approaches to nutrition programs, the user's perceptions of prenatal care providers, and the constraints adolescents face in obtaining prenatal care are particularly timely and useful. However, understanding of an issue often leads to new and more specific questions. Accordingly, in addition to answering many questions, the studies supported under this program identified many interesting areas for future research. As with all research efforts, reflecting on the program's implications for future study is appropriate.

Priority Areas for Future Research

The MNHC Program's findings reinforce the need to continue research in several areas. Key areas for future study within maternal nutrition and health include education about the importance and availability of prenatal care (especially for adolescents), the potentially negative nutritional effects of frequent reproductive cycling on mothers, the special constraints to service use women face, and users' perspectives on maternal care. Many of the studies found women suffering from poor health and nutrition. To end the intergenerational cycle of poor health found in many developing countries, mothers must start and finish each pregnancy in good health. Improving maternal health is one of the most effective preventive measures for improving the long-term health of the entire family.

To be truly effective in improving maternal health and nutritional status, interventions must (a) consider the welfare of both the mother and child; (b) look beyond the duration of pregnancy and lactation; and (c) consider the broader context of women's lives. The current narrow definition and focus of maternal nutrition and health efforts does not adequately promote long-term health and good nutrition for mothers or their children.

Even the most common and accepted maternal and child health care efforts should be re-examined for their impact on women. More research is needed on the potentially negative nutritional effects of reproduction and lactation, especially of frequent reproductive cycling and of pregnancy concurrent with lactation in the context of poverty and limited food supplies. The importance of birth spacing and family planning to increase the length of the recuperative period between reproductive cycles needs to be emphasized not only for the benefit of child growth and survival but also for improving women's nutritional status. Programs should recognize the nutritional demands of breastfeeding on women and, particularly when it occurs concurrent with pregnancy. Breastfeeding promotion programs should provide women with food supplements to protect their

nutritional status. Health researchers and other professionals must look beyond conventional interventions that too often have been designed to benefit the child without careful consideration of the impact on the mother.

The lack of focus on nonpregnant, nonlactating women, typical of most maternal nutrition and health efforts, allows many women to enter and complete pregnancy malnourished and in poor health. The definition of maternal health must be expanded to include efforts to maintain women's health and nutrition between and following reproductive cycles and to include adolescents. Few health education programs target adolescents, who tend to know little about reproductive health. The growing numbers of adolescents in developing countries and the health risks of adolescent pregnancy highlight the need to focus attention on this age group.

In addition to expanding the definition of maternal nutrition and health to include nonlactating, nonpregnant women, future research should consider the broader context of women's lives. Factors that constrain women's abilities to care for their own health and nutritional status and the health of their families, such as women's disproportionate share of poverty, dual home and market production activities, and longer work hours, are as important to consider as their physiology. The impact of seasonality on food availability, on women's energy expenditure, and thereby on women's nutritional status should also be recognized. A more complete understanding of the realities of women's lives would greatly enhance the health care system's ability to address women's health and nutritional needs and the constraints to service use and self care by women. Such a holistic approach is crucial for the success of health sector goals, such as Health For All by the Year 2000.

The urgent need for more prenatal care education was evident from many of the MNHC Program studies. The lack of information was particularly marked among adolescents. Since the adolescent years are crucial for forming beneficial nutrition and health habits and ensuring that women enter pregnancy in good health, health care programs should place greater emphasis on targeting adolescents.

The MNHC research results also offer evidence that the user's perspective is key to understanding why existing services are underused, often by the subgroups of the population that need them the most. Such elements as the amount of social support available to the potential service user and her beliefs and attitudes about care providers are very significant determinants of service use.

In general the MNHC Program studies were not able to contribute a significant amount of information on morbidity related to pregnancy and childbirth. The development of better measures of morbidity and appropriate methodologies is crucial, and the collection of morbidity data is a priority for future research.

Priority Approaches and Methodologies

In addition to directing researchers to priority topics for future research, the results of the MNHC Program provide guidance on certain approaches and methodologies that may be useful. Approaches found to be particularly useful include the formation of multidisciplinary and multinational research teams, the combined use of qualitative and quantitative methodologies, and the collection and analysis of population based data rather than clinic or hospital based data.

The research projects under the MNHC Program are, in general, characterized by multidisciplinary research teams. Almost every team consisted of both medical or public health specialists and social scientists. Having team members with a variety of backgrounds improves the quality of research by allowing consideration of research questions from different perspectives and limiting the possibility of overlooking possible interpretations of research findings.

All the teams were composed either exclusively of developing country nationals or of developing country nationals working in collaboration with U.S. researchers. Research teams unfamiliar with the study population may collect data incorrectly or mistakenly interpret the data they collect. Teams with developing country nationals as members may be more likely to identify the locally important issues for research, design appropriate research methodologies, interpret the research findings correctly, and make more relevant policy and program recommendations.

Combining quantitative and qualitative methodologies improved the relevance and reliability of the findings. The importance of social supports for service use by adolescents was highlighted largely through qualitative data. Qualitative data also helped to shed light on barriers to service use and compliance that were otherwise difficult to measure. The focus group technique proved to be particularly effective way to gather qualitative data.

In addition, the MNHC Program highlighted the limitations and biases inherent in clinic or hospital based data for making health policy recommendations for a larger population. Clinic or hospital samples are, for example, more likely to be highly motivated to seek health care, or have more extreme forms of a particular illness or condition, than the general population. Population based studies therefore, generate more representative, and more useful data.

Conclusion

The MNHC Program has shed light on priority research topics for the future, as well as on the methodologies and approaches that appear most likely to answer the many questions that remain on the most appropriate ways to improve maternal nutrition and health care. To advance current efforts, research teams should expand their definitions of maternal health and the factors that affect

maternal health. Future research should focus on the realities of women's lives outside their reproductive roles and consider the needs of women as well as children. More research should be conducted by developing country nationals, and research teams should expand their use of common methodologies to include multidisciplinary approaches and developing country researchers. Moving in these directions will bring the international health community closer to defeating the high rates of maternal mortality and morbidity in the developing world.

More research programs based on the MNHC Program model could meet the demand for information effectively and efficiently. This model is particularly well-suited to encourage smaller scale studies by developing country teams or collaborative teams, which improves the likelihood that priority research questions are being addressed in an appropriate and timely fashion, and allows an expanded pool of researchers to use a broader range of creative methodologies. Without effective and efficient funding mechanisms such as this, research will be less likely to provide health care practitioners with the help they need to meet the tremendous health care needs of developing countries facing growing populations and shrinking health sector budgets.

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**A Longitudinal Analysis of the Patterns and Determinants
of Women's Nutrition in the Philippines**

Research Team: Linda Adair, University of North Carolina at Chapel Hill; Barry M. Popkin (Principal Investigator), University of North Carolina at Chapel Hill; Eilene Bisgrove, University of North Carolina; Corazon Barba, University of the Philippines at Los Baños.

This study examined a longitudinal data set collected from 1983 to 1984 in the Metropolitan Cebu region of the Philippines. More than 3,000 randomly selected Filipino women were studied from the third trimester of pregnancy until 24 months postpartum. These rural and urban women were marginally nourished, as evidenced by their low dietary intake and energy, iron and calcium relative to WHO recommendations, and a 14-15% prevalence of chronic energy deficiency (BMI less than 18.5) at two months postpartum.

The study focused on the relationship of women's work and income to diet and the relationship of lactation to diet and nutritional status. To identify the determinants of nutritional status, maternal anthropometric data and information on lactation behavior, morbidity, activity patterns, work status, and income were collected bi-monthly throughout the study, and dietary data were collected in the third trimester of pregnancy and at 2, 6, and 14 months postpartum.

Using a combination of bivariate and multivariate analyses, the researchers found that mean intakes of energy and nutrients (protein, fat, iron, and calcium) increased from the third trimester of pregnancy to the highest level at two months postpartum, and then decreased steadily to levels below baseline at 6 and 14 months postpartum. Urban women consumed significantly more energy, protein, and fat than rural women in multivariate analyses, independent effects of work and income on energy intake were found. In the urban sample, while work status had no significant effect, after adjusting for income of others in the household, women's own income had an important positive effect on energy intake. For each additional 160 pesos (\$8) per week of women's own income, dietary energy intake would increase by 200 kcal per day. In the rural sample, however, there was a significant negative effect of women's work on their nutrient intake and the effect of increased income was not significant. Educational level had strong positive effects on dietary intake: for each additional year of education, urban women consumed an additional 38 kcal per day and rural women

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an additional 26 kcal per day.

Lactation behavior was strongly related to maternal nutritional status. Although women who breastfed their infants differed in several ways from women who never established lactation (they are younger, of lower income and education, live in less modern communities, and have smaller triceps skinfold thicknesses and lower height and weight). In multivariate analyses, with these factors controlled, lactation had a statistically significant and biologically important negative effect on maternal weight. The most important effects of lactation on maternal weight occur among urban women who breastfed for more than 12 months. Among rural women, the largest negative effects on weight occurred with lactation for more than 24 months.

In separate analyses of weight changes, the majority of women (67%) were found to have experienced net weight losses between 2 and 24 months postpartum. The likelihood of net weight loss is increased among older women and by prolonged lactation (particularly for more than 24 months). The longer a woman has to recuperate from the nutritional stresses of lactation, the more likely she is to show a net weight gain. This finding emphasizes the importance of birth spacing.

Energy intake had a significant positive effect on weight among urban women. For each additional 100 kcal consumed, urban women weighed, on average, 2.3 kilograms more and rural women weighed about 1.5 kilograms more. The effects of increased energy intake became more significant over time for urban women only. The study concludes that an additional 200 kcal/day for this population of marginally nourished mothers would decrease the likelihood that their energy reserves would be reduced during the postpartum period and potentially offset the negative effect on prolonged lactation the nutritional status of undernourished women.

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**Improving Maternity Care Services
in the Karawa Health Zone of Zaire**

Research Team: Carol Hermann (Principal Investigator), Family Health International; and Samba Duale, Projets des Soins de Sante Primaires en Milieu Rural, Zaire.

This project conducted a secondary analysis of data collected from 1984 to 1986 as part of the Pregnancy Monitoring Study conducted at the Hopital de la Communale Evangelique en Ubangi-Mongala in Karawa, Zaire. The data included information obtained for 8,034 deliveries, both hospital deliveries and home deliveries assisted by traditional birth attendants (TBAs). In addition to the secondary analysis of data, the study also conducted a survey of TBAs from 1988 to 1989 and organized group discussions on TBA referral practices in the Karawa Health Zone. The goal of the study was to identify the factors that best predict the need for referral and intervention at delivery, compare these with criteria actually used in Karawa, and suggest modifications to existing risk assessment criteria and instruments for risk detection. To do this, the study was divided into four phases. The first phase was designed to understand the patterns of referral by TBAs and the criteria TBAs use to assess risk prior to referral. The second phase assessed the risk factors that were most closely associated with maternal death in a hospital. The third phase studied the effectiveness of basic risk indicators in predicting obstructed labor. The fourth phase compared the effectiveness of symphysiotomy and cesarean section for obstructed labor in the presence of cephalopelvic disproportion (see summary 15 for more information on this work which was funded as a separate study).

The analysis of the TBA birth register data revealed that when TBAs made referrals, they were appropriate referrals, however, they did not refer all women with acute complications. The results of interviews with 91 TBAs revealed confusion about risk factors and the danger signs of acute problems. Less than three-fourths of the TBAs freely recalled several important pregnancy-related risk factors, including antepartum bleeding, twin deliveries, and malposition. Only a small minority mentioned the importance of antecedent risk factors. In general, the data showed that TBAs did not play an active role in early or mid-pregnancy. For this reason, TBAs were probably more likely to think in terms of acute danger signs rather than antecedent risk factors. The researchers suggested that because there was no monetary reward for making an appropriate referral, the loss of income every time a TBA made a referral may have acted as a disincentive to referral. In addition, if

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services are inadequate, if patients face long delays at medical facilities, or if for some other reason the birth outcome is unfavorable, the TBA may be further discouraged from making the necessary referrals.

The second phase, the analysis of the factors associated with maternal mortality, further emphasized the importance of access to emergency obstetric services. Duration of labor (more than 24 hours) was associated with the greatest risk of death among women admitted to hospital for delivery. An examination of the maternal deaths revealed that several factors delayed access to the hospital. These were lack of transportation, lack of understanding or noncooperation on the part of family members, and preference for treatment from alternative nonmedical sources. Difficult terrain and distance were also critical factors.

Referral was associated with a significant increase in the risk of death for the same reasons. By the time a referred woman was admitted to the hospital she was often moribund from the complications of extremely prolonged labor. Obstructed labor was another variable associated with the greatest risk of death. However, when duration of labor and referral status were included in the analysis, the level of risk associated with obstructed labor decreased and was no longer significant. Lack of prenatal visits was another significant risk factor for maternal death.

In general, the analysis confirmed the importance of reducing the length of time between onset of labor and medical intervention, particularly for women with obstructed labor. The researchers recommend that a composite of strategies be developed to promote the early recognition and referral of women at risk of complications, and that women's access to emergency obstetric facilities be improved. The researchers also suggest that efforts should be made to improve the skills of TBAs, health center nurses, and community members.

The third phase of the study focused on screening criteria designed to detect women at risk of surgical intervention for obstructed labor due to cephalopelvic disproportion. The analysis measured the importance of six risk factors using two screening methods. The first method produced a screening test using the predominant risk factor of parity status in combination with different height criteria. The second method used logistic regression to estimate the probability of obstructed labor given each combination of risk factors occurring in the study population. These methods produced screening criteria of different levels of specificity and sensitivity.

A major limitation of this analysis was the reliance on hospital data, since the distribution of risk factors is likely to differ in nonclinic populations. Thus, population based data are required to validate the criteria for identification of women at risk of cephalopelvic disproportion in the community.

Maternal Nutritional Depletion: Evidence of Responses to Frequent Reproductive Cycling

Research Team: Kathleen Merchant, Stanford University; Reynaldo Martorell (Principal Investigator), Stanford University; Teresa Gonzalez-Cossio, Instituto de Nutrición de Centroamerica y Panama (INCAP); Juan Rivera, INCAP; Jere D. Haas, Cornell University.

This research team first reviewed the literature, then conducted a secondary analysis of longitudinal data collected in 4 villages in the eastern highlands of Guatemala from 1969 to 1977. Of the original sample of births during the study period (1,529) a subsample (509) was chosen of women who had singleton births, had a previous pregnancy during the study, and for whom reliable data on previous gestational age and lactation duration was available. The team explored the effect of reproductive cycling on maternal nutritional status. The study addressed the issue of maternal nutritional depletion through an investigation of the prevalence and responses to lactation concurrent with pregnancy and short recuperative intervals between reproductive cycles.

The research team undertook a literature review and devised a framework for investigating maternal nutritional depletion. The review concluded that our understanding of the cumulative energetic stresses of pregnancy and lactation over several reproductive cycles is inadequate.

The research design of the Guatemalan supplementation trial on which this analysis was based made food supplements available *ad libitum*. Within each village, supplementation centers were set up and the supplement drink was made available twice daily between meals to the entire community. This supplementation intervention was present in the village for all eight years of the intervention study period. Despite the increased availability of energy, the nutritional stress of frequent reproductive cycling was evident. Women with long recuperative intervals (nonpregnant/nonlactating intervals ranging from six months to eight years between cycles, with a mean of almost four years) had measurably higher fat stores than women with short recuperative intervals between reproductive cycles. The women who experienced long recuperative intervals took significantly less supplement than the women who had short recuperative periods. These differences persisted across consecutive

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pregnancies in the same woman. Pairing of consecutive pregnancies was done to control for characteristics of the mother that could confound the relationships of interest.

The data revealed that 50 percent of the women experienced lactation overlapping with pregnancy, that is, 50 percent of the women had no recuperative nonpregnant/nonlactating interval. The mean supplement intake of women who experienced the overlap of lactation with pregnancy was higher than that of women who did not. These differences persisted across pregnancies in the same woman and after controlling for the short birth interval in the analyses. The presence of the pregnancy/lactation overlap also affected fat stores negatively.

The results indicated that of the two reproductive states, overlap was more stressful to maternal nutritional status than short recuperative interval. Long recuperative intervals were the least energetically stressful on the mother. A comparison of consecutive pregnancies in the same women indicated the same order of stress among the reproductive states.

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**Communications/Education Strategies for Improvement
of Prenatal Health Behaviors in Mexico**

Research Team: Susan C. M. Scrimshaw (Principal Investigator), University of California Los Angeles (UCLA); Ruth E. Zambrana, UCLA; Saskia Estupinan, UCLA; Rosa Luna, Universidad Autonoma de Baja California (UABC); Hector Rivera, UABC.

This project used ethnographic study methods, surveys, and focus groups to obtain information from 491 pregnant women in Tijuana, Mexico. The researchers relied on this information to develop educational messages for public mass media with the goal of improving health-related behaviors during pregnancy. The initial ideas for messages were then tested in focus groups and refined.

In the initial survey women were asked about food beliefs, use of prenatal care services, and common sources of health information. The survey results showed that women who initiated prenatal care early in pregnancy were more likely to seek advice from a physician, were more knowledgeable about self-care and the risks of pregnancy, and were likely to make more prenatal clinic visits. The women had inadequate knowledge about optimum weight gain during pregnancy and cited anemia as a common problem. They had varying degrees of awareness of other risk factors in pregnancy (namely, diabetes, hypertension, vaginal bleeding, abdominal cramps), but a need for more information was evident. They also reported that their male partners were not supportive about weight gain and other self-care behaviors.

Television, radio, pamphlets, posters, and communication with relatives were important sources of information. The preferred source of pregnancy-related information was one-on-one or small group contact with doctors or nurses in clinic settings.

The project produced prototypes for four communication materials: a consciousness-raising poster, a calendar with basic prenatal care messages, a pamphlet with more detailed messages, and two songs with messages about the responsibilities of the baby's father and the importance of good nutrition during pregnancy. The key consciousness-raising message was "Pregnancy is a serious matter: inform

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yourself; take care of yourself." The prenatal message emphasized the need for prenatal examinations at least three times during the pregnancy: at the beginning, middle, and end of pregnancy. Both men and women were targeted with the message that a gradual weight gain of between 10 and 12 kilograms is important during pregnancy. The nutritional messages underlined the need for good nutrition to prevent anemia and the importance of taking vitamins. The calendar and the brochure included messages to encourage pregnant women to consult a physician if they experienced any of a set of symptoms, such as severe headaches, swollen feet, cramping, and vaginal bleeding. The researchers also recommended talk radio programs using local physicians for questions and answers and clinic discussion sessions as useful mechanisms for educating women about appropriate health care during pregnancy.

The use of ethnography methods, surveys, and focus groups was complementary. Potential topics were often identified during the ethnographic phase, quantified during the survey phase, and then refined into messages by means of the focus groups. The researchers recommend the use of these complementary methods for future educational efforts.

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**Evaluation of a Novel Delayed-Release Formulation
for Iron Supplementation in Pregnancy**

Research Team: William K. Simmons (Principal Investigator), Caribbean Food and Nutrition Institute.

The purpose of this study was to test a hydrodynamically balanced (HBS) formulation of iron. This formulation allows for the slow release of ferrous sulfate into the system and may also permit superior absorption. The study sought to document the compliance rates and gastrointestinal side effects for this formulation of iron.

Clinical trials were conducted in several prenatal care clinics in the Kingston, Jamaica, urban area. Women were divided into three groups: a control group of women who were given a placebo, and two experimental groups, one of which was given the HBS iron, and the other ferrous sulfate. All three groups were also given folacin. The total sample size was initially 372, but due to a high drop-out rate, the final sample size was 260. Seventy-eight percent of the total sample was anemic with an average hemoglobin count of 10.2 g/dl.

The results indicated there was no cost difference between HBS and ferrous sulfate and that the compliance rate for both was high. There were also no significant differences in the side-effects reported by all three groups. The researchers noted that the side effects that were reported by both experimental groups diminished over time.

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**Beliefs, Attitudes, and Behavior Limiting the Demand
for Prenatal Care among Guatemalan
Indian Adolescent Girls**

Research Team: Alfredo Méndez-Domínguez (Principal Investigator), Universidad del Valle de Guatemala.

This study explored the knowledge, attitudes, and practices of pregnant Guatemalan Indian adolescents regarding pregnancy and the use of prenatal care. Through interviews conducted from August 1988 to January 1989, the researcher gathered information from 282 adolescents (aged 15 to 19), 217 adult women, and 28 health care providers from eight semirural communities. Information from the interviews was used to describe the knowledge, attitudes, and conceptualization of traditional and formal prenatal care and how these affect the use of prenatal care services. The researcher also sought to determine how available sources of information and support influence adolescent's knowledge, attitudes, and prenatal care seeking behavior.

The study found that the pregnant adolescents received inadequate prenatal care and that they often did not institute care until late in pregnancy. This may be explained by the findings that adolescents had very limited knowledge about the physiological processes involved in pregnancy or about the health services available in their communities. In addition, most adolescents felt that there was no need for prenatal care. Other significant findings include the importance of the adolescent's mother-in-law as a source of support, education, and advice on prenatal care.

An explanatory model that considered characteristics of the adolescent, attributes of pregnancy and common illnesses, and feelings about pregnancy and common illnesses was tested for its ability to explain and predict prenatal care seeking behavior.

Recommendations resulting from this study include increasing educational efforts targeted to adolescents, targeting adult women with messages concerning the importance of prenatal care, and improving the skills and knowledge of midwives.

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**Prevention of Maternal Malnutrition
through a Community Kitchen in Peru**

Research Team: Sandra L. Huffman (Principal Investigator), Center to Prevent Childhood Malnutrition (CPCM); Marfil Francke, CPCM/Peru; Hillary Creed de Kanashiro, CPCM/Peru; Nair Carrasco, CPCM/Peru; Jasmin Casafranca, CPCM; Betsy Slater, CPCM/Peru; Ruth Palomino, CPCM/Peru.

This study investigated the effects of a community kitchen (*comedor comunal*) located in a slum area on the outskirts of Lima, Peru, on maternal diet and maternal activity patterns. Community kitchens are sites where women take turns preparing food together. The team collected data through surveys and observations from April 1988 to April 1989 on a final sample of 22 women who were either pregnant or had at least one child under four in the *comedor* community and on a control sample of 13 similar women living in a community with no *comedor*.

Maternal dietary intake was assessed using 24-hour individual recall (using estimated quantities) and food frequency methodologies based on survey information on food consumption. The recall data were validated by weighed intakes of food for six women. Maternal activity patterns were assessed using information on time allocation based on a 24-hour recall of activities, validated by comparing the reported times with observations of time spent in typical activities. The operation of the *comedor* was monitored at bimonthly intervals and participation was assessed every three months.

The study found that although the *comedor* was open to all community members, women were more likely to use it than men or children. This seems to be because on the days when it was their turn to work, the women received and consumed free rations. While duty at the *comedor* meant one full day of extra work for the women every two to three weeks, it resulted in an overall savings of time spent in home food production for two classes of women, those who worked for wages outside the home and those who worked as volunteer community leaders. Women who did not work outside the home, however, continued to spend the same amount of time in home food preparation.

The effect of the *comedor* on women's dietary intake was difficult to assess because of the economic crisis in Peru during the study period. Extremely high rates of inflation (estimated at 1,700 percent in 1988 and 2,755 percent in 1989) skewed the food expenditure data, and consequently the food intake data. Nevertheless, the evidence suggested that participation in the *comedor* was associated

with improvements in the diets of mothers and that the *comedor* may have helped the community buffer the effects of inflation.

The researchers concluded that this innovative program has many advantages, including that it is run by the community itself, and therefore avoids many common problems in nutritional interventions, such as lack of cultural appropriateness, continuity, and logistical problem. It also considered the many demands on women's time and allowed women to participate in the design and implementation of a nutritional program.

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**Maternal Nutrition and Health Status of Indian Tamil
Female Tea Plantation Workers in Sri Lanka**

Research Team: Vidyamali Samarasinghe (Principal Investigator), University of Peradeniya, Sri Lanka; Sirimai Kiribamune, University of Peradeniya, Sri Lanka; Wijaya Jayatilaka, University of Peradeniya, Sri Lanka.

Official statistics indicate that Indian Tamil female tea plantation workers have the lowest life expectancy levels and the highest maternal mortality rate among all segments of the population in Sri Lanka. This is true even though plantation female labor earnings and plantation household earnings are well above the national average and the official poverty line. Plantations typically have relatively good health care facilities and specially designed maternal nutrition programs. The study's hypothesis was that the reasons for poor maternal nutrition and health status among the Indian Tamil plantation workers are probably due to factors other than acute poverty or lack of access to adequate health care. In an attempt to discover the determinants of high maternal mortality rates among this population of women, the research team examined the factors that affect maternal nutrition and health status.

During 1988 and 1989 data was gathered using questionnaire based interviews of a sample of workers on 22 tea plantations. The sample included pregnant women, lactating women, older women, younger unmarried women, resident Sinhalese women, and Indian Tamil male workers. The total female sample was 411. Further information was compiled from informal interviews with resident senior managers and resident health and welfare personnel of the selected plantations. Clinical tests on a subsample drawn from the larger female sample were used as an additional source of data. Data were also drawn from official primary sources.

The study confirmed that although Indian Tamil female tea plantation workers enjoyed higher levels of income than many other segments of Sri Lankan society, their health status during pregnancy and lactation was lower. Moreover, the study indicated that the subordination of women was the norm, not only at the household level, but also at the employment level. While managers openly acknowledged that women's labor was more valuable than male labor as a factor of production and

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that women were in theory supposed to receive equal wages, women, actually worked longer hours and form the lowest level in the plantation hierarchy.

Dietary intake levels, especially for pregnant and lactating women, were below levels recommended as nutritionally adequate. The data indicated that pregnant women consumed less calories than either lactating women or women outside the reproductive period. Mean daily energy intake from cereals (the principal source of energy in the diet) for pregnant women was 1,120 kcal, while lactating women consumed an average of 1,328 kcal per day. These levels are lower than recommended daily allowances (RDA) by approximately 8 percent. The average energy intake level for unmarried women was 1308 kcal per day, and for older women 1134 kcal per day, representing levels that exceed RDA by 7 percent and 30 percent, respectively. A significant interhousehold food allocation bias was noted, with men consuming from 4 to 17 percent more than RDA.

Most of the women workers did not have control over their incomes. Their take-home wages (minus the deduction made for cereal purchases) were principally controlled by the male members of the household. Nevertheless, the research team found a correlation between women's income levels and their level of participation in decisionmaking about purchases of household items. Women who had higher incomes reported greater participation in food purchase decisions. Data from questionnaires and interviews indicated that the plantations' geographical isolation and their distance from markets limited women's ability to buy food. Moreover, high demand for female labor on the plantation left women little time for home based activities, such as preparing food or seeking health care.

Based on the research findings, the study concluded that the persistence of poor maternal health and nutrition among the female tea workers is the result of uneven social change and disjointed policy reform over time. The researchers suggest that policymakers need to understand better the linkages between such factors as current plantation management structures, the health care delivery system, female education, women's social mobility, and the status of women.

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**A Comparison of Use Patterns, the Health Care Process,
and the Effectiveness of Four Prenatal Health Services
in a Provincial Community of the Philippines**

Research Team: Violeta Villaroman-Bautista (Principal Investigator), University of the Philippines; Aurorita Tan Roldan, University of the Philippines; Monina Basco, University of the East, the Philippines.

This study, conducted in 1988, focused on the patterns of prenatal care use and described the content and effectiveness of such care as provided by four types of health care providers: the public doctor, the private doctor, the licensed midwife, and the hilot (or traditional midwife). The study was conducted in two phases, each with an independent methodology. Phase I focused on patterns of care use and attempted to determine the effect of four independent variables on the patterns of use: domicile (urban or rural), socioeconomic status, educational status, and parity. Phase II focused on the content and effectiveness of prenatal care.

For Phase I, the research team interviewed a sample of 150 women from rural and urban areas of Laoag City and the municipalities of Sarrat and Dingras in the Philippines. The majority of these women belonged to the lower and middle socioeconomic groups, were between 20 and 30 years of age, were literate, and had been through at least one pregnancy. For Phase II, the team interviewed 40 health workers and observed over 30 consultation sessions. The interviews revealed that 96 percent used some form of prenatal care. Twenty-four percent chose to go to public doctors, 21 percent to midwives, 13 percent to private doctors, and only 8 percent sought prenatal care from hilots. Professional competence and recommendations by friends and relatives were the reasons most often cited for choosing one health care provider over another. In general, public and private doctors were perceived as the most knowledgeable and skilled for prenatal care, but midwives were perceived to be the experts for delivery care. Hilots were used specifically for prenatal and postnatal massage.

When women went to more than one type of health care provider for prenatal care, they most often selected a combination of a public doctor and a midwife. The decisions about the choice of prenatal care provider were most often made by the women themselves or by means of discussions with their

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husbands and family elders. The results also indicated that the women's socioeconomic status, type of domicile, and educational level significantly influenced the choice of health care provider.

The results from Phase II showed that both health workers and clients defined the goal of prenatal care as "ensuring the health of the pregnant mother and her baby." All four health care providers, however, seemed to lack knowledge about the importance of the separate components of prenatal care. Although the providers showed care and concern, they did not spend sufficient time in establishing rapport with their clients. Many of the health workers restricted their sessions to physical and laboratory examinations and did not provide nutrition information. In general, the health care providers did not encourage their clients to participate actively in the sessions. The study also provided detailed comparisons of the effectiveness and consultation styles of the four types of health care providers.

The researchers recommend broadening the roles of the midwives and hilots in the primary health care system. They suggest that such traditional care givers be trained in all aspects of prenatal care and that they be incorporated more completely into the primary health care system. Other recommendations emphasize the need to sensitize doctors to local cultural customs, beliefs, and practices.

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**Participation of Women in Primary
Health Care in Swaziland**

Research Team: Jean Rutabanzibwa-Ngaiza (Principal Investigator), London School of Hygiene and Tropical Medicine.

This research on women's participation in Swaziland's primary health care efforts was conducted in the Hluti and Matsanjeni areas of the Shiselweni regions. The study focused on women as health care providers and users at both the community and maternal and child health (MCH) clinic levels.

The study population consisted of 185 women with children below the age of six in their care. The women resided in two rural areas, one with a rural development program (RDP) and one without. The researcher hypothesized that women in the RDP would be more involved in developmental activities via women's groups, and that this involvement would greatly enhance their health and other decision-making powers within the home.

In-depth interviews were conducted with 53 women on their knowledge of primary health care, community participation in health, and the concept of Health For All by the year 2000. All 185 women in the sample were also asked to name the MCH services available, and to explain the relevance of vaccinations and weight monitoring. The in-depth interviews revealed that 68 percent of the women had never heard of the concepts of primary health care and Health For All by the year 2000. The remaining 32 percent were not certain what primary health care meant and were skeptical of the possibility of attaining the state of health for all by the year 2000. More than 90 percent of the entire sample were aware of at least five MCH services, although some components were more well known than others. For example, 90 percent mentioned vaccinations for children and weight monitoring for women, whereas 37 percent mentioned delivery services, and just 1 percent mentioned postnatal services. However, 87 percent did not know why children were weighed and 85 percent did not know why pregnant women were vaccinated. Approximately 95 percent knew of children's preventive services.

The hypothesis that women in the RDP area would be more involved with women's groups was not found to be valid. In fact, more women in the non-RDP area were involved in women's groups.

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In addition, the study found that women made the majority of health care decisions concerning women and children in both areas.

The study revealed a relatively high utilization of some specific services, such as the vaccination of children. In general, however, the use of formal services was low. The key barriers to the use of services appeared to be the scarcity of health resources, such as personnel, delivery beds, and equipment, and the geographical inaccessibility of the clinics. In contrast, traditional birth attendants (TBAs) within the communities were found to provide health care and advice for most of the pregnant women in rural areas. Observations and interviews revealed that TBAs have a wealth of knowledge about traditional care, some of which could be incorporated into the modern health care system. There are, however, some aspects of traditional care that the researcher highlights as urgently needing modification because they appeared to contribute to the infant and maternal morbidity and mortality in this region. Specifically, these include the level of hygiene during childbirth (especially when labor is obstructed), the kind of instruments used to cut the umbilical cord, and the kind of episiotomies performed by TBAs. The researcher recommends that with some additional training, TBAs could be included within the formal health care system.

The study also examined women's knowledge and acceptance of modern contraceptive methods. The data revealed that although the knowledge of such methods was high among the women, less than a quarter reported that they were currently using contraception. The researcher suggests that the high pregnancy wastage rates and high rates of child deaths (birth to two) are reasons that inhibit women's use of contraception.

The study concluded that in evaluating women's participation in primary health care programs, their involvement in family health at the household level is relevant and should be taken into account. Moreover, since women's involvement at the clinic level was found to be limited to the role of consumer, careful planning is required to improve women's participation in the planning and management of MCH and other primary health care services.

The researcher recommends that the Ministry of Health, through the primary health care committee, should closely examine the concept of community participation and its meaning in the Swazi context. She suggests that working with existing women's groups is important to understanding women's need for and perceptions of health care.

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**Factors Affecting the Nutritional Status
of Mothers: The Food and Nutrition Program of
the Ouanda Horticulture and Nutrition Center
in the People's Republic of Benin**

Research Team: Leopold Fakambi (Principal Investigator), The National University of Benin.

This study assessed the nutritional status of a group of mothers participating in a nutrition intervention program with their children in southern Benin in an attempt to identify the factors contributing to the continued levels of poor nutrition among this population. Maternal nutritional status was assessed using both anthropometric measurement (weight for height, arm circumference, and four different skinfold thicknesses), as well as biochemical tests for iron, albumin, folate, erythrocytes, and protein levels. Hemoglobin, hematocrit, red cell count, mean corpuscular volume, and mean hemoglobin concentration were used as indicators of blood iron status. Attempts were made to distinguish nutritional from nonnutritional anemia using tests for parasitic infection.

Of the 970 women participating in the nutrition intervention program, the researcher recruited an initial sample of 940 pregnant and lactating women and collected data from August 1988 to September 1989. The women lived in three different zones, periurban, valley, and plateau, which differed not only in ecological terms, but also in terms of food availability, activity patterns, and a number of socioeconomic variables. Measures of nutritional status were taken twice, once during the season of food abundance and once during the period of food scarcity. The number of women in the study dropped to 739 for the second measuring period.

Despite high levels of participation in the nutrition program, which has been active in the community since 1963, the women have high levels of anemia (25 percent during the season of food scarcity), and a relatively large proportion (12 percent) are malnourished (body mass index less than 18 kg/m²). These figures are not significantly different from those found for women in similar communities outside the intervention zone.

Although the sample varied widely in demographic, socioeconomic, and environmental characteristics, no significant relationship was found between maternal nutritional status and such

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sociocultural variables as ethnic group, religion, food taboos, educational level, household size, and such reproductive variables as parity, pregnancy interval, and lactation behavior. The study concluded that one effect of the nutrition education intervention was to mitigate the effects that these variables typically have on maternal nutritional status.

Two factors, however, had a highly significant effect on maternal nutritional status: seasonality and residence zone. Nutritional status, as measured by anemia levels, BMI, and skinfold thicknesses, was significantly poorer in the season of food scarcity than in the season of food abundance. The plateau region is the most densely populated and most heavily cultivated zone of Benin. It had the highest levels of maternal malnutrition in this study (17 percent of the women had body mass index less than 18 kg/m² as opposed to 7 percent in the valley zone and 7 percent in the periurban zone). Arm circumference measures indicated that women in the periurban zone were less well-off nutritionally than women in the valley zone. The proportion of periurban and valley women who had arm circumference measures of less than 22.8 cm were 16 percent and 13 percent, respectively, while the proportion for plateau women was 24 percent. Anemia levels were highest among periurban women, of whom 55 percent had hemoglobin levels indicating anemia. Anemia levels for plateau women and valley women were 37 percent and 9 percent, respectively.

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**The Determinants of Diet and Prenatal
Care of Pregnant Adolescents in Mexico City:
An Exploratory Study**

Research Team: Rebecka Lundgren (Co-Principal Investigator), Centro de Orientación para Adolescentes (CORA); Guadalupe Valadez Ramirez, CORA; Noe Chavez Alarcon, CORA; Anameli Monroy de V. (Co-Principal Investigator), CORA.

The researchers collected interview data from 300 pregnant and postpartum adolescents (ages 14 to 17) and other key informants on the knowledge, attitudes, and practices of adolescents regarding prenatal care in the metropolitan area near Mexico City, Mexico. The data were collected from August 1988 to August 1989. The team sought to determine the relationship between age, education, and social support and better nutrition and early parental care use.

The factors found to be most strongly associated with indicators of better nutrition included financial support of the adolescent's father, moral support of the adolescent's father, knowledge of nutrition, moral support of the adolescent's mother or mother-in-law, higher purchasing power, and absence of nausea during pregnancy.

Prenatal care use by adolescents was found to be inadequate. The most common reasons adolescents gave for not using prenatal care were that it was not important or that they felt fine. They also cited access problems (money, time, or transportation) and embarrassment as barriers to prenatal care use. Many of the adolescents used more than one source for the care they did receive. Physicians were used principally to confirm the pregnancy and midwives were used principally to position the baby.

The research team also found that younger adolescents appeared to depend more on their mothers for advice and support, while older adolescents depended more on their partners. Adolescents who were more likely to use prenatal care were those whose mothers came from urban rather than rural areas, those who were born and raised in urban areas, those who planned or desired their pregnancy, and those who had a higher level of educational attainment.

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The adolescents most at risk had the following characteristics: they were single, without family support, less educated, from rural backgrounds, and did not desire the pregnancy. The researchers concluded that adolescents fitting this risk profile should be targeted with health education and program efforts.

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Prenatal Care Use in Peru

Research Team: Luis Locay, University of Miami, Warren C. Sanderson (Principal Investigator), State University of New York (SUNY) at Stony Brook; Ethel Carrillo Welks, SUNY at Stony Brook.

In this study, the researchers examined data on the use of prenatal care among Peruvian women collected during 1982 to 1984. They analyzed four dimensions of prenatal care behavior: (a) the decision to seek care, (b) the decision on where to seek care, (c) the decision on when to initiate care, and (d) the decision on how many prenatal care visits to have. The primary focus in the analysis and discussion of the data was on identifying government policies that would facilitate the use of prenatal care. Data from the National Nutrition and Health Survey (Encuesta Nacional de Nutrición y Salud or ENNSA survey) was used. This data is based on a stratified random sample of 19,277 households. The study included both a descriptive and quantitative analysis of these data.

During 1982 to 1984, 82 percent of pregnant women in urban Peru had at least one prenatal care check-up. In rural areas, that figure was 35 percent. Private prenatal care use was as common in the urban as in rural areas. Public care was much less frequent in rural areas. The reduced level of public prenatal care in the rural areas as compared with the urban areas was balanced by a roughly comparable increase in the percentage of care performed at home. Most urban women with prenatal care initiated care in the first trimester of their pregnancy, while only about 38 percent of the rural women did so. About two-thirds of all rural women with care had three or fewer prenatal care visits, while for urban women that proportion was less than one-quarter. Around 41 percent of urban users had seven or more visits compared with only 10 percent of the rural users.

The researchers divided the women in the urban area and those in the rural area into three groups based on their behavior toward prenatal care use: the low use, the average use, and the high use groups. These three groups represented different socioeconomic and cultural strata of Peruvian society. The team studied characteristics of women in each of the strata and their relationship to prenatal care behavior.

The list of variables associated with differences in prenatal care behavior were divided into a number of categories, including demographic variables, socioeconomic and household structure variables,

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regional variables, accessibility measures, and measures of price and quality of available health care.

The most important single variable explaining why urban women sought health care was the quality variable measured by whether or not women had access to hospitals run by the Peruvian Social Security Institute (Instituto Peruano de Seguridad Social or IPSS). The analysis indicated that if the Government of Peru could make hospitals with the IPSS level of quality available to all urban Peruvian women, the level of prenatal care use would come close to 100 percent even for women who previously had low levels of use.

Women's education proved to be one of the most important variables explaining differences in prenatal care behavior across groups. For example, women's education alone accounted for around 41 percent of the difference in the behavior between the urban low use and the average use group in terms of seeking prenatal care, and 32 percent of the difference in terms of visits per month. Data from the ENNSA survey showed that past government policies had increased women's level of education. The analysis in this study suggested that these increases would result in more women seeking prenatal care, and that they would seek this care both earlier and more frequently. The researchers suggest that further increases in women's educational levels would be helpful in improving levels of prenatal care in the urban area, although the existing levels of education in urban areas are already reasonably high. In contrast, improving women's educational levels is virtually a prerequisite for any improvement in prenatal care use in the rural area.

The women in the rural low use group had virtually no education, lived in areas with few facilities, and had virtually no access to health insurance. The results indicated that no single policy can have much of an effect on their prenatal care behavior. A simultaneous program that increased their average educational level from 0.6 years to 4 years, increased the average number of hospitals and health centers in their districts from 0.4 to 3, and increased the proportion with access to high-quality health care facilities from zero to 50 percent, would increase the proportion of women seeking care from about 20 percent to approximately 50 percent. Even with such an enormous program, the use of prenatal care among the rural poor would be below that of the high use rural group and the low use urban group.

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**Factors Influencing Prenatal Care Use
among Low-Income Jamaican Women**

Research Team: Joan Rawlins (Co-Principal Investigator), University of the West Indies; Carolyn Sargent (Co-Principal Investigator), Southern Methodist University.

This study focused on the patterns of utilization of prenatal care services in Jamaica and explored factors related to the late initiation of prenatal care. The sample included 125 women from the prenatal care clinic at the Victoria Jubilee Hospital in Kingston, Jamaica, a community sample of 50 women (half from the rural township of May Pen and half from a low-income Kingston neighborhood) 50 women from the postnatal clinic at the Victoria Jubilee Hospital, and another 50 women from the postnatal wards at the same hospital. In addition, the researchers interviewed senior nursing staff and ward nurses to obtain a service perspective. The prenatal clinic sample, the postnatal clinic sample, and the community sample were interviewed with the help of a detailed questionnaire that consisted of both structured and open-ended questions. The women in the postnatal wards were administered an abbreviated form of the same questionnaire.

The results confirmed that low-income Jamaican women were reluctant to seek early prenatal care. Only 16 percent of the sample took advantage of such care during the first trimester. The interviews revealed that the women did not view pregnancy as a pathological condition that needs medical attention. They did, however, recognize the need for such care when a complication or problem arose.

Pregnant women are required to register or "book" for a hospital delivery, and that booking is usually done at the first prenatal care visit. The results showed that multiparous women attended the prenatal clinic more frequently than primiparous women, however, primiparous women registered for hospital delivery earlier than multiparas. Thus, researchers suggest that primiparas were more concerned about inclusion in the hospital system of labor and delivery than about prenatal care.

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In exploring the possible factors responsible for delayed registration and delayed onset of prenatal care, the researchers found that the financial cost of registration was not a significant barrier. The blood donation requirement of registration was also not found to be a significant barrier to the use of prenatal care services. A factor that did appear to play a significant role in deterring use of these services was the attitude of the health personnel. The data suggested that differential treatment was given to clients based on the client's class, cleanliness, manner of speech, and conduct.

The researchers concluded that the attitude of the staff towards their clients could be vastly improved by upgrading the work conditions within the hospital and increasing the salaries of health personnel such as nurses. The researchers also recommend that senior nurse administrators should remind nurses of their responsibilities towards clientele and that the nurse-client ratio be improved at the prenatal clinic. This would help to reduce the case load of individual nurses and permit them the time to communicate with their clients in a more relaxed manner.

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**A Follow-Up Study of Pregnancy Outcome
in Women with Symphysiotomy versus Cesarean Section
in Zaire**

Research Team: Sambe Duale, *Projet des Soins de Sante Primaires en Milieu Rural, Zaire*; Carol B. Hermann (Principal Investigator), *Family Health International (FHI)*; Thomas Petrick, *FHI*; Philip G. Lampe, *FHI*.

This study compared the immediate and longer-term effects of symphysiotomy versus cesarean section for obstructed labor due to cephalopelvic disproportion. The study included (a) a secondary analysis of baseline data collected during a two-year (1984-1986) hospital based, pregnancy care, monitoring study in the Karawa region of northern Zaire, and (b) follow-up interviews conducted in 1988, two-and-a-half to four and a half years after the referent procedure.

During the two-year study period when the baseline data were collected, 133 women delivered by symphysiotomy and 348 women delivered by cesarean section in the presence of obstructed labor. Seven women who had undergone a cesarean section and one woman with symphysiotomy died after delivery. The sample for the follow-up phase of the study was selected from the remaining 473 women (132 with symphysiotomy and 341 with cesarean section).

An attempt was made to match all the 132 surviving symphysiotomy cases with an equal number of women who had undergone a cesarean. The variables on which they were matched included maternal height, number of previous deliveries, duration of labor, cretinous status, presentation, birthweight, and whether or not a woman had a fertility limiting event in the referent delivery. A total of 114 pairs were matched based on these criteria, although the cut-off points used for maternal height and duration of labor had to be adjusted in three rounds of selection to maximize the number of women selected. In addition, the 18 unmatched symphysiotomy cases were included for the follow-up interviews so as to increase the amount of information on the sequelae of symphysiotomy.

In the follow-up phase of the study, the selected women were interviewed about their physical condition and their personal and social situation since the referent procedure. A total of 170 valid follow-up questionnaires (91 symphysiotomies and 79 cesareans) were obtained. The results indicated

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that there was no difference between the two groups in the mean number of prenatal visits prior to the referent delivery. The duration of labor for women in the symphysiotomy group was significantly longer than for women in the cesarean group, but there was no significant difference between the two groups in birthweight.

Following the referent operation, there was no statistically significant difference in the fetal or early neonatal death rates among women in the symphysiotomy group compared with those in the cesarean section group. In the symphysiotomy group only, babies born to women after 12 or more hours of labor were significantly more likely to die in the perinatal period than were babies born after less than 12 hours of labor.

The morbidity data revealed that the types and severity of complications associated with the two interventions were different, but that comparing rates of complications (such as for fistulae) for the two interventions without controlling for the effects of prolonged duration of labor did not provide reliable results. More women from the symphysiotomy group than the cesarean section group reported that life had changed for them as a result of the operation. Moreover, women in the symphysiotomy group were significantly more likely than those in the cesarean section group to report having pain or difficulty with taking long walks, defecating, lifting or carrying, and bending or stooping.

Women in the symphysiotomy group were significantly less likely than those in the cesarean group to report strong negative social reactions to their surgical interventions. The common belief about women who went through either surgical intervention was that they were weak, inactive, and unable to deliver vaginally. In general, the results indicated that women who had undergone surgical intervention were treated either as fragile or as second-class citizens.

In terms of the long-term effects of the two referent procedures, a higher percentage of infants from the cesarean section group than from the symphysiotomy group subsequently died. No clinical data, however, was available on the cause of the death.

No clinical data were available on subsequent deliveries. Based on the questionnaire, however, the majority of women in both groups had had at least one pregnancy since the referent operation. More than half the women in the symphysiotomy group said they would prefer to deliver by symphysiotomy next time and a similar percentage of women from the cesarean section group said they would like to deliver by cesarean.

While the data were not conclusive enough to permit policy recommendations, this study did help to highlight the methodological difficulties involved in assessing the effectiveness of symphysiotomy.

The main methodological obstacle is to find an appropriate control group with which to compare the short- and long-term effects of symphysiotomy. Women who undergo symphysiotomy resemble women who have had a cesarean section for absolute cephalopelvic disproportion in that both are undeliverable without surgical intervention. However, because they deliver vaginally, women with symphysiotomy are more like women who have had spontaneous vaginal deliveries or vacuum extraction. Thus, the researchers recommend that future research should include appropriately matched controls from both groups: those with spontaneous vaginal deliveries and those who deliver by cesarean section.

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**The Effects of Improved Weight Monitoring
Feedback during Pregnancy in a Khmer Refugee
Camp in Thailand**

Research Team: Christopher J. Roesel (Principal Investigator), CARE/International; Timothy D. Schaffter, CARE/Thailand; Somchai Durongdej, Mahidol University, Thailand; LaOng Tokmoh, CARE/Thailand.

The objective of this study was to increase knowledge about the importance of weight gain during pregnancy and to increase dietary consumption for women in a Khmer refugee camp in Thailand. A sample of 603 pregnant women were assigned to an intervention group and 580 women were assigned to a control group. The control group received the pre-existing educational program, rations, and supplements. The pre-existing education program included noninteractive and nonjudgmental feedback on weight gain. The intervention group received discriminating feedback about weight gain and counseling on how to increase weight gain and participated in discussions on how to improve pregnancy outcomes. Many of the weight gain feedback messages for the intervention group were developed from information gathered through focus group sessions. Data were collected through pre and post tests of women's attitudes toward weight gain and dietary practices and through questionnaires from August 1988 to July 1989.

Significant effects of the intervention included decreased incidence of low birthweight infants, improved weekly weight gain, and improved support for the women from their spouses. These effects were noted only for those women who attended classes for more than three months. Knowledge improved and attitudes towards weight gain changed as indicated through increased test scores.

The use of focus groups to define the content of and methods used for feedback proved successful. The use of credible sources of information and the support of spouses were found to be important factors in improving the nutritional status of the pregnant women.

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and researchers recommend that in populations with a high incidence of low birthweight infants, prenatal care programs include weight gain feedback in their educational efforts. They also recommend the use of open-ended methodologies (focus groups) to determine feasible ways to change dietary practices.

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**The Effects of an Educational Program
on Lactating Mothers in Mexico**

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Research Team: Rosario Roman-Perez (Principal Investigator), Centro de Investigación en Alimentación y Desarrollo, A.C.

This study was carried out in semiurban areas of Sonora, Mexico, from September 1988 to September 1989 in an attempt to understand that area's low level of breastfeeding. The project sought to explore the obstacles to prolonged breastfeeding and present women with information that could help them in addressing these obstacles. In the first stage, a sample of 61 women reported to interviewers that they did not breastfeed despite their belief that it was the preferred method of infant feeding. Sore breasts and nipples and lack of sufficient milk were cited as the major reasons for discontinuing breastfeeding.

The researchers then used the information gathered from the interviews to prepare four short videos designed to provide women with information about ways to overcome common problems experienced in breastfeeding. Two of the videos contained motivational messages in addition to the educational messages.

The videos were then shown to 32 new mothers within a few days of delivery. The breastfeeding patterns of this experimental group were compared with the patterns of a control group of 32 women who did not see the videos. Although financial and time constraints and difficulties in the follow-up stage prevented the researchers from collecting data for most of the women beyond 30 days postpartum, the videos did appear to have an effect. The women who viewed the videos showed increased knowledge about breastfeeding, its problems, and potential solutions to the problems. They also continued exclusive breastfeeding for 30 days postpartum more frequently than the control group. The researchers recommend continued study of the impact of educational programs specifically designed to address the needs and problems of lactating mothers.

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**The Role of Compliance with Nutritional
Supplementation during Pregnancy: A Comparison
of Data from Guatemala and Indonesia**

Research Team: Kathleen M. Rasmussen (Principal Investigator), Cornell University; Constance S. Johnson, Cornell University; Jane A. Kusin, Royal Tropical Institute, The Netherlands; Sri Kardjati, Airlangga University, Indonesia; Jean-Pierre Habicht, Cornell University.

This study conducted secondary data analyses to examine both service and user characteristics of two food supplementation programs: a program conducted by the Instituto de Nutricion de Centroamerica y Panama in El Progreso, Guatemala, and the East Java Pregnancy Study's program in Madura, East Java, Indonesia. The Guatemala data set was collected from January 1969 to February 1977. The Indonesian data set was collected from August 1981 to December 1984. The sample size was 1,566 from the Guatemalan data and 719 from the Indonesian data. Through analyses of these data sets, the researchers sought to describe actual compliance patterns, identify the characteristics of pregnant women and services that predict compliance, and explain variance in participation in food supplementation programs.

The study considered the difference between participation and actual consumption of the food supplements. One striking finding was that in both programs many women who had high levels of participation failed to consume any supplement during the third trimester of pregnancy.

The research team found that certain variables were found to be significant predictors of compliance in both populations, however, in general the predictors were not consistent across the different populations. In Indonesia maternal age was associated with compliance. In Guatemala maternal age and number of pregnancies during the study period predicted compliance.

In Indonesia compliance decreased with time, while in Guatemala it increased. Distance had a negative effect on attendance in the Guatemala program and a positive effect on volume taken by women assigned to the high-protein supplement group. As socioeconomic status in Indonesia increased, so did the likelihood that a woman would come to the clinic to be assigned to a group. In Guatemala, as socioeconomic status increased, attendance and volume taken decreased. The effect

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of number of deceased children on compliance was also different in the two studies: in Guatemala, the relationship was positive and in East Java it was negative. Nutritional status and home diet did not consistently predict compliance in either study. Other variables considered, but not found to be significant, were birth interval, maternal height, and sex of infants.

Unfortunately, for many potential predictors, the researchers discovered that significant amounts of information were missing for the women who had low levels of participation in both programs. This information is essential for a complete understanding of the reasons for lack of participation.

The researchers concluded that their results on compliance are incomplete, and that future studies on compliance behavior should include information on the noncompliers. They also recommend that future studies should complement quantitative information with qualitative information, that is, they should include interviews with women to determine their feelings about participation.

In addition to the statistical analyses, the study contains a review of the literature on compliance with food supplementation programs and a conceptual framework for analyses of compliance issues.

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**Work Patterns, Prenatal Care, and Nutritional Status
of Pregnant Subsistence Farmers in Central Malawi**

Research Team: Katherine L. Tucker (Co-Principal Investigator), McGill University; Christine Lamba (Co-Principal Investigator), University of Malawi.

This exploratory study examined the relationships between dietary intake, nutritional status, and the socioeconomic situation of pregnant subsistence farmers in rural Malawi. In an area of high levels of maternal malnutrition, particularly during pregnancy, the study sought to identify priority areas for policy formulation and for relevant program intervention through an assessment of the impact of work on nutritional status during pregnancy, and an examination of patterns of utilization of prenatal care services. Data were collected twice during pregnancy and once postpartum. Initial data were collected for 78 women, second observations for 57, and postpartum measures for 42. Data collection is continuing with other funding to increase these sample sizes.

The researchers gathered data on patterns of agricultural labor and other work, energy expenditure, dietary intake, nutritional status (measured both anthropometrically and biochemically), rates and determinants of prenatal care use, and birthweights of infants. The study contained both cross-sectional survey and prospective longitudinal components with data collected primarily through direct observation and structured and semistructured questionnaires.

Results of analyses conducted with the small sample sizes currently available indicate that this population of women was expending a large amount of energy in agricultural and other work. In addition the researchers found no significant increase in dietary intake or decrease in activity patterns from mid-pregnancy to the postpartum period. This appeared to put the women investigated at serious nutritional risk, as shown by low anthropometric measures and poor birth outcome.

Data on energy expenditure, dietary intake, anthropometric measurements, and birthweights by season of the year suggested that the seasonality of food availability and agricultural labor affected maternal nutritional status and birth outcome. The rainy season (December through February)

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corresponds to the period of lowest food adequacy and the period of heavy demand for women's labor in hoeing, planting, and weeding. Although the sample sizes are extremely small, the results indicated that the pattern of maternal weight change was also affected by seasonality. Measures taken late in pregnancy showed the expected pattern more clearly than the earlier measures. Differences in maternal triceps skinfold thickness also suggested a seasonal trend.

Fifty-five percent of the women used formal prenatal care services at least once, and 9 percent used a midwife or traditional healer at least once during pregnancy. On average, the first prenatal visit occurred in the fifth month.

The study concluded that food supplementation during pregnancy can improve maternal nutritional status and the birthweight of infants. The researchers recommend that although increasing maternal food intakes through more long-term and permanent changes would be preferable, food supplementation programs are justified, particularly during the rainy season, which is the period of highest nutritional risk. The researchers suggest that this intervention should be combined with improved prenatal care efforts to improve women's nutrition and birth outcomes.

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**Relationships among Dietary Intake, Nutritional
Status, and Milk Production of Marginally
Nourished Bangladeshi Women**

Research Team: Kenneth H. Brown (Principal Investigator), Johns Hopkins University; Alastair D. Robertson, University of Colorado; Nahed Ahmed Akhtar, Children's Nutritional Unit, Bangladesh.

This study conducted analyses on data collected in a 1986 longitudinal study of 42 marginally-nourished Bangladeshi women from periurban slum communities. The data on maternal dietary intake, nutritional status, and milk production are from 24-hour recall histories and full-day weighted dietary observations, as well as anthropometric assessments. Milk data include 24-hour test weighing and 24-hour milk extractions with laboratory analyses.

Prior analyses on the same data set indicated that the milk fat, energy content, and the amount of milk produced were related to the women's nutritional status. The new analyses will be conducted to explain more thoroughly the relationships between maternal dietary intake and changes in maternal nutritional status, and the relationship between maternal dietary intake and milk production. The results will provide information on the minimal levels of maternal energy intake required to support adequate lactational capacity and to preserve or improve maternal nutritional status.

This study was not completed at the time of publication of this paper and has, therefore, not been included in the MNHC Program's Research Report Series.

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Appendix B: MNHC Program Timetable

August 1, 1987	Maternal Nutrition and Health Care Program begins.
October 1987	First meetings of the Technical Advisory Group. Selection of five unsolicited proposals for funding.
October-December 1987	Distribution of the open research grants competition announcement.
November 1987	First research projects begin.
January 15, 1988	Deadline for submission of proposals for the open research grants competition.
March 1988	Second Technical Advisory Group meeting. Selection of 15 proposals for funding.
April-June 1988	Technical and administrative negotiations with researchers.
May-June 1988	Second group of research projects begins.
January 1989	Third Technical Advisory Group meeting. Progress of research projects evaluated.
June-August 1989	Research projects reach completion and drafts of final research reports submitted.
July-December 1989	Research reports reviewed by ICRW, USAID, and Technical Advisory Group. Technical comments sent to researchers. Researchers revise reports.
October 1989	Fourth Technical Advisory Group meeting. Research reports reviewed. Plans for conference and other dissemination efforts discussed.
January-February 1990	Research report series produced. Synthesis paper written. Final conference organized.
February 28-March 1, 1990	Maternal Nutrition and Health Care Program Final Conference held.
March 2, 1990	Maternal Nutrition and Health Care Program Workshop held.
March-June 1990	Research report series completed. Assistance given to researchers in publishing journal articles. Dissemination efforts continue.

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THE INTERNATIONAL CENTER FOR RESEARCH ON WOMEN

Announces

Maternal Nutrition and Health Care in the Third World:

A Research Competition

The International Center for Research on Women is pleased to announce a small grants research competition under its recently established Maternal Nutrition and Health Care Program. The goal of the competition is to encourage research that will improve our understanding of key social, cultural, behavioral, technological, and economic factors at the household and community level that influence the choices made by women of reproductive age concerning their own nutrition and health care.

The Maternal Nutrition and Health Care Program of the International Center for Research on Women (ICRW) has been set up to study ways to improve the provision and utilization of nutrition and health care for women of reproductive age living in the Third World. The overall objective is to improve the lives of women and their families. As part of this program, ICRW will support a number of empirical studies of factors determining women's utilization of nutrition and health care, with particular emphasis on care during the prenatal period.

The Maternal Nutrition and Health Care Program, funded through a cooperative agreement with the Offices of Nutrition and Health of the US Agency for International Development, complements and builds on ICRW's ongoing program on Women's Work and Child Welfare, which focuses on how poor women in the Third World reconcile their responsibilities as mothers and producers of income, and how these dual roles affect the well being of their children. ICRW now wishes to focus on the nutrition and health status of women themselves, which is important as a determinant of the survival and quality of life of women in the Third World, and of their children.

Scope

ICRW encourages the design of maternal nutrition and health projects that are sensitive to the multiple responsibilities of women in the Third World. Therefore, the Maternal Nutrition and Health Care Program solicits studies that highlight key social, cultural, behavioral, technological, and economic factors that influence the choices women of reproductive age make concerning their own nutrition and health care. Research proposals may either focus on factors that determine women's choice among a range of alternative health care

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1717 Massachusetts Avenue, N.W.
Suite 501
Washington, D.C. 20036
Telephone: 202 797-0007
Cable: INTERCENT

Selection criteria will stress professional experience and background, feasibility and quality of the proposed research project, congruence between the proposed research and the objectives of the Maternal Nutrition and Health Care Program, and demonstrated field experience. Awards will be made for a period of 12 months. In order to be eligible, applicants must clearly show that data will be analyzed and findings available within the time frame of the award.

Budget

ICRW anticipates funding projects with budgets in the range of US\$20,000 to US\$70,000. Researchers are encouraged to use funds from ICRW to complement funds from other sources including their home institutions. Information about other sources of support should be included in the application.

Funds may be requested to cover salaries, honoraria, consulting fees, travel and per diem, costs associated with gathering data in the field, data analysis, modest communication and document preparation costs, and substantiated overhead or indirect costs; however applicants are encouraged to limit overhead or indirect costs to 15% of total direct costs.

Format for Applications

Details of the format which ICRW would like all proposals to follow are provided in the attached outline. Please note that proposals may be submitted in English, Spanish, Portuguese, or French. Proposals (five copies if possible) should be mailed to:

Project Director
Maternal Nutrition and Health Care Project
International Center for Research on Women
1717 Massachusetts Ave. NW
Washington, DC 20036, U.S.A.

DEADLINE: Applications must be received by ICRW by January 15, 1988.

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MATERNAL NUTRITION AND HEALTH CARE

FORMAT FOR PROPOSALS

Proposals submitted to the Maternal Nutrition and Health Care Program should provide sufficient information and detail to allow for evaluation by the Technical Advisory Group. They should be self-contained, i.e., not dependent on supporting documents such as previous papers by the researcher(s). Proposals may be submitted in English, French, Spanish, or Portuguese. Five typewritten copies should be submitted. Applicants are encouraged to model their submissions on the following outline, which lists in sequence the main elements to be included.

1. **A Title Page** headed "Maternal Nutrition and Health Care." Below this heading should appear; a) the title of the research project (15 words or less); b) the names, titles, disciplines and institutional mailing addresses of all principle investigators; c) the total amount of funding sought (in U.S. dollars); and d) the duration of the project in months, with beginning and ending dates specified. Duration of the project should not exceed 12 months.
2. **A Summary Page** (1 page) that presents the research problem and objectives, data, method, and potential policy relevance.
3. **A Table of Contents.**
4. **A Project Description** section that includes the following subsections:
 - a. **Scope** (3-5 pages if single-spaced) Describe the substantive scope of the project in detail, including the conceptual framework, specific objectives, hypotheses, and cite key related research and literature.
 - b. **Methodology** (3-5 pages) Describe the research design, and proposed analytical techniques. Discuss the adequacy of these measures and techniques for testing the research hypotheses. For proposals involving statistical analyses, applicants should identify the dependent, independent, and control variables to be used, and discuss their measurement and relation to the conceptual framework.
 - c. **Data** (2-4 pages): If scholars plan to draw on existing data, these data must be described fully (for example, sampling frame, number of cases, variables, etc.), and a copy of the questionnaire (if applicable), and assurances of necessary clearances and access provided. If new data are to be gathered, describe plans in the same detail (attaching a copy or detailed outline of the questionnaire if a survey is proposed).
5. **Policy Significance of Expected Findings** (1-2 pages) Specify the relevance of the research findings and the expected contribution of the study to improving health and nutrition of mothers in the country or countries of research.

GRANTEE EMPLOYEE BIOGRAPHICAL DATA SHEET

1. Name (Last, First, Middle)		2. Grantee Name	
3. Address (include ZIP Code)		4. Position Under Grant	
		5. Proposed Salary	
6. Telephone Number (include area code)	7. Date of Birth	8. Place of Birth	9. Citizenship (if non-US citizen, give visa status)

10. EDUCATION
(include all secondary, business college or university training)

NAME AND LOCATION OF INSTITUTION	MAJOR SUBJECTS	Type of Degree	Date of Degree

11. EMPLOYMENT HISTORY

1. Give last three years and relevant related employment
2. Exclude bonuses, profit-sharing arrangements, commissions, consultant fees, overtime, etc.

POSITION TITLE	EMPLOYER'S NAME AND ADDRESS	Dates of Employment (mo, yr)		Salary	
		From	To	US\$	Per

12. SPECIFIC CONSULTANT SERVICES (give last three years)

SERVICES PERFORMED	EMPLOYER'S NAME AND ADDRESS	Dates of Employment (mo, day, yr)		DAILY RATE
		From	To	

Appendix D: Technical Advisory Group Members, February 1990

Adrienne Germain
Vice President and Program Director
International Women's Health Coalition

Frederick Golladay
Principal Health Economist
Population, Health, and Nutrition Division
The World Bank

Davidson Gwatkin
Director
International Health Policy Program
The World Bank

Marjorie Koblinsky
Project Director
MotherCare Project
John Snow, Incorporated

Barbara Kwast
Public Health Nurse Midwife
Maternal and Child Health Unit
World Health Organization

Joanne Leslie
Public Health Nutritionist Consultant
(former Director MNHC Program, ICRW)

W. Henry Mosley
Department of Population Dynamics
The Johns Hopkins School of Hygiene and
Public Health

Chloe O'Gara
Deputy Director
Office of Women in Development
Agency for International Development
(former Program Officer MNHC Program,
USAID)

Per Pinstруп-Andersen
Director
Cornell Food and Nutrition Policy Program

Eva Rathgeber
Coordinator
Women in Development Unit
International Development Research Centre

Patricia Rosenfield
Program Officer
The Carnegie Corporation of New York

David Rush
Professor of Nutrition and of Community Health
Head, Epidemiology Program
Human Nutrition and Research Center
Tufts University

Barbara Underwood
Special Assistant for Nutrition Research and
and International Programs
National Institutes of Health

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**BETTER HEALTH FOR WOMEN:
RECENT RESEARCH PERSPECTIVES FROM THE MATERNAL
NUTRITION AND HEALTH CARE PROGRAM**

**Wednesday
February 28, 1990**

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9:00 - 9:30 Welcome and Opening Remarks

Eugene Chiavaroli (*Division of Science and Technology, U.S. Agency for International Development*)
Mayra Buvinic (*International Center for Research on Women*)

9:30 - 10:45

Panel # 1

Effects of Pregnancy and Lactation on Nutritional Status

1. Maternal Nutritional Depletion: Evidence of Responses to Frequent Reproductive Cycling - Kathleen M. Merchant (*Stanford University*)
2. A Longitudinal Analysis of the Patterns and Determinants of Women's Nutrition in the Philippines - Linda Adair (*University of North Carolina*)
3. Factors Affecting the Nutritional Status of Mothers in Benin - Leopold K. Fakambi (*Groupement d'Experts en Projets d'Education et de Developpement*)

Discussant: W. Henry Mosley (*Johns Hopkins University*)

10:45 - 11:00 Coffee Break

11:00 - 12:30

Panel # 2

Nutrition and Dietary Intake

1. Relationships among Maternal Dietary Intake, Nutritional Status, and Milk Production of Marginally Nourished Bangladeshi Women - Kenneth H. Brown (*Johns Hopkins University*)
2. Prevention of Maternal Malnutrition through a Community Kitchen in Peru - Sandra L. Huffman (*Center to Prevent Childhood Malnutrition*)
3. Work Patterns, Prenatal Care, and Nutritional Status of Pregnant Subsistence Farmers in Central Malawi - Katherine L. Tucker (*McGill University*)
4. Maternal Nutrition and Health Status of Indian Tamil Female Tea Plantation Workers in Sri Lanka - Vidyamali Samarasinghe (*International Centre for Ethnic Studies*)

Discussant: Judith E. Timyan (*International Center for Research on Women*)

12:30 - 2:30 Lunch

The Maternal Nutrition and Health Care Program was funded by the Offices of Nutrition and Health of the U.S. Agency for International Development through cooperative agreement #DAN-1010-A-00-7061-00.

2:30 - 3:45
Panel # 3

Nutrition Programs: Issues in Compliance

1. Effects of Improved Weight Monitoring Feedback During Pregnancy in Increasing Women's Dietary Control - Christopher Roesel (*CARE Thailand*)
2. Role of Compliance with Nutritional Supplementation during Pregnancy: Comparison of Data from Guatemala and Indonesia - Kathleen M. Rasmussen (*Cornell University*)
3. Evaluation of a Novel Delayed-Release Formulation for Iron Supplementation in Pregnancy - William K. Simmons (*Caribbean Food and Nutrition Institute*)

Discussant: Barbara A. Underwood (*National Institutes of Health*)

3:45 - 4:15 **Coffee Break**

4:15 - 4:45 **Closing Session**
Joanne Leslie (*Consultant, International Center for Research on Women*)
Nina P. Schlossman (*Office of Nutrition, U.S. Agency for International Development*)

5:00 - 6:00 **Cocktail Hour**

6:00 - 8:00 **Dinner**

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Thursday
March 1, 1990

9:00 - 9:30 **Welcome and Opening Remarks**

Nina P. Schlossman (*Office of Nutrition, U.S. Agency for International Development*)
Margaret A. Lycette (*International Center for Research on Women*)

9:30 - 11:00

Panel # 4 **Improving Maternal Care**

1. The Effects of an Educational Program on Lactating Mothers in Mexico - Rosario Roman-Perez (*Centro de Investigación en Alimentación y Desarrollo*)
2. Participation of Women in Primary Health Care in Swaziland - Kris Heggenhougen (*Harvard Medical School*)
3. Improving Maternity Care Services in the Karawa Health Zone of Zaire - Sambe Duale (*Projet des Soins de Santé Primaires en Milieu Rural*)
4. A Follow-Up Study of Pregnancy Outcomes in Women with Symphysiotomy versus Cesarean Section in Zaire - Philip G. Lampe (*Family Health International*)

Discussant: Barbara Kwast (*World Health Organization*)

11:00 - 11:30 **Coffee Break**

11:30 - 1:00

Panel # 5 **Patterns in Prenatal Care Utilization**

1. Prenatal Care Use in Peru - Warren C. Sanderson (*State University of New York at Stony Brook*)
2. Factors Influencing Prenatal Care among Low-Income Jamaican Women - Joan Rawlins (*University of the West Indies*) and Carolyn Sargent (*Southern Methodist University*)
3. A Comparison of Utilization Patterns, the Health Care Process, and the Effectiveness of Four Prenatal Health Services in a Provincial Community of the Philippines - Violeta Villaroman-Bautista (*University of the Philippines*)
4. Mass Communication/Education Strategies for Improvement of Prenatal Health Behaviors in Mexico - Susan C. M. Scrimshaw (*University of California at Los Angeles*)

Discussant: Geeta Rao Gupta (*International Center for Research on Women*)

1:00 - 2:30 **Lunch**

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2:30 - 3:30
Panel # 6

Adolescent Care During Pregnancy

1. The Determinants of Prenatal Care: Use by Adolescents in Mexico City -
Rebecka Lundgren (*Centro de Orientación para Adolescentes*)
2. Beliefs, Attitudes, and Behavior Limiting the Demand for Prenatal Care among
Guatemalan Indian Adolescent Girls - Alfredo Méndez-Domínguez
(*Universidad del Valle de Guatemala*)

Discussant: Laurie Noto Parker (*International Center for Research on Women*)

3:30 - 4:00 **Coffee Break**

4:00 - 4:45 **Closing Session**

Mary Ann Anderson (*Office of Health, U.S. Agency for International
Development*)
Chloe O'Gara (*Office of Women In Development, U.S. Agency for International
Development*)

5:00 - 7:00 **Reception**

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Note: The institutional affiliations listed for presenters reflect their affiliation at the time that the research was conducted.

**BETTER HEALTH FOR WOMEN:
RECENT RESEARCH PERSPECTIVES FROM THE MATERNAL
NUTRITION AND HEALTH CARE PROGRAM
Friday, March 2, 1990**

**Workshops:
Issues in Multidisciplinary Methodologies
for Nutrition and Health Research**

9:30 - 11:00

Workshop # 1 Qualitative and Quantitative Research Methodologies for Nutrition and Health Research

Moderators: Alfredo Méndez-Domínguez (*Universidad del Valle de Guatemala*) and Warren Sanderson (*State University of New York at Stony Brook*)

11:00 - 11:30 Coffee Break

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11:30 - 1:00

Workshop # 2 From Research to Policy

Moderators: Barbara Kwast (*World Health Organization*) and Ana Monroy (*Centro de Orientación para Adolescentes*)

1:00 - 2:30 Lunch

2:30 - 4:00 Concurrent Roundtable Discussions

Roundtable # 1: Methodological Issues in Nutritional Assessment
Moderator: Kathleen M. Merchant (*Stanford University*)

Roundtable # 2: Ensuring Safer Motherhood: Strategies for Moving from Research to Advocacy
Moderator: Per Pinstруп-Andersen (*Cornell University*)

Roundtable # 3: Health Service Delivery from a Woman's Perspective
Moderators: Marjorie Koblinsky (*John Snow, Inc.*) and Frederick Golladay (*The World Bank*)

4:00 - 6:00 High Tea

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