Safe Motherhood

Toward the Development of Safe Motherhood Program Guidelines

Report of a Workshop organized by The World Bank and the MotherCare Project of John Snow, Inc.

Diana M. Measham
Family Care International

with Marjorie Koblinsky
John Snow, Inc.
and
Anne Tinker
The World Bank

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Diana M. Measham
Family Care International

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Marjorie Koblinsky
MotherCare Project, John Snow, Inc.

and

Anne Tinker
The World Bank

This publication is one in a series of reports designed to provide information in the field of maternal health. The series is directed primarily to concerned health professionals such as program managers and decision makers who plan and implement health programs in developing countries.

POPULATION, HEALTH AND NUTRITION DIVISION
POPULATION AND HUMAN RESOURCES DEPARTMENT
THE WORLD BANK

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EXECUTIVE SUMMARY

On November 18-20, 1992, international health and family planning experts and leaders of maternal health projects from developing countries met at the World Bank to work towards the development of Safe Motherhood program guidelines for World Bank staff and others involved in health planning and management, based on state-of-the-art technical knowledge and practical field experience in the maternal health and family planning arena.

To facilitate and guide this process, the following frameworks were used:

- A conceptual framework outlining the linkages between maternal mortality and its proximate, intermediate, and distant causes, based on the work of the School of Population and Family Health at Columbia University; and

- a set of typologies representing points on the continuum from resource-poor to resource-rich settings and a range of levels of maternal mortality, women's isolation, and health service capacity, developed by the MotherCare Project of John Snow, Inc.

Participants agreed that Safe Motherhood programs should be designed with the specific aim of reducing maternal mortality and, more generally, improving women's health. Given the linkages between maternal and infant health, it was suggested that infant health goals also be considered in Safe Motherhood program design. Efforts to ensure that pregnancies are both wanted and safe must receive specific priority, however, in light of past neglect of women's health concerns.

While a range of socio-economic factors influence women's health, it was suggested that Initiative resources should not be expended on interventions related to women's overall status, short of encouraging relevant agencies to recognize the links between their activities and women's health and to accelerate their efforts.

While more research, particularly operational research, is and will always be needed to refine Safe Motherhood goals and interventions, priority areas for action can now be identified, and the nature of that action delineated within certain parameters. The following were defined as the core, Safe Motherhood interventions:

- prenatal care;
- adequate routine delivery care (trained attendance at delivery);
- emergency obstetric care (including emergency alarm and transport);
- family planning;
- and safe abortion care.

Current knowledge of related strategies and their influence on maternal mortality and women's health are outlined in this report. Each of these elements must be supported by communications activities to be successful. The role of communications is outlined, including specific program examples and lessons learned from its key role in the fields of family planning and child survival. A guide to estimating the costs of Safe Motherhood programs and building this analysis into program design is also outlined.

It is clear that no externally designed, general program can be superimposed on a specific setting and achieve its desired outcomes. The typology approach can serve as a guide, but in each program area a situation-specific analysis of epidemiological need and demographic context will always be essential, if the program is to succeed in meeting its objectives. Determining resource availability and capacity, and ensuring that the program designed is not just effective but cost-effective, are also critical. Equally important, and often neglected, are situational assessments that aim to determine existing community perceptions and practices, and to define needs and priorities from women's perspective.

Recent Safe Motherhood programs from a range of developing countries in Asia, Africa and Latin America are described, including available evaluative findings. These programs, which represent a broad range of strategies (e.g. traditional birth attendant training, risk assessment and referral, posting midwives at the community level, improving hospital case management, etc.), supplement the technical, theoretical discussion with field-based lessons learned.

The conclusion of this report is structured around a set of key program planning questions related to the following issues:

- Safe Motherhood program goals;
- core and fringe interventions;
- resource need and availability;
- service providers, linkages, and delegation strategies;
- program costs, financing, and sustainability;
- evaluation;
- and replication.

The Workshop succeeded in moving the Safe Motherhood Initiative forward on the path from advocacy to implementation. While there is clearly debate on the Initiative's precise goals, on the effectiveness of interventions, and on the structure and content of Safe Motherhood programs in different settings, there is also a great deal of consensus, and a large body of knowledge and experience to guide programming. Based on the workshop's outcomes and the continuing input of a wide range of technical experts and program managers in the field, these guidelines are now being prepared, and will soon be available for the benefit of those working to promote Safe Motherhood worldwide.

I. INTRODUCTION

Since the Safe Motherhood Initiative was launched in Nairobi in 1987, great strides have been made in alerting policy-makers in developing countries and the larger health and development community to the toll of maternal mortality and morbidity in developing countries, and mobilizing them to take appropriate action. The emphasis to date has been on advocacy, planning, and research: by the end of 1993, over 100 developing countries and numerous international agencies and non-governmental organizations (NGOs) representing various sectors will have been involved in related activities. Commitment has indeed been mobilized: reducing the toll of pregnancy-related complications is widely recognized not only as a health sector priority, but as an essential pre-requisite for sustained social and economic development. As a co-sponsor of the International Initiative, and in light of the well-documented links between women's health and development, the World Bank has played an active role in promoting Safe Motherhood and facilitating the development of related activities.

In a continuing effort to accelerate the Initiative's progress from advocacy to program implementation, the World Bank, in collaboration with the MotherCare Project of John Snow, Inc., convened a workshop to review the theoretical and practical work in maternal health to date, with the objective of arriving at sound data- and field-based lessons learned and, specifically, to develop program guidelines for World Bank Task Managers and others involved in health planning and management. The workshop, which was held at the World Bank, November 18-20, 1991, brought together international health and family planning professionals, researchers, and leaders of demonstration projects representing a range of developing country settings and programmatic approaches. The proceedings of the workshop, which represent the state-of-the-art of our knowledge in the area of maternal health, are synthesized in this report.

A. SAFE MOTHERHOOD: A CONCEPTUAL FRAMEWORK

The primary, medical causes of maternal mortality (see Box I) are responsible for up to 75 percent of the 500,000 maternal deaths estimated to take place each year. The remaining 25 percent of maternal deaths are due to causes related to or aggravated by pregnancy and its management, such as diabetes and hepatitis, and the complications of anesthesia. Maternal morbidity, while poorly documented, includes acute obstetric complications; chronic morbidity related to these complications, such as uterine prolapse and fistulae; and associated illnesses that occur or progress rapidly in pregnancy, such as hypertension and malaria. It can also include sexually transmitted diseases, including AIDS. A recent review indicates that there are 100 cases of acute morbidity for each maternal death, implying that 59 million women are affected each year (Koblinsky et al., 1992).

The chain of events that leads to a woman's premature death or suffering related to childbearing is rooted in her social, cultural, and economic environment. The following conceptual framework, which is based largely on the work of the School of Population and Family Health at Columbia University, attempts to describe the mechanisms through which these contextual factors operate to influence maternal health (See Appendix 4, Figure 1).

Box 1: Major Causes of Maternal Mortality

Hemorrhage: Particularly common among multiparas, following unsafe abortion, and in cases of retained placenta. Requires obstetric first aid to slow bleeding and rapid transfer and treatment, as death usually ensues in less than two hours. Treatment includes blood transfusion, other clinical measures and, when necessary, manual removal of the placenta. Reducing the prevalence of anemia may also reduce the prevalence of hemorrhage-related mortality.

Infection: Particularly common after unsafe abortion or following long, complicated deliveries. Premature rupture of the membranes, frequent vaginal examinations, any surgery and use of instruments, and lack of sterile technique increase the risks of infection. Treatment requires antibiotics and, in serious cases, surgical intervention, including possible hysterectomy. Those who survive infection face increased risk of Pelvic Inflammatory Disease, infertility, and ectopic pregnancy.

Eclampsia, pre-eclampsia: Early stage pre-eclampsia usually arises in the second or third trimester and is most common among primiparas. It is characterized by high blood pressure, edema, and protein in the urine. Untreated, it may lead to eclampsia, which is characterized by very high blood pressure, convulsions, and possible cerebral hemorrhage. Immediate transfer and treatment, including expedited delivery, are required. Prognosis is poor: five to 17 percent of eclampsia victims die, and those who survive may suffer paralysis, blindness, or chronic hypertension and kidney damage.

Prolonged labor: Commonly caused by cephalopelvic disproportion leading to obstructed labor in young and/or undernourished and stunted women with small pelvises; weak uterine contractions in multiparas; deformities or abnormal positions of the fetus; and abnormalities of the cervix or vagina, which are sometimes caused by female circumcision. Prolonged labor can lead to mortality through blood loss, often due to ruptured uterus, dehydration, or metabolic disturbances. In general, transfer and treatment are required if labor continues for more than 24 hours. Treatment requires forceps or ventouse delivery, cesarean section, or symphysiotomy.

Unsafe Abortion: Causes 115,000 to 200,000 maternal deaths each year, due primarily to infection and hemorrhage. Women who survive often suffer severe long-term morbidity and secondary infertility.

The proximate determinants of maternal mortality include pregnancy itself, without which there is clearly no risk of related mortality, the development of pregnancy-related complications, the provision of safe routine services for uncomplicated deliveries, and the management of complications when these arise. These proximate determinants are dependent on intermediate determinants, including women's reproductive and health behavior, health and nutritional status, and access to quality family planning and maternal health care.

The way in which these intermediate determinants influence the proximate determinants of mortality, pregnanc (pregnancy-related complications, and th. management of complications) is described in Box 2. The intermediate determinants, in turn, are influenced by women's education, access to and control of resources, and level of isolation, as well as political commitment, general resource availability, and infrastructure. Education, for example, has significant effects on women's health and reproductive behavior through its influence on age at marriage, contraceptive and health care use, and awareness of risks and danger signs. Women's access to household resources and power to make decisions influence their ability to seek care when needed. Political commitment determines whether or not resources are allocated to making care available and accessible to those most in need, including the development of transport and communications infrastructure to link women in need with formal health care.

Box 2: Intermediate Determinants of Poor Maternal Health

Reproductive and Health Behavior: The age at which a woman becomes pregnant, the parity of the pregnancy, the wantedness of the pregnancy, and women's practices and utilization of care during pregnancy have a profound impact on the proximate determinants of mortality. For example, very young women who have not completed their own growth are at greater risk of obstructed labor; unwanted pregnancies are more likely to end in unsafe abortion; and lack of knowledge of danger signs delays women's decision to seek formal care when needed.

Health and Nutritional Status: Women who are undernourished or in poor general health are more prone to certain maternal morbidities and complications, and hence to mortality. For example, women with anemia are at greater risk of hemorrhage-related mortality; undernourished, short women are at greater risk of obstructed labor; and those with Vitamin A deficiency may be more vulnerable to infection.

Access to and Quality of Care: Whether or not maternal health and family planning services are available, acceptable, accessible, and affordable and, once reached, equipped and staffed to provide adequate care, will also have a profound influence on the proximate determinants of maternal mortality. For example, lack of transport may prevent women from reaching care in time; lack of supplies and equipment, or providers' reluctance to undertake emergency procedures under difficult conditions, may prevent effective treatment.

These mechanisms are further clarified by cross-classifying countries by maternal mortality and fertility levels (see Table 1). No low fertility countries fall into the high mortality category, which illustrates the profound influence of fertility on maternal mortality, and the potential of family planning to reduce maternal mortality in high fertility settings. In low fertility settings, it is likely that further mortality reductions could be brought about by improving the availability and quality of maternal health care. Many low mortality countries fall into the high fertility category, however, indicating that despite high fertility, the risks of mortality in pregnancy have been reduced; further gains could clearly be made in this context by expanding the availability and quality of family planning services. In countries where both mortality and fertility are high, both improved maternal health care and family planning strategies are essential. The data for each of the 70 countries in Table 1 is also matched with data on prenatal care use and trained attendance at delivery. Predictably, utilization of such care is highest in low mortality countries, and vice versa.

The reasoning behind the conceptual framework outlined above is further reinforced by the results of a multivariate analysis examining the proportion in the variation in maternal mortality explained by various proximate and intermediate determinants. The total fertility rate and the proportion of women who receive trained attendance at delivery were found to explain

TABLE 1: DISTRIBUTION OF COUNTRIES BY MATERNAL MORTALITY* AND FERTILITY**

P = Prenatal Care (%); D = Delivery Attended by Trained Person (%)

Total Fertility Rate	MMRatio <150 P D	MMRatio 150-300 P D	MMRatio >300 P D
<3.0	Chile 91 95 China 97 93 Cuba 99 99 Hong Kong 99 92 Jamaica 72 89 Mauritius 90 85 Puerto Rico – – Republic Korea 70 70 Singapore 95 100 Sri Lanka 97 95 Trinidad 96 98 Uruguay – 96	Thailand 50 52	
3.0-5.0	Argentina – 87 Burma 75 65 Colombia 65 51 Costa Rica 68 96 D.R.Korea 78 68 Dom.Republic 95 90 Malaysia 65 82 Mexico 83 94 Mongolia 100 51 Panama 89 89 Philippines 54 52 Venezuela 68 96 Vietnam 99 –	Brazil 75 83 Ecuador 49 27 Indonesia 26 31 Turkey 50 50	India 50 35 Paraguay 65 22 Peru 46 44
>5.0	Angola 27 15 Cape Verde 99 50 Dem.Yemen 39 32 El Salvador 23 35 Guatemala 14 34 Honduras 20 50 Kuwait 99 99 Laos PDR – 15 Mauritania 100 85 Nicaragua – – Tanzania 85 60 Zambia 88 60	Algeria 27 15 Botswana 82 52 Kenya 40 28 Madagascar 33 62 Malawi 37 45 Rwanda 85 22 Syria 21 37 Uganda 90 40	Afghanistan 08 08 Bangladesh 12 05 Bolivia 54 47 Cen.African Rep. 68 66 Congo 35 – Ethiopia 50 11 Ghana 82 40 Haiti 41 40 Lesotho 50 40 Nepal 09 06 Niger 47 47 Nigeria 70 40 Pakistan – 24 Papua New Guinea 54 34 Senegal 30 50 Sierra Leone 70 63 Somalia 02 02

(Koblinsky and Huque, 1991)

* Maternal mortality ratio (deaths per 100,000 live births)

** Total fertility rate (average number of births per woman)

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52 percent of the maternal mortality ratio (deaths per 100,000 live births, a measure of obstetric risk) and 38 percent of the maternal mortality rate (deaths per 100,000 women of reproductive age, which combines obstetric risk with the risk of getting pregnant). Women's education, measured here as the percentage of women of secondary school age enrolled in secondary school, was found to explain 51 percent of the variation in fertility and 39 percent of the variation in trained attendance at delivery, illustrating some of the mechanisms through which women's status influences maternal health (See Appendix 4: Figure 2).

Workshop participants stressed that if available data were more complete and of better quality, the effect of female education would probably be found to be even stronger. They also emphasized that non-formal education could help to overcome deficiencies in formal education, with perhaps similar results. It was noted, however, that these macro-level relationships cannot be projected to the individual level.

Finally, it was emphasized that the relationships between women's education and maternal mortality are more distant than those between education and, for example, child survival, an area in which there is a great deal more women can do in the absence of health care to prevent or treat illness in their children. The mother's ability to provide oral rehydration therapy in cases of diarrhoea, which has contributed enormously to reducing child mortality, serves as an example. On the other hand, when women, either educated or uneducated, are faced with a severe pregnancy-related complication, there is little they can do in the absence of appropriate medical care.

(Koblinsky and Huque, 1991; Huque, presentation)

B. SAFE MOTHERHOOD: PROPOSED TYPOLOGIES

In recognition of the economic, epidemiological, demographic, infrastructural and cultural heterogeneity within and between developing countries, the workshop was conducted around a set of typologies. These were originally developed by the MotherCare Project, a five year USAID-funded effort to improve maternal health and nutrition through research and technical assistance. The typologies, which represent points on the continuum from resource-poor to resource-rich environments and a range of levels of maternal mortality and women's isolation (including exposure to health information and influence in decision making), the capacity of delivery care, and the effectiveness of the referral system are presented in Box 3. While these settings differ in numerous key respects, they also share certain attributes: poor quality of maternal care, and lack of understanding of reproductive health, its associated risks, and the appropriate action to take -- both as a user of services and a provider of care -- when a potential or actual emergency arises. The workshop was initially conducted around hypothetical settings A - D. It became apparent, however, that the program strategies relevant to Settings B and C in the original configuration were similar enough to warrant merging. The final typological configuration, as presented in Box 3, is based on three settings (A - C).

Workshop participants stressed both the strengths and limitations of the typological approach. Firstly, the indicators represented by the settings do not move in tandem: in numerous

settings, health care is poorly developed, but women's status and ability to care for their own health and gain access to available resources is high; in others, women are isolated, dependent, and powerless, though health care may be well developed and physically accessible.

Secondly, the approach should not be seen as a substitute for country-specific diagnostic activities. Careful, situation-specific assessments to determine women's status, needs, preferences, and patterns of health care utilization, as well as available resources and infrastructure, are essential. Since it is likely that most countries encompass most, if not all, of the settings described, such assessments must take place nationally, regionally, and locally. This is further complicated by the fact that within individual settings there may exist both resource-poor and resource-rich households facing high risks of mortality, but for differing reasons.

Nonetheless, the typological approach has many merits. Program guidelines developed in the past have not been specific enough. By elucidating the primary settings faced by program planners, the typological approach moves beyond stating the importance of context specificity by illustrating how this might influence program design, and provides preliminary guidance for further assessment and tailoring. In addition, it helps to eliminate the debate that often arises when individuals from different settings gather to discuss priorities, by enabling them to focus on common problems.

Box 3: Proposed Typologies

SETTING A: Setting A is isolated. It has a district hospital that is little used. There is essentially no peripheral care and women remain isolated and remote from the services available. Family planning is not readily available. Contraceptive prevalence is very low, and unsafe induced abortion is common. Fertility and maternal mortality are very high.

SETTING B: A public health service with hospitals and health centers/posts is in place and could provide both family planning and maternal health care. Most women, however, remain outside the formal service structure, using traditional birth attendants at the time of delivery. Contraceptive use is low. Both fertility and mortality are moderately high.

SETTING C: A fairly well-developed public and private health infrastructure exists and is in heavy demand. The referral site is typically overwhelmed with normal deliveries as well as emergency cases. Quality of care remains an issue. Contraceptive prevalence is about 40 percent but maternal mortality remains between 100 to 300 per 100,000 live births

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(Koblinsky, presentation)

II. PROGRAM COMPONENTS

A. COMMUNICATING SAFE MOTHERHOOD

The role of communications in the fields of family planning and child survival is well established. Communications efforts in the field of maternal health lag far behind, reflecting both general neglect of women's health and low appreciation of the contribution communications can make to overall program success. As Safe Motherhood program planning efforts move forward, they can and should benefit from the lessons learned by communications efforts in related fields. It is likely, as illustrated below, that communications can contribute significantly to the success of efforts to reduce maternal mortality and promote women's health. Examples of the multifaceted role of maternal health communications are listed in Box 4.

Box 4: What Can a Communications Program Do?

- Promote programs, policies and services to policy-makers, health personnel and the public.
- Facilitate coordination within and between institutions.
- Help programs consider the user's perspective, to make services convenient, acceptable, and satisfying.
- Make people aware of health problems and their severity.
- Motivate people to adopt more healthful behaviors.
- Give people the essential information they need to improve their health.
- Teach the essential skills required for improving health.

Communications should play a key role in efforts to prevent and treat all major maternal health problems. For example, it can help increase women's awareness of danger signs during pregnancy. Such awareness is low, because the danger signs are not dramatic, or are so common in the community they are considered normal. Generalized swelling (edema), a sign of pre-eclampsia, provides an example, as do the signs of anemia and undernutrition. Communications can increase awareness of the need to seek care when swelling occurs, where to get iron tablets to treat anemia, and for improved nutrition for women, especially during and immediately following pregnancy. Communications can also help ensure compliance with prescribed dietary or treatment regimens: delivery in appropriate facilities in the case of severe pre-eclampsia, and how to reduce the side effects of iron pills in the case of anemia.

Using communications as part of an effort to reduce the prevalence of infections poses special challenges. Here, communications must deal with highly sensitive issues, such as unsafe abortion and sexually transmitted diseases, and must influence not only the woman but her sexual contacts and health care providers who assist with abortion or childbirth. Modesty, embarrassment, fear, shame and denial are often associated with discussion of sexually transmitted diseases and related practices, and women are often powerless to discuss these issues with their partners, or to demand partner participation in prevention or treatment. However, if the communications are handled sensitively they can often pave the way for more frank discussion between partners and between client and health care provider.

Hemorrhage provides an example of a serious maternal complication that cannot be reliably predicted and requires rapid referral and treatment. The importance of ensuring recognition of danger signs and the need for care is a matter of life and death. Communications can inform communities of the urgency and assist in conveying a protocol on what to do.

As with all maternal health interventions, communications efforts must be tailored to the setting in which they will be implemented. While the typologies outlined in section IB are useful in this regard, it must again be stressed that there is no substitute for thorough, situation-specific assessment, including a thorough understanding of local perceptions and practices. Changing reproductive health and health care seeking behavior often involves challenging deeply entrenched traditional norms, and reconciling differences between traditional and medical notions of disease causation and appropriate health behavior. In some cultures, for example, retained blood is seen as a greater threat than blood loss. Complications may be perceived as fate, divine will, or punishment, and seeking modern medical care may be seen as inappropriate. The concept of risk may not exist, or may be radically different. In Bangladesh, for example, traditional birth attendants (TBAs) do not wash their hands prior to delivery because they will only touch the "dirty substances" of childbirth. These traditional concepts have a significant effect on the recognition of and response to problems when they arise.

Communications efforts must also be directed to the health system. Women cannot be targeted in isolation, since in many instances they have little control over the attitudes and practices that influence their health, and may not be able to seek health care without the permission of their husband, mother-in-law, or other designated family members. As such, influential family members, birth attendants, and community leaders must also be reached. Effective service utilization, for example, hinges on ensuring that facility development is based on a sound understanding of women's perceptions of their problems, their preferences regarding service design, and the obstacles they may face in using existing facilities. Some of the common obstacles to service utilization are listed in Box 5.

Possible themes for maternal health communications, indicating how these might differ according to the typologies outlined in Section IB, are listed in Box 6. While the themes are quite consistent across settings, care must also be taken to ensure that not only themes but specific health messages, and the media used to convey them, are appropriate to the target audience.

Box 5: Common Obstacles to Service Utilization

- People may not perceive high-risk conditions or even illness to require medical attention.
- People may lack information about available services.
- Hours of service may conflict with essential daily activities.
- Service fees may be considered expensive.
- Transportation may be difficult or expensive or women's travel outside the home may be restricted.
- Clinic staff may not treat women with dignity and respect.
- Treatment may be of poor quality.
- Standard procedures in health facilities may run counter to strongly-held folk beliefs.
- Health education messages may run counter to women's attitudes and beliefs.

For each program objective it is important to consider where communications can assist and to think more broadly than communicating directly with mothers. Communications can serve various functions in a program, including:

- advocacy;
- institutional strengthening;
- program support;
- and motivating and teaching health promotive behaviors.

Advocacy, through television, conferences, and various other media can be used to increase awareness among policy-makers and others of the magnitude of the problem, the need for policy reform and appropriate resource allocation, and the society-wide benefits of improving maternal health, as well as providing them with state-of-the-art information to facilitate program planning. The Safe Motherhood advocacy and planning conferences organized by Family Care International, which have involved high-level policy-makers from over 70 countries to date, are illustrative. A national conference in Uganda, for example, was followed by the establishment of a Safe Motherhood Coordinating Board, which involves leaders of NGOs from various sectors. The Board is now implementing a pilot maternal health program focusing on the role of health education and community mobilization in reducing maternal mortality.

The process of planning, managing, and evaluating a communications project should result in an enhancement of institutional capacity. This enhanced capacity extends beyond communications per se by strengthening such capabilities as the health system's capacity to build traditional perceptions, preferences and practices into program design. In the Rural Gadchiroli District of India, for example, research was undertaken to investigate women's actual and perceived reproductive health problems. Gynecological problems were detected in over 90 percent of the women examined, but few had ever sought examinations or treatment independently. Because it was found that women would not seek care from male health care

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Box 6: Themes of a Maternal Health Communications Program

- Promoting healthy behaviors by women and families during pregnancy and the postpartum period (Settings A-C).
- Improving early recognition of danger signs, problems and emergencies, with an emphasis on reducing delays in care seeking (Settings A-C).
- Motivating communities to mobilize available resources and develop organized responses when problems and emergencies arise (Settings A and B).
- Increasing awareness of the need for and use of the formal maternal care services available (Settings A-C)
- Promoting awareness and use of safe, local community-based alternatives to formal care (Settings A-C).
- Motivating TBAs to adopt safe practices, abandon harmful practices, and refer women for formal care when problems arise (settings B,C).
- Promoting awareness of and use of alternative birth locations when these exist (settings B-C).
- Modifying services to be more appealing and acceptable to women (Settings B-C).
- Training modern maternal care providers to improve detection, treatment and referral of maternal health problems and to counsel women effectively (settings B-C).

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providers, a new cadre of female care providers was formed. A carnival was held to present the results of this research to the villagers, generating demand for further information, interest among men for a similar study of male reproductive health problems, and other community-initiated activities.

Communications can support the overall maternity care program not only by incorporating local perceptions and preferences into service design, as outlined in the example above, but also by letting the community know where and when services are available, how to use them, what their benefits are, etc. It can also promote utilization of new and/or improved maternal care products: a new form of iron supplementation or family planning method, for example. In Tunisia, one hospital brought about a significant increases in return visits for postpartum care by giving women a specific return date on the fortieth postpartum day, which marks the end of the traditional period of convalescence in many cultures; redesigning the service to integrate maternal and infant services in one location; and promoting postpartum care in the maternity ward.

Motivating and teaching health promotive behaviors aims primarily to foster behavior change among selected groups. The first step in motivating people to take steps to improve their health may well be to make them aware of health problems and high-risk conditions, combatting common notions that prevalent health problems are normal. Communication can promote early recognition of maternal health problems, danger signs, and risk; appropriate self-care; iron tablets and family planning; compliance with iron supplementation or referral, and completion of treatment regimens; use of hygienic birth techniques; etc. Communications can also discourage practices that are harmful to maternal health.

In Port Harcourt, Nigeria, for example, a radio campaign to alert communities to the need for prompt referral of women in labor longer than 24 hours resulted in a significant reduction in fistulae, a common consequence of obstructed labor, in the campaign's target area. The success of an iron supplementation program in Northeast Thailand was attributed to effective persuasion from health workers and the distribution of calendars containing well-tested motivational messages. In India, an effort to improve the health and nutrition education of pregnant and lactating women used various media. An "action sheet," which was designed to be given to women as soon as they recognized they were pregnant, reminds them of the basic actions they should take. Radio spots, and a short film spot to motivate husbands to encourage their wives to eat properly in pregnancy, were developed to reinforce the campaign. The program experienced certain difficulties: a monitoring study found that the action sheets were popular in some areas, but not in others. Indeed, in some areas, husbands would not allow their wives to have the action sheet.

Many lessons can be derived from the few maternal health communications programs that have been undertaken, as well as from the more extensive and rigorously evaluated experiences of other health communications efforts. First and foremost, the mandate for communications must be established in Safe Motherhood. This mandate must be set from the onset of program

design. Too often, communications activities are added late and suffer from improper development. Second, communications strategies must be based on what is required to change practices, not only knowledge, and must target not only pregnant women, but all women, families, communities, care providers, and decision-makers at all levels of society.

Communications programs should be based on a careful diagnosis of the overall socio-cultural environment into which they will fit, and communities must be centrally involved in planning and implementation. Messages need to be based on a solid understanding of cultural perceptions and practices, and should focus on priority areas, not only as defined by program planners and health experts, but as perceived by the people whose lives they seek to affect. This requires that a balance be achieved between locally planned and centrally managed activities, which implies a greater amount of community control over decision-making and resources than is typically allowed. Programs should take a comprehensive, strategic approach to addressing women's health problems. They should also move beyond conventional health education approaches: women often do not utilize services, may have low literacy skills, and may have perceptions of physiology far different from the western model. Innovative ways of reaching women, and creative message expression, have been elements of most successful programs.

Other lessons learned include the need to cost all elements of the program to ensure sustainability; setting well-defined, measurable objectives to ensure that impact can be demonstrated; ensuring that the service delivery component is prepared; and communicating with decision-makers and other program implementors to ensure support for the communications program once developed, particularly when sensitive reproductive health issues are being addressed. Service provider attitudes and service changes must be in line with those expected by the community.

There was considerable discussion regarding the phasing of program components: in the context of limited resources, it is not always possible to improve service supply and generate service demand simultaneously. In addition, workshop participants emphasized that while Safe Motherhood communications efforts should be integrated with ongoing health communications programs, they should move beyond the health infrastructure to where women can be reached and, more importantly, to where women are organized (eg. mother's clubs, women's savings groups).

(Griffiths et al., 1991; Griffiths, presentation)

B. COMPONENTS OF MATERNITY CARE

1. The Effectiveness of Prenatal Care: A Review

While not all prenatal care (PNC) has mortality reduction as its aim, this was the focus of the review presented at the workshop. The presentation, which was based on a review of the effectiveness of prenatal care carried out by the London School of Hygiene and Tropical Medicine for the World Health Organization (Rooney and Graham, 1991), identified the antecedents of mortality in pregnancy, and all tests and treatments that might be used to detect, treat, or prevent them. The effort was hampered by the striking lack and/or incompleteness of data on this topic. Thorough searches of the published and unpublished literature were conducted, with particular attention to evidence from developing countries, to identify studies linking PNC with maternal outcomes. All identified randomized control trials, the estimates of which can be taken as unbiased, were reviewed, as were other studies in which confounding factors and bias could be minimized or estimated, and associated interventions thus confidently listed as definitely or potentially effective.

While reductions in maternal mortality in developed countries can be attributed, at least in part, to improvements in delivery care, it is difficult to show a direct association between maternal mortality reduction and the introduction of PNC. In developing countries, lack of PNC is often cited as a risk factor in maternal mortality. Where this care is lacking, however, delivery care is also likely to be poor, and no studies adequately control for lack of delivery care, or other possible confounding factors. Ecological studies have found a link between PNC attendance and lower maternal mortality. There is almost total correlation, however, between attendance for PNC and trained attendance at delivery, the latter which may be the more direct link to mortality reduction. Selection biases are also found at the individual level; women at lower risk of complications are both more likely to seek PNC and less likely to die from pregnancy-related causes.

It must be said, however, that PNC could have many benefits in high maternal mortality and morbidity contexts, insofar as it provides an opportunity to reach a large proportion of the pregnant population with health education and services. If adequate routine and emergency delivery care are indeed the primary factors reducing mortality risks, then PNC provides an opportunity to ensure that such care is utilized, to the extent possible. And while the impact of PNC on maternal mortality is questioned, its impact on women's health and infant mortality and morbidity are better documented. Indeed, prenatal care provides a perhaps unique opportunity to put a substantial proportion of the female population in contact with the health system, the benefits of which extend far beyond reductions in maternal mortality.

One of the primary functions of PNC is to screen the pregnant population and ensure that those predicted to be at high risk of complications receive continuing surveillance and treatment when necessary. The effectiveness of screening is determined by its ability to discriminate between women at low and high risk. It also requires that the whole population be screened for conditions linked to the major causes of mortality; that appropriate action is taken

when such conditions are detected; and that adequate referral services exist and are accessible and utilized. Unfortunately, many of these essential steps are weak in and of themselves: the discriminatory power of many screening tools is poor; those most in need of screening and referral are often those least likely to use available services; appropriate action is often not taken when a risk factor is detected, due to lack of appreciation of its significance and lack of access to or utilization of referral services. Some studies have shown that risk screening programs can have a significant influence on maternal health outcomes when carried out effectively in the context of adequate referral services (see, for example, section IV D, "Cameroon: The Risk Approach"). Further research is urgently needed, as the approach may have real benefits when carried out under these circumstances.

The evidence on the potential of PNC interventions related to the major causes of maternal mortality is outlined in Box 7. In summary, few effective interventions were identified. PNC's strongest potential is in the following areas:

- detection and treatment of chronic anemia;
- detection, investigation and referral of hypertensive disorders of pregnancy;
- detection and treatment of certain types of infection, especially STDs;
- and prediction of the risk of some obstetric complications, most notably cephalopelvic disproportion, followed by arrangements for delivery in an appropriate facility.

PNC contributes little to preventing mortality associated with hemorrhage or puerperal infections, which require improved delivery care, an adequate system of transfer, and treatment at the referral level.

Participants stressed that providing even the few PNC interventions that have been proven effective or show promise presents a major challenge, as they are not widely available in most settings. They also emphasized the importance of arriving at informed consensus on interventions in the absence of robust statistical evaluation. While such evaluation is important, it is not a realistic goal in all cases, and the costs of waiting for the results of rigorous research, in terms of women's lives, can be too high. The users' perspective on which services and interventions should be included should also be considered in PNC design, and some work has been undertaken in this area. Finally, several participants spoke of program success based on the risk screening approach, which has been the subject of debate. Related programs are described in Section IV.

Box 7: THE EFFECTIVENESS OF PNC INTERVENTIONS IN REDUCING MATERNAL MORTALITY

HEMORRHAGE:

Risk screening and referral: Only effective in the context of adequate referral services. Known risk factors include a history of hemorrhage and grand-multiparity, but these have poor predictive value.

Identification and prompt treatment: PNC may play a role in enquiring and acting on symptoms, signs, and predisposing conditions; providing education on the seriousness of vaginal bleeding, particularly late in pregnancy; and ensuring that women are informed of the appropriate action to take.

ANEMIA:

Preventing and treating anemia is justified in its own right. It may also play a role in the reduction of hemorrhage-related mortality, though its impact in this regard is poorly documented. Knowledge of the proportion of anemia due to iron deficiency, malaria, hookworm, etc., as well as the reasons behind iron deficiency (eg. food taboos, lack of appropriate foods, etc.), is essential to determining the ideal intervention strategy (eg. role of malarial chemoprophylaxis, parasitic disease prevention/treatment, health and nutrition education).

Routine prophylactic administration of iron: Can prevent development of anemia in large numbers of women, or correct mild anemia. Prevalence levels at which routine administration would be beneficial are unclear. Effectiveness of providing dietary advice is unclear, as is the role of staple food fortification, though the latter has been effective in some settings.

Oral iron supplementation in pregnancy: Can correct anemia in women attending PNC in mid-trimester, but side effects often reduce compliance.

Intravenous/intramuscular administration of iron: Proven effective, but requires facilities and skills for infusion and the treatment of allergic reactions. Only advantage over oral supplementation is in overcoming poor compliance.

Screening: Needed to ensure detection and treatment of severe anemia even when routine iron and folate supplements are provided. Rarely undertaken, or undertaken with poor diagnostic methods (eg. inspection of conjunctivae, mucous membranes). Research underway to develop screening methods appropriate for the field.

HYPERTENSIVE DISORDERS OF PREGNANCY (HDP) - (Pregnancy induced hypertension, pre-eclampsia, eclampsia):

Risk factors and primary prevention: Risk factors include nulliparity and previous HDP, but none alone or in combination has strong predictive power. Fish oil or calcium supplements show promise for primary prevention in women at high risk (but more trials needed, including long-term infant follow up) as does low dose aspirin and/or other antiplatelet agents.

Early detection of hypertension and proteinuria: Possible with relatively simple instruments. Blood pressure (BP) measurement is the most sensitive test, but not all women with high BP develop pre-eclampsia, and some who develop eclampsia do so with little preceding hypertension. Ideal timing, frequency, and number of measurements not known. BP measurement is often not available at the primary level. Appropriate BP measurement technology, and training methodologies to ensure accurate measurement, are needed. Detection of edema and/or proteinuria alone may have a place as an interim measure in the absence of universal BP measurement. Accurate tests to detect proteinuria exist, but are not universally available or used at the primary level. Examination of all pregnant women

for edema requires modest skill and should be universally practiced. PNC also provides an opportunity to teach women and communities that swelling is a sign of danger and requires rapid referral to a facility where BP and proteinuria can be measured and treatment arranged.

Treatment: Pre-eclampsia and eclampsia have better outcomes when professional care is available and used, but little is known about which treatments are most effective; many are and have been used in developed countries, with little evaluation. There is insufficient evidence on the role of bed rest. Trials of antihypertensive drugs indicate that they do prevent further increases in BP in women with mild/moderate hypertension, but effects on outcome are poorly documented. Anti-convulsant therapy is also promising, but various drugs are used, and which regime is best in terms of maternal and infant outcomes is not yet established.

OBSTRUCTED LABOR (OL)

Definitive treatment, including Cesarean Section, must be available to improve maternal health outcomes.

Primary prevention: Primary prevention of cephalopelvic disproportion, a major cause of OL, is possible through improved nutrition of girls and efforts to delay first births, which fall outside the scope of PNC. There is some evidence that PNC, through providing nutritional supplements for very young primigravidae, may increase their growth during pregnancy, but pelvic growth is completed later than growth in height. This approach may also increase the risk of fetal-pelvic disproportion by increasing fetal size.

Risk assessment and referral: CPD can be virtually ruled out in a woman who has previously delivered a good sized infant. But information on obstetric history is not available for primigravidae, who are at high risk of CPD. The majority, however, will not suffer obstructed labor. A more specific test, with higher predictive value, must be also be used. The simplest tests are height, foot size and age, as proxies for internal pelvic diameters. It is possible that discriminatory performance could be improved by refining measures with anthropometry and/or pelvimetry, but this is not yet known with any certainty. There is insufficient data to assess the role of clinical pelvic assessment by manual examination, which could theoretically be used as a secondary level screening tool in conjunction with referral of women of short stature or very young age. At present, the best and easiest test is maternal height. Cut-off points for maternal height need to be determined locally to maximize the sensitivity (proportion of women with CPD detected) while minimizing over-referral of false positives. Other causes of OL include fetal malpresentation, which is more frequent in grand multiparas and multiple pregnancies. Determining obstetric history is the first step in assessing risk. Abdominal examinations by skilled examiners in late pregnancy might also play a role, but more information is needed to determine the skill level required, as well as the predictive accuracy of abnormal presentation near term for malpresentation in labor.

INFECTIONS

Puerperal Sepsis: Most puerperal sepsis and associated mortality are related to a lack of trained assistance at delivery and poor obstetric facilities. Risk increases in proportion to the frequency of vaginal examinations and intervention in labor. Improvements in developed countries were linked first to prevention through improved hygiene at delivery and later to the introduction of antibiotic treatment. PNC, through health education to improve recognition of symptoms and signs, distribution of safe birth kits, and promotion of trained attendance and hygienic practices at delivery, might prevent some infection. Premature rupture of the membranes increases the risk of infection and requires prompt referral. The role of PNC in the prevention of membrane rupture is limited, though it could play a role in educating women and communities about the importance of seeking appropriate care, provided such care exists. No assessments of the effectiveness of health education of this type have been undertaken.

Sexually Transmitted Diseases (STDs): PNC should screen all women for STDs, due to the specific risks to pregnancy outcomes these imply and as opportunistic screening. Guidelines on appropriate tests for initial and confirmatory screening are needed. Limiting screening to high-risk groups and symptomatic women (or women with symptomatic partners) may be an alternative in areas of proven low prevalence, but ideally screening should be universal.

Gonorrhoea: A review of the effectiveness of gonorrhoea screening found that it is justified even in low-prevalence areas. Screening of all pregnant women early in pregnancy, with repeated testing for high-risk groups, is advocated. Microbiological screening detects asymptomatic disease. With treatment, contact tracing and follow up, it can improve maternal outcomes. Effective treatment exists, though knowledge of local patterns of antibiotic resistance is essential to ensuring effectiveness.

Syphilis: Prevalence rates are very high and have a significant impact on pregnancy outcomes. All pgnt women should be screened, with repeated testing for women at high risk. Several quick, reliable tests exist. Serological screening detects asymptomatic disease. With treatment, contact tracing and follow up, it can improve maternal outcomes.

Human Immune Deficiency Virus (HIV): In some regions, HIV infection is the overriding public health problem in young adults and children. Screening of women at high risk is advocated, though the options for further action are currently limited to counselling on the advisability of further pregnancies, avoiding transmission, and early detection and treatment of opportunistic infections.

Genito-urinary Tract Infections (GTIs): Screening for upper GTIs and treatment with antibiotics are highly recommended in first trimester though it is not clear whether repeated screening is beneficial. Further research on appropriate technology for screening is needed. Lower GTIs are not closely linked to acute puerperal sepsis, though they are an important factor behind low grade infection and chronic morbidity. Ascending infection from the lower genital tract may predispose women to membrane rupture; as such, investigation and treatment of discharge in PNC could prevent some cases.

(Rooney and Graham, 1991; Rooney, presentation)

2. The Effectiveness of Delivery Care: A Review

The distinction between prenatal and delivery care is not clear cut; the treatment of eclampsia or severe pre-eclampsia, for example, can be regarded as both. This section deals with a review of the effectiveness of interventions that can be used to prevent, reduce the severity of, or treat complications during labor and delivery. Again, the evidence is scarce. Many standard obstetric practices have never been rigorously evaluated. The evidence on the role of delivery care in addressing the major causes of maternal mortality is summarized in Box 8.

In developed countries, effective maternity services were introduced following the development of communications, transport, and other infrastructure. The challenge in many developing country settings is to ensure that such care is made available to all women prior to the development of such infrastructure. Many innovative strategies have been developed, though most have not been subject to rigorous evaluation.

Bringing women closer to routine and emergency delivery care, or bringing this care closer to women, is key to reducing maternal mortality. The former implies establishing peripheral health centers equipped to serve all essential obstetric functions, or training, equipping and posting community-based care providers and providing access to emergency services, including transport. Box 9 outlines the essential obstetric functions related to the major causes of maternal mortality, as defined by WHO. Economic constraints and the need for adequate

training, supervision, and practice to maintain skills make it unrealistic to ensure the availability of essential obstetric functions in every village. A balance must be struck between the level of expertise provided, the size of the population served, the area (or distance) covered by the services, and resource availability.

BOX 8: THE EFFECTIVENESS OF DELIVERY CARE IN REDUCING MATERNAL MORTALITY

INFECTION

Prevention: As indicated in the summary of preventive PNC interventions, prevention of infection relates primarily to improving standards of hygiene in delivery care. Aseptic technique is simple when adequate supplies of water, soap and disinfectant are available. One of the aims of traditional birth attendant (TBA) training is to promote clean deliveries, but this is difficult to ensure when clean water is in short supply, and training is often not reflected in practice. The relative effectiveness of aseptic and "clean" conditions in preventing infection are unclear. Other strategies include minimizing vaginal examinations and interventions; ensuring referral of women with prolonged rupture of the membranes; ensuring referral of and providing prophylactic antibiotics to women suffering pre-labor rupture of the membranes; and evacuating retained placental fragments promptly.

Treatment: In some areas, TBAs and other community health workers are allowed to begin treatment with antibiotics before referral, the latter which is essential to assess the need for more extensive intervention, including surgery. Early detection is key to reducing the risk of mortality and long-term sequelae. Community-level awareness of danger signs and preliminary community-level treatment are essential: even women who deliver in hospitals may be discharged before signs of infection appear.

HEMORRHAGE

Prevention: There is conclusive evidence that routine active management of the third stage of labor, including intramuscular administration of oxytocic drugs to contract the uterus, reduces the incidence of postpartum hemorrhage (PPH) by 60 percent. This practice is recommended for all deliveries attended by skilled professionals. There is an urgent need to explore the potential and safety of oxytocic use by TBAs as well as the efficacy of administering oxytocics by other routes (eg. rectal suppositories).

Treatment: Requires prompt action to stop bleeding and replace blood. Most PPH results from failure of the uterus to contract/remain contracted, in which case oxytocics are highly effective, or from retained placenta, which should be removed manually within one hour of delivery if possible. WHO recommends that all midwives be trained in manual removal of the placenta. Other measures include external bimanual uterine massage and putting the baby to the breast to induce uterine contraction, but evidence on the relative effectiveness of these procedures is unclear.

OBSTRUCTED LABOR

Prevention: (See Box 7: Effectiveness of PNC Interventions)

Early detection: The partograph has proven a very effective tool to monitor the progress of labor and enhance decision-making among both hospital specialists and midwives in peripheral units. Relatively high levels of skill and hygiene are essential, as its use is dependent on repeated vaginal examinations. Some success has been documented in training community health workers to use the partograph, but it is recommended that simpler, less invasive methods be used by TBAs, such as enabling them to determine prolonged labor based on time (eg. one sunrise and sunset during labor). No evaluation of these methods has been undertaken.

Operative delivery: Cesarean section (CS) is generally seen as definitive treatment, though recent studies have prompted a reconsideration of symphysiotomy, suggesting that previous estimates of associated morbidity were overestimated, and that it may be associated with lower mortality than CS. Further study comparing the immediate and long-term outcomes of both procedures is essential. Training nurses and midwives to perform CS has been very successful in some settings. Symphysiotomy, which is simpler and requires lower levels of skill and equipment, may be more amenable to delegation and provision at the periphery. Delay in delivery that is not due to absolute disproportion or abnormal lie may be overcome by forceps or ventouse delivery. A recent review found that ventouse delivery leads to fewer maternal injuries than forceps, though the relative safety of the two procedures in terms of long-term impact on the infant is unclear. Ventouse systems using suction from a foot pump, and designed for easy maintenance, have been developed.

HYPERTENSIVE DISORDERS OF PREGNANCY (See Box 7 - Effectiveness of PNC Interventions)

Various strategies have been developed to bring women and services together in emergencies. "Flying Squads," which originated in Britain, provide an example of bringing services to women in need. They involve a team of health professionals who travel by ambulance with emergency equipment to treat the woman on site, or to provide basic care and transfer her to the hospital. Similar services have been established in some developing countries, though no formal evaluation of their effectiveness has been undertaken. Problems encountered have included unpassable roads and lack of community awareness of the service.

There are many other innovative ways of bring women to services. Much more effort should be put into ensuring the availability of inexpensive, maintainable, community-level transport options for emergency transfer, including motivating communities to make optimum use of existing vehicles and developing emergency transfer protocols. It is also essential that effective means to summon emergency transport be available, which poses particular challenges in the absence of telephones or radios. Maternity waiting homes, to which women can move prior to labor and be assured of ready access to higher level care, show promise, but have not yet been rigorously evaluated in terms of their impact on maternal mortality. There is evidence that the utilization of these facilities is strongly influenced by community participation in their development.

The risk approach can also help ensure that women are brought to services when in need. The approach is based on the assumption that factors that predict a risk of later complications can be identified during or before pregnancy, and that women so identified can be referred or provided with special care. This approach can, in theory, help ensure that resources are allocated to those most in need of care, prior to the emergence of a serious complication. The effectiveness of this approach is currently the subject of debate, as outlined in Section B1.

The shortage of specialist care in developing countries points to a need to increase the number of midwives or other skilled professionals, and to delegate essential lifesaving functions to this cadre. There are several program examples illustrating the potential impact and safety of this approach (training midwives in Cesarean section, symphysiotomy, and manual removal of the placenta, for example), some of which are outlined in Section IV. The shortage of

professional care also implies a need to improve the quality of care provided by TBAs, who continue to attend the vast majority of births. Evaluations of TBA training programs have tended to focus on the degree to which they improve knowledge, rather than practices, and the limited evidence available indicates that knowledge is often not reflected in improved practices. Positive program examples do exist, however, in the context of a strong system of supervision and referral, and through an emphasis on mutual respect and understanding. Some of these programs are outlined in Section IV. It is likely that much could be gained from improving the quality and appropriateness of training programs, and basing them on a thorough understanding of the beliefs, attitudes and motivations of TBAs and the communities in which they work.

Careful planning and siting of facilities, and coordination of transport and communications between levels of the health system, can help ensure that the effectiveness of limited specialist care available is maximized. Lack of supplies, equipment, drugs and blood supplies in higher level care facilities, however, often limits access to effective treatment once women have reached the care site. Equipment should be as simple to operate and maintain as possible, and providers should receive training in repair and maintenance. Ensuring that facilities are adequately stocked with essential drugs and supplies is also a priority. In many settings, women often die while relatives are sent to obtain supplies from pharmacies and other sources. Various schemes have attempted to overcome this problem by making supplies available near the facility.

(Rooney, 1991; Rooney, presentation)

BOX 9: EIGHT GROUPS OF ESSENTIAL OBSTETRIC FUNCTIONS RELATED TO THE MAJOR CAUSES OF MATERNAL MORTALITY

GROUP 1: SURGICAL FUNCTIONS

- Cesarean Section
- Surgical treatment of sepsis
- Repair of high vaginal and cervical tears
- Laparotomy for repair of ruptured uterus
- Removal of ectopic pregnancy presenting as acute abdomen
- Evacuation of uterus in uncomplicated abortion
- Oxytocin intravenous infusion for augmentation of labor
- Amniotomy with/without I.V. oxytocin infusion

GROUP 2: ANESTHETIC FUNCTIONS

- General anesthesia

GROUP 3: MEDICAL TREATMENT FUNCTIONS

- Treatment of shock
- Intravenous total dose iron infusion
- Medical treatment of sepsis
- Control of hypertensive disorders of pregnancy and eclamptic fits

GROUP 4: BLOOD REPLACEMENT

- Blood typing, cross-matching and transfusion

GROUP 5: MANUAL AND/OR ASSESSMENT FUNCTIONS

- Manual removal of placenta
- Vacuum extraction
- Partograph

GROUP 6: FAMILY PLANNING SUPPORT FUNCTIONS

- Surgical family planning (tubal ligation, vasectomy)
- Intrauterine device (IUD)
- Norplant
- Other contraceptives

GROUP 7: MANAGEMENT OF WOMEN AT HIGH RISK

- Maternity "Villages" or Homes

GROUP 8: NEONATAL SPECIAL CARE

- Resuscitation
- Thermal control
- Feeding

(WHO, 1986)

C. THE ROLE OF FAMILY PLANNING

As outlined in Section IA, family planning can contribute significantly to reducing pregnancy-related mortality by reducing exposure to pregnancy. Its effect on the maternal mortality ratio (deaths per 100,000 live births), a measure of the risk women face when already pregnant, will depend on which women adopt family planning: if family planning use is equal across categories of obstetric risk, the ratio will remain the same. Increasing family planning use could, theoretically, even increase the maternal mortality ratio, in that first births, which are riskier, will increase as a proportion of the total number of births. It is also possible that women who accept family planning where contraceptive prevalence is relatively low are healthier, better educated and more likely to use health facilities, placing them at lower risk of maternal mortality. Expanded use of family planning will, however, reduce the maternal mortality rate (maternal deaths per 100,000 women of reproductive age), which combines the level of obstetric risk with the risk of getting pregnant. The central point is that fewer births implies fewer deaths, under any and all circumstances.

Unlike the fields of prenatal and delivery care, substantial attention has been devoted to determining the biological efficacy of contraceptive methods. Their effectiveness in practice, however, varies. For many methods (eg. oral contraceptives, barrier methods) efficacy is dependent on proper use, which hinges on the provision of adequate information and counselling in addition to contraceptive supplies. Poor storage conditions may also compromise the effectiveness of some methods.

Certain policy-level conflicts emerge in efforts to ensure that priority is given to providing family planning to those at highest risk of maternal mortality. The typologies outlined in Section IB ranked settings according to infrastructural, demographic and epidemiological factors, as well as the degree of women's isolation. In the case of family planning, USAID, for example, classifies countries according to contraceptive prevalence, beginning with "emergent" countries, where prevalence ranges from zero to seven percent, to "mature" countries, where prevalence is greater than 50 percent. In Setting A, given high fertility, mortality, and limited options for expanding formal health services, community-based distribution of a limited range of contraceptives (eg. oral contraceptives, condoms) may be the most feasible and effective means of reducing maternal mortality. Setting A, however, corresponds with USAID's "emergent" countries, in which the agency has adopted a demographic strategy focusing on more educated, urban women -- those who are most likely to adopt family planning, but least likely to suffer pregnancy-related mortality.

In setting B, a comprehensive range of contraceptive methods should be made available through both clinic- and community-based delivery, in light of the greater availability of facilities, skills and equipment in these settings. In setting C, which in many cases will correspond with USAID's "consolidation" or "mature" categories, an extensive family planning program offering the full range of contraceptive methods should be in place. Family planning is generally well-established in such settings, and Safe Motherhood programs should concentrate on the components of maternal care that aim to reduce obstetric risk. It is likely that maternity

care interventions become more cost-effective than family planning at levels of contraceptive prevalence over 50 percent, after which each percentage increase becomes increasingly difficult to bring about. That is, the marginal impact of family planning on maternal mortality is greater in setting A than in B, and greater in B than in C.

Participants stressed that because women in setting A have little education and low status, their acceptance of family planning is likely to be lowest. As such, realizing the benefits of family planning in such settings will require not only ensuring the availability of contraceptive methods, but improving women's status, and empowering them to control their reproductive lives. It must be said, however, that there are setting A countries/areas in which demand for family planning has been high despite women's limited education and relatively low status, and without considerable emphasis on measures to improve their status.

Participants also stressed the importance of targeting family planning to two major groups. Firstly, adolescents, whose access to family planning information and services is limited in most settings. Adolescent pregnancy, much of which is unintended and ends in unsafe abortion, is very high and on the rise in some settings. Adolescent HIV infection is also a growing concern. Secondly, women who have undergone an abortion are at high risk of unwanted pregnancy and repeated abortion, and clearly in need of family planning counselling and services. They are also likely to accept contraception, having demonstrated their strong desire not to have a child at that time.

(McCarthy, presentation; Destler et al., 1990)

D. PREVENTING THE TRAGEDY OF UNSAFE ABORTION

Up to half of all maternal deaths are due to the consequences of unsafe abortion. Abortion is subject to severe legal restrictions in many developing countries. In some, it is not legal under any conditions, even when necessary to save the woman's life. The reality, however, is quite different from the law. Millions of women in developing countries resort to abortion each year. It is most often performed by the pregnant woman herself or by untrained providers, under unhygienic conditions, with inappropriate instruments. While family planning can help to prevent unsafe abortion by preventing unwanted pregnancy, it is not enough. Even if all women who wanted to prevent pregnancy had access to and used contraceptives, contraceptives fail. Furthermore, many of the women who need and want family planning do not have such access. While expanding and improving family planning services is indeed a priority, most women in need will remain unreached for some time to come.

As indicated above, the effectiveness of available care in pregnancy and childbirth is often compromised by lack of demand for such care. Demand for abortion services, however, is such that women are willing to risk their lives, health, and future fertility to obtain one. Many participants stressed that ensuring the provision of safe services to meet this demand deserves

special emphasis in Safe Motherhood programs, given the hundreds of thousands of women's lives that would be saved. It was acknowledged, however, that changes in legislation are unlikely in the short-term. While advocating for changes in legislation will not be possible in many contexts, it is time to be more outspoken about the consequences of unsafe abortion, and the enormous public health gains and cost savings associated with the provision of safe services. At a minimum, the following activities should be undertaken:

- analysis of the true magnitude of unsafe abortion and associated death and suffering, with wide dissemination of the facts to policy-makers.

- analysis of the economic implications of unsafe abortion in terms of its drain on scarce health resources used to treat complications and the loss of women's productivity, with wide dissemination of the facts to policy-makers.

- ensuring that all women have access to safe and humane treatment of the complications of unsafe abortion.

Women and communities must also be educated about the dangers of unsafe abortion and the availability of safe services when these exist. When performed under safe conditions by trained providers, abortion is one of the safest surgical procedures that exists. Safe, simple technologies, which could be delegated to lower level health cadres and made available at the peripheral level, exist. Workshop participants emphasized that even in settings where abortion is legal, safe services are scarce, and unsafe abortion remains prevalent. Often, women are unaware of the services to which they are theoretically entitled, or when they should use them. Working toward universal access to safe services, and ensuring women are fully informed of their right to and the appropriate time to use such services, are priority actions in such settings.

III. COSTING SAFE MOTHERHOOD PROGRAMS: A GUIDE

When designing programs, it is essential to take into account not only the effectiveness of interventions, but also their cost. We live in a world of limited resources. This is particularly true of health sector budgets in developing countries, and within these health budgets, maternal health tends to receive limited priority. It is essential to advocate for greater resource allocation. This goal, however, will be assisted by efforts to prove that Safe Motherhood programs are cost-effective -- that is, that substantial gains in health can be achieved at limited cost. Information on the cost-effectiveness of different interventions and/or sets of interventions also has immediate practical relevance, in that it provides information on how the impact of existing resources can be maximized.

Four primary categories of information are needed to increase our understanding of the cost-effectiveness of Safe Motherhood programs and specific interventions: a quantifiable goal, such as improving the outcome of maternal complications; a set of potential activities to achieve that goal, such as improving community awareness of danger signs, ensuring emergency transport, establishing emergency obstetric facilities, or a combination of the three; the costs of the activities; and the impact of the activities on the goal. As outlined in Section IIB, we have limited information on the efficacy and/or field-based effectiveness of many Safe Motherhood interventions. Until our information base improves dramatically, service selection and assumptions regarding impact will continue to be made on the basis of incomplete information.

This section will concentrate on the third category of information: determining the costs of selected activities once goals have been set and a set of potential services selected. The first step is to delineate the types of resources that will be used to produce each service, such as staff, training, equipment, supplies, and transport services, and to define units of measurement. Staff resources can be measured using days of staff time, and vehicle services by miles, or trips. Units of measurement for other resources can be set by defining the unit of supplies, for example, that is equivalent to one unit of the relevant currency. The most common way to determine the resources used to undertake a specific activity is to monitor resource use in current operations. Problems arise when resources are shared between different activities (eg. when staff provide maternal care as well as other services), in which case they need to be apportioned between uses. Other difficulties include the fact that resource requirements for similar services will vary, often substantially, in different settings.

The next step is to determine the unit costs of these resources -- the cost of one day of staff time, for example, or of one vehicle mile. In some cases, this information can be derived from payment records. In others, unit costs can be inferred: for ~~example, the cost of one mile~~ of transport can be determined by dividing the cost of drivers, maintenance, repairs, fuel, and average annual expenditure on new vehicles by the total number of miles driven by project vehicles in one year. It must be emphasized, however, that costs are rarely constant: economies of scale often allow costs to fall as more resources are used. In addition, costs vary by location:

the cost of training, for example, will be influenced by the level of general education. For small projects, it is usually sufficient to define a single cost measure for each category of resources. To forecast costs for larger projects, however, cost curves should be defined, as one can usually assume that costs will be affected by program implementation.

Combining information on the units of resources required to provide a set of services and the cost of each unit allows planners to determine overall program costs and feasibility. If the resources required by the program as designed exceed the resources available, alternative formulations can be considered. Costing information can also facilitate program monitoring and foster efficiency: if actual resource use exceeds resource use as forecasted, areas of waste and inefficiency may be identified and corrected.

This simple costing analysis can also be used to perform a preliminary version of cost-effectiveness analysis, insofar as it allows comparison of the costs of alternative service formulations that are assumed to have equal impact on program goals. Finally, the analysis allows planners to forecast the impact of changes: changes in goals, based on changing needs; changes in the services chosen to meet those goals and how best to deliver them, based on improved knowledge of effectiveness; and changes in the costs of resources, due to inflation or changes in exchange rates, for example.

Moving toward true cost-effectiveness analysis will require far better knowledge of the impact of services on health outcomes than is currently available. If it were available, one could theoretically determine the percentage change in the probability of mortality or morbidity that could be brought about by a service or set of services, holding other factors constant. One could then determine the cost per percentage change for each service -- or the marginal cost of achieving the goal. Ideally, programs would then be adjusted to ensure that spending on each service had the same cost per percentage change in mortality, which would imply that the resources available were being used to maximum effect. This analysis would, as stated above, assist with the generation of needed resources and provide guidance on how best to use the limited resources available. While it is not possible given current data limitations, the simple costing analysis described above is also extremely valuable, and should be incorporated into all relevant programs.

(Forgy, 1991; Forgy et al., 1992; Forgy, presentation)

IV. REDUCING MATERNAL MORTALITY: EXAMPLES FROM THE FIELD

A. Posting Trained Midwives in Rural Bangladesh: The Matlab Maternity Care Project

The Matlab district of Bangladesh is located 40 miles southeast of Dhaka, the country's capital, in the rural, flood-prone Ganges-Meghna delta region. Eighty five percent of the area's 200,000 people are Moslem, and the active practice of purdah is the norm. As such, women's mobility is limited to the household compound and they have minimal exposure to adult men other than relatives. Female literacy is only 17 percent. Women are virtually invisible in labor statistics, though their multiple responsibilities include childcare, maintenance of the physical household structure, and food processing and preparation. Female children receive less food and health care within the family than their brothers, and are often chronically undernourished.

Nearly 80 percent of women are married by age 20. Suicide and homicide are common outcomes of illegitimate pregnancies. Talking about reproductive issues is considered inappropriate, limiting access to care when problems arise. Matters related to the female genital tract are associated with shame, though women may exchange experiences freely among themselves, particularly within their compound. Walking and rickshaws, when available, are the main modes of transport to health facilities, even in emergencies. Transport by boat is also common, but boats are often not available, particularly after dark. Night travel is further limited by lack of electricity, and taboos associated with women leaving home at night, especially when pregnant. Twenty five percent of all adult female mortality is due to the direct complications of pregnancy and childbirth.

Since 1966, the International Center for Diarrhoeal Disease Research/ Bangladesh (ICDDR/B), has operated a rigorous demographic surveillance system in Matlab. In the late 1970s, the area was divided into an intervention area, where a maternal and child health and family planning (MCH-FP) project was implemented, and a control area, which receives government health services only. Female Village Health Workers (FVHWs) provide a full range of contraceptive methods through home-based delivery, monitor and manage adverse effects, provide a range of child health services, and refer women and children to MCH-FP outposts staffed by paramedics or to the Central Matlab clinic, when necessary. Contraceptive prevalence rates increased from eight percent in 1977 to 56 percent in 1989. The provision of family planning services in the area is responsible for a reduction in the number of pregnancies and, consequently, a 57 percent reduction in the number of pregnancy-related deaths. The risk women face when pregnant, however, remains high, as reflected in a maternal mortality ratio of 550 per 100,000 live births. In addition, unsafe, induced abortion remains a primary cause of death. As part of the MCH-FP project, the FVHWs also provide women with safe delivery kits and iron tablets, and traditional birth attendants (TBAs) are trained in hygienic delivery practices. While these interventions have helped to reduce neonatal mortality, which was their primary objective, their impact on maternal mortality has been minimal.

A retrospective study of maternal mortality in Matlab found that the main causes of death, in order of importance, are unsafe induced abortion, postpartum hemorrhage (PPH), toxemia, obstructed labor, and post-partum sepsis. Ninety-five percent of all deliveries, and 80 percent of all deaths, occur at home. Most deaths occur during or within 48 hours of labor and delivery. The results of this study, and the failure of the MCH-FP project to improve maternal outcomes, prompted the development of a home-based maternity care project. Professional nurse-midwives were posted at the community level in an effort to ensure timely intervention in complicated pregnancies and deliveries and a functioning referral system. Access to emergency obstetric surgery and blood transfusion in the area is limited to the government district hospital, one hour away. Prior to the introduction of the project, the Matlab clinic had no emergency obstetric capacity. The nearby Chandpur Red Crescent Hospital remains better equipped, but also has no surgical capacity.

The Matlab MCH-FP area was divided into a control and intervention district, comparable in terms of socio-economic, demographic, and specific health indicators (see Table 2). One nurse-midwife was posted in each health outpost, serving a population of approximately 20,000. The midwives, who had received three years of standard government nursing training and one year of midwifery training, were given a brief orientation but no project-specific training. All were from a rural background and had experience working in traditional communities. They were provided with a standardized midwifery kit, as well as with antibiotics, heavy sedatives, infusions and plasma expanders, and pitocin, to be administered intra-nasally. The focus was on supplementing, rather than supplanting, the work of TBAs, who would remain responsible for managing deliveries as far as possible. The midwives were responsible for making prenatal visits to establish rapport with pregnant women, provide information, detect and manage prenatal problems, and screen for potential future complications; encouraging labor calls and attending as many deliveries as possible; providing immediate treatment for complications in labor and delivery, when possible; organizing referral and accompanying the patient to the Central Matlab Clinic, when necessary; and visiting new mothers as soon as possible after delivery. There were about 1600 pregnancies a year in the intervention area, or an average of about 33 per month per midwife.

The aim was to ensure that the complications that arose received appropriate intervention as early as possible, to prevent progression to a severe stage, given the limitations of existing services to cope with severe complications, and community resistance to referral. Examples of feasible timely interventions the midwives could carry out include early administration of anti-eclamptic drugs; complete evacuation of the uterus in case of an early retained or torn placenta; vaginal packing in cases of PPH; stitching of vaginal tears; infusion of plasma-expanders in cases of hemorrhagic shock; and administration of antibiotics to prevent severe infections.

Each midwife was supported by:

* A locally recruited village man who accompanied her, especially at night; transmitted messages; carried equipment and a lantern; assisted in transporting the patient by stretcher or boat; and motivated male members of the community.

TABLE 2: CHARACTERISTICS OF WOMEN IN CONTROL AND INTERVENTION AREAS PRIOR TO MATLAB MATERNITY CARE PROJECT, 1986

	Control Area	*Intervention Area*
Population	51,468	47,808
Women aged 15-44	11,564	10,260
Live births	1,781	1,534
Infant mortality (per 1000 live births)	79.6	86.2
Female death rate (per 10,000 women aged 15-44)	25.9	29.2
Contraceptive prevalence rate (% married women using contraception)	42.4	44.4
Tetanus toxoid imm. rate (% married women)	86.2	87.8
Mean years of school attended by married women	2.3	2.0
Married women who attended school (%)	42%	37%

(Fauveau, 1991)

- The installation of a maternity clinic at Matlab with limited emergency obstetric capacity, at which female physicians were always available. Clinic physicians supervised the midwives, evaluated and managed referrals for which they were equipped to cope (eg. Dilation and Curettage,management of pre-eclampsia/eclampsia) and ensured timely referral of cases in need of transfusion and surgery to the district hospital. The project was not able to ensure the quality of services at the district hospital level.

- A communications strategy, which aimed to orient the TBAs, familiarize them with the referral system and care facilities (including visits to these facilities), and introduce the midwives. Efforts were also made to inform and motivate women and their families.

The project's communications element was helped enormously by the results of an anthropological study, which shed light on family level decision-making dynamics: while women are involved in decision-making regarding health and health care, they do not make decisions independently. When complications occur, decision-making roles shift, and the mother-in-law, elder sister-in-law, or husband take charge. Another study found that there was often conflict between young mothers and older family women with regard to appropriate health behavior. As is often found, the mother-in-law tends to be the gatekeeper.

Outcomes were measured by comparing maternal mortality ratios in the control and intervention districts during three years prior to (1984-86) and three years following (1987-89) the implementation of the project (see Table 3). The mortality difference between the two areas prior to implementation was not statistically significant. During the three years after the project was implemented, the difference between the two areas was statistically significant, and the ratio in the intervention area had fallen by 68 percent. In short, the introduction of the maternity care project had a substantial impact on maternal mortality.

The causes of death that were reduced by the project were, in order of importance, the complications of unsafe abortion, PPH, post-partum sepsis, and eclampsia. Other causes of adult female mortality were constant over the project period. Although abortion was not a specific focus of the project, the decrease in abortion-related mortality may have been related to earlier intervention in complications by the midwives. In addition, the midwives may have succeeded in discouraging some women from resorting to dangerous traditional abortion procedures.

Of the 4,884 registered pregnancies, 44 percent of the women were visited at home at least once during pregnancy. Fifteen percent of the pregnant women requested attendance during labor. In nine percent of cases the midwife herself delivered the baby, and in four percent she attended the delivery but allowed the TBA or a female paramedic to perform the delivery. In two percent of cases, the midwife was on her way. Nineteen percent of the women attended by midwives were referred to the Matlab clinic. Of the 1,712 women visited postpartum, three percent were referred to the clinic.

TABLE 3: MATERNAL MORTALITY RATIOS (MMR)*, BEFORE/AFTER MATLAB MATERNITY CARE PROJECT, IN CONTROL AND INTERVENTION AREAS, 1984-89

	Control Area	*Intervention Area*
Before (1984-86)	**390**	**440**
After (1987-89)	**380**	**140**

* Maternal deaths per 100,000 live births.

(Fauveau, 1991)

Some reviewers have questioned the relationship between the small proportion of deliveries attended by the midwives and the reduction in mortality. Although it is not possible to determine exactly which of the home deliveries they performed and which of the patients they referred would have died in their absence, it is legitimate to accept that the averted deaths were drawn from the patients attended or referred by the midwives.

Research was conducted to identify the factors that differentiated women who requested midwife attendance from those who delivered alone or with a TBA. Attended women were more often of lower parity, and were more often primigravidae. Women who lived closer to the midwife's residence, women who had received antenatal care from the midwife, women with poor obstetric histories, women with pathologic signs during ~~pregnancy (eg. vaginal bleeding)~~, and women who experienced complications during labor were also more likely to be attended. Contrary to what was expected, users and non-users did not differ significantly in terms of socio-economic status.

TABLE 4: MATLAB MATERNITY CARE PROJECT: INDICATORS OF COST-EFFECTIVENESS

	No. cases	Cost per case (US$)
Cost per death averted (direct obstetric death)	12	7155.20
Cost per death averted (neonatal death)	28	2862.10
Cost per death averted (total deaths)	40	2044.30
Cost per married women of reproductive age in the community -- women/years (10,457 * three years)	31,371	2.74
Cost per pregnancy	4,884	17.58
Cost per woman receiving care	2,458	34.93
Cost per antenatal visit performed	2,160	39.75
Cost per delivery attended *	640	134.16
Cost per postnatal check performed	1,712	50.15
Cost per postnatal home visit	4,512	19.03
Cost per referral to Matlab clinic	178	482.37

* *Deliveries performed and deliveries attend without actual performance by Project nurse-midwives.*

(Fauveau, 1991)

The low proportion of requests for attendance may be related to distance or to the rarity of complications. In addition, it is possible that the reluctance of family decision-makers (husbands, mothers-in-law) to call for external assistance was greater than expected. Many would not call until complications had already arisen. Others would hesitate to call for fear of referral to the district hospital, based on negative past experience and a common perception that quality of care at the facility is poor.

An attempt was made to estimate the cost of integrating the maternity care project into the MCH-FP project, and the relationship of costs to project outcomes. Between 1987 and 1989, detailed monthly cost reports were collected by resource category. The total direct cost of the three-year project was US$85,862. A substantial increase in costs occurred between 1988 and 1989 due to a major revision of salaries and services within ICDDR/B in 1989. The cost of the project per maternal death averted, neonatal death averted, and other indicators are listed in Table 4. Two caveats must be made. Firstly, the costs represent only the additional amount required to build a maternity care project onto a well-established MCH-FP project; and secondly, the costs represent those of a large international organization, with higher salary and other costs relative to the rest of Bangladesh. In addition, comparative data on alternative health interventions or service delivery mechanisms are not provided, though work in this area is underway.

Replication of the project as currently designed will not be possible in the Bangladeshi context due to insufficient nurse-midwives and lack of national commitment. A modified version of the project, using female paramedics with 18 months training, is being tested. The project could be further improved through a strengthened communications element to improve utilization of midwifery care at delivery and reduce resistance to referral, and by improving the capacity and quality of referral-level facilities. It is clear, however, that ensuring the availability of community-based maternity care involving professional level midwives and an adequate referral system has the potential to bring about substantial reductions in maternal mortality in Bangladesh.

(Fauveau, 1991; Fauveau et al., 1991; Fauveau and Chakraborty, 1988; Stewart, presentation)

B. Zaire: The Karawa Health Zone Project

Maternal mortality in Zaire, a country of 38 million people, is 800 per 100,000 live births. Sixty to 80 percent of all births take place at home and are attended by traditional birth attendants (TBAs). Total fertility is high, at 6.1. Per capita GNP is US$160.

In 1980, health officials instituted a policy of decentralization based on the primary health care approach. The country was divided into 306 health zones, which serve as the organizational units for health programming. Each zone covers 150-200,000 people and has at least one referral-level facility. Zone health teams have full authority to deliver services in the

manner they feel best serves the needs of the zone population and are responsible for ensuring effective linkages between community-based health activities, health centers, and the zone hospital, at which they are based.

The Karawa Health Zone (KHZ), which covers 19,000 square kilometers and is home to 300,000 people, is located in the northern Equateur Province. The local economy is based primarily on subsistence farming, and infrastructure is poorly developed. There are no paved roads or public transport options, and most people travel by foot, bicycle, or motorized two-wheeled vehicles. Iodine deficiency is very common, resulting in a high incidence of cretinism and, as a result, cephalopelvic disproportion (CPD), a major cause of obstructed labor.

An ongoing program in KHZ aims to strengthen maternal health care within the primary care system, based on what can realistically be done to improve the accessibility and quality of maternal care given existing resource constraints. At the village level, TBAs are trained in basic delivery practices and the identification and referral of women at high risk. They are also responsible for encouraging prenatal care attendance. TBAs are selected for training by a Village Development Committee composed of community leaders. They receive a small stipend during the training period (five days per month for six months) and a tee-shirt, cloth badge, and locally-made birth kit (soap, razor blades, oral ergot, mercurochrome, cord ties, etc.) upon completing the course. Kit resupplies are made available at a subsidized rate.

KHZ's 30 health centers, which serve 5-10,000 people, are staffed by a public health nurse and auxiliary personnel. Health center staff oversee routine deliveries, refer women with complications to the zone hospital (CEUM), and provide prenatal care and family planning. Most of these centers have minimal equipment and supplies and very limited emergency obstetric capacity. Four health centers have now been equipped to provide emergency obstetric care, and are staffed by an obstetric nurse or auxiliary midwife, a public health nurse, and auxiliaries. Most nursing staff have completed a two-year nursing program (public health nurse) and a third year of training in either public health or midwifery (obstetric nurse). Auxiliary midwives undergo a two-year midwifery training program and receive some training in general hospital nursing.

The maternity center at the CEUM hospital is supervised by one physician and staffed by one nurse-midwife, supported by auxiliary midwives and obstetric nurses. Center staff are responsible for prenatal and family planning clinics, and selected obstetric nurses are trained to perform emergency surgery, including cesarean section, symphysiotomy, repair of ruptured uterus, and hysterectomy.

A pregnancy care monitoring study conducted in 1984-86 found that despite considerable effort to improve maternal care, maternal mortality in KHZ remained high, due primarily to deficiencies in the referral system at all levels. The women who died in the hospital were often admitted following prolonged labor, and lack of transport, distance, cost and other factors were found to cause significant referral delays. TBAs did not refer all women in need of medically-supervised delivery, and many of the women who were referred did not comply.

Further research was undertaken to investigate the factors influencing referral and utilization in greater detail. The first component of this research focused on the effectiveness of TBA training. TBAs were found to make appropriate referrals in some cases, but to refer only about 20 percent of women with acute complications. They exhibited some confusion over risk factors and signs of acute problems. While TBAs are not usually called to assist before deliver, and are thus more likely to think in terms of problems in delivery than in terms of antecedent risk factors, less than half mentioned hemorrhage as a danger sign when asked, and less than a third mentioned prolonged labor. TBAs are not reimbursed for referrals, and lose their delivery fee when they do, which may act as a disincentive. The study recommends limiting the type and number of risk factors taught to TBAs, and investigating the use of visual aids to enhance risk assessment; ensuring that TBAs have a plan of action before emergencies arise; and developing a system to ensure that TBAs receive some form of remuneration when they refer clients.

User fees are charged for services at all levels of the health system. Health centers, for example, must generate sufficient revenue to cover their operating costs. Hyperinflation in recent years has increased the numbers of people who cannot afford to pay for care, a factor which must be addressed in efforts to improve service utilization. Negative perceptions of referral facilities also limit utilization of available services. The study confirmed that TBAs are more accepted by the community as sources of care than formal health system staff, and recommends broad-based community-based health education to increase awareness of danger signs, help overcome fears of referral, and promote the development of community-iniuated emergency protocols. In addition, formal health system staff need to improve collaboration with TBAs and communities in general.

A sixty-bed maternity waiting home was built in KHZ but is severely underutilized, due primarily to a lack of community involvement in service design and consequent lack of consideration of community concerns, particularly those related to food preparation. The study recommends investigating providing food, cooking facilities or fuel, and/or a staff member to assist patients with food preparation, laundry, etc.

Further analysis of the factors associated with maternal mortality found that duration of labor for 24 hours or longer was associated with the greatest risk of death among women delivering in hospital, due primarily to referral delays. Delays stemmed primarily from lack of transport, lack of cooperation of family members, and efforts to seek non-medical alternatives. Neglected obstructed labor was the cause diagnosed for four-fifths of the hospital patients with prolonged labor. The analysis confirmed the importance of reducing delays for women with obstructed labor, by promoting earlier recognition and referral. The study recommends the development and improvement of management protocols, including visual charts for providers at all levels, to facilitate the identification of women at risk; training providers at all levels to recognize CPD as early as possible, including training staff at the health center level in the use of the partogram, and possibly training formal care providers in complete pelvic mensuration, a technique not currently in use in KHZ.

While screening for CPD using clinical pelvic mensuration requires specialized training, screening for such risk factors as maternal height can be conducted by TBAs. While short stature is associated with increased risk of CPD, the proportion of women at risk in different populations varies, and there is no universally accepted at risk level for height. All women who have previously undergone a cesarean section should be referred, as should all cretinous women.

Improving access to surgical interventions is also key. As mentioned above, obstetric nurses in two health centers have been trained to perform cesarean section and symphysiotomy, the latter which requires fewer surgical materials and assisting staff, is associated with lower risk of infection, and can be performed using local anesthesia. Research was undertaken to compare symphysiotomy with cesarean section as an alternative intervention in cases of obstructed labor, and found that it was not associated with a significantly higher level of perinatal mortality. Further research comparing the long-term health outcomes of the two procedures is needed.

Additional improvements in the equipment and staff available at health centers, and efforts to address transport and communications deficiencies, will also be needed to maximize the effectiveness of the maternal care system in KHZ.

(Duale, presentation; Duale et al., 1991; Hermann and Duale, 1990)

C. Training Traditional Birth Attendants (TBAs) in The Gambia: The Farafenni Project

Estimates of the maternal mortality ratio in The Gambia are among the highest ever documented: 1000-2000 per 100,000 live births. Most of the country's 800,000 people live in small, scattered villages, with limited access to health care. The country's climate is typical of Africa's sub-sahel, with a long dry and short wet season. Annual rainfall has fallen steadily over the last 100 years. Women in this predominantly Moslem country have little decision-making power. They are responsible to the men around them, first their fathers, and then their husbands. Marriage is arranged through contract and bride price. Contraceptive use is rare and total fertility is high, at 6.5 births per woman. Life expectancy for women is 45 years.

Following the Alma Ata Conference that launched the global "Health for All" strategy in 1978, the government of the Gambia decided to reorganize its health system based on the primary health care (PHC) model. Village elders were asked to select one male and one female to be trained as a village health worker (VHW) and trained Traditional Birth Attendant (TBA). Most villages with over 400 people are now served by a government-trained TBA.

The Government of the Gambia asked the United Kingdom Medical Research Council (UK MRC), which has had laboratories in The Gambia for fifty years, to evaluate the impact of its PHC scheme, including the effect of trained TBAs on pregnancy outcomes. The UK MRC's evaluation was undertaken in a rural area on the north bank of the River Gambia, near the town of Farafenni, and began with a year's collection of baseline data in 1982-3. This was followed by three years of data collection after the PHC scheme had been implemented in the area.

After an initial period of consultation with village leaders, VHWs and TBAs were selected for training. The TBAs, most of whom were elderly, illiterate, and already served as untrained TBAs, received the standard, 10-week government training course. They were supplied with birth kits, which include clean dressings, scissors, string, oral ergometrine and disinfectant. TBAs conduct deliveries in their homes, and advise women on prenatal and postnatal care. They also refer and accompany women with complications to the health center, where they can be delivered by a trained midwife. Women in both PHC intervention and non-PHC control villages have access to health centers and trained midwives, but the health centers have no surgical or blood transfusion capacity. The nearest hospital equipped with such facilities is 200 miles away, and can only be reached after crossing the river by an unreliable ferry.

The population of the area at the midpoint of the survey was 13,780, including 2,738 women of reproductive age. Data were collected using three methods: a) monthly morbidity surveys during pregnancy; b) three cross-sectional surveys following confirmation of pregnancy (using urine tests), performed at the end of the dry season and at the end of the rains and c) mortality studies of all women who died during their reproductive years using the verbal autopsy technique, to determine a likely cause of death and its relationship to pregnancy. The maternal mortality ratio was found to be 2,360 per 100,000 live births during the pre-intervention year with primigravidae, multigravidae, and women under 20 or over 40 years of age most at risk of dying.

Following the introduction of the scheme, the proportion of women who attended prenatal care increased, but not significantly. The change was similar to increases registered in non-PHC control villages over the same period. Sixty-five percent of deliveries in the intervention area were attended by trained TBAs. A small proportion (four percent) of deliveries in non-PHC villages were also attended by TBAs from neighboring PHC villages. There was a significant increase in the number of deliveries attended by trained midwives in PHC villages, but not in non-PHC villages. Mortality fell in both PHC (2,716 to 1,051) and non-PHC (1,498 to 963) villages, but the difference in the change in ratio is not statistically significant.

In summary, the introduction of the PHC scheme was associated with some improvements in maternal outcome. The TBAs may have had an effect by encouraging prenatal care attendance and by referring and accompanying women with complications to the health center for delivery by a trained midwife. These improvements cannot be attributed solely to the PHC scheme, however, as the Farafenni health center was upgraded during the study period and transport options improved, which may also have had an impact. It is also likely that the system of surveillance played a role, though the researchers tried to interfere as little as possible.

Further improvements could be made:

- The TBAs could play an important role in identifying women who need to deliver in the health center in advance and persuading them to do so. This will require the development of a system whereby women can stay near the center prior to delivery, and a major effort to make it socially acceptable for women at risk, and especially primiparas, to leave the village for delivery.

- Education is needed to reduce the proportion of women who do not use the services of the trained TBAs.

- The TBAs could also play a greater role in providing family planning to women at high risk.

- The health center could be equipped to provide surgery and blood transfusions. The government has plans to ensure more peripheral availability of such services.

In conclusion, trained TBAs have an important role to play, but cannot bring about major reductions in maternal mortality unless they are supported by accessible, well-equipped referral centers.

(Greenwood, presentation; Greenwood et al., 1990)

D. Cameroon: The Risk Approach

The maternal mortality ratio in Cameroon, a country of 11.9 million people, is 420 per 100,000 live births. Access to health care is limited for most of the predominantly rural population, with one physician for every 17,466 people. Until three years ago, the government did not have a family planning program. Contraceptive prevalence is very low, at five percent. More than 21 percent of the female population is between the ages of 10 and 19, and early marriage and pregnancy are the norm. Teenagers account for more than 22 percent of all births each year, and nearly 18 percent of teenage pregnancies end in induced abortion, which is legally restricted and usually unsafe. The total fertility rate is six, and the average age for grand multiparity is 27.

Since the Nairobi and Niamey Safe Motherhood conferences, many African countries have begun working on the development of strategies to reduce maternal mortality. At the Central Maternity (CM), University Hospital Center (UHC), and 18 private maternities in Yaounde, the capital of Cameroon, this work began many years earlier. The strategy adopted is based on the risk approach, which requires that all pregnant women be screened for risk factors during the prenatal, intrapartum and postpartum periods, and that those identified as being at high risk receive special surveillance and care from scarce experts, with the objective of concentrating expert attention on those most likely to need such care.

Approximately 85 percent of the 22,575 deliveries in Yaounde each year are estimated to take place in these facilities. Complicated cases are referred primarily to the CM. Between 1973 and 1978, studies were undertaken to determine the characteristics of the women who died ~~in these facilities. The results of these studies were used to develop training courses for all~~ health service staff on the screening and management of high risk pregnancy, including the following elements: detection of risk factors; use of the partogram; identification of contraceptive need; IUD insertion; and the establishment and maintenance of service records. Health service staff were also provided with screening and referral guidelines, and rotate regularly through different maternity services to ensure that their clinical skills are kept up to date and to promote effective ad hoc deployment when necessary.

Midwives are responsible for screening patients, receiving referrals, and turning them over for specialist management when necessary. Physicians are involved in the selection of women at high risk, and provide back-up support. Sixty percent of all risk factors can be identified in the prenatal period. Teenage pregnancy and grand multiparity combined account for 63 percent of all high risk pregnancies, which in turn account for 27 percent of all pregnancies, and 67 percent of complications in labor and the puerperium.

Studies had found that inadequate care of hospitalized mothers was responsible for 54 percent of all deaths. In addition to ensuring that all women at high risk receive appropriate surveillance, all women in labor in the teaching hospitals are now monitored using the partogram, which can be used to detect intrapartum risk. The sensitivity and specificity of the instrument has not been determined and taught to the midwives, however, which would be unnecessarily complicated. Instead, their clinical judgement is relied upon. The partogram has been found to provide reliable guidance to health personnel in detecting problems in labor. It has been introduced in some maternities in rural areas, and will soon be introduced to others.

Family planning service provision began in 1975 at the CM, and in 1982 at the UHC. Government permission to start these services was granted at a time when official policy was unsupportive of family planning. Midwives are responsible for the provision of family planning services, with specialist backup. Contraceptive prevalence among service users has increased 40 percent, and there has been a decrease in the number of high parity women.

The program has succeeded in bringing about significant reductions in maternal mortality. At the UHC, the maternal mortality ratio (MMR) has been maintained at 0 - 0.84 per 100,000 live births. At the CM, maternal mortality fell 50 percent between 1979 and 1989, from 200 to 120 per 100,000 live births. The populations delivering in the CM and UHC are comparable, except in terms of socio-economic status. Nutritional status is satisfactory in both groups, however. The difference between the two institutions, given the similarities of their patient groups, is thought to be related to organizational factors. The CM has a much higher workload and more limited space, equipment, personnel, etc.

A recent pilot project in six rural communities indicates that the approach can be successfully replicated in rural areas. The program will now be implemented country-wide, with full government support. Research in progress will inform this effort and includes standardizing instruments and equipment; determining the socio-cultural factors that affect the acceptability of contraception among women at high risk; and the knowledge, attitudes and practices of different groups to be served by the program.

Following are some of the most significant areas thought to be key to the successful implementation of this program on a national scale: ensuring sufficient political commitment, adequate coordination, uniform data collection and the use of standardized instruments; providing adequate monitoring, supervision, and continuing training to service providers; and undertaking information, education and communication activities to sensitize the community, taking into account existing socio-cultural and religious taboos.

The advantages of this approach relate primarily to social justice: it helps ensure that women most in need of care have priority access. It also permits the development of an alert system of referral and feedback between the levels of the health system; it entails reorganization and in-service training at all levels; it extends the reach of the health system to the most peripheral rural areas; it is based on prevention rather than cure, which may make it more cost-effective; and it relies on community responsibility and involvement.

(Leke, presentation; Leke, 1991; Nasah et al., 1991)

E. A Rural Case Management Strategy in Guatemala: The Quetzaltenango Project

Maternal mortality estimates in Guatemala range from 100-144 (government estimates) to 1000-1700 (World Bank estimates) per 100,000 live births. Three of the five leading causes of all hospital discharges are pregnancy-related. Forty percent of the country's nine million people are illiterate, and more than two-thirds live in extreme poverty in both rural and urban areas. Access to health care is limited, with hospital capacity for a maximum of 25 percent of all births, and 4.4 physicians per 10,000 population.

The health system, which is highly centralized, is divided into health regions, areas, and districts. The district chief is responsible for a network of health posts, which are staffed by rural health technicians and auxiliary nurses, who are in turn responsible for supervising traditional birth attendants (TBAs) on an informal basis. The supervising auxiliary nurses, whose training emphasizes the health needs of children under age five, have little training and practical experience in obstetrics. This reflects the heavy emphasis on child survival in recent decades and limited programmatic attention to maternal mortality. Guatemala's 20,000 TBAs attend 60-70 percent of all births, but have little functional interaction with the referral system. Community organization and emergency transport are extremely limited.

The Government recently initiated a decentralization policy, and the Instituto Nutricional de Centroamérica y Panama (INCAP) was requested to develop a "local health system" in the high priority highland districts of Quetzaltenango as a test-case, prior to country-wide implementation. As part of this effort, INCAP conducted an operational study to determine how high risk pregnancies were perceived, detected, and managed, focusing on all levels of the health system. A maternal and neonatal health project has been developed on the basis of the study findings, in collaboration with the MotherCare Project of John Snow, Inc.

Maternal mortality in the area was found to be 234 per 100,000 live births. Most deaths occurred in the area's one hospital (57 percent), followed by deaths at home (37 percent) and deaths en route (six percent). Most were due to hemorrhage (41 percent), sepsis (35 percent) and eclampsia (16 percent). In the case of hemorrhage, 52 percent died within 2-6 hours, 74 percent within 24 hours and 98 percent within 48 hours. In the case of sepsis, days elapsed

between onset and death. Seventy one percent of the deaths that took place at home were attended by TBAs, who recognize problems or sought help too late, and had no knowledge of simple management techniques (eg. external uterine massage in the case of post-partum hemorrhage).

TBAs, who attend over 90 percent of all births in Quetzaltenango, were found to have limited understanding of the concept of risk. They recognize certain situations as dangerous, but often attribute them to luck or divine will, and do not know how to prevent or manage problems. Their opinion of the formal health system, from which they receive little support, is low. Harmful practices are common, including the widespread and often inappropriate use of oxytocin to "give force to the labor." Community members were found to have some knowledge high risk situations and to perceive hospitals and doctors as the most appropriate source of care. Nonetheless, their opinion of the health system, due to poor treatment, fear, lack of confidence, high cost, and long waiting times, is low, and they are reluctant to use available services. The formal health services do not use a risk screening and management approach, and lack institutional norms and basic screening equipment. The referral system is non-functional, as are information and registration systems for patient management. Health staff have little knowledge of the conditions in which TBAs work, and tend to view their practices as dangerous, even when they are not.

The study was followed by a long program development process, which began with the presentation of findings to health personnel and the development of a collaborative plan of action. The program, which is now in the early implementation phase, aims to reduce mortality by accelerating the detection and referral of cases, and by ensuring appropriate management at all levels of the health system. The traditional risk approach is inappropriate in this context given the low absorptive capacity of the formal health system. Referring all first births alone would far exceed this capacity. Therefore, an approach based on a small number of actual, high risk events, those which are associated with the greatest risk of mortality, has been adopted.

Strategies include TBA training and supervision, through a modular, participatory approach that builds on their own experience and is appropriate to the local culture; the establishment of new relationships between all levels of the health system, focusing on the TBAs as the critical link, and promoting mutual respect; increasing the assessment and problem-solving skills of medical and nursing staff; increasing the registration of births through a simple technique of TBA reporting; and ensuring that the information collected is used for improved decision-making. Community education, using interpersonal media, will be undertaken to improve recognition of danger signs, health care seeking behavior, and compliance with referral. Outcome and process indicators in the four intervention districts will be compared with those in four comparable control districts.

TBA training materials are being revised based on specific, priority obstetric/perinatal complications and the specific tasks the TBAs will need to perform to prevent death. A pictorial maternity card depicting these high risk situations will be developed, and will be managed by the TBAs themselves. The TBA will be able to send patients to health facilities and alert health

staff to risk situations using the card. Health staff can also use the card to alert the TBAs to additional problems encountered, facilitating joint patient management.

To improve relationships between levels of the health system and the functioning of the referral system, regular meetings will be held between TBAs and district health staff to identify training needs and discuss the problems TBAs confront. TBAs have been taken to visit the hospital, to familiarize themselves with the surroundings in which their patients will be attended, and to exchange points of view on patient management with hospital staff. The chief of obstetrics and gynecology is considering making it possible for the TBA to remain with the mother in hospital, as well as other changes to make the hospital environment more comfortable for women. Physicians were also taken to communities to gain a greater understanding of prevailing conditions, including transport and resource constraints.

The project aims to develop a replicable model, including norms, information and referral forms and training materials. It will be promoted to facilitate replication throughout Guatemala, and possibly in other parts of Central America.

(Schieber, presentation; Schieber, 1990)

F. Indonesia: Regionalization of Care in West Java

Estimates of the maternal mortality ratio in Indonesia range from 150-720 per 100,000 live births, with hemorrhage, infection and toxemia responsible for 75-80 percent of all deaths. Less than 50 percent of Indonesian women receive prenatal care, and more than 70 percent are anemic. Eighty percent of all deliveries are attended by traditional birth attendants (TBAs). Though TBA training has been undertaken on a wide scale since the 1970s, it has failed to improve pregnancy outcomes. The training and supervision of TBAs is inadequate, and their functional interaction with the formal care system is minimal. Since the national Safe Motherhood meetings held in Indonesia in 1988, the government of Indonesia has made a commitment to improving pregnancy and delivery care services, through a strategy based on increasing the number of trained professional midwives and posting them at the community level. Ongoing work in the Tanjungsari sub-district of West Java, Indonesia's most populated province (32 million), aims to make recommendations for continuing development in national maternal care policy, training curricula and program inputs.

In 1985, a study was undertaken in Tanjungsari to evaluate the impact of a revised system of TBA training using the risk approach. Ninety percent of all deliveries in the sub-district are carried out by TBAs, some of whom are men. According to government policy, TBAs in Indonesia can only be trained in preventive and promotive care. The program used pictorial maternal and child cards, which were kept by the woman but filled in by TBAs and other attending health staff, to improve TBA recognition of risk factors, and promote appropriate referral to the health center or hospital, depending on the specific condition identified and which facility was best equipped to handle it. They were also trained to weigh the mother and to use

Longitudinal studies to assess the program's impact on outcomes will be undertaken in the intervention and control areas, and its results will be presented to health authorities, professional organizations, and universities. The program is expected to provide valuable information to the government's midwifery program, by providing a model of the midwives' fixed village-level facility (the MCH huts). It will also provide information on the effectiveness of a bottom-up approach to improving the accessibility of care, which will be invaluable during the transition from TBAs to trained midwives in village-level delivery care. It is also expected to show that the training and posting of midwives must be supplemented by improvements in all levels of the referral system, as well as by efforts to ensure appropriate links between them, if improvements in maternal outcomes are to be achieved.

(Alisjahbana, presentation; Alisjahbana et al., 1991; Alisjahbana and Thouw, 1991)

G. Training and Learning from Traditional Birth Attendants (TBAs) in Northeast Brazil: the PROAIS Project

More than 30 million of Brazil's people live in the country's eight dry, desert-like northeast states. Most are very poor; average per capita income is less than $200. Sixty five percent of the population and 95 percent of physicians live on a narrow greenbelt bordering the Atlantic ocean. As a result, most of the rural population has little access to formal health services.

In the late 1970s, the late Prof. Galba Araujo, then Medical director of the Ceara Federal University (CFU) in Fortaleza, developed a community health program based on the following observations: many of the rural women who came to the city for care did so for problems that do not require hospital care. Worse, many women suffering severe complications requiring hospital-level care arrived too late and too ill to be saved.

Traditional birth attendants (TBAs) selected by rural community leaders were trained to manage rural maternity units, provide prenatal care, and screen and refer women at high risk. They were trained in the use of a risk detection form, and to measure women's weight, blood pressure, and other indicators.

A referral system was developed to ensure the transfer of high risk patients to the CFU maternity hospital, which is the key to the program's success. Health professionals from the maternity hospital visit weekly, to ensure that the prenatal care provided is adequate and that women at high risk are identified and provided with appropriate care. Most risk factors are identified during these visits.

The TBAs are trained to refer all women suffering complications. Harmless or beneficial traditional practices are encouraged, and are replicated at Rural Delivery Houses. These include the vertical delivery position, with the delivering woman seated on a traditional birthing stool, and the participation of a family member, usually the husband. Women usually hold a rope hung

a specially developed one minute hourglass to take vital signs, and were taken to visit the hospital to visit mothers and infants and familiarize themselves the hospital environment. In the control area, TBAs received conventional government training only.

Maternal mortality in the area (500 per 100,000 live births) was not affected by the risk approach training program. TBAs trained in the risk approach referred 22 percent of women, compared to only eight percent in the control area, but misreported 29 percent of risk factors, and missed 30 percent. Perinatal mortality decreased by a total of 23 percent, but greater reductions were recorded in the control area, due probably to a spillover in training between the intervention and control areas. Of the 20 women who died between 1988 and 1989, 18 were referred, but six refused referral, many due to distance from the health facility. The terrain in the area is difficult, and adequate transport virtually non-existent. Most women are currently transferred by hand-carried bench. Distance from the main road, however, was not found to influence mortality levels. In addition to difficulties associated with poor communications and transport, the quality of the referral system is compromised by poorly-equipped facilities, which are poorly linked to one another as well as to the community.

As a result, the development of a coordinated system for the delivery of maternal and child health (MCH) services, including pre-natal, intrapartum and postnatal care, is proposed, beginning with an augmented package of services at the village level. Comprehensive health service posts (known as "birthing huts," though they will provide the full range of maternal and child health services) will be established. They will serve as the meeting point between formal and informal care, and will be managed by TBAs and the village midwife, coordinated by the village head and village committee. The huts will be equipped to provide prenatal care (including scales, blood pressure gauges, and dipsticks to measure protein in urine), a clean place for delivery, family planning, and child health care. They will also serve as a transfer point for referral: they will be located both near the main road and near the villages, will be equipped with a stretcher, and will have access to four-wheel drive vehicles. The huts will also serve as the village drug store.

Specific sites will be chosen by village heads, and the communities will be responsible hut maintenance. Two way radios will link the huts with area health centers (and the health centers with the hospital), to ensure immediate emergency notification and to facilitate the provision of advice. The huts will also serve as information, education and communication centers, and will aim to improve community awareness of risk and the benefits of referral.

Each of three sub-district health centers will be responsible for supervising three to four huts. Only one of these facilities has an inpatient service, and will be equipped to serve 20 percent of all deliveries. An emergency van and driver will be available on a 24 hour basis. The hospital will be equipped to attend five percent of all deliveries, or those at highest risk. All health personnel will receive continuing training in treatment and preventive care protocols. Appropriate screening tools, norms, training modules, and information systems will also be developed at all levels. Continued interaction of all levels will be fostered through a system of meetings.

from the rafters, or wrap their arms around their husbands neck, for leverage. Several types of maternity huts are in operation. The most simple consists of a small mud room attached to the TBA's home and equipped with a small bed or hammock. Such units handle two to six deliveries per month and cost $US50 per month to operate. Type B units, which have more than two beds and additional equipment, cost US$100 per month. The most sophisticated unit, with 10 beds, costs about US$200 per month to operate.

Some TBAs are trained to take PAP smears, perform breast examinations, and detect gynecological cancer by distinguishing between a normal and abnormal cervix. They are also trained to provide information on all family planning methods, distribute barrier methods, and refer women who desire other methods to a nurse or, in the case of the IUD, a physician.

The TBAs deal specifically with women and their needs. Other traditional health care providers have been trained to undertake child survival activities. Faith Healers, for example, are trained to train mothers in oral rehydration therapy. Their traditional prayers and practices are respected. Community coffin makers assist the rural health program by collecting mortality data. Adolescents also play an active role. The PROAIS project offers them entertainment and sporting activities, as well as providing them with sex education and family planning and encouraging them to contribute to improving village life. Those who are willing and able serve as health agents, providing home follow-up visits for children, and participating in child growth monitoring.

Teams of professors and health science students from the university provide medical care to the villages on an interim basis and supervise high-risk, prenatal, postpartum and perinatal clinics held at the Rural Delivery Units. All health science students are required to work in a rural community prior to graduation, and many select PROAIS. Most have benefitted substantially from exposure to community needs and preferences and from the opportunity to combine their formal training with the wisdom of traditional care systems. Indeed, the PROAIS program has not only succeeded in providing remote, rural areas with access to modern medical care, but has also resulted in a transfer of traditional delivery practices, many of which are beneficial, to the formal care system. A modern version of the traditional birthing stool has been developed, and the vertical delivery position, as well as minimal interference with delivery, have been absorbed into hospital obstetric routine. Hospital deliveries in Brazil are often characterized by excessive intervention, as illustrated most dramatically by the fact that 60 to 90 percent of women are delivered by Cesarean Section. The PROAIS project has reduced the incidence of this procedure to 2.4 percent, though in the private wing of the hospital, rates remain high. Immediate breastfeeding, which speeds the delivery of the placenta, is also now encouraged, and the umbilical cord is not cut until the placenta has been delivered, unless it is too short to allow the baby to reach the breast.

A World Bank project in the region includes the development of Rural Delivery Units and is based in large part on the PROAIS model. Continuing dialogue with the Ministry of Health and medical professionals has been essential to overcome continuing unfavorable opinions of TBAs. While it is clear that enormous gains have been made from training and delegating

responsibility to TBAs in this project, its success has relied on effective referral-level facilities, a functioning referral system, and extensive supervision by health professionals.

(Bomfim, presentation; Bomfim, 1991; Bomfim, 1991 (summary))

H. Jamaica: Setting Maternal Health Priorities

In Jamaica, a semi-rural country of 2.4 million people, the maternal mortality ratio remains high, at 102 per 100,000 live births. The most common causes of mortality are hypertensive diseases of pregnancy (26 percent), hemorrhage (20 percent), ectopic pregnancy (10 percent), pulmonary embolism (eight percent), and sepsis (eight percent). High maternal mortality persists despite a relatively well-developed and physically accessible health infrastructure, suggesting inadequacies in the timing, content, and quality of care.

A study was conducted to determine the effectiveness of the maternity care system, focusing on access to appropriate care among women at highest risk of pregnancy-related complications. The study began by attempting to identify the characteristics of women at high risk and determine whether these characteristics were good predictors of complications. It then sought to determine whether women so characterized were receiving appropriate prenatal and delivery care.

The study included a representative random sample of women of reproductive age who had been pregnant in the five years prior to the Jamaican Survey of Living Standards, the source of the study's data. Information on the women's socio-demographic characteristics and maternal care utilization was analyzed.

Young primiparas are generally at higher risk of maternal complications. In Jamaica, data indicate that these women are twice as likely to suffer complications in delivery, controlling for socio-economic factors and health service availability. The study found that 13.62 percent of the sample were women under the age of 20, pregnant for the first time. This high risk category accounted for 28 percent of all births to women in the sample. The mean age at first birth was 17. Women who self-reported complications in pregnancy were also found to have a higher frequency of complications in delivery.

While 90 percent of the women surveyed had received some prenatal care (PNC), about 14 percent of the women defined as being at high risk received no PNC at all. In addition, those women at high risk who did use PNC tended to seek care later in pregnancy than women at lower risk. No difference was found in the content of care provided to women at high risk or women with self-reported pregnancy complications, suggesting that the system does not provide appropriate care to those most likely to suffer adverse pregnancy outcomes (See Appendix: Chart 1).

The study also evaluated the content of PNC, beginning with its use of diagnostic evaluations (assessments of weight gain, hypertension, anemia, etc.). While the PNC system provides moderately adequate care in this regard, improvements are needed. While blood pressure is regularly assessed, blood tests are rarely administered, due in part to laboratory test delays of up to several months. Only five percent of facilities had their own microscope, and only 80 percent had a scale. Less than 30 percent of facilities had tetanus toxoid immunizations in stock. Rubber gloves were only in stock in 55 percent of facilities, aspirin in 55 percent, and medication for the treatment of toxemia in 30 percent.

The PNC system was also evaluated with respect to the quality of prenatal counseling on diet, warning signs for complications, the desirability of a medically-supervised delivery, etc. Nutritional counseling was found to be adequate, but counseling regarding appropriate delivery care was poor. Again, no difference was found with regard to the counseling provided to women at higher risk (See Appendix 4: Chart 2).

Those attending PNC were twice as likely to be supervised by a physician/midwife during delivery; most women in Jamaica are supervised by a public health nurse. Those at high risk, however, were no more likely to be attended by a physician/midwife than those at lower risk. Women with self-reported pregnancy complications were more likely to have a supervised delivery, regardless of their utilization of PNC.

In conclusion, while use of PNC does increase the probability of appropriate delivery care, women at highest risk underutilize PNC services. When women do enter the PNC system, they receive the same moderately satisfactory care regardless of their level of risk. No differential attention is paid to women at high risk. The results of the study imply a need to target young primiparas, particularly those who are poor, with appropriate services. Possible interventions include providing targeted family planning education and services to increase age at first birth; instituting PNC services in the school system; and providing financial incentives to use PNC. The design of an intervention strategy must be preceded, however, by an effort to gather qualitative information on the perceptions, needs, and circumstances of young Jamaican women.

Additional recommended modifications of the maternity care system include improving the quality and content of counselling, with particular attention to women at high risk; and improving and expanding the availability of laboratory and other facilities to facilitate the provision and effective use of diagnostic evaluations, particularly for women at high risk.

(Gertler, presentation; Gertler et al., 1991)

I. The Toll of Women's Ill-Health

We know that maternal mortality represents only the tip of the iceberg of women's ill health, but our knowledge of the true burden of adult ill health -- among both women and men -- is limited. This information gap must be overcome. Within 20 years, due to fertility decline and demographic transition, developing country health systems, which are currently geared toward child health needs, will be overwhelmed by adult health problems. Adult ill health also has serious implications for economic productivity and growth, and thus for national development.

Most of the information available on adult health relates to mortality. Available morbidity data is scarce, and often biased, with wealthier -- and usually healthier -- individuals more likely to report ill health. But the causes of poor health are often different from the causes of mortality. Using mortality statistics to develop health services will not ensure that these services are equipped to cope with the population's broader health needs. For example, though male mortality rates are greater than female mortality rates, women's health tends to be poorer than men's.

In the United States, health status measures have been developed and successfully applied to give planners a clearer idea of the true burden of ill health in the adult population. Individuals are first asked to provide an assessment of their own health. They are then asked specific questions regarding their ability to perform physical activities representing a range of difficulty levels (eg. bending, walking uphill, bathing). Based on this information, a "health index" can be developed. These indices have been found to be internally consistent; that is, individuals who report being in poor health also report difficulty with vigorous activity. The measures have since been applied in Asia (Malaysia and Bangladesh) and Jamaica.

In all instances, women report significantly more ill health, across problems and age ranges. When the indices are adjusted using mortality statistics, the gender difference declines but remains significant. Certain hypotheses can be put forward to explain this differential. Biological factors may be responsible. Maternal depletion syndrome may play a role, as may the fact that female children are often discriminated against in terms of nutrition, health care utilization, and education. It may also be true that women are simply more likely to complain of ill health, but this is unlikely to hold across cultures and socio-economic groups.

A multivariate analysis was conducted to help shed some light on some of these questions. The health index was regressed against age, education, long-run economic resources, per capita consumption, assets, unearned income, the income of family members outside the household, whether or not the individual had a spouse, and other characteristics, controlling for the disease environment and the availability of health care.

Predictably, education is found to have strong, significant effects, particularly on male health. Having a spouse was found to improve health, but the effect of this factor diminishes and eventually disappears with advancing age and declining educational levels. When more

serious dimensions of the health index are considered, education and income effects line up across males and females. Interestingly, for women, having a spouse is found to be associated with greater levels of these more serious health problems. Education is still found to have an impact on the likelihood of the most serious health problems (represented by having trouble bathing). The effect of socio-economic factors is found to be strongest under age 50. It then declines with advancing age, disappearing altogether in the 70s.

In conclusion, while education and income are clearly associated with adult health, their association with health diminishes with advancing age and the severity of the health problem. As such, there is a limited amount that can be done to improve the large and growing burden of ill health among the severely impaired and elderly through income and education interventions. It is likely that investment should be concentrated on the health of prime age adults to delay the onset of ill health later in life.

(Gertler, presentation)

J. Factors behind Family Planning Use in Indonesia: More than Contraceptive Supplies

Between 1970 and 1990, contraceptive prevalence in Indonesia increased from 25 to 50 percent, fertility declined 45 percent, and the average age at marriage increased significantly. Until 1967, the government had been opposed to family planning. In the 1970s, under the leadership of Suharto, a formal family planning board was established, contraceptives were made available, village-based distribution centers and mobile family planning teams were established, and medical professionals were trained in family planning service provision.

Much of the program's success can be linked to community organization and communications activities. Volunteers were recruited to provide communities with family planning education and contraceptive supplies. Communications activities, which were designed to be both informative and entertaining, took place around the mobile family planning teams. Another element behind the program's success was the availability of a number of methods and flexibility of distribution. In addition, concurrent community empowerment increased contraceptive demand.

Using DHS data, labor force surveys, and family planning service statistics, a study was undertaken to determine the supply and demand factors responsible for the rise in contraceptive prevalence, changes in method choice and age at marriage, and other outcomes of interest. Among the variables considered were the existence of a family planning clinic, family planning doctor, or Village Contraceptive Distribution Center (VCDC), visits by mobile teams, and female and male wages.

The presence of family planning facilities and/or providers influenced contraceptive use. It also had an impact on method choice, as clients are influenced by the method preferences of their providers. Wage rates -- and particularly female wage rates -- were found to have a large

impact, illustrating the influence of demand-side factors on contraceptive use. Rising female wages increase the opportunity costs of women's time, making it more likely that they and their families will opt for longer-term female education and formal employment, smaller families, and thus contraceptive use. In situations where the family planning service delivery system is in place, demand-side factors are likely to play the most important role in determining family planning use.

(Gertler, presentation)

V. CONCLUSIONS

The workshop's concluding session was conducted around a set of key questions commonly asked by program planners:

1/ What is the goal of the Initiative? Reducing the maternal mortality rate? Reducing the maternal mortality ratio? Improving maternal health? Improving maternal and child health?

Participants agreed that maternal mortality objectives are at the core of the Initiative. The maternal mortality rate -- which includes both the risk of becoming pregnant and the risk of death once pregnant -- should be used instead of the maternal mortality ratio, which only measures obstetric risk. It was emphasized, however, that maternal mortality represents only the tip of the iceberg of maternal ill-health, and that there is little point in focusing on extending lives riddled with ill health and suffering. Often, we focus on mortality simply because it is easier to measure, its causes easier to identify, and potential solutions easier to delineate. Reducing maternal morbidity, and enabling women to have children safely when they want to (and not to have them when they do not), should also be key Safe Motherhood program objectives. In addition, given the linkages between maternal and infant health, infant health objectives should also be considered in Safe Motherhood program design. It was emphasized, however, that the inclusion of infant health goals must not be allowed to perpetuate past neglect of maternal health, which requires specific and concerted action in its own right.

2/ What program areas need emphasis to meet these goals? What are the core interventions? What are the fringe interventions?

Participants emphasized that Safe Motherhood must not be allowed to become an Initiative of crisis management. Avoiding an overemphasis on mortality will help prevent an overemphasis on the event of a maternal death. While some major causes of maternal morbidity will be prevented through improved management of complications in pregnancy and childbirth, others will not.

As illustrated by the conceptual framework presented in Section IB of this report, a variety of socio-economic and other factors influence women's chances of suffering pregnancy-related complications, surviving these complications, and leading healthy reproductive lives. Even programs that do choose to focus on reducing maternal mortality should not focus on curative interventions alone. While it was agreed that ensuring access to emergency obstetric care is key to reducing maternal mortality, this care must be accompanied by efforts to prevent as many complications as possible from arising if our goal is to improve women's reproductive health. Emergency care provision is also far less likely to achieve its mortality reduction goals in the absence of efforts to improve women's ability and willingness to use related services.

As such, it was suggested that the Initiative's priorities be viewed in terms concentric circles -- with efforts to improve women's status in the outer ring, efforts to promote women's reproductive health in the middle ring, and efforts to prevent maternal mortality in the innermost

ring. The essential point is that efforts to improve women's status and their general reproductive health have a significant impact on efforts to prevent death itself. While Initiative resources should not be used for general efforts to improve women's status, all appropriate agencies should be stimulated to recognize their reproductive health role and accelerate their efforts. Initiative resources should focus on the following areas, each of which helps ensure the effective functioning of the other:

- prenatal care;
- adequate routine delivery care (trained attendance at delivery);
- emergency obstetric care (including alarm and transport);
- family planning;
- and safe abortion care.

As outlined in section IIA, each core element must be supported by communications activities to ensure that it achieves its goals. Maternity care interventions must operate at three key levels: First, the level of the community, including women, their families, and traditional care providers. Second, the level of the health center, which can serve as a base for midwifery operations and/or as a site for prenatal care and routine deliveries. Third, the hospital level, which should be equipped to handle complicated deliveries. Communications between levels are key; each level must be linked to the others, to ensure effective training, supervision, support, and the referral and transfer of emergency cases. The balance between these core elements, and the specific interventions, improvements or changes needed at each level, will vary based on maternal mortality levels and causes, resource and infrastructural capacity, socio-cultural, legal and political factors, and the current knowledge, attitudes, practices, and priorities of the community, and particularly women.

3/ What can be done in these areas? What resources are currently available? What additional resources will be required?

The key roles of communications, prenatal care, delivery care, family planning, and abortion were outlined in detail in section II of this report. The following general resources will be required for the development and operation of effective health sector interventions:

- Clinical management guidelines on necessary tasks and the skill levels necessary to carry them out.
- Equipment, supplies, and drugs.
- Health systems management, including support, supervision, supply, communications, referral, and transfer.
- Community support for and participation in program design and implementation, to ensure effective utilization of services.
- Information (to plan programs, to ensure cultural, political, and economic feasibility, to assess the biomedical efficacy of and evaluate interventions, and to ensure that programs are based on community priorities).

4/ Who can provide these interventions? What are the connections between the service providers?

Appropriate delegation is key to achieving the Initiative's goals, and is one of its major stumbling blocks. Ensuring that women have access to appropriate care will require, in many settings, training and equipping non-medical personnel to provide services commonly reserved for medical personnel. While in some cases this may result in inappropriate intervention and harm to the woman, the alternative is providing no intervention at all, and certain death for many more.

In addition, there is a great deal of evidence that non-medical cadres, if appropriately trained and supported, are capable of carrying out certain "medical" tasks with great success. In the Zaire project described in Section IV, for example, nurses and midwives were trained to perform cesarean section and symphysiotomy. In numerous other projects, traditional birth attendants (TBAs) have been trained to provide a range of risk identification, pregnancy management, and referral services; where they have not succeeded, it is clear that this is as much a failing of the system of training, supervision, and support as it is an indication of the limitations of TBAs. Midwives, in particularly, are a key link in the maternal care chain, and their potential should be maximized. The project in Matlab, Bangladesh described in Section IV clearly illustrates the potential of midwives to improve women's access to care in emergencies.

An appropriate balance must be struck, ensuring that tasks are delegated only to those with the right amount of skill, practice, and access to support and supervision. Adequate training, re-training, supervision, support, and access to referral services are key to maximizing the effectiveness of delegation and minimizing potential risks. Often, it is not so much delegation but deployment that is the issue. Sufficient numbers of adequately trained personnel may exist, but they may not be posted to the areas where they are most needed.

While delegation is sometimes viewed as a second-best strategy, it is actually optimal in many circumstances. Delegation should not always be seen as "delegating down." Often, it improves the status quo, enabling physicians, for example, to concentrate on those areas that most require their skill and training. Each health cadre must have as its mandate a set of services that fall within its comparative advantage. All care providers, and the services they provide, must operate in the context of a well-functioning whole, in which all core services are available at the appropriate level to all women who need them.

A major effort to overcome government and physician resistance to delegation will be required not only to make it possible, but to make it work in practice. Even in contexts where delegation is formally authorized, the power of the medical community often presents a formidable barrier to implementation. It was recommended that a review of the evidence on delegation be undertaken and widely disseminated as a critical first step.

5/ What will the program cost?

Program cost is an essential, and often neglected, planning element. Resources are limited. They must be allocated such that their impact on maternal health is maximized. Information on the cost-effectiveness of different interventions and/or sets of interventions enables us to ensure that this is indeed the case. This information also enables us to show that substantial gains in maternal health can be achieved at limited cost, which is essential to generating additional investment in Safe Motherhood. Unfortunately, little comparative information on the costs of programs and interventions exists. Participants agreed that the collection and analysis of such information should be a critical element of the planning and evaluation process, as well as a priority for ongoing and planned operational research.

6/ Who will pay for the program? How will it be sustained?

Participants emphasized that however important it may be to involve the community in the identifying priorities and designing, implementing, and even financing programs, the community cannot do it alone. A three-pronged approach is required, combining community, government and donor resources. Programs must be designed such that donor involvement can be phased out after a specified period of time, and the program sustained through a combination of government and community resources. Program success and sustainability hinge, to a large extent, on building political commitment and policy support, strengthening institutional capacity within developing countries, and overcoming often entrenched resistance -- physician resistance to delegation, or men's resistance for family planning, for example -- to programs or specific program elements.

It is now common for planners to consider cost-sharing or user fees in program financing. A critical assessment of the effect of these fees on utilization must precede their institution. Families in developing countries already do pay for a substantial proportion of their health care -- from drugs, to fees (in cash or in kind) to TBAs. There is often willingness to pay for certain health services, particularly when this payment can be linked to a tangible improvement in service quality. In some areas, there is evidence that demand for maternal care is sensitive to price increases, but not greatly so. But in others, the institution of fees has been followed by drastic declines in utilization. As with all aspects of program planning, determining the way a program is financed must be based on a thorough, situation-specific assessment of the potential impact of alternative schemes.

It is often not a question of generating new resources, but of reallocating resources that already exist. This applies to the community level -- where individuals often spend substantial proportions of household income on care and drugs of unknown or questionable efficacy in the absence of better information or service alternatives -- as well as to the government level -- where budgetary allocations to the health sector, and re-allocations within the health sector, are often warranted from a cost-benefit perspective.

7/ How will we know it works?

The difficulties associated with measuring maternal mortality -- and even greater difficulties associated with measuring "maternal health" -- present a primary impediment to the evaluation of interventions and programs. While maternal mortality levels are too high, a maternal death is in fact a rare event. As such, measuring its base levels and monitoring changes are extremely difficult tasks. It is essential that appropriate process indicators be developed to enable us to evaluate interventions without measuring their direct maternal mortality impact. Broader women's reproductive health status measures, along the lines of the general health index described in Section IV of this report, should also be developed and tested.

While we are now much further ahead in our knowledge of proven and promising interventions, there is a great deal more work to be done in evaluating the effectiveness of these interventions in the field, and determining the key factors behind their success. It is essential, for example, that we know not only that prenatal care is being provided and achieving its goals, but the elements that are being provided, which elements work best under which circumstances, the personnel are responsible for providing specific services, how those personnel are selected and trained, etc.

8/ How do we replicate the program, or phase it up?

As is clear from the field experiences documented in Section IV, there is a great deal that can be done, even when resources are limited. While some are endeavoring to build on their success through replication or national program development, it is clear that this is no easy task. In Bangladesh, for example, midwives are not available on large enough scale to post them to villages throughout the country. A variation of the scheme, using female paramedics, is now being tested. In Cameroon, the effectiveness of the risk screening program, which was undertaken in a primarily urban population, was tested in rural settings prior to national program planning. Most importantly, any effort to scale up or replicate a program must be based on a thorough, situation-specific assessment. A program that achieves its goals in one area may fail in another, even within the same country or region. Blanket replication rarely succeeds.

While more research, particularly operational research, is and will always be needed to refine goals and interventions, priority areas for action can be identified, and the nature of that action delineated within certain parameters. It is clear, however, that no externally designed, general program can be superimposed on a specific setting and achieve its desired outcomes. Detailed, situation-specific analysis of epidemiological need and demographic context will always be essential to program development, if a program is to succeed in meeting its objectives. Determining resource availability and capacity, and ensuring that the program designed is not just effective but cost-effective, are also critical.

Equally important, and often neglected, are situational assessments that aim to determine existing community perceptions and practices, and to define needs and priorities from women's perspective. How can the user's perspective be incorporated in practice? In the projects and programs described in this report, the focus group approach was used to great advantage, and the input of anthropologists, not commonly solicited in health sector programming, proved indispensable. Participants also suggested involving the community's natural leadership from the onset. The views of health workers, in particular, should be solicited.

The World Bank - MotherCare Project Workshop succeeded in moving the Safe Motherhood Initiative forward on the path from advocacy to implementation. While there is clearly debate on the Initiative's precise goals, on the effectiveness of interventions both within and outside the health sector, and on the structure and content of Safe Motherhood programs in different settings, there is also a great deal of consensus, and a large body of knowledge and experience to guide programming. This was the workshop's goal: to gather and capitalize on state-of-the-art technical knowledge and practical field experience in the maternal health arena, with the ultimate objective of developing program guidelines for Safe Motherhood planners and program managers in a variety of settings. Based on the workshop's outcomes and the continuing input of a wide range of technical experts and program managers in the field, these guidelines are now being prepared, and will soon be available for the benefit of those working to promote Safe Motherhood worldwide.

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VII. APPENDICES

APPENDIX 1: SELECTED RESOURCES

Columbia University

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London School of Hygiene and Tropical Medicine

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Manoff Group

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APPENDIX 2: Agenda

Workshop
November 19-20, 1991

Location: The World Bank, Room H-1200, H Building, 600 19th Street, N.W.

TUESDAY, NOVEMBER 19, 1991

0900-0915	Welcome and Introductions	Ann Hamilton
	Workshop Objectives	Marge Koblinsky
0915-0930	Conceptual Framework	Zahidul Huque
0930-0945	Discussion	
0945-1015	Communications Strategies	Marcia Griffiths
1015-1030	Discussion	
1030-1045	Break	
1045-1130	Effective Services (FP, Antenatal and Delivery Care)	Cleo Rooney
1130-1200	Discussion	
1200-1300	Lunch	
1300-1430	Country Presentation -- Panel Presentations. There will be 20 minutes for each presentation followed by a 10 minutes discussion aimed at clarifying issues raised.	James Socknat (ASTPH) Chair
	• Bangladesh — Kate Stewart • Zaire — Dualé Sambe • The Gambia — Alice Greenwood	
1430-1515	Discussion: Implications for project design and implementation: Strategies, project components and project support features.	
1515-1530	Break	
1530-1630	Country Presentations	Michael Azefor (AF1PH)

	• Cameroon • Nigeria	Robert Leke Sulaiman Braimoh
1630-1715	Discussion: Implications for project design and implementation: Strategies, project components and project support features.	
1715-1730	Summary and Close	Anne Tinker

WEDNESDAY, NOVEMBER 20, 1991

0900-1000	Country Presentations	Susan Stout (AS5PH) Chair
	• Guatemala • Indonesia	Barbara Schieber Anna Alisjabhana
1000-1030	Discussion: Implications for project design and implementation: Strategies, project components and project support features.	
1030-1045	Break	
1045-1145	Country Presentations	Bruce Carlson (LA1PH) Chair
	• Brazil • Jamaica	Silvia Bomfim Paul Gertler
1145-1215	Discussion: Implications for project design and implementation: Strategies, project components and project support features.	
1215-1345	Lunch (Optional Brown Bag Lunch: Preliminary Results of Data Analysis from Bank-supported studies in Jamaica and Indonesia on Women's Health (Paul Gertler))	
1345-1445	Discussants	
1445-1500	Conclusions and Closure	Marge Koblinsky Anne Tinker

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APPENDIX 3: Participants Lists

A. Workshop Participants: *November 19-20, 1991*

Dr. Ranjit Atapattu
Senior Primary Health Care Advisor
UNICEF
3 United Nations Plaza
New York, NY 10017

Mr. Michael Azefor
AF1PH (J-8009)
The World Bank
1818 H Street, NW
Washington, D.C. 20433
Tel: 202-473-4746

Ms. Mina M. Bail
Program Officer
UNDP
1 UN Plaza
New York, NY 10017

Dr. Jose-Luis Bobadilla, PHRHN
The World Bank (S-6129)
1750 Pennsylvania Ave., NW
Washington, D.C. 20433
Tel: 202-473-3427
Fax: 202-477-0643

Ms. Marylou Bradley, AFIPH
The World Bank
1818 H Street, NW
Washington, D.C. 20433
Tel: 202-473-7552
Fax: 202-477-8145

Mr. Bruce Carlson
LA1PH (I-7193)
The World Bank
1818 H Street, NW
Washington, D.C. 20433

Ms. Marlea Covelli
The World Bank
ITFCO (H-3073)
1818 H Street, NW
Washington, D.C. 20433
Tel: 202-473-3098

Ms. Lina Domingo
AF4PH
The World Bank
1818 H Street, NW
Washington, D.C. 20433

Mr. Luis F. Duque
World Bank Consultant
Apartado 089903
Bogota, D.C. Colombia
Tel: 571-274-2797

Ms. Catherine Fogle
AS2PH
The World Bank
1818 H Street, NW
Washington, D.C. 20433
Tel: 202-458-1303

Mr. Birger Fredriksen
AF5PH (J-9061)
The World Bank
1818 H Street, NW
Washington, D.C. 20433
Tel: 202-473-5033

Ms. Adrienne Germain
IWHC
24 East 21st Street
NYC, NY 10010
Fax: 219-979-9009
Tel: 212-979-8500

Ms. Ann Hamilton
Director, PHR
The World Bank
1750 Pennsylvania Ave., NW
Washington, D.C. 20433

Mr. Jeff Hammer
The World Bank
PHRHN, Rm. S-6415
1750 Pennsylvania Ave., NW
Washington, D.C. 20433
Tel: 202-473-3225
Fax: 202-477-0643

Ms. Sabrine Huffman
AF5PH
~~The World Bank~~
1818 H Street, NW
Washington, D.C. 20433
Tel: 202-473-5016

Ms. Ethna Johnson
AF1PH
The World Bank
1818 H Street, NW
Washington, D.C. 20433
Tel: 202-473-4742

Dr. Malika Ladjali
IPPF
18-20 Lower Regent Street
London, SW1Y 4PW
England
Tel: 071-487-7866

Ms. Nydia Maraviglia
ASTPH
The World Bank
1818 H Street, NW
Washington, D.C. 20433
Tel: 202-458-1230

Ms. Mary Beth Moore
PATH
1990 M Street #700
Washington, D.C. 20036
Tel: 202-822-0033

Dr. German Mora
Regional Advisor, MCH/FP
~~PAHO/WHO~~
525 Twenty-Third Street, NW
Washington, D.C. 20037

Ms. Elaine M. Murphy
PATH
1990 M Street #700
Washington, D.C. 20036
Tel: 202-822-0033

Dr. May Post
Consultant, PHN
The World Bank
1818 H Street, N.W.
Washington, D.C. 20433
Tel: 202-473-3104

Ms. Karen Otsea
Senior Program Associate
Family Care International
588 Broadway
Room 510
NYC, NY 10012
Tel: 212-941-5300
Fax: 212-941-5563

Dr. Matanda Sabwa
UNFPA
220 East 42nd Street
New York, NY 10017
Tel: 212-297-5224

Ms. Barbara Parker
USAID
R&D/H/HSD
1601 N. Kent Street
Arlington, VA 22209
Tel: 703-875-6436

Ms. Margaret Saunders
EDIHR
The World Bank
1818 H Street, NW
Washington, D.C. 20433
Tel: 202-437-6448

Ms. Elaine W. Patterson
ASIVP
The World Bank
E-10-079
1818 H Street, NW
Washington, D.C. 20433
Tel: 202-458-1437

Ms. Jill Sheffield
President
Family Care International
588 Broadway
Room 510
NYC, NY 10012
Tel: 212-941-5300
Fax: 212-941-5563

Ms. Francis Plunkett
The World Bank
~~AS4PW (D-10-031)~~
1818 H Street, NW
Washington, D.C. 20433
Tel: 202-458-0312

Ms. Mari Simonen
Special Assistant to the ED
~~UNFPA~~
220 E 42nd Street
New York, NY 10017

Mr. Jim Socknat
ASTPH
The World Bank
1818 H Street, NW
Washington, D.C. 20433
Tel: 202-458-1232

Ms. Elizabeth A. Toalton
The World Bank
EM3CO
1750 Pennsylvania Ave., NW
Washington, D.C. 20433
Tel: 202-473-2721
Fax: 202-471-1603

Ms. Susan Stout
ASTPH
The World Bank
1818 H Street, NW
Washington, D.C. 20433
Tel: 202-458-2537

Dr. Victoria Ward
Columbia University
Center for Population and
Family Health
60 Haven Avenue, B-3
New York, NY 10032
Tel: 212-304-5266
Fax: 212-305-7024

Mr. K. Subbarao
PHRWD
The World Bank
1750 Pennsylvania Ave., NW
Washington, D.C. 20433
Tel: 202-473-3898

B. Working Group Participants: November 18-22, 1991

Dr. Anna Alisjahbana
School of Medicine
University of Padjadjaran
Indonesia
Fax: 62-22-87218

Ms. Mary Ann Anderson
Office of Population and Health, USAID
1601 N. Kent St., Suite 714
Arlington, VA 22209
Tel: 703-875-4663
Fax: 703-875-5490

Dr. Silvia Bomfim
PROAIS
Maternidade Escola
Rua Corovel Nunes de Melo S-N
60430 Fortaleza
Ceara, Brazil
Tel: 55-85-281-2885

Dr. Oona Campbell
London School of Hygiene and Tropical Medicine
Keppel St.
London, WC1E 7HT
England
Fax: 44-71-388-3076

Mr. J. Chakraborty
ICDDR/B
Dhaka, Bangladesh
Fax: 88-02-883116

Ms. Colleen Conroy
MotherCare
1616 N. Fort Myer Dr.
11th Floor
Arlington, VA 22209
Tel: 703-528-7474
Fax: 703-528-7480

Ms. Pat Daly
The World Bank
PHRHN, Room S-6145
1750 Pennsylvania Avenue, NW
Washington, D.C. 20433
Tel: 202-473-3224
Fax: 202-477-0643

Ms. Andrea Eschen
The Population Council
1 Dag Hammarskjold Plaza
New York, NY 10017
Tel: 212-644-1333
Fax: 212-755-6052

Mr. Larry Forgy
ABT Associates
4800 Montgomery Lane, Suite 500
Bethesda, MD 20814
Tel: 301-913-0500
Fax: 301-652-7791

Dr. Paul Gertler
1700 Main Street
Dept. 8C2, Room 1345A
P.O. Box 2138
Santa Monica, CA 90407
Tel: 213-393-0411 x 6283
Fax: 213-393-4818

Dr. Alice Greenwood
Medical Research Council Laboratories
The Gambia
Tel: 22-09-5919
Fax: 22-09-5442

Ms. Barbara Herz
Chief, PHRWD
Room 5-9131
The World Bank
1750 Pennsylvania Avenue, NW
Washington, D.C. 20433
Tel: 202-473-3483

Dr. Marge Koblinsky
MotherCare
1616 N. Fort Myer Dr.
11th Floor
Arlington, VA 22209
Tel: 703-528-7474
Fax: 703-528-7480

Ms. Diana Measham
Senior Program Associate
Family Care International
588 Broadway
Suite 510
New York, NY 10012
Tel: 212-941-5300
Fax: 212-941-5563

Dr. Cleo Rooney
MCEU, London School of Hygiene and
Tropical Medicine
Keppel St.
London, WC1E 7HT
England
Fax: 44-71-388-3076

Ms. Marcia Griffiths
Manoff Group, Inc.
2001 S Street, NW
Washington, D.C. 20009
Tel: 202-265-7469
Fax: 202-745-1961

Dr. Zahidul Huque
3003 N. Charles Street, Apt. 1GB
Baltimore, MD 21218
Tel: 301-889-6034
Fax: 301-955-0792

Professor Robert Leke
Chef de Service Gynécologie-Obstétrique
Hospital Central de Yaounde
University of Yaounde, B.P. 1935
Cameroon
Tel: 237-22-36-17
Fax: 237-31-12-24

Dr. Jim McCarthy
Center for Population and Family Health
Columbia University
60 Haven Avenue, Level B-3
New York, NY 10032
Tel: 212-304-5200
Fax: 212-305-7024

Dr. Duale Sambe
Director, SANRU
Projet de Soins de Sante Primaire en
Milieu Rurel
Kinshasa, Zaire
Tel: 243-12-30121

Dr. Barbara Schieber
INCAP
Carretina Roosevelt Zona 11
Guatemala City, Guatemala
Tel: 502-2-719913
Fax: 502-2-736529

Ms. Mary Ellen Stanton
American College of Nurse Midwives
1522 K Street, NW
Washington, D.C. 20005
Tel: 202-289-4005
Fax: 202-289-4395

Dr. Kate Stewart
Health & Child Survival Fellow
IRD Macro International
8850 Stanford Blvd.
Suite 4000
Columbia, MD 21045
Tel: 410-290-2849
Fax: 410-290-2999

Ms. Anne Tinker
PHRHN, S-6109
The World Bank
1750 Pennsylvania Avenue, NW
Washington, D.C. 20433
Tel: 202-473-3683
Fax: 202-477-0643

Ms. Pat Taylor
MotherCare
1616 N. Fort Myer Drive
11th Floor
Arlington, VA 22209
Tel: 703-528-7474
Fax: 703-528-7480

Dr. Godfrey Walker
WHO, Medical Officer
Geneva, Switzerland
Tel: 41-22-791-3386
Fax: 41-22-791-0746

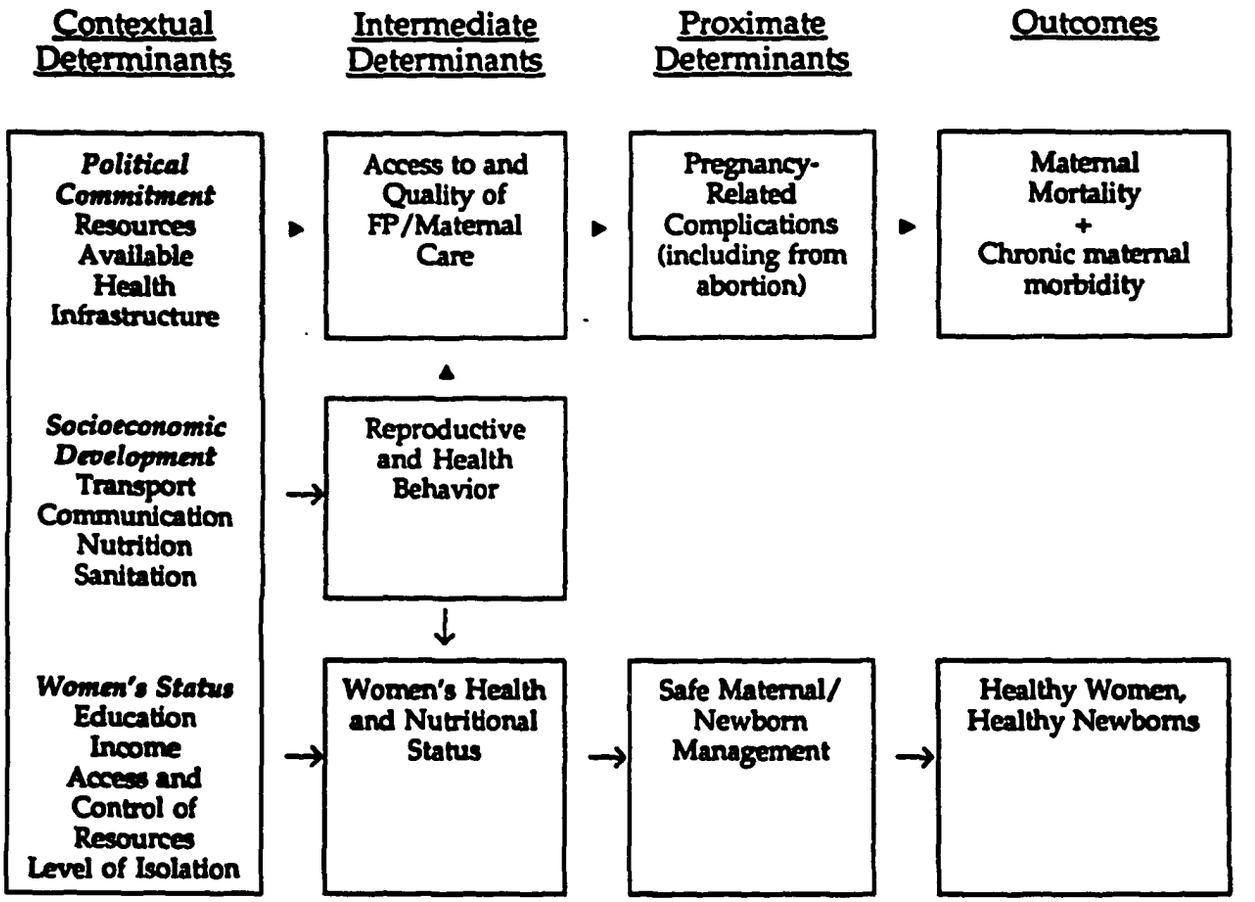
Dr. Beverly Winikoff
Senior Medical Associate
The Population Council
1 Dag Hammarskjold Plaza
New York, NY 10017
Tel: 212-644-1333
Fax: 212-755-6052

APPENDIX 4: Charts and Figures

FIGURE 1

SAFE MOTHERHOOD

CONCEPTUAL FRAMEWORK*

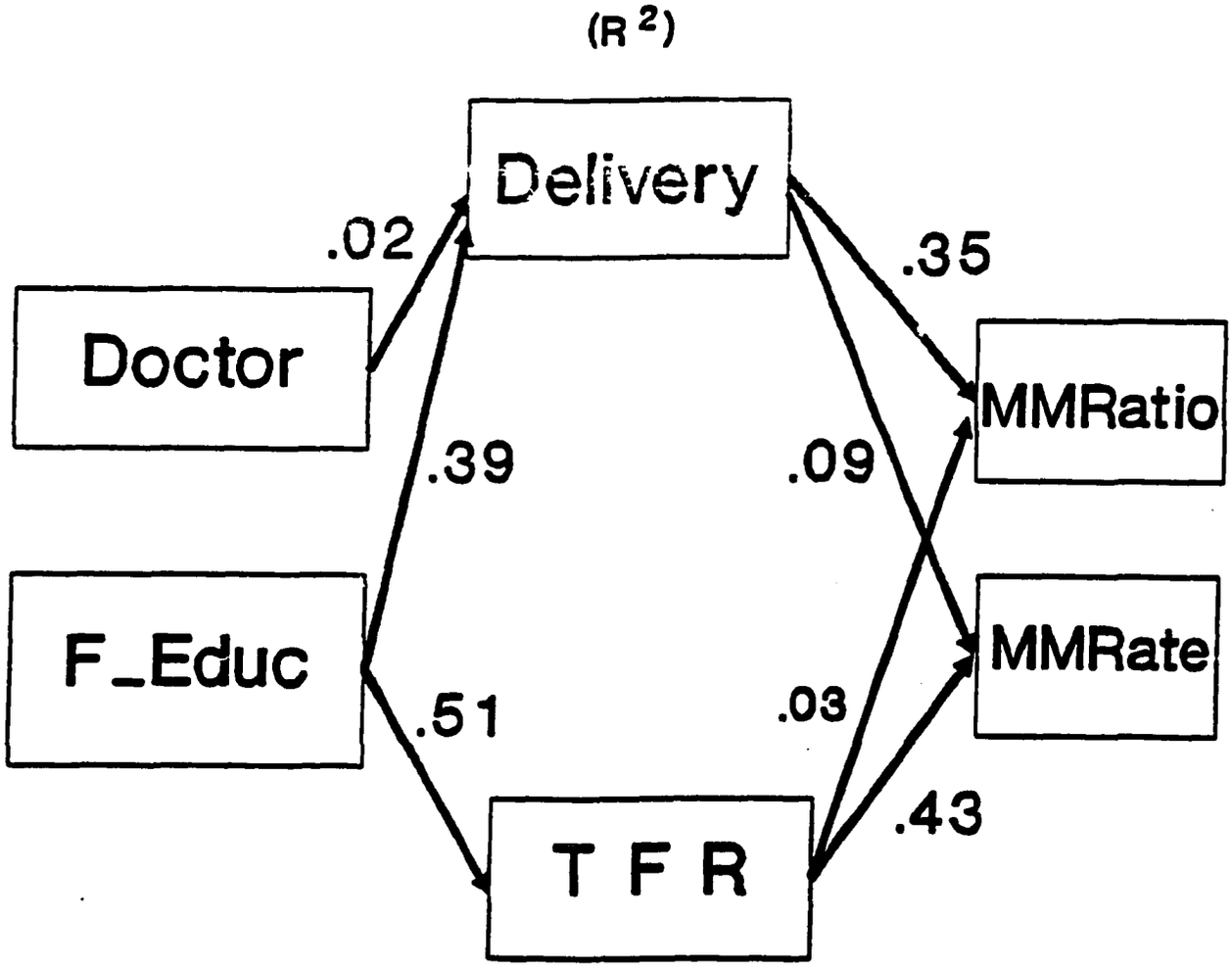


The dark arrows (▶) describe the more influential pathway leading to maternal mortality and chronic maternal morbidity.

(Adapted from McCarthy and Maine, 1991)

Figure 2

Proportion of Variation of Maternal Mortality Explained



(Koblinsky and Huque, 1991)

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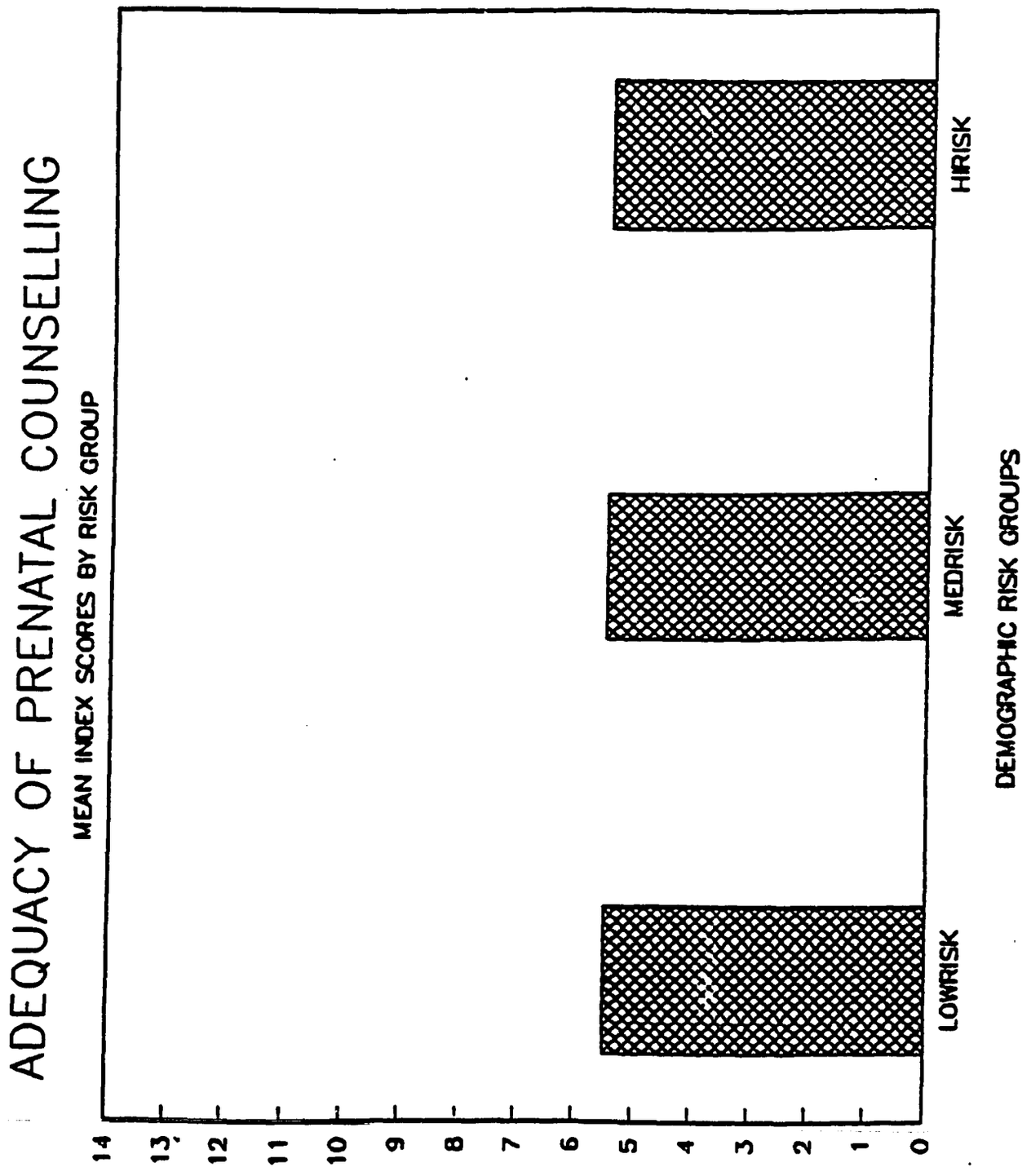
CHART 1

MEAN INDEX SCORE [RANGE: 0–14]



(Gertler et al., 1991)

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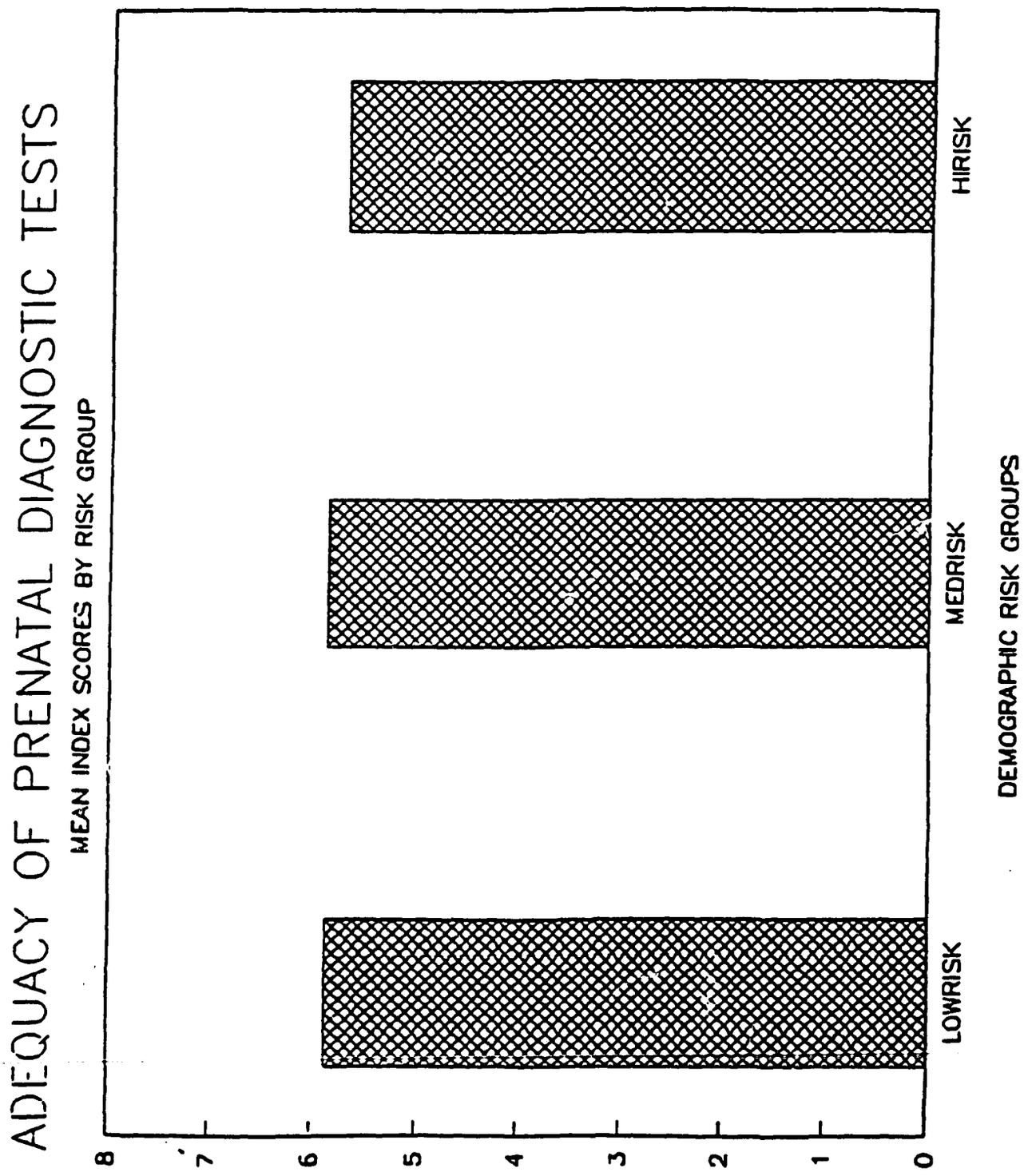
CHART 2

MEAN INDEX SCORE [RANGE: 0–7]



(Gertler et al., 1991)

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