WDP 202

202

World Bank Discussion Papers

Making Motherhood Safe

Anne Tinker
Marjorie A. Koblinsky

with contributions from
Patricia Daly, Cleone Rooney,
Charlotte Leighton, Marcia Griffiths,
A. A. Zahidul Huque, and Barbara Kwast

Recent World Bank Discussion Papers

No. 142 *Restructuring Socialist Industry: Poland's Experience in 1990*. Homi J. Kharas

No. 143 *China: Industrial Policies for an Economy in Transition*. Inderjit Singh

No. 144 *Reforming Prices: The Experience of China, Hungary, and Poland*. Anand Rajaram

No. 145 *Developing Mongolia*. Shahid Yusuf and Shahid Javed Burki

No. 146 *Sino-Japanese Economic Relationships: Trade, Direct Investment, and Future Strategy*. Shuichi Ono

No. 147 *The Effects of Economic Policies on African Agriculture: From Past Harm to Future Hope*. William K. Jaeger

No. 148 *The Sectoral Foundations of China's Development*. Shahid Javed Burki and Shahid Yusuf, editors

No. 149 *The Consulting Profession in Developing Countries: A Strategy for Development*. Syed S. Kirmani and Warren C. Baum

No. 150 *Successful Rural Finance Institutions*. Jacob Yaron

No. 151 *Transport Development in Southern China*. Clell G. Harral, editor, and Peter Cook and Edward Holland, principal contributors

No. 152 *The Urban Environment and Population Relocation*. Michael M. Cernea

No. 153 *Funding Mechanisms for Higher Education: Financing for Stability, Efficiency, and Responsiveness*. Douglas Albrecht and Adrian Ziderman

No. 154 *Earnings, Occupational Choice, and Mobility in Segmented Labor Markets of India*. Shahidur R. Khandker

No. 155 *Managing External Debt in Developing Countries: Proceedings of a Joint Seminar, Jeddah, May 1990*. Thomas M. Klein, editor

No. 156 *Developing Agricultural Extension for Women Farmers*. Katrine A. Saito and Daphne Spurling

No. 157 *Awakening the Market: Viet Nam's Economic Transition*. D. M. Leipziger

No. 158 *Wage Policy during the Transition to a Market Economy: Poland 1990–91*. Fabrizio Coricelli and Ana Revenga, editors

No. 159 *International Trade and the Environment*. Patrick Low, editor

No. 160 *International Migration and International Trade*. Sharon Stanton Russell and Michael S. Teitelbaum

No. 161 *Civil Service Reform and the World Bank*. Barbara Nunberg and John Nellis

No. 162 *Rural Enterprise Development in China, 1986–90*. Anthony J. Ody

No. 163 *The Balance between Public and Private Sector Activities in the Delivery of Livestock Services*. Dina L. Umali, Gershon Feder, and Cornelis de Haan

No. 164 *How Do National Policies Affect Long-run Growth?: A Research Agenda*. William Easterly, Robert King, Ross Levine, and Sergio Rebelo

No. 165 *Fisheries Development, Fisheries Management, and Externalities*. Richard S. Johnston

No. 166 *The Building Blocks of Participation: Testing Bottom-up Planning*. Michael M. Cernea

No. 167 *Seed System Development: The Appropriate Roles of the Private and Public Sectors*. Steven Jaffee and Jitendra Srivastava

No. 168 *Environmental Management and Urban Vulnerability*. Alcira Kreimer and Mohan Munasinghe, editors

No. 169 *Common Property Resources: A Missing Dimension of Development Strategies*. N. S. Jodha

No. 170 *A Chinese Province as a Reform Experiment: The Case of Hainan*. Paul M. Cadario, Kazuko Ogawa, and Yin-Kann Wen

No. 171 *Issues for Infrastructure Management in the 1990s*. Arturo Israel

(Continued on the inside back cover.)

202

World Bank Discussion Papers

Making Motherhood Safe

Anne Tinker
Marjorie A. Koblinsky

with contributions from
Patricia Daly, Cleone Rooney,
Charlotte Leighton, Marcia Griffiths,
A. A. Zahidul Huque, and Barbara Kwast

The World Bank
Washington, D.C.

Manufactured in the United States of America
First printing May 1993
Second printing October 1994

The complete backlist of publications from the World Bank is shown in the annual *Index of Publications,* which contains an alphabetical title list (with full ordering information) and indexes of subjects, authors, and countries and regions. The latest edition is available free of charge from the Distribution Unit, Office of the Publisher, The World Bank, 1818 H Street, N.W., Washington, D.C. 20433, U.S.A., or from Publications, The World Bank, 66, avenue d'Iéna, 75116 Paris, France.

ISSN: 0259-210X

Anne Tinker is a health specialist in the World Bank's Population, Health, and Nutrition Department. Marjorie A. Koblinsky was a consultant to the department.

Library of Congress Cataloging-in-Publication Data

Tinker, Anne G.
Making motherhood safe / Anne Tinker, Marjorie A. Koblinsky, with contributions from Patricia Daly . . . [et al.].
p. cm. — (World Bank discussion papers ; 202)
Includes bibliographical references.
ISBN 0-8213-2468-3
1. Maternal health services. I. Koblinsky, Marjorie A. II. Daly, Patricia. III. Title. IV. Series.
RG940.T55 1993
362.1'982—dc20 93-19573
CIP

Abstract

More than 150 million women become pregnant in developing countries each year and an estimated 500,000 of them die from pregnancy-related causes. At least 7 million pregnancies result in stillbirths or infant deaths within the first week of life, also because of maternal health problems. The death of a woman of reproductive age translates into substantial economic and social hardship for her family and community. Most women in the developing world lack regular access to modern methods of contraception. Most pregnant women receive insufficient prenatal care or none at all and deliver without access to skilled obstetrical care when complications develop. Even in countries with relatively well-developed health systems, preventable maternal illness and death persist because of inadequate management of the complications of pregnancy.

To assist policymakers and program managers to design and implement programs to reduce maternal mortality, this paper discusses the lessons for reducing maternal mortality derived from experience and research in both developing and industrial countries. That evidence shows that community-based approaches such as family planning and training and the deployment of midwives have helped reduce maternal deaths in high-mortality settings. A World Bank analysis of health sector priorities identified prenatal care and delivery services as among the most cost-effective government interventions for improving adult and child health.

The paper also recommends priorities and program strategies for making family planning services and maternal health care more effective by improving quality, increasing access, and educating the public about the importance of such services. Programs succeed best when they provide a package of services, including community-based family planning, health, and nutrition services. Substantial—and sustained—reduction of the risk of dying once pregnant, however, requires an effective continuum of care from the community to the first-referral level, supported by a public education program. No matter how effective community-based maternity care is, some women will continue to die from complications if adequate referral and treatment to deal with emergency obstetric complications are not available. A more comprehensive plan includes expanding women's opportunities in a variety of other sectors, particularly in education. While there has been some progress, the challenge remains to get safe motherhood programs rapidly in place at the country level.

Photo credits: Photographs are from Family Care International, The MotherCare Project, UNFPA/Ms. Lily Solmssen Moureaux, UNICEF, and the World Bank.

Foreword

Women's health has received relatively little attention in developing countries. Maternal mortality rates, for example, show the widest disparity between industrial and developing countries of any human development indicator. The World Bank recognizes that policies to improve women's health are not only humanitarian, but economically sound as well. Well-directed interventions to improve women's health, particularly when combined with education, also expand the social and economic capacity of countries through the contributions of those women and their healthier, more productive children.

The World Bank is a cosponsor of the Safe Motherhood Initiative and has assisted in the development of a large and growing number of activities in all regions of the world, designed to reduce maternal illness and death. The number of Bank-assisted projects with safe motherhood components has increased from six in 1987 to more than seventy in 1993.

This paper was prepared to facilitate policy dialogue and program design, implementation and evaluation in maternal health and family planning. The information and direction for the paper came from workshops and conferences, interviews with World Bank staff, research and program evaluations, commissioned papers, and WHO technical documents. The Meeting of Partners for Safe Motherhood held in March 1992 provided a valuable opportunity to explore many of these ideas and project experiences in more detail.

The paper is intended for the use of World Bank staff, but we hope that it will also provide guidance to governments, other international agencies, and nongovernmental organizations in the design and implementation of programs to reduce maternal mortality and improve the status of women. In the words of Lewis Preston, President of the World Bank, "Safe motherhood is a high priority for the World Bank.... We all know what has to be done. We have the means to do it. Together, we can halve maternal mortality by the end of the decade. We can help women have more voice and choice in their lives. We can transform the prospects of this generation of women." And the prospects of all those who follow.

Janet de Merode
Director, Population, Health
and Nutrition Department

Acknowledgments

This discussion paper is the work of many people to whom we give our thanks. In November 1991, the World Bank and the MotherCare project of John Snow, Inc., convened a Workshop on Guidelines for Safe Motherhood Programming in Washington, D.C. Working Group participants—from Bangladesh, Brazil, Cameroon, the Gambia, Guatemala, Indonesia, and Zaire and those from the Center for Population and Family Health at Columbia University, Family Care International, International Women's Health Coalition, London School of Hygiene and Tropical Medicine, Manoff Group, the Population Council, U.S. Agency for International Development, World Health Organization, and the World Bank—brought their insights and experience to the table and are the architects of this document. To Michael Azefor, Bruce Carlson, James Socknat, and Susan Stout, chairpersons for the workshop, we give special thanks for the clarity and enthusiasm they brought to their sessions. We are also grateful for Diana Measham's superb proceedings of the workshop and her comments on various drafts of this document.

Several technical papers prepared for the workshop were synthesized by Marjorie Koblinsky into a background document that was discussed at the Meeting of Partners for Safe Motherhood hosted by the Bank in March 1992. At this meeting, comments were particularly appreciated from the members of the Inter-Agency Group for Safe Motherhood—including UNDP, UNFPA, UNICEF, WHO, the World Bank, IPPF, and the Population Council—as well as representatives from thirty-three countries around the world, bilateral assistance agencies, and nongovernmental organizations.

Selected background papers used in preparing this document are available, including: "Levels, Trends, and Consequences of Maternal Mortality and Morbidity" (A. Huque, A. Zahidul, and Marjorie Koblinsky 1991); "World Bank Guidelines on Safe Motherhood in Developing Countries: Outline of Effective Care at Delivery for Safe Motherhood" (Cleone Rooney 1991); "Communicating Safe Motherhood: Using Communications to Improve Maternal Health in the Developing World" (Marcia Griffiths, Mona Moore, and Michael Favin 1991); and "Programming for Safe Motherhood" (Marjorie Koblinsky and others 1992).

A special thanks is owed to Ann Hamilton, Barbara Herz, and Anthony Measham for their insightful comments and continuous support throughout the process. The authors would also like to thank the many World Bank colleagues who reviewed and provided comments on drafts of the document, including Michael Azefor, José-Luis Bobadilla, Eugene Boostrom, Randy Bulatao, Richard Cambridge, Robert Castadot, Susan Cochrane, Catherine Fogle, Rae Galloway, Jeff Hammer, Richard Heaver, Robert Hecht, Janet Hohnen, Michele Lioy, Nydia Maraviglia, Francisco Mardones, Judith McGuire, Philip Musgrove, Mead Over, Indra Pathmanathan, Elaine Patterson, Frances Plunkett, Sandra Rosenhouse, Fadia Saadah, Helen Saxenian, James Socknat, Susan Stout, Kalanidhi Subbarao, and Denise Vaillancourt. Technical reviews and constructive comments from Wendy Graham, May Post, Malcolm Potts, Kajsa Sundström, and Vivian Wong were also valuable. Finally, we appreciate the help of Coni Benedicto, Joyce Bruce, Noni Jose, Mely Menciano, Ottie Nadora, and Christopher Wilson, who helped prepare this report.

The World Bank, the Swedish International Development Authority, and the U.S. Agency for International Development provided the support that allowed this paper to be developed and produced.

Abbreviations

AIDS	Acquired immune deficiency syndrome
CBD	Community-based distribution
FTE	Full-time equivalent
HDP	Hypertensive disorders of pregnancy
HIV	Human immunodeficiency virus
IEC	Information, education, and communications
IM	Intramuscular
IMR	Infant mortality rate
IPPF	International Planned Parenthood Federation
IUD	Intrauterine device
IV	Intravenous
MCH	Maternal and child health
MMR	Maternal mortality ratio or rate
NGO	Nongovernmental organization
NMR	Neonatal mortality rate
PAHO	Pan American Health Organization
PMR	Perinatal mortality rate
RTI	Reproductive tract infection
STD	Sexually transmitted disease
TBA	Traditional birth attendant
TFR	Total fertility rate
UNICEF	United Nations Children's Fund
UNDP	United Nations Development Program
UNFPA	United Nations Population Fund
WHO	World Health Organization

Note: All dollar amounts in this report are current U.S. dollars.

Contents

Figures

Tables

Boxes

Executive Summary

The gap in pregnancy-related deaths between developing and industrial countries shows the greatest disparity of any human development indicator. Pregnant women in developing countries face a risk of death that is up to 200 times greater than for women in industrial countries. Unless vigorous, scientifically informed action is taken, more women may die from causes related to pregnancy, childbirth, and unsafe abortion in the 1990s than in any previous decade.

The issue involves more than women's lives. Also at stake are the lives of an estimated 7 million or more newborns who die annually as a result of maternal health problems and the health and socioeconomic prospects for surviving children, families, and communities. Yet most women in the developing world lack regular access to modern methods of contraception and do not receive adequate prenatal or delivery care.

The Safe Motherhood Initiative

In an effort to reduce the high toll of maternal morbidity and mortality, the World Bank, World Health Organization, United Nations Fund for Population Activities, and agencies from more than forty-five countries launched the Safe Motherhood Initiative at a conference in Nairobi in 1987. The goal is to reduce maternal illness and deaths by half by the year 2000.

The short-term strategy would make family planning services and maternal health care more effective—by improving quality, increasing access, and educating the public about the importance of such services and how they can best be used. A more comprehensive plan calls for improving women's socioeconomic status through health, education, and other factors.

The initiative, in its first six years, has brought greater awareness of the problem of maternal health, and countries are beginning to develop plans and programs. The challenge, however, is to accelerate program implementation at the country level.

At a follow-up conference at the World Bank in 1992 on the Safe Motherhood Initiative, international agency representatives and maternal health experts worked to help transform the effort from advocacy to action. This paper, an outgrowth of that meeting, is intended mainly to guide Bank operations staff in their work on safe motherhood programs. It should also prove useful to program planners in borrower countries and in other agencies.

What Is Needed

The experience of developed countries has shown that maternal mortality is not reduced by socioeconomic development alone, that an active program to improve the health infrastructure and behavior is needed. By the same token, research projects in Bangladesh, Ethiopia, Guatemala, and elsewhere have helped show which approaches do and don't work. For example, community-based approaches such as family planning and training and deployment of midwives have helped reduce maternal deaths in high-mortality settings.

Substantial—and sustained—reduction of the risk of dying once pregnant, however, requires adequate referral and treatment to deal with emergency obstetric complications. Deliveries performed by traditional birth attendants without skilled backup services have not reduced the risk of maternal deaths. And the use of demographic factors, such as age and

number of previous deliveries, to predict delivery complications has not proved reliable; most obstetric complications occur among women without these "risk" factors. Experience demonstrates that survival and well-being depend primarily on early detection of actual complications or disease and appropriate care. A radio campaign about the risks of labor lasting more than twenty-four hours significantly reduced the mortality and long-term disability that can result from prolonged labor.

The pathway to safe motherhood consists of interlinked steps: an adolescent's nutritional status; a woman's information about contraception, danger signs during pregnancy, and sexually transmitted diseases (including AIDS); access to appropriately trained health providers in a community; access to health care facilities or emergency transport to facilities elsewhere—all affect pregnancy outcomes and can be improved through public health interventions. Family planning reduces women's exposure to pregnancy-related risks; it also benefits the newborns, whose health prospects are improved by appropriately timed and spaced pregnancies.

The more than 500,000 maternal deaths each year result mainly from five causes: hemorrhage, unsafe abortion, infection, hypertensive disorders, and obstructed labor. In addition, tens of millions of maternal morbidities and disabilities in developing countries result from complications related to these problems or from life-threatening diseases—such as malaria, viral hepatitis, and AIDS—that are exacerbated by pregnancy. But the most immediate determinant of maternal morbidity and mortality is the management of complications directly associated with pregnancy, labor and delivery, the postpartum period, and abortion.

So, a safe motherhood program requires community-based nutrition, health, and family planning services; a continuum of care from community to hospital; and a public information program. Such a program ought to be an integral part of a country's primary health care and overall public and private health system.

Policy Considerations

Programming for safe motherhood requires local flexibility and initiative in planning, combined with strong national and local political support. From the outset, policymakers and planners will need to build commitment among decisionmakers, opinion leaders, and potential program beneficiaries, both women and men. Policymakers will also have to balance needs—based on an analysis of epidemiologic, demographic, and sociocultural factors and on available financial and other resources.

At the same time, in a broader context, the leaders should work to strengthen intersectoral coordination of activities that can advance the socioeconomic and legal status of women. Such factors as a woman's level of education, economic potential, and family and social status clearly affect fertility levels, pregnancy outcomes, the health of women and children—and their capacity to contribute to economic development.

Tailoring a Program to Its Setting

To consider how different settings might affect strategy, this report gives examples of approaches in three different settings—ranging from setting A, which has very limited health service infrastructure, through setting C, which has extensive services. However, nothing can

replace an individualized assessment of a country's unique maternal health needs, including considerable variation within a country, in preparation for embarking on program development.

In the example of setting A, high fertility, high mortality, and limited resources indicate that community-based distribution of contraceptives and appropriate abortion management should be established as the first line of offense. In setting B, the priority interventions are likely to be strengthening the referral system, upgrading maternity-care provider skills, and expanding health service coverage. In setting C, improving the quality and efficiency of care—with some decentralization of services—and developing a more comprehensive strategy for women's health, are probable areas of emphasis.

In all settings, information, education, and communications are essential—to improve community awareness of the need for better health-related practices and health care services and to tell the community how best to use such services.

Projected Costs

Projected costs for a substantial reduction in maternal morbidity and mortality are approximately $2 per capita per year, with half of that for maternal health and half for family planning. A recent World Bank analysis of health sector priorities identified prenatal care and delivery services as among the most cost-effective interventions with which governments can improve adult and child health.

The Bank's Role

The Bank's role in safe motherhood is to support member governments, in coordination with other assistance agencies and nongovernmental organizations, to formulate and implement policies and programs. Bank lending for safe motherhood has grown from nine projects in fiscal 1986 to seventy in fiscal 1992. To complement safe motherhood projects, the Bank assists projects that expand opportunities for women in a variety of sectors.

Chapter 1

Maternal Morbidity and Mortality and the Consequences

More than 150 million women become pregnant in developing countries each year and an estimated 500,000 of these women die from pregnancy-related causes. Well over one-fourth of all deaths to women of reproductive age in many developing countries are pregnancy related. The five main causes of maternal deaths are hemorrhage, unsafe abortion, hypertensive disorders, sepsis, and obstructed labor.

The death toll is greatest in Sub-Saharan Africa and South Asia, where maternal mortality ratios (maternal deaths per 100,000 live births) may be as much as 200 times higher than those in industrial countries. This is the widest disparity in human development indicators yet reported (table 1.1, box 1.1). The profound difference in maternal health and mortality between developing and industrial countries is expressed even more starkly by

Table 1.1 Selected Measures of Maternal and Perinatal Mortality by Region and Subregion

Region/ subregion	*Maternal mortality ratio, 1988 (per 100,000 live births)*[a]	*Total fertility rate, 1991*[b]	*Lifetime risk of maternal death*[c]	*Perinatal mortality rate, 1983 (per 1,000 live births)*[a]
World	370	3.4	1 in 67	57
Industrial countries	26	1.9	1 in 1,687	
Developing countries	420	3.9	1 in 51	
Africa	630	6.1	1 in 22	81
North	360	5.0	1 in 47	62
East	680	6.8	1 in 18	81
Middle	710	6.0	1 in 20	80
West	760	6.4	1 in 18	94
South	270	4.6	1 in 68	77
Asia	380	3.9	1 in 57	59
East	120	2.2	1 in 316	20
Southeast	340	3.4	1 in 72	52
South	570	4.4	1 in 34	87
West	280	4.9	1 in 61	55
South America	220	3.3	1 in 115	
North America	12	2.6	1 in 2,671	13
Europe	23	1.7	1 in 2,132	14
Oceania	600	2.6	1 in 54	13
Commonwealth of Independent States	45	2.3	1 in 805	28

a. *Maternal mortality ratio* and *perinatal mortality rate* are explained in box 1.1.
b. The total fertility rate is the number of children a woman would bear if she lived to the end of her childbearing years and bore children at each age in accordance with prevailing age-specific fertility rates.
c. Lifetime risk=$1-(1-MMR)^{1.2(TFR)}$ where the MMR is expressed as a decimal—for example, 0.2—and the total fertility rate is adjusted by 1.2 to account for pregnancies not ending in births (Herz and Measham 1987).
Source: For maternal mortality ratio, WHO (1991b); total fertility rate, Haub, Kent, and Yanagishita (1991); and perinatal mortality rate, WHO (1989a).

Box 1.1 Maternal and Perinatal Mortality—Definitions of Ratios and Rates

Maternal mortality is defined as "death of women during pregnancy or within forty-two days of termination of pregnancy, irrespective of the duration and the site of pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes."

$$\textit{Maternal mortality ratio} = \frac{\text{Women dying from causes related to pregnancy and childbirth}}{\text{100,000 live births}}$$

The ratio measures the risk women face of dying once pregnant—the obstetric risk. The maternal mortality ratio ranges from 25 to 2,000 in studies from developing countries and averages 10 in industrial countries.

$$\textit{Maternal mortality rate} = \frac{\text{Women dying from causes related to pregnancy and childbirth}}{\text{100,000 women age 15-49}}$$

The rate reflects the maternal mortality ratio and the fertility rate (births per 1,000 women of reproductive age); it is influenced by the likelihood of becoming pregnant and by the obstetric risk.

Perinatal mortality includes all newborn infants—stillborn or live—with a birthweight of at least 1,000 grams, who die before day 7 (168 hours).

$$\textit{Perinatal mortality ratio} = \frac{\text{Fetal deaths and early neonatal deaths}}{\text{Live births}} \times 1{,}000$$

The *perinatal mortality ratio* ranges from 40 to 60 per 1,000 live births in most developing countries, but it is between 6 and 10 in industrial countries.

$$\textit{Perinatal mortality rate} = \frac{\text{Fetal deaths and early neonatal deaths}}{\text{Total births}} \times 1{,}000$$

Source: WHO 1992d.

comparing lifetime risk: one in every 21 women in Africa dies of complications of pregnancy, delivery, or abortion, compared with only one in every 10,000 in Northern Europe (Rochat 1987).

Maternal mortality is not the only adverse outcome of pregnancy. Because of miscarriage, induced abortion, and other factors, well over 40 percent of the pregnancies in developing countries result in complications, illnesses, or permanent disability for the mother or child (WHO 1992a). More than 7 million newborn deaths are believed to result from maternal health problems and their mismanagement.

Poor maternal health hurts women's productivity, their families' welfare, and socio-economic development. So safe motherhood should be a critical part of any broader strategy to expand female education and employment and to improve health, nutrition, and gender equality—and thus alleviate poverty.

Given the magnitude of these problems and the interventions available, why hasn't more been done? Unfortunately, these problems are silent. They remain, to a large extent, uncounted and unreported. The death of a pregnant women is often attributed to fate. Changing this prevailing attitude to a belief that "pregnancy is special" is the major challenge for safe motherhood programs (Winnard 1991). This paper focuses on clarifying policy and

program alternatives and identifying cost-effective health-related program interventions that are likely to reduce maternal morbidity and mortality expeditiously.

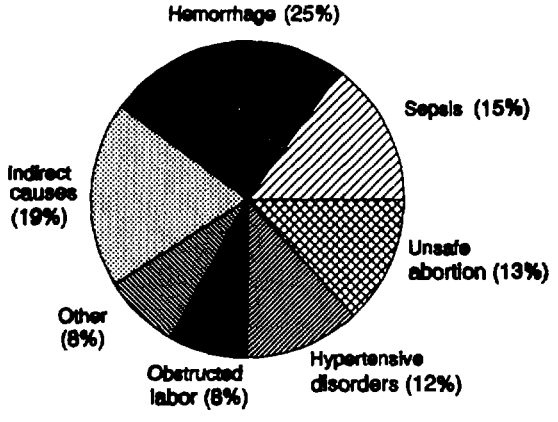
Complications of Pregnancy and their Consequences

Health problems associated with pregnancy affect the health and quality of life of the mother, but also of the newborn, the family, and the wider community.

Effects on the Mother

About 80 percent of maternal deaths in developing countries are direct obstetric deaths—they result "from obstetric complications of the pregnant state (pregnancy, labor, and puerperium), from intervention, omissions, incorrect treatment, or from a chain of events resulting from any of the above" (WHO 1977). The remaining maternal deaths are from indirect causes aggravated by pregnancy or its management, such as malaria, viral hepatitis, diabetes, anemia, or rheumatic heart disease. Of the direct obstetric deaths, hemorrhage contributes about 25 percent, unsafe abortion at least 13 percent, hypertensive disorders (eclampsia) about 12 percent, infection (sepsis) about 15 percent, and obstructed labor and other direct causes about 8 percent each (figure 1.1 and appendix 1) (WHO 1992a).

Figure 1.1 Medical Causes of Maternal Deaths in Developing Countries



Direct obstetric complications or health problems exacerbated by pregnancy can also harm the mother's health without killing her. Acute complications—many from the causes associated with maternal death—affect an estimated 50 million or more women in developing countries yearly, with more than 20 million cases serious enough to warrant referral-level care (WHO 1992a).

One of the worst chronic consequences of childbirth is obstetric fistula, a common consequence of untreated obstructed labor. Women suffering from obstetric fistula continuously leak urine and sometimes feces. They often become social outcasts. Obstetric fistula is particularly common when the first pregnancy occurs soon after puberty (Cottingham and Royston 1991).

An uncounted number of women suffer pregnancy-related disabilities long after delivery. Between 9 and 25 percent of women under forty-five years of age suffer uterine prolapse in Colombia, Pakistan, the Philippines, and Syria (Omran and Standley 1976, 1981). Because prevalence increases as a result of childbearing and its frequency, prolapse is likely to affect younger women in countries where marriage and childbearing begin early and fertility is high. In Egypt, for example, a recent community-based study in a rural area found that more than half of all women suffered from uterine prolapse (Zurayk 1991).

Poorly timed or unwanted pregnancies carry high risks of morbidity and mortality, as well as social and economic costs, particularly to the adolescent. In a study in Nigeria, girls age 15 and under had a maternal mortality ratio seven times that of women age 20 to 24, and in Jamaica, women over 40 were five times more likely to die during pregnancy than women age 20 to 24 (Royston 1989). Many unwanted pregnancies end in unsafe abortion. For example, when contraception and abortion were illegal in Romania in 1988, the maternal mortality ratio was reported to be 159 deaths (per 100,000 live births), 86 percent of them caused by complications from unsafe abortion. After legalization in 1989, the frequency of abortion persisted because of a scarcity of contraceptive information and supplies, but the mortality ratio fell by 50 percent in 1990 (Hord and others 1991).

Countless women suffer severe chronic illnesses that can be exacerbated by pregnancy and the mother's weakened immune system. Anecdotal information indicates that levels of these illnesses are extremely high. Malaria is more prevalent in pregnant women than in nonpregnant women and is most common in the first pregnancy. Resistance to malaria developed during childhood begins to diminish in the pregnant woman at about the fourteenth week. Viral hepatitis is far more prevalent among pregnant than nonpregnant women in developing countries and 3.5 times as likely to prove fatal (WHO 1991b). Severe viral hepatitis can lead to premature labor, liver failure, or severe hemorrhage.

In addition, an increasing number of pregnant women are testing positive for the human immunodeficiency virus (HIV), which is a precursor to acquired immune deficiency syndrome (AIDS). In Sub-Saharan Africa, 3 million women have been infected with the AIDS virus (WHO 1992c). In Lusaka, Zambia, for example, in the early 1990s, nearly one-quarter of the pregnant women attending maternity clinics were infected—a jump from 8 percent in 1985 (U.S. Bureau of the Census 1992).

From 60 to 70 percent of pregnant women in developing countries are estimated to be anemic (Sloan and Jordan 1992). An infant may secure adequate iron stores at the expense of the mother's reserves. The resulting anemia in the mother may impede her ability to resist infection or survive hemorrhage, increasing the likelihood of death in childbirth by a factor of four (Chi, Agoestina, and Harbin 1981; Llewellyn-Jones 1965).

Effects on the Fetus or Newborn

Pregnancy involves a dyad—the mother and the fetus. When the mother suffers, the fetus or newborn is vulnerable. Of the 13 million deaths each year in children under 5 years old in the developing world, 3 million occur in the first week after delivery. In addition, there are some 4 million stillbirths or late fetal deaths each year (WHO 1989b). These 7 million perinatal deaths are associated with maternal complications, poor management techniques during labor and delivery, and the woman's general health and nutritional status before and during pregnancy.

If a woman dies, the effect on her fetus or newborn is devastating. The overwhelming majority of pregnancies that end in a maternal death also result in fetal or perinatal death. Among infants who survive the death of the mother, fewer than 10 percent live beyond their first birthday (Koenig and others 1988; Chen and others 1974).

Even if a woman does not die, the effects of a complicated birth are also staggering. Antepartum hemorrhage, eclampsia, and other complications—excluding abortion—are associated with at least 1.5 million perinatal deaths each year in developing countries, plus

considerable suffering and poor growth and development for those infants who survive. Poor management during labor and delivery is associated with an additional 1.5 million perinatal deaths and many more developmental impairments among children (MotherCare 1991). For example, birth asphyxia, a lack of oxygen before birth or in the first minutes of life, kills or causes brain damage—most notably cerebral palsy—to more than 2 million children each year (CAMHADD 1990).

At least 3 million additional perinatal deaths and an unknown number of infant deaths are associated with women's health problems during pregnancy (WHO 1989b). Countless more infants who survive suffer consequences from their mother's ill health. For example, women suffering from malaria in Sub-Saharan Africa give birth to an estimated 3 million severely underweight babies (USAID 1991).

Similarly, women with poor nutritional status (short stature, low pre-pregnancy weight, inadequate weight gain during pregnancy, and anemia), reproductive tract infections, or other infections during pregnancy are more likely to deliver a low-birth-weight infant. Of the estimated 25 million low-birth-weight babies born each year worldwide, 24 million are in developing countries (WHO and UNICEF 1992). The perinatal mortality rate for low-birth-weight babies is five to thirty times higher than for fetuses or infants of normal weight. Low-birth-weight infants who survive may have serious neurological problems and hearing and visual defects and may be subject to slow development throughout life. Low-birth-weight girls are of special note: they are less likely than boys to catch up, because they are fed less, marry early, carry a heavy workload, and spend a considerable portion of their lifespan in pregnancy and lactation. Persistent low nutritional status and high energy expenditure predispose such girls to bear low-birth-weight babies themselves, passing the problem on to the next generation (Garcia and Lofti 1991).

A woman with HIV has a 25 to 40 percent chance of passing the infection on to her fetus in the womb or at birth. Using a 25 percent transmission rate, the World Health Organization (WHO) estimates that 4 million infants of HIV-infected mothers will have been born by the end of 1992 in Sub-Saharan Africa, and nearly a million are expected to be infected at birth (Chin 1990). The progression of HIV to AIDS in children is less well-documented than in adults, but according to WHO, 25 percent of the children born with HIV will be diagnosed with AIDS in the first year and 80 percent by the fourth year. As death follows about a year after diagnosis of the disease in children in Africa, 80 percent of those infected at birth—800,000 children—are not likely to survive to their fifth birthday (Chin 1990).

Effects on the Household and Community

The death of a woman of reproductive age can bring economic hardship to a family in poverty. At least one-fourth of male-headed households rely on female earnings for more than half of total income (Agarwal and others 1990). The situation is worse when a woman who dies is the head of a household. Women are estimated to be the sole breadwinners in one-fourth to one-third of the world's households. In India, for example, women head one-third of all families below the poverty line (World Bank 1991).

The family loses not only the woman's contribution to household income, but also her contribution to household maintenance. Women in Africa produce most of the food necessary for a household; women in Bangladesh raise vegetables or small animals, despite their seclusion. It is the woman who cooks for the family, fetches water from a tubewell or pond,

cleans the house, disburses food, and cares for the children, the sick, and the elderly at home. It is estimated that if women's unpaid household labor were enumerated, the gross national product of most developing countries would increase by about one-third (Sivard 1985). And if the work performed by women were given monetary value, the death of a woman of reproductive age would translate into a substantial financial loss.

Barriers to Maternal Health Care

Despite the clearly demonstrated need for family planning and maternal health services, women often lack access to relevant information, trained providers and supplies, emergency transport, and other essential services. Furthermore, cultural attitudes and practices may impede women's use of services that are available. Decisions about whether to seek care are generally not the woman's alone, but are often made by the husband or mother-in-law (Thaddeus and Maine 1990; Huque and Koblinsky 1991).

Most pregnant women in the developing world receive insufficient or no prenatal care and deliver without help from appropriately trained health care providers. Only about half of the married women of reproductive age in the developing world practice contraception. In some countries in Africa, family planning and maternity care coverage is less than 10 percent (WHO 1992e). Even in countries with relatively well-developed health systems, preventable maternal morbidity and mortality persist. A study of four institutions in Mexico City classified 85 percent of the maternal deaths examined as potentially preventable; clinical or surgical misjudgment was blamed for more than eight out of ten of the preventable deaths (Bobadilla 1992).

Lessons Learned

The significant reduction of maternal mortality—in an industrial or developing country—requires an active effort, one that can be managed with limited resources. Past macroeconomic growth in industrial countries did not, by itself, reduce maternal mortality. Increased availability of midwives trained to assist in home deliveries and the introduction of aseptic techniques led to a dramatic decline in maternal mortality in Sweden in the eighteenth and nineteenth centuries (Högberg and Wall 1986, Högberg, personal communication 1992). In the 1930s, maternal mortality fell in England, the Netherlands, and other European countries when antibiotics for infections, blood transfusions for hemorrhage, and improved surgical techniques for cesarean section became available (Loudon 1991). Modern family planning and safe abortion services later reduced maternal mortality further.

Socioeconomic improvements are no substitute for family planning and quality health care during pregnancy, delivery, and postpartum. Even in an industrial country, the morbidity and mortality associated with pregnancy and childbirth are high if obstetric care is not used. In the United States, in 1983, well-nourished, well-educated, and relatively affluent women of a fundamentalist religious sect had a maternal mortality ratio of 872—compared with a national level of 8—per 100,000 live births because they did not believe in obstetric or other modern medical care (Kaunitz and others 1984).

If a developing nation allots scarce resources appropriately, relatively low maternal mortality rates can be achieved. Appropriate services need to be easily accessible to all pregnant women, or pregnant women must be able to move closer to them when necessary.

Concentrating medical attention only on women identified as at risk has not proved effective. This is because the criteria for risk are often broadly defined and are not closely linked with adverse outcome. Recent studies have found that most of the women who are identified as having "risk factors" do not actually develop life-threatening complications and that a majority of pregnancy-related deaths result from unpredicted complications, that is, among women not identified as "at risk." Thus, risk screening is useful only when based on demonstrated risk factors and combined with monitoring, referral, and prompt treatment to deal with complications as they develop, whether predicted or not (see box 2.2 in chapter 2).

In a study of non-hospital birth centers in the United States, about one of thirteen "low-risk" women—who had an average of eleven prenatal visits—developed a serious complication (Rooks and others 1989). In Zaire, a study to predict complications during pregnancy found the best predictor was a history of problems in previous pregnancies. These women were nine times more likely to suffer obstructed labor. Still, more than two-thirds of the women with obstructed labor had been identified as low-risk (Maine 1991).

In Guatemala, referral following prediction by traditional birth attendants of complications based on demographic risk categories—for example, age or the number of previous deliveries—would overwhelm the service delivery system. Instead, a project in the rural highlands bases referrals on the detection of complications of pregnancy or delivery. There are no certified midwives at health centers in Guatemala who can assist with prenatal screening (Schieber 1991).

In a rural subdistrict of Bangladesh, maternal mortality has declined substantially in the past ten years because of new approaches to family planning and maternity care. An effective community-based family planning project has raised contraceptive prevalence to above 50 percent in the study area—compared with 23 percent in the control area—and reduced the maternal mortality rate (maternal deaths per 100,000 women of reproductive age) by about one-third. Family planning succeeded in decreasing total pregnancies, and thus the number of pregnancy-related deaths, but did not change the risk of death faced by women, once pregnant (Fauveau 1991).

In addition, an effective community-based maternity care project—added to the family planning program—reduced the risk of dying once pregnant (the maternal mortality ratio) by two-thirds. The combination of basic family planning and maternal care cut the maternal mortality rate by more than one-half. The maternity care project posted trained midwives in the community to assist women with births in their homes, if requested. The midwives provided prenatal care, carried supplies to stabilize or treat women with complications, and had access to transport and referral services for cases they could not manage (Fauveau 1991).

Other projects have contributed knowledge about effective—and ineffective—interventions (appendix 2). In Indonesia, training traditional birth attendants in the absence of skilled backup support did not decrease women's risk of dying once pregnant (Alisjahbana 1991). In the Gambia, a similar approach helped reduce excessively high maternal mortality ratios, but only to a still relatively high level. There, trained traditional birth attendants provided monthly prenatal care visits to pregnant women. Each woman was also examined by a physician and treated for any illness identified. While this care resulted in a reduction of the maternal mortality ratio from 2,230 to 1,052 deaths per 100,000 live births, it remained excessively high because women who developed complications during late pregnancy or delivery could not obtain the care they needed in time (Greenwood 1991).

In Ethiopia and Nigeria, maternal mortality was reduced through prenatal screening of demonstrated risk factors and identification of danger signs (see box 2.2)—provided by certified nurse-midwives working with traditional birth attendants at the health-center or community level. The screening identified women with poor obstetric histories, and very young and very short women giving birth for the first time, discerned existing medical problems or complications, and referred the women before the onset of labor (Poovan, Kifle, and Kwast 1990, Brennan 1991). In the program in Ethiopia, maternity waiting homes near a rural referral hospital or health center are successfully used by women who live far away. The community constructs and maintains the homes. Thus, men have contributed financing and labor and are thus more likely to allow their wives to use the facilities (Poovan, Kifle, and Kwast 1990).

In Zaire, women's lives have been saved by delegating essential obstetric care—cesarean sections—to nurses who were readily accessible to women during birth (White, Thorpe, and Maine 1987). In Kenyatta National Hospital, Nairobi, substantial health care resources were being used to manage incomplete abortions. After introduction of the manual vacuum aspiration technique, clients and providers have benefited from shorter hospital stays, better results, and costs that have been reduced by 23 to 66 percent. Given these substantial savings, a Ministry of Health task force developed a plan to extend manual vacuum aspiration training and service delivery to all Kenyan hospitals (IPAS 1991).

In Zaria, Nigeria, the incidence of women diagnosed at the district hospital with obstetric fistulae, a common consequence of prolonged labor, was alarmingly high. Prolonged labor also contributes to maternal mortality. A radio campaign was developed to alert women to the dangers of a labor lasting more than twenty-four hours. In the several years following the campaign, the incidence of obstetric fistulae decreased significantly at the hospital serving the area of the campaign. There was no corresponding decrease at hospitals outside the reach of the campaign (Harrison 1986).

In Lahore, Pakistan, a nongovernmental organization, the Maternal and Child Welfare Association of Pakistan, established a program to provide family planning and maternal and child health services to urban slum dwellers out of reach of public services. Over three years, the association increased the contraceptive prevalence rate by 50 percent and reduced infant and maternal mortality rates, relying entirely on indigenous organizational and financial support (MCWAP 1992).

In Tunisia, the Faculty of Medicine in Sousse has institutionalized postpartum care in the family planning and maternal and child health program. The doctor or midwife who attends the birth schedules as postpartum visit for the mother and infant forty days after the birth. (In Tunisia, this marks the end of the traditional period of seclusion of the mother and her newborn.) As a result, the proportion of women and infants who receive postpartum care as well as family planning and other appropriate health care has increased substantially.

Lessons from ongoing demonstration projects in developing countries confirm the need to ensure women's access to:

- Information and education to promote health practices for safe motherhood.
- Family planning services and appropriate abortion management (appropriate treatment for complications of unsafe abortion and safe services for pregnancy termination, where legal).

- Skilled assistance during pregnancy, delivery, and the postpartum period.
- Referral services and transport for complications and emergencies.

Although all safe motherhood programs in the developing world need these priority elements to reduce maternal mortality, the exact strategy developed by a country will depend on its requirements and resources. The model presented in the next chapter illustrates the events leading to maternal deaths and the factors that should be considered in developing strategies to save lives.

Chapter 2

Essential Elements of a Safe Motherhood Program

Maternal mortality and morbidity can be reduced to a certain extent through improved access to family planning, simple hygienic practices by trained birth attendants, and appropriate strategies to deal with unsafe abortion. Unlike most other aspects of public health, however, obstetric problems can only be effectively managed by continuous, active medical interventions. The health services must be able to use potent drugs (oxytocics and antibiotics), provide blood transfusions, perform obstetric surgery, and handle life-threatening complications. Moreover, because life-threatening obstetric complications are often unpredictable, maternal health services must be widely and rapidly accessible. It is the ordered development and rational management of an appropriate health infrastructure, along with behavioral changes and informed choices among potential consumers, that help make motherhood safe.

To illuminate the determinants of maternal death, the following conceptual framework outlines the linkages between maternal mortality and morbidity and their proximate, intermediate, and distant causes (figure 2.1). These include aspects of the social, cultural, and economic environment.

Factors Influencing Safe Motherhood

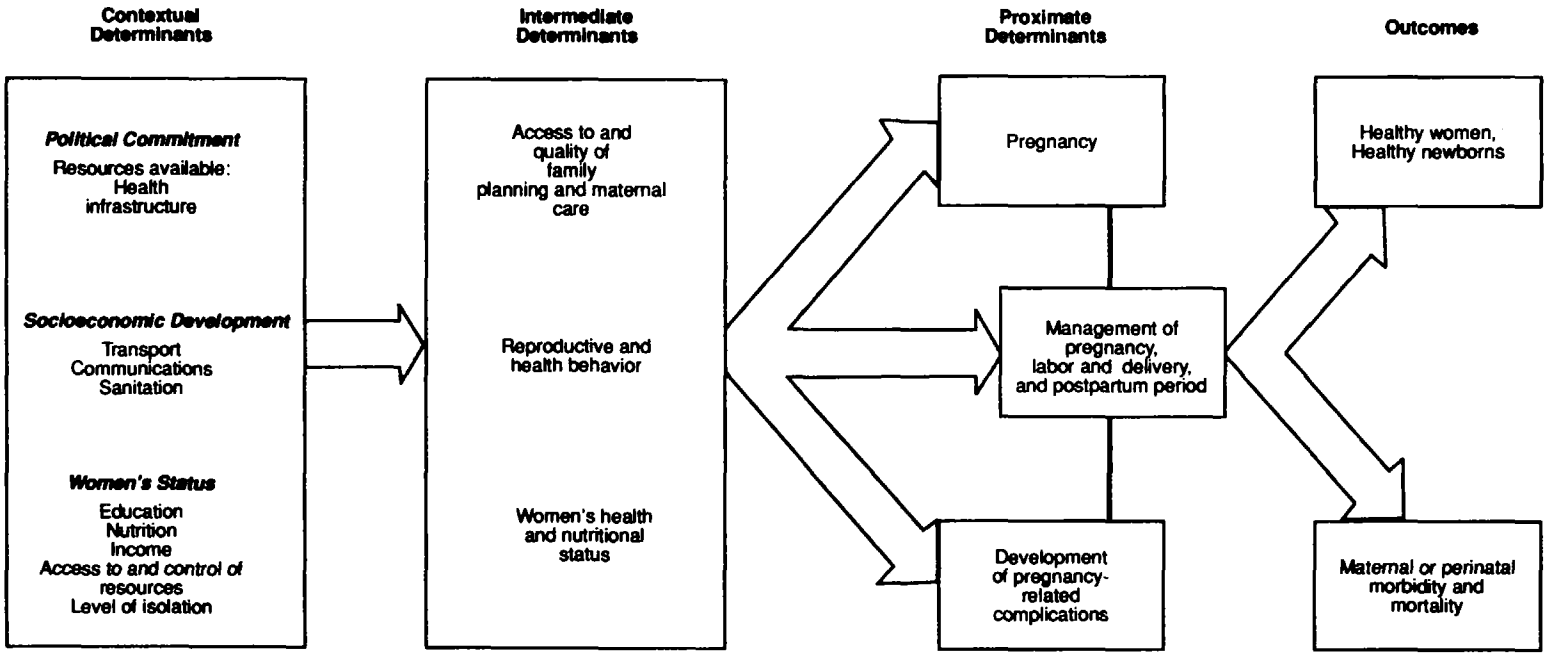
The important outcomes for a safe motherhood program are: prevention of maternal morbidity and mortality, recognition and treatment of complications as they arise, and the promotion of a healthy woman and healthy newborn. The proximate determinants of maternal morbidity and mortality include pregnancy; the development of pregnancy-related complications, including complications from abortion; and the management of pregnancy, delivery, and the postpartum period.

Family planning seeks to ensure that pregnancies are wanted and planned for, thereby reducing exposure to pregnancy-related risks. Maternal health care, which should start early in pregnancy and continue through the postpartum period, seeks to prevent the development of complications and ensure that they are managed appropriately if they do arise. These proximate determinants are affected by intermediate determinants, including access to quality family planning and maternal health care, women's reproductive and health behavior, and women's health and nutritional status. Reproductive and health behavior involves, for example, the age at which a woman becomes pregnant, whether the pregnancy is wanted, and what kind of health care the woman seeks.

Although the focus of safe motherhood is on pregnancy and birth, many conditions that affect pregnancy outcomes are determined before pregnancy—for example, women's nutritional status—and some consequences, such as uterine prolapse, extend beyond the postpartum period.

The intermediate determinants, in turn, are influenced by social factors such as women's status—education, access to and control of income and resources, and level of isolation—and

Figure 2. 1
Safe Motherhood
Conceptual Framework



Source: Adapted from McCarthy and Maine (1992).

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, contraception and health care use, and awareness of risks and danger signs. Women's income, access to household resources, and power to make decisions influence their ability to seek health and family planning services. Male attitudes toward reproductive issues also influence women's willingness and ability to use family planning and health services. Political commitment determines whether resources are used to make good-quality care accessible to those most in need—for example, through the development of transport and communications infrastructure to link women with referral services.

Although all factors in the framework are likely to influence maternal morbidity and mortality as well as the health of newborns and all women, some have greater impact in the short term, particularly on the incidence of maternal death. As noted in chapter 1, maternity care and family planning services—especially the management of emergency obstetric complications—have stronger effects on maternal mortality reduction than broad-based socioeconomic development.

Components of a Safe Motherhood Program

In a resource-poor environment with a weak health infrastructure, and where women's status is generally low, the most important immediate steps toward safe motherhood are improved family planning, appropriate management of induced abortions, and simple improvements in delivery practices—combined with community education. Even before obstetric referral services are reinforced, a relatively small investment can bring about a substantial return in saved lives and better health.

To achieve significant and sustained impact, however, maternal health care programs require effective action at several levels. A literature review and ongoing field projects point up three systems needed to support a safe motherhood program: community-based health care, a continuum of care from the community to the first-referral level, and an information, education, and communications system. And even if hospital delivery were available to all women, mechanisms still would be needed to identify, motivate, and transport women in danger. No matter how effective the community-based maternity care, some women will die from complications if not delivered or treated in a referral center or hospital. A recent study found that the incidence of pregnancy-related complications ranged from 27 percent in industrial countries to 44 percent in Sub-Saharan Africa (WHO 1992a).

A safe motherhood program must ensure that all women of reproductive age have access to essential maternal health and family planning services and make such services available close to all communities. Clinical skills in obstetric care, particularly midwifery skills, are essential. While some maternal health programs may rely primarily on doctors and traditional birth attendants, the midwife plays the critical role in saving mothers' lives. Some services are only offered in first-referral-level centers and thus require a telephone or radio communications and transport system to enable women's immediate access to emergency care. The private sector, nongovernmental organizations (NGOs), and government services all have a role to play.

Community-based Care

Community-based care emphasizes family planning, nutrition, hygienic practices, infection prevention and control, and identification and referral of complications. Care may be self-care, care provided by a family member, traditional birth attendants, community health workers, or a mobile outreach team from a health center. Community workers should be trained, supervised, and supported by staff from a health center. It should be noted that the skill level of traditional birth attendants will vary from setting to setting, with training in simple hygienic practices the minimum, and a broader range of tasks where the traditional birth attendant is better educated. Social marketing can help expand awareness and access by promoting and providing some services (for example, contraceptives, iron tablets, safe birth kits) through the private sector at subsidized prices.

Community-based care should include:

- Family planning counseling and nonclinical services.
- Prenatal, delivery, and postpartum care (including counseling on breastfeeding and appropriate newborn care) provided by trained health staff.
- Linkages between traditional birth attendants and skilled medical staff to identify pregnant women showing danger signs or at high risk of complications during labor and delivery and to determine and refer to appropriate site of delivery (box 2.1).
- Nutrition monitoring and supplementation, as needed, during pregnancy and lactation.
- A regular supply of contraceptives, safe birth kits for deliveries, iron and folate tablets, home-based mothers' records, and partographs where feasible.

Box 2.1 Danger Signs and Risk Factors in Pregnancy

A woman should be referred to a more highly skilled level of care for any of these signs:

- Vaginal bleeding.
- Edema (general swelling, especially in face and limbs).
- Fever and other signs of infection, such as severe headache or vomiting.
- Convulsions.
- Failure to gain weight.
- Extreme pallor.
- Labor longer than twelve hours.

These factors suggest that a woman is at high risk:

- Short stature, younger than eighteen years old, and having her first baby.
- A history of prolonged labor, cesarean section, postpartum hemorrhage, retained placenta, fistula, or stillbirth.

All traditional birth attendants and primary health care workers should be trained by a health center nurse or nurse-midwife, be supervised continually, and have ready access to a source of referral care.

Facility-based Care and Referral

The continuum of care should encompass health centers, first-referral facilities, and a communications system linking them.

Health center level and special role of the midwife. The health center is defined here as a facility staffed by a trained nurse or nurse-midwife, which offers facility-based and outreach services to the community in family planning and maternity care, including obstetric first aid. The midwife, or other health provider with midwifery skills, has the competence and skill—through formal training—to provide reproductive care as an independent and interdependent practitioner in the maternity care team. Some countries require that a midwife be licensed. The health center must also be linked with a first-referral facility whose staff provides supervision. All women should have *reasonable access*—within two to four hours—to a health center with a nurse-midwife (see appendix 3).

A health center should provide these services:

- Family planning counseling and a variety of contraceptive methods (oral contraceptives, condoms, and intrauterine devices).
- Safe abortion management (safe services where legal and detection and early treatment or referral of complications for any unsafe abortions).
- Detection of maternal problems and their management or referral, such as emergency care of severe preeclampsia and eclampsia.
- Normal prenatal and delivery care (including tetanus, toxoid immunization, and iron supplementation), labor monitored by a partograph, and postpartum care.
- Obstetric first aid—for example, sedatives for eclampsia, intravenous infusions, antibiotics, vacuum extraction, manual removal of placenta, oxytocics immediately after delivery to prevent or control postpartum hemorrhage—by trained staff with access to first-referral services.
- Routine care of normal newborns, identification and referral of neonatal problems, and counseling on early and exclusive breastfeeding.

First-referral-level facilities. First-referral facilities are defined here as hospitals or adequately equipped and staffed health centers with twenty or more beds. First-referral centers should be responsible for ensuring adequate family planning and maternity care services for women in their geographical area. All family planning services should be offered, as well as treatment for the complications of abortion. First-referral facilities may be complemented by maternity waiting homes for women who live far from the facility and have a history of severe health problems associated with pregnancy, to ensure ready access to skilled care if complications arise (see appendix 4).

First-referral centers should be capable of providing essential obstetric services 24 hours a day, including:

- Surgical obstetrics.
- Anesthesia.
- Medical treatment for sepsis, shock, eclampsia, and the like.
- Blood replacement.
- Manual procedures and labor monitoring (for example, manual removal of placenta, vacuum extraction, partograph).
- Management of women at high risk, specifically those who have had previous operative delivery and those at risk of obstructed labor.

- Family planning support, including surgical methods.
- Neonatal special care (WHO 1991a).

A referral and communications system. This should include telephone or radio communications to enable the community-based provider or health center to obtain medical advice and follow-up from the first-level facilities. In addition, emergency transport is needed to link communities and health centers to the referral facilities.

Table 2.1 (at the end of the chapter) details these tasks by type of service. Table 2.2 details these tasks by cause of maternal morbidity and mortality. For more information on family planning, prenatal care, and labor and delivery care, see appendix 1.

Information, Education, and Communications

All levels of the health system for safe motherhood can benefit from information, education, and communications activities. In addition to improving knowledge of family planning, maternity care, and nutrition, such activities can be used for advocacy, behavior change, and program support. Advocacy should increase awareness of the problem of maternal morbidity and mortality among decision makers to promote new or reformed policies. Communications can promote changes in attitudes and practices among women, men, and other health providers. And information, education, and communications program support informs people about maternity care services and motivates them to use the services appropriately.

There should be a clear mandate and strategy for information, education, and communication activities from the outset of project design. Information, education, and communication programs need to be based on research findings, well-designed, and consumer-oriented. The programs should be tailored to the local situation, with a focus on the viewpoints of women and maternal health care workers. Information, education, and communication messages should be targeted to modifying or strengthening practices.

Information, education, and communication strategies need to move beyond conventional health education to reach out to women who often do not use health services and who may have low literacy skills and differing perceptions of problems. The program should include both locally planned and run activities and a centrally run and managed component. Monitoring systems should be built into the program to detect problems—and budget allocated to correcting them.

The main target audience consists of the people whose behavior the information, education, and communications activities are trying to change—women and their husbands. Defining this audience and segmenting its critical groups, such as non-users of services—for example, adolescents—from users of services, is critical to program success. The secondary target audience comprises those who will help the primary audience change its behavior—health care providers, policymakers, and program managers.

The information can be communicated through health providers, written and pictorial materials, mass media, and other channels. The types of messages that information, education, and communication programs need to provide will vary according to the audience. For example, at the community level, the messages might focus on the need to improve family planning, maternal health, and nutrition behavior. Messages might promote appropriate use of maternity care services and "products," such as contraceptives, iron and folate tablets, safe-birth kits, and alternative birth facilities. Or, messages can inform

communities of the risks of adolescent pregnancy and unsafe abortion, danger signs of pregnancy, and where to receive help.

To health providers, the messages might be to promote beneficial practices in prenatal, labor and delivery, and postpartum care; discourage unhygienic delivery procedures and other harmful practices; improve sensitivity to social and cultural factors; and reinforce the maternal health messages disseminated to the community.

Policymakers and program managers might be educated about the need to develop comprehensive maternal health programs, allocate appropriate resources, and promote policy reforms that enhance women's status and their reproductive rights (see appendix 5).

Summary

Not all levels of service need to be utilized by every pregnant woman. Instead, a minimal level of care needed should be used—to save costs—with quick access to facilities that can manage complications. Staff at the community level need protocols that guide their work and allow each woman access to the first-referral level. Important decisions about the delegation of medical tasks need to be made—for example, the use of oxytocic drugs to prevent postpartum hemorrhage at home deliveries—and research may be required to assess the usefulness of a particular technology in a specific setting.

It is thus essential that policies be in place to ensure the availability and encourage the use of maternal health services. The next chapter discusses the design and implementation of safe motherhood strategies in three representative settings.

Table 2.1 Essential Safe Motherhood Functions by Level of Care

	Family planning	*Prenatal care*	*Labor and delivery care*	*Postpartum care*
Client	• Uses appropriate method of contraception as needed to prevent unintended pregnancy • Learns about timing, spacing, and other factors that affect reproductive risk	• Contacts health provider early in pregnancy • Gets nutritional advice, iron and folate tablets, and malarial prophylaxis • Gets tetanus toxoid immunization • Recognizes danger signs • Plans for possible emergency • Arranges for appropriate delivery care	• Promptly seeks appropriate referral or care based on danger signs • Delivers with trained attendant • Delivers under hygienic conditions	• Practices early and exclusive breast feeding • Allows for appropriate rest and recovery period • Practices good nutrition • Seeks postpartum checkup with trained provider • Plans future pregnancies • Contacts health provider for immunization of infant
Traditional birth attendant or other community health worker	• Provides family planning counseling and supplies (nonclinical) • Provides referral information for clinical and surgical methods of contraception and abortion, where legal • Counsels on dangers of unsafe abortion and refers women with complications of abortion	• Identifies pregnant women and maintains register of women of reproductive age • Counsels women on appropriate prenatal care and nutrition • Provides iron and folate tablets • Monitors arm circumference and refers undernourished women • Provides anti-malarials where necessary • Arranges appropriate delivery and maintains safe-birth kit • Recognizes danger signs and refers • Mobilizes community for emergency transport support	• Uses hygienic practices during delivery • Refers women suffering complications • Monitors mother immediately after delivery • Monitors newborns' vital signs and refers in emergency • Ensures warmth of mother and infant • Counsels mother on breastfeeding • Informs health center of delivery and arranges for postpartum visit of mother and child	• Counsels on nutrition and infant care, including immunization • Counsels on need for postpartum checkup • Refers women with postpartum complications, such as infection and hemorrhage • Visits new mother to advise on family planning methods

Table 2.1 Essential Safe Motherhood Functions by Level of Care (cont.)

	Family planning	*Prenatal care*	*Labor and delivery care*	*Postpartum care*
Health center or community nurse-midwife	• Counsels on family planning • Provides family planning services (clinical and nonclinical) • Manages complications of abortion • Provides safe abortion where legal	• Provides tetanus toxoid immunization • Provides prenatal screening, management, or referral for infections, anemia, and demonstrated risk factors or complications • Monitors arm circumference and/or weight, and targets supplemental feeding • Advises on appropriate birth attendant and site of delivery • Counsels on prenatal self-care, including nutrition, hygiene, and danger signs • Supports and trains community maternal health workers and traditional birth attendants • Manages maternity waiting home • Diagnoses, counsels, and treats AIDS, syphilis, and other reproductive tract infections	• Uses partograph • Provides obstetric first aid • Conducts routine deliveries and manages certain complications, such as postpartum hemorrhage (manual removal of placenta, oxytocics) and eclampsia • Refers complications, when necessary • Provides routine neonatal care and manages or refers complications	• Provides postpartum checkup for mother and child • Immunizes child • Offers postpartum family planning counseling and services • Counsels on maternal and child nutrition and breast feeding and provides supplementation to undernourished lactating women, as appropriate • Manages or refers postpartum complications
First-referral facility	• Provides family planning counseling and services for women and families • Provides surgical methods of contraception • Manages complications of abortion • Provides safe abortion where legal	• Provides prenatal care for women at high risk (such as previous adverse outcome or operative delivery) or with medical problems (such as severe anemia, diabetes, or rheumatic heart disease)	Provides: • Surgical obstetrics • Anesthesia services • Medical treatment for sepsis, shock, eclampsia, and the like • Blood replacement • Manual removal of placenta, vacuum extraction, partograph • Neonatal special care	• Counsels on nutrition and infant care • Offers family planning services and counseling, including surgical contraception • Manages postpartum complications

Table 2.2 Prevention and Treatment of Major Causes of Maternal Deaths by Level of Health System

	Abortion	*Anemia*[a]	*Hemorrhage*	*Hypertensive disorders of pregnancy*	*Obstructed labor*	*Sepsis*
Client	• Uses family planning • Uses safe abortion services, where legal • Seeks immediate treatment for complications of unsafe abortion and seeks referral care	• Uses iron and folate tablets	• Seeks immediate treatment for excessive bleeding	• Rests as needed • Knows danger signs of edema of legs, hands, and face, and blurred vision, and seeks skilled assistance	• Recognizes need for referral when labor continues beyond twelve hours	• Knows importance of hygienic practices and use of birth kit by attendant • Knows danger signs of prolonged labor and prolonged rupture of membranes over twelve hours
Traditional birth attendant or other community health worker	• Provides family planning information and nonclinical methods • Detects and refers complications	• Detects clinical signs of anemia and refers severe cases • Provides malaria protection • Provides iron and folate tablets	• Monitors prolonged labor and refers • Massages uterus and encourages early suckling by newborn to induce uterine contractions • Performs bi-manual uterine massage in cases of postpartum hemorrhage • Uses oral ergometrine/oxytocics immediately after delivery[b] • Refers complications	• Detects edema of legs, hands, and face, and refers • Promptly refers in cases of convulsions	• Refers cases of previous complications • Keeps women well-hydrated • Encourages women to pass urine • Does not use drugs • Notes changes of presentation of fetus in labor • Refers in cases of transverse lie • Refers in cases of labor over twelve hours • Monitors women of short stature	• Prevents or refers prolonged labor or prolonged rupture of membranes (over twelve hours) • Detects sepsis and refers • Conducts hygienic delivery (uses safe-birth kits) • Refers women with fever

Table 2.2 Prevention and Treatment of Major Causes of Maternal Deaths by Level of Health System (cont.)

	Abortion	*Anemia*	*Hemorrhage*	*Hypertensive disorders of pregnancy*	*Obstructed labor*	*Sepsis*
Health center or community nurse-midwife	• Provides safe abortion where legal, and manages complications of abortions with manual vacuum aspiration, antibiotics, and fluid replacements • Provides post-abortion counseling • Provides family planning services (clinical and nonclinical)	• Provides iron and folate tablets • Treats serious cases with supplementation of iron dextran • Counsels on appropriate use of iron-rich foods • Treats intestinal parasites and malaria	• Provides prophylactic oxytocics[b] • Catheterizes and performs controlled cord traction if postpartum hemorrhage and placenta are retained • Performs manual removal of placenta • Resuscitates and provides intravenous fluids • Refers if necessary • Organizes blood supply	• Counsels on rest and reduced workload • Monitors blood pressure and proteinuria • Uses diazepam as needed to control or prevent convulsions • Follows-up women detected with hypertensive disorders of pregnancy	• Monitors labor with partograph • Performs vacuum extraction, symphysiotomy, or forceps delivery, if trained to do so, or refers cases of labor lasting longer than twelve hours	• Provides antibiotics • Provides tetanus toxoid immunization • Uses intravenous fluid therapy, when necessary • Treats associated conditions • Monitors labor • Refers or performs vacuum extraction or symphysiotomy in labor lasting more than twelve hours
First-referral facility	• Provides vacuum aspiration • Manages complications • Provides post-abortion counseling • Provides family planning services (clinical and nonclinical)	• Improves diagnosis • Treats with IV/IM iron dextran, total dose iron infusion, or blood transfusion • Treats associated conditions such as intestinal parasites and malaria	• Provides blood replacement • Performs operative treatments • Provides oxytocics and catheterization	• Provides magnesium sulphate or diazepam or hydralazine • Manages seizures and prompt delivery	• Uses partograph • Performs cesarean section and symphysiotomy • Performs vacuum extraction	• Provides antibiotics, IV fluid therapy, evacuation of uterus, and surgical treatment of sepsis, as needed

a. Anemia is included here because, while not a direct cause of obstetric death, it is a significant contributing factor to death from hemorrhage and infection.
b. The feasibility of providing oxytocics at the community level is still under debate (see appendix 1).
Source: Adapted from WHO, Table 1, 1992-93 Workplan.

Chapter 3

A Strategy for Safe Motherhood in Representative Settings

This chapter is intended to enable planners and managers to assess maternal health needs and decide how best to allocate resources in different settings. This approach is presented while recognizing that there is no universal prescription for safe motherhood. Indeed, the mix of strategies that can be adopted is more variable than in other branches of public health: strategies must be adapted to the particular economic, epidemiological, demographic, infrastructural, and cultural conditions of different countries, and the conditions of different areas of any country.

Three Examples of Programs Designed for Local Conditions

This approach addresses the following question for each of three examples of settings: "What can be done to improve maternal health?" The three types of settings are points on the continuum from relatively resource-poor to resource-rich environments and reflect a range of levels of maternal mortality, women's isolation (including female education and exposure to health information, and influence in decision making), the capacity of the health system to deliver maternal health and family planning services, and the effectiveness of the referral system (figure 3.1). Setting A, for example, which has poor health infrastructure, lies at one end of the spectrum, while setting C, which has extensive infrastructure, lies at the other end. Criteria to distinguish settings have been selected to describe the present level of the maternal health problem (see table 6.1 in chapter 6).

Figure 3.1 The Maternal Health Environment in Three Settings

	A	B	C
Infrastructure:	Poor	<——>	Extensive
Women:	Uneducated, isolated	<——>	Educated, mobile
Family planning:	Unavailable	<——>	Available
Abortion:	Unsafe	<——>	Safe
Health center:	Unavailable	<——>	Available but underutilized
Delivery attendant:	Unskilled	<——>	Trained
Referral services:	Poor	<——>	Available but underutilized
IEC capability:	Poor	<——>	Available but underutilzed

Practicable interventions are listed, including policy issues, service delivery interventions, and communications strategies to promote behavioral change. These suggestions, however, are not a substitute for an assessment of local problems and options.

Setting A: Expanding Family Planning and Deliveries Attended by Trained Providers—Initial Safe Motherhood Activities Where Resources Are Scarce

In this setting, families and communities, mostly rural, are largely illiterate and have little access to information. Women are particularly isolated, uneducated, and powerless, valued mainly for their role as mothers—particularly of sons—and have limited income. Thus

women's nutritional and health status tends to be poor and their use of services limited, resulting in high fertility and high maternal mortality rates. Breastfeeding is almost universal and commonly continues for well over one year; it is likely to be the most important proximate variable for reducing fertility. No doctor, nurse, or nurse-midwife is readily accessible, as health centers are either unavailable or nonfunctioning. Family planning is essentially unavailable, unsafe abortion is common, and deliveries are performed outside the formal service structure by traditional birth attendants or relatives. A district hospital may exist but lacks the capacity—skills, equipment, and supplies—to respond to obstetric complications or provide supervision and backup for lower levels of the health system. Reaching the services that do exist is difficult because of lack of transport, geographic barriers, cost, traditions, language, poor education, ethnicity, or the community's negative perception of these services.

These conditions apply to much of South Asia and Sub-Saharan Africa, and to the rural Andean areas of South American countries—although there also are major distinctions among particular settings. In some, the population is widely dispersed (for example, Bolivia), whereas in others (for example, Bangladesh) the population is very crowded. This distinction should influence program options, particularly for communications and referral transport. Given high fertility, high mortality, and limited infrastructure and resources—which may prevent the development of comprehensive maternity care in the short term—community-based distribution of a limited range of contraceptives probably would be one of the most feasible and cost-effective initial steps in reducing maternal mortality.

Policy issues. Policy changes should focus on developing family planning and abortion management services as a first priority. Such measures might include:

- Promoting delayed age of marriage and fertility, improved education for girls, and better employment opportunities for women.
- Reaching a consensus to initiate or expand family planning services through community-based distribution, social marketing, and existing health facilities.
- Reaching a consensus on the need to educate women and men about optimum timing and spacing of pregnancies, the dangers of unsafe abortion, and the need to improve abortion management services—for complications of unsafe abortion and, where abortion is legal, the safe delivery of services.
- Revising regulations to enable family planning and maternity care providers to perform necessary tasks.
- Expanding the role of midwives through training and community-level deployment, with responsibility delegated for the medical treatment of obstetric complications.
- Helping to develop a communications program to raise awareness of danger signs and appropriate responses.
- Mapping the coverage of existing first-referral facilities and institutionalizing accountability for back-up support, supervision, and referral for designated geographic areas.
- Developing strategies for emergency transport to referral facilities.
- Facilitating the work of the private sector to complement the work of the public health system.
- Bringing the perspective of community leaders—especially women—into planning services and designing appropriate communications strategies.

Improved services. Improved family planning and maternity care services should include:

- Developing community outreach to identify women of reproductive age and providing them with family planning information and a variety of methods that can be obtained through community-based distribution—for example, condoms and oral contraceptives.
- Improving health communications capabilities.
- Training traditional birth attendants to use hygienic practices, refrain from harmful practices, and recognize women with demonstrated risk factors or danger signs and refer them to trained providers.
- Training outreach workers in family planning education about maternal health and nutrition, and breastfeeding promotion.
- Enabling health and community workers—once they are identified and trained—to provide some types of contraceptives (such as oral or injectable contraceptives and condoms); safe birth kits; iron and folate tablets; home-based mothers' records; and tetanus toxoid immunization.
- Linking community health workers with health center and first-referral-level staff who could meet with them periodically to assist with problem solving and be available to provide advice and backup.
- Upgrading skills of district-level—and, if available, health-center-level—medical officers, nurses, and nurse-midwives through refresher training and changes in basic training curriculums to enable them to provide family planning information and services and manage obstetric complications, including incomplete abortions.
- Equipping health centers or district hospitals to provide clinical contraception and manage obstetric complications (for example, vacuum aspiration, vacuum extraction, and blood transfusion).

Behavioral change. Policy changes and improved services—particularly information, education, and communication activities—should work to:

- Educate women and influential family members—such as husbands and mothers-in-law—about the benefits of family planning, especially the timing and spacing of births, sources of further information and contraceptive supplies, danger signs and demonstrated risk factors during pregnancy, labor and delivery and the postpartum period, dangers of AIDS and sexually transmitted diseases, and the appropriate use of services. In dispersed populations, this may require working through community organizations, such as women's organizations; mobile teams; and radio. In densely populated areas, community workers who go house to house, print media, and posters may be added channels.
- Educate women and families on the importance of prenatal care, especially early and late in the term, trained assistance at delivery, referral options, and healthy practices during pregnancy, delivery and the postpartum period—such as use of safe birth kits, hygienic delivery, and adequate intake of micronutrients and calories during pregnancy and lactation.
- Mobilize communities to organize for transport and referral in response to complications associated with pregnancy and delivery, including emergencies such

as postpartum hemorrhage. In dispersed populations, a private car, taxi, boat, or animal may need to be available, but in densely populated areas, public transport may be usable.

In summary, cost-effective interventions can be implemented that will meet any latent demand for family planning—reducing mortality related to pregnancy, childbirth and abortion by preempting unintended pregnancies. Family planning strategies need to take into account existing patterns of breastfeeding—not using high-dose oral contraceptives that may interfere with lactation—and should be built on up-to-date analyses of the risks and benefits of oral contraceptives and injectable contraceptives, including the risks of pregnancy. In setting A, for example, for all women, the choice of oral or injectable contraceptives will be much safer than having an unintended pregnancy.

The interventions that can make pregnancy and delivery safe are limited but important. Infections can be greatly reduced by teaching hygienic birth practices and providing tetanus immunization, but the sudden and partly unpredictable catastrophe of severe hemorrhage will be more difficult to solve. Educating the community on the need for an early response to danger signals and establishing an emergency transport system will help, but referral facilities (perhaps limited to a provincial capital) will also be needed to improve delivery services. For example, all medically qualified staff at referral centers who undertake surgery should be able to perform a cesarean operation. Clinical research in local settings may demonstrate the usefulness of an increased delegation of clinical responsibilities—for example, the routine use of oxytocic medicines immediately after delivery by a trained birth attendant at the community level. Where possible, increasing the numbers of trained midwives and deploying them to provide backup and supervision to traditional birth attendants—and a link to referral services—is likely to be cost-effective in these settings (see box 3.1).

Technically, providing safe abortion services and treating abortion complications are similar procedures. In both cases it is essential to completely empty the uterus by surgical means, although doing so is often much more difficult in the case of abortion complications, where blood loss and infection are common. Treatment by vacuum aspiration can be conducted without local anesthetic and, if needed, by trained nonphysicians. Post-abortion family planning counseling and access to services should be a priority to help prevent repeat unwanted pregnancies.

Policymakers will have to try to assess the true dimensions of unsafe motherhood, listen to the perspectives and perceptions of women and families, and involve a resource-poor community in the solution of its own problems, largely building on existing skills or infrastructure—including retail outlets—for the distribution of contraceptives, iron tablets, or safe delivery kits. Social marketing can promote the subsidized sale of contraceptives, iron tablets, and safe delivery kits. It can help make the strategy cost-effective, if backed up by messages on radio and other media.

Setting B: Upgrading Provider Skills and Strengthening the Referral System—Emphasizing the Use of Improved Services

Public maternal health and family planning services are available in rural areas but are rarely used. Similarly, in periurban and urban areas, public and private services are available, but

Box 3.1 Strengthening Maternity Services at the First-Referral Level in The Gambia

The Gambian Government, with donor support, has worked vigorously to strengthen the national health services, especially the weak maternity care system. It established a network of health centers, mobile teams, and village-based health workers, all supported by two referral hospitals. Through the British Medical Research Council, traditional birth attendants were trained to provide monthly prenatal care visits to pregnant women. Pregnant women were also examined by a physician and treated for any illness identified. While this package of prenatal care significantly reduced maternal deaths (from 2,230 to 1,053 per 100,000 live births), maternal mortality remained high. Women who developed complications during late pregnancy or delivery could not obtain the care they needed quickly enough because of the long and often difficult journey to the nearest hospital.

Improvements came in 1988 with the development of a strategy for strengthening prenatal care and the management of high risk pregnancies, expanding the referral and communication system, and establishing an efficient logistical supply system to ensure the availability of pharmaceuticals to all health facilities. Midwives and nurse anesthetists receive appropriate local training and have been given responsibility for family planning services and for most life-saving procedures in obstetric and perinatal care. Trainees are taught to identify "high-risk" mothers during pregnancy, labor, and postpartum care and to manage obstetrical complications, including cesarean sections, manual removal of the placenta, and treatment of postpartum hemorrhage. They are also trained in IUD insertion and management and control of sexually transmitted diseases.

These midwives, nurse anesthetists, and physicians are then assigned to the seven newly upgraded first-referral centers, which have been equipped to provide advanced obstetrical treatment and to handle emergencies, including blood transfusions. The centers are supported by two tertiary centers and, at the community level, by the combined services of traditional birth attendants trained to identify high-risk pregnancies and mobile outreach teams providing prenatal care. Maternity waiting homes have been established at two of the health centers for women who need to be close to a referral center because of the risk of complications.

The evacuation and communications systems are being upgraded to ensure timely transport for emergency evacuation of pregnant women. Ambulances are available at the seven health centers and at the key villages. Animal-drawn carts or boats are being used to evacuate women to a point where motorized transport is available. A radio communication network links the villages and health centers to the first-level referral system.

Maternal mortality at Royal Victoria Hospital, one of the two tertiary centers in the country, has declined since the this safe motherhood program began. Before, women frequently arrived at the hospital already at death's door; now many women arrive in sufficient time for treatment. And since the outlying health centers were upgraded to provide advanced obstetrical treatment, the total number of pregnant women referred to the hospital has dropped.

are underutilized. In rural areas—for example, in Indonesia and Zimbabwe—most deliveries are performed by birth attendants, trained or untrained, who remain isolated from referral services. The average duration and extent of breastfeeding may be falling. Sexually transmitted diseases and HIV/AIDS are often increasingly important problems. The health system does provide rural communities with primary health services—child immunization, for example—that are well-utilized. Family planning services are available, but the use of contraceptives is low or unsystematic and fertility remains high.

Health centers are generally staffed by a medical assistant and a licensed nurse-midwife. Health centers can provide routine care for normal pregnancies and deliveries, but screening, early case detection of obstetric complications, management of complications, and referral remain ineffectual because of poor-quality care. The infrequent use of maternal services may also be because of the cost of care, a lack of awareness of the benefits of care, a lack of awareness of danger signs of certain complications of pregnancy, or other factors such as traditions, language, and poor health education, despite widely disseminated health messages. Those most needing services are least likely to seek care. Many women, especially

the young and unmarried, resort to unsafe abortion. As a result, and because of the low use of obstetric services and poor quality of these services, pregnancy-related deaths remain relatively high.

Policy issues. Policy measures should enhance and formally coordinate available services. This would mean:

- Reaching consensus to enhance family planning coverage and choice by providing a wide range of reversible and permanent methods through social marketing, community-based distribution, and clinical methods at health centers and hospitals.
- Reaching a policy consensus on the provision of abortion services and the provision of care for incomplete and septic abortions and postabortion family planning.
- Ensuring referral and supervisory linkages between the community, health center, and hospital levels and developing protocols detailing responsibilities for family planning services and obstetrics, including the management of complications at each level of care.
- Considering developing maternity waiting homes near referral facilities for women from rural areas.
- Authorizing the delegation of medical responsibilities, such as IUD insertion, manual removal of the placenta, or symphysiotomy, to accessible skilled staff and training and licensing staff to carry out associated tasks.
- Ensuring logistical support for referral—for example, communications and transport—through inter- and intra-sectoral coordination of public service organizations in rural areas and of public and private organizations in urban or periurban areas.
- Bringing women's perspectives into service planning and communications design and engaging men and health providers in this dialogue.
- Encouraging the work of the private sector and expanding the resources provided to nongovernmental organizations—to encourage cost recovery and build on the competitive advantage of each sector, including provision of subsidized services to marginalized groups.

Improved services. Improved services should include:

- Enhancing the quality of family planning programs by making available a variety of methods, appropriate counseling, and follow-up through several distribution channels.
- Ensuring the availability of services to treat abortion complications; provide safe services, where legal; and provide postabortion family planning services.
- Enhancing primary health care to ensure provision of tetanus immunization to all women of reproductive age; strengthen health, nutrition, and family planning education; and provide iron and folate supplementation, home-based mothers' records, and safe birth kits for all pregnant women.
- Improving the basic training and using refresher training to upgrade the skills of providers—at health centers and district hospitals—in family planning; management of abortion, if legal, and treatment of abortion complications; prenatal screening;

early case detection of obstetric problems; and management, treatment, counseling, and appropriate referral.

- Equipping and staffing referral facilities based on mapping to assure geographic coverage, 24-hour service, and accountability.
- Improving the access of rural women to referral care, possibly through use of maternity waiting homes near district hospitals.
- Strengthening the distribution system for drugs, supplies, and equipment.
- Designing special programs for adolescents and other neglected groups—such as prostitutes and the very poor and isolated.

Behavioral change. Interventions to improve health behavior should include:

- Designing and implementing a communications program that aims to expand use of family planning and maternity care services, as well as improve awareness of pregnancy-related danger signs and the dangers of AIDS and sexually transmitted diseases.
- Mobilizing communities to organize appropriate transport and referral systems for maternal complications.
- Educating mothers, husbands, and families about healthy practices during pregnancy, delivery, and the postpartum period, specifically about family planning, safe birth kits, hygienic labor and delivery, the need for tetanus toxoid immunization, and nutrition.
- Enhancing health providers' awareness of the cultural, psychological, and social aspects of family planning and reproductive health.
- Improving providers' attitudes and practices.

Opportunities for social marketing and cost recovery for services are greater in this setting than in setting A, but charges for curative health care—for services other than maternal and child health and family planning—should be instituted first. Caution is also needed to ensure that fees do not reduce the use of essential safe motherhood services. Compared with setting A, the over-the-counter trade—particularly through pharmacies—becomes more important. At the same time, community-based distribution or special outreach programs may remain the only way of helping poor and isolated populations, or the most socially disadvantaged in expanding urban areas.

Educating families about breastfeeding and monitoring the marketing of milk formula in accordance with the WHO Milk Formula Code become especially important, as rapid and unnecessary changes in breastfeeding practices jeopardize the health of infants and undermine any rise in contraceptive prevalence. And clinical family planning services achieve a wider coverage, methods requiring higher levels of skill and equipment—such as IUDs and surgical contraception—are more widely used. So, the appropriate delegation of clinical services, such as insertion of IUDs by midwives, often remains a key to success (see box 3.2). Without a strong commitment to expanding and improving family planning services, abortion rates are likely to rise as more and more women resort to whatever means available to control their fertility for the first time.

The challenge to provide safe, accessible family planning, abortion management, and maternal care services is augmented in this setting. Life-saving interventions, such as

Box 3.2 Expanding Service Delivery and Upgrading Midwifery Skills in Zimbabwe

Zimbabwe has made impressive gains in providing health services to its 10 million people since its independence in 1980. The rural population has access to basic health care services, over 80 percent of children are fully immunized, malnutrition has declined substantially, and water and sanitation is being provided to rural areas throughout the country. Contraceptive prevalence of over 40 percent of women of reproductive age is the highest in Sub-Saharan Africa. Nevertheless, there are still underserved populations. Maternal mortality rates remain unacceptably high for rural women. Although more than 90 percent of expectant mothers attend prenatal clinics, over 30 percent of the deliveries are unattended. The leading causes of maternal deaths are infection, hemorrhage, and abortion.

The government has emphasized primary health care. It has organized public and nongovernmental institutions plus some private facilities into a four-tiered system of national health service delivery. The program, supported by a donor consortium, aims to strengthen maternal health by improving coverage of prenatal, delivery, and postnatal services, ensuring that rural health facilities are properly equipped and staff adequately trained to offer a full range of preventive and outpatient care, including uncomplicated deliveries. Communication and transport links are being strengthened for referring patients to higher levels of care.

To better understand the problem of maternal deaths in Zimbabwe, the Zimbabwe Medical School is conducting a community-based study on maternal mortality. The program provides improved access to safe deliveries through trained nurse midwives and a quality referral system and emergency obstetric care. The project is strengthening training in midwifery skills for nurses, midwives, and community midwives. The aim is to increase the number of nurses trained in midwifery by 50 percent overall and by 60 percent in rural health centers. (World Bank 1992)

cesarean operations for obstructed labor and blood transfusions for hemorrhage, become more frequent. Nevertheless, the pressure on maternity services still makes it worthwhile to explore other possibilities, such as symphysiotomy, which may be delegated to lower levels of the health system. Policymakers should regularly review clinical practices and should never allow perfection to become the enemy of the achievable.

Logistics are likely to be uneven because of the differences in infrastructure across the country, and special attention must be given to ensuring that ruptures do not occur in the supply lines for medicines, disposable equipment needed for obstetric care, and contraceptives. Communications strategies will be more sophisticated than in setting A because of more diverse and widespread media coverage, and commercial advertising agencies that have proven skills might be appropriately subcontracted by governments and nongovernmental organizations to provide related services.

Setting C: Maximizing Women's Access to and Efficient Use of Reproductive Health Services

In urban settings, women may not have a high level of education but tend to be mobile and have access to information—for example, in Brazil, Jamaica, and Mexico. Fertility and mortality levels are relatively low. Public and private maternal health services are widely available for most sectors of the population, and institutions—primarily hospitals—are the venue of choice for delivery and selected family planning services. This is in contrast to setting B. Despite widely available general practitioners and nurse-midwives, a high proportion of women elect to deliver in hospitals, because the hospital can provide the highest level of care. Thus, referral hospitals tend to be over-used by those at low risk and under-used by those at high risk: the most socioeconomically disadvantaged women tend to deliver at home without adequately trained assistance, as in settings A and B.

Contrary to women's beliefs, however, medical facilities, which have become overstretched by demand, fail to provide high-quality, supportive care for family planning, routine deliveries, abortion management, or obstetrical emergencies (see box 3.3). Furthermore, the overuse of certain procedures in hospitals, such as fetal monitoring and cesarean section, carries unnecessary health risks and costs. Prenatal screening is poorly linked to action, and referral is generally weak. The failure to provide adequate family planning or maternal care often stems from inadequate training, a lack of supportive supervision, and a lack of job descriptions and standardized protocols. Options for changing the venue or person providing family planning, safe abortion management, or routine delivery care are strongly tied to policy and the organization of health services. Although many methods of family planning are available through the public and private sectors, the poor may still lack access to services and—in those countries where abortion is not legal—the use of unsafe abortion remains high, especially among adolescents and recent migrants living in periurban areas. Given relatively high rates of contraceptive prevalence and consequent low fertility, improving the quality of maternity care is likely to be the priority intervention for further improvement in maternal health. In the states of the former U.S.S.R. and Eastern Europe, however, excessive reliance on abortion—as virtually the only method available for birth prevention—creates an additional problem. In those countries, expanding access to contraceptive methods should be a priority.

Policy issues. Policymakers should expand the focus beyond family planning and basic maternity care to decentralize services and redirect women to appropriate levels of care. Policymakers should thus:

- Reach a consensus on the provision of abortion services, ensuring effective care for incomplete and septic abortions and post-abortion counseling and services.
- Establish a systematic continuum of care, with routine services decentralized to the community level, referral services provided at appropriate facilities, and hospital care reserved for those whose health conditions require it most.
- Institute provider accountability for maternity outcomes.

Box 3.3 Jamaica: The Importance of Quality Care

In Jamaica, a semirural country of 2.4 million people, the maternal mortality rate remains high, at 102 per 100,000 live births. The most common causes of mortality are hypertensive diseases of pregnancy, hemorrhage, ectopic pregnancy, pulmonary embolism, and sepsis. High maternal mortality persists despite a relatively well-developed and physically accessible health infrastructure. High fertility is a problem among teenage girls. There are still widespread misperceptions about contraceptive methods. In addition to stress-related factors affecting women, such as unemployment, separation of partners, male promiscuity, limited availability of schooling for children, and violence, women suffer from poor nutrition, high blood pressure, and infections resulting from sexually transmitted diseases and inappropriate care for abortions and childbirth.

A recent study found that while 90 percent of women receive some prenatal care, the quality of that care needs to be improved. Less than 30 percent of facilities regularly offer tetanus toxoid immunization, and few health centers have access to laboratory facilities. Women tend to receive the same moderately satisfactory care regardless of their level of risk. Referrals to the hospital are not made, and delays occur in starting drug therapy for pre-eclamptic women and in physicians' response to calls for aid in hemorrhage cases. Deaths from pulmonary embolism have been largely a consequence of insufficient attention to warning signs. (Walker 1986; Feifer 1990)

- Authorize delegation of medical responsibility—for example, IUD insertion or manual removal of the placenta—to more accessible providers, such as midwives, and train and license such providers.
- Develop a more comprehensive strategy for women's health, including expanding prenatal care to provide other reproductive health services, such as the prevention and treatment of AIDS and reproductive tract infections, and expanding nutritional screening and treatment.
- Promote policies to encourage breastfeeding in hospitals and the workplace.
- Emphasize diversification of family planning programs to meet the varying needs of women of different ages by providing services through a variety of channels—including private sector advertising and distribution, postpartum programs, and outreach to adolescents.
- Determine how to improve the cost-efficiency of programs through, for example, the establishment of cost-recovery schemes or cross-subsidization programs for public sector services, the institution of fees to discourage use of higher-level facilities when not needed, or privatization of services at all levels for those able to pay.
- Encourage the development of responsible private sector and nongovernmental organization services and provide regulatory monitoring.
- Bring women's perspectives into strategies for redirecting services and promoting healthy maternity care and reproductive health practices.
- Improve women's status through female education, employment, and the promotion of overall gender equality.
- Remove restrictions on private sector advertising of contraceptives and implement the Code of Marketing of Breastmilk Substitute promoted by WHO and other international agencies.

Improved services. Better services, tied to policy changes, should include:

- Using changes in basic training and refresher training to upgrade providers' skills in a full range of family planning services, management of abortion or complications from abortions, and comprehensive obstetric and broader reproductive health care.
- Strengthening and integrating broader services for women's health, to address other problems of nutrition, sexually transmitted diseases, AIDS, other infections, and cancers, as appropriate.
- Improving the efficiency of service management, instituting maternal and perinatal death audits, and coordinating feedback and systematic supervision between the hospital and community levels to ensure the quality of all available maternal services.
- Shifting provider focus toward enhanced quality of care—such as case management and counseling—for family planning and maternal care, with special attention to marginalized groups, such as adolescents.
- Reducing excessive medical intervention—such as cesarean section.

Behavioral change. The desired behavioral changes include:

- Promoting awareness and the use of alternative prenatal care and birthing facilities to divert women needing only routine care from hospitals.
- Influencing providers toward the preventive and promotive perspective of safe motherhood and away from more advanced technologies for treatment.
- Developing community-oriented messages to redirect the use of services and to inform adolescents and other vulnerable groups about family planning, health practices during pregnancy, labor and delivery, and the postpartum period, and the dangers of AIDS and sexually transmitted diseases.

In setting C, all women should have access to cesarean sections and blood transfusions, when needed. Unhygienic, traditional deliveries should practically disappear. A key issue facing policymakers and program managers is to ensure that services are not overloaded; this usually means encouraging the use of private practitioners and private clinics, possibly introducing fees for certain public services, and instituting quality assurance mechanisms in the health profession, such as confidential enquiries into maternal deaths. Establishing birthing centers with close access to hospitals has proven cost-effective in countries such as Mexico. More reliable vital statistics should be available than in settings A and B, although abortion deaths may continue to be underestimated.

A higher proportion of family planning and health costs are likely to be met by consumers, who now benefit from a wider variety of distribution channels and a full range of contraceptive choices. Abortion policies and techniques can be expanded beyond those found in setting B. The private and public sectors may need to review and upgrade the quality of outreach and preventive education and condom distribution through sexually transmitted disease clinics and other channels, particularly because the heterosexual spread of HIV/AIDS is becoming more common.

Health communications strategies are also likely to involve complementary public and private sector activities. Policymakers should ensure that no arbitrary rules restrict the commercial advertising of contraceptives. The public sector will need to maintain scientifically informed education on the nutrition of infants and pregnant women, and health practices related to pregnancy, breastfeeding, sexually transmitted diseases, and AIDS—sometimes in the face of false information from the media or misinformed public perceptions in a modernizing society (table 3.1, at the end of the chapter, summarizes possible interventions in the three settings).

Critical Issues for All Developing Countries

Based on maternal health assessments in several countries, five important factors are known to be shared across all three settings. First, national and local political and financial support for improvements in women's health care must be generated. Second, access to and use of effective family planning and appropriate abortion management can almost always be improved and should not only be directed toward expanding coverage and options, but also to reach vulnerable groups—such as adolescents—and to improve quality. Third, a

knowledge of reproductive functions, awareness of danger signs during pregnancy, labor, delivery, and the postpartum period, and the appropriate actions to take once danger signs are noted, are typically lacking in every setting, among women, family members, community leaders, and providers, making IEC essential. Fourth, the availability and quality of services for obstetric complications—especially emergencies—is often inadequate, and is almost always the factor determining life or death. Last, no maternal health program can work effectively at only one level; a program is only as strong as the weakest link in the chain, from community-based care to the referral level. Coordinating these levels of care is a major objective of a safe motherhood program.

The following tools are important for establishing safe motherhood programs: a phased-in implementation plan based on a thorough needs assessment; sound knowledge of the costs and effectiveness of interventions; the development—or strengthening—of a vital registration system that effectively records all births and deaths; and a monitoring and evaluation plan. Subsequent chapters deal with these elements.

Table 3.1 Possible Priorities in Three Settings Ranging from A, Weakest Health Systems, to C, More-Developed Systems

	Possible interventions	*Setting* A	B	C
Family planning	Reach consensus to initiate	X		
	Develop outreach or provide services	X		
	Establish community-based distribution	X	X	
	Establish social marketing	X	X	
	Increase coverage and choices of methods		X	X
	Enhance quality and follow-up		X	X
	Enhance efficiency of service delivery			X
	Promote breastfeeding	X	X	X
Linkages with related health services	Strengthen linkages between maternal health and family planning	X	X	X
	Integrate maternity care with broader health services			X
	Enhance overall quality of care		X	X
Extension of maternity services	Determine a strategy to extend coverage of prenatal and obstetric services (midwives, maternity waiting homes, first-referral facilities)	X	X	
	Implement special programs for marginalized groups		X	X
	Broaden resources for NGO participation in programs for under-served groups	X	X	
	Develop maternity waiting homes		X	
	Decentralize services (maternal and child health clinics, birthing centers)			X
Family planning and maternal care training	Train outreach workers for case identification and referral	X		
	Upgrade providers' skills at all levels (traditional birth attendants, midwives, nurses, physicians)	X	X	X
Essential obstetric services	Equip and supply district hospitals or health centers to manage obstetric complications	X	X	
	Ensure services for abortion and/or abortion complications	X	X	X
	Reduce excessive surgical procedures (such as cesarean section)			X
	Upgrade providers' skills at all levels	X	X	X
Distribution of medical supplies	Strengthen drugs and equipment distribution system	X	X	X
	Provide safe birth kits for all deliveries	X	X	
	Provide iron and folate tablets to all pregnant women	X	X	X

Table 3.1 Possible Priorities in Three Settings Ranging from A, Weakest Health Systems, to C, More-Developed Systems (cont.)

	Possible interventions	*Setting* A	B	C
Immunization program	Extend tetanus toxoid immunization, particularly to pregnant women	X		
	Enhance tetanus toxoid immunization coverage to all women of reproductive age		X	X
Organization and management	Establish phased planning, needs assessments	X	X	X
	Assure functioning referral systems	X	X	X
	Develop or strengthen vital statistics registration system	X	X	X
	Establish and strengthen linkages—health centers and hospitals	X	X	X
	Train, license, and delegate to health provider staff	X	X	X
	Coordinate referrals through public, private, and NGO structures		X	X
	Incorporate women's perspectives into service structure	X	X	X
	Establish home-based mothers' records	X	X	
	Improve management, supervision, and efficiency		X	X
Resource mobilization	Mobilize communities for transport and referral	X	X	
	Encourage commercial marketing and cost-recovery		X	X
	Privatize routine services			X
Behavior change	Enhance provider understanding of complications	X	X	X
	Educate mothers, men, and families and other decisionmakers to the danger signs and the importance of seeking care	X	X	X
	Educate mothers and families in promoting healthy practices	X	X	X
	Redirect service demand to appropriate level facility			X

Chapter 4

Policy and Planning Considerations

Despite recent attention to maternal mortality, maternal health has not been a priority for most governments, even in countries with formal maternal and child health programs. Although government health policies often stress maternal and child health and family planning, most health budgets allocate less than 20 percent to those programs—and most of this allocation is to child health (Herz and Measham 1987). A recent World Bank study, which compared an extensive range of possible interventions to reduce premature death and the burden of disease among adults and children, identified maternity care as one of the most cost-effective approaches—for adults and children. A package of prenatal care and safe delivery for pregnant women is the second-most cost-effective way to improve child health, the first being the immunization of infants against measles (Jamison and Mosley, in press).

When maternal health care and family planning services are inadequate, pregnancies cannot be planned and managed safely. This hurts women, households, and the economy. Women are one-third of the world's labor force and responsible for more than half of the food produced in the developing world. In the developing world, women are also expected to maintain the home and care for society's dependents—children and the elderly.

This chapter is intended to identify some policy issues that will need to be addressed as safe motherhood strategies are instituted in various settings. Policymakers and health planners need to consider several factors. The first concern should be the building of a commitment to safe motherhood among decisionmakers, opinion leaders, and potential program beneficiaries. Second, planners should establish policies and program strategies in the health sector that focus on maternal health and family planning and promote women's well-being.

A third consideration is the strengthening of intra- and inter-sectoral coordination of activities to improve women's access to maternal health, family planning, and abortion management services and to improve their social, economic, and legal status. Fourth, the planners should ensure the cost-effective and efficient allocation and management of resources for safe motherhood programs.

Building Commitment

Programming for safe motherhood requires that commitment be harnessed at the highest levels of the public and private sectors and that communities be involved during program development and management. Flexibility and initiative also are needed in the planning process to enable planners to tailor programs to each setting. The positive effects of strong country commitment are almost universally recognized as one of the main factors behind program success (Heaver and Israel 1986). And, a lack of commitment is one of the reasons most commonly cited for program failure. A review of safe motherhood activities in French-speaking Africa found that a lack of political commitment to reducing maternal mortality undermined efforts to strengthen safe motherhood programs (Azefor, Daly, and Leke 1991).

Commitment can be built in several ways. First, planners can build it through discussions with the government; local interest groups, such as women's organizations, health providers, and local political leaders; and communities. The discussions can include education and persuasion. Second, planners can change organizational processes and structures. The creation of a safe motherhood position or committee within a ministry of health may help those who are committed to the issue to influence those who are not and to establish program norms and procedures. In some countries, a safe motherhood committee has been successfully instituted, involving not only the ministry of health but also other relevant government sectors, legislative members, and nongovernmental organizations. Third, donors can use their sector analyses to influence government commitment to expand family planning and maternal health programs. Donor coordination at the country level can be used as a way to expand policy dialogue and strengthen national programs. Fourth, the conduct and dissemination of research on the scope and dimensions of women's reproductive health also can build commitment and provide quantitative and qualitative data that can be used to influence policy decisions.

Experience from family planning programs demonstrates that community commitment and participation of both women and men are essential to the success of maternal care and family planning programs. Listening to and talking with women offers the best way to find common ground between what health professionals think is best and what local women can and will accept. In many countries, husbands are the principal decisionmakers about whether and when their wives use family planning and maternity care. Communications and education programs can increase awareness of maternal health and motivate changes in behavior for family planning and maternity care among women and their families.

Planning Safe Motherhood Programs

During the planning and implementation of safe motherhood programs, it is important to recognize that the various components chosen for a given setting are closely interrelated. Safe motherhood services must be available to a woman from the primary health care level up through first-referral level obstetric care if there is to be a substantial reduction in maternal mortality. The development of one component without the simultaneous development—or carefully designed phasing—of related components could increase costs and diminish effectiveness. For example, if traditional birth attendants are trained to use birthing kits and to refer complications, the program requires a logistics plan for supplying the kits and developing the links to appropriate transport and first-referral care. It is also necessary to consider that some elements take longer to develop than others. For example, more time may be needed to identify and train staff for first-referral obstetric care than to train health staff who are already in place in primary health care units.

The following specific issues need to be considered in the development of safe motherhood policies and programs.

Needs Assessment

A review of a country's demographic and epidemiologic situation with respect to maternal morbidity and mortality is the first step in developing a safe motherhood program. Practices related to adolescent sexual activity, contraceptive use, abortion, pregnancy, childbirth,

nutrition, and newborn care must be understood. (The information that should be included in a maternal and perinatal health assessment is detailed in appendix 6.)

A needs assessment of the health infrastructure can identify facilities, equipment, and personnel that already support family planning and maternal care services—and related gaps. Health planners also need reliable information on sexually transmitted diseases, HIV infection, and the problems associated with unsafe abortion.

Although problems and available resources need to be assessed nationally and locally, some general themes will be found. In countries with high fertility and maternal mortality levels, for example, priority should be given to providing expanded family planning services, training community-based maternity care providers and strengthening referral linkages for complications. For areas typical of Latin America and some East Asian countries, lower fertility and maternal mortality rates likely will indicate that governments should focus on enhancing the quality, efficiency, and reach of maternal health services. In much of Central and Eastern Europe and in the states of the former U.S.S.R, the improvement of contraceptive availability and use is a major priority.

Adapting Existing Health Systems to Meet Women's Needs

Simultaneously, policymakers need to consider how the existing delivery system can be adapted to meet women's needs, and the special needs of particular population groups. This requires collecting information on women's knowledge, attitudes, and behavior, and building this information into program design. Information should also be collected on men to determine their priorities and behaviors when faced with family planning and maternity care choices. Adolescents and other often neglected groups—women in extreme poverty, those residing in remote rural areas or urban slums, unmarried women, certain castes or tribal groups, religious minority groups, and refugees—often fall outside the service structure, for geographic, legal, cultural, or other reasons. Specific strategies need to be identified to target services to such groups. Adolescents are of particular concern because they may not have access to contraception, are more likely to resort to abortion, and are biologically more vulnerable to such threats as eclampsia and obstructed labor. Sociocultural factors in many countries make adolescent pregnancy more complex and difficult to address. Communications and education strategies targeted at adolescents and other vulnerable groups can provide some of the information that will empower and motivate them to adopt better health, nutrition, and reproductive behaviors.

Strengthening the Health Infrastructure

The exact nature and scope of program activities required to reduce maternal mortality levels in a country will depend on the state of existing services. Policymakers need to determine the extent to which the health system can provide community-based family planning, maternal health care, and first-referral-level obstetric care. In some settings, the existing infrastructure is too weak to absorb additional services. For example, it may be counterproductive to integrate family planning services into the existing service delivery system if maternal and child health services are poor. In such cases, social marketing programs or community-based distribution systems, perhaps using NGOs, may be appropriate ways to integrate family planning with other community services and make information available at the consumers'

doorstep. Elsewhere, integrating maternal health services at the primary health care level may offer the best opportunity for promoting maternal health. Linkages between the levels of the health system—to provide a continuum of maternal care services for women—and also support, training, and supervision to maternal health providers, are essential. Many governments will need to strengthen their drug distribution to ensure supplies at all levels of the health system, as well as their health communications capabilities to support information, education, and communications activities.

Upgrading Health Facilities

All pregnant women are at risk of serious obstetric complications and must have access to emergency care when these arise. This requires that a first-referral-level facility—a district hospital or health center—be accessible to all women and equipped for essential obstetric functions. This may require building and upgrading health centers and hospitals. Mapping the existing facilities and defining each facility's region of responsibility will help promote accountability and identify where new facilities are most needed. Policymakers need to consider the availability of resources to build, repair, equip, and maintain health facilities for obstetric care.

Health facilities are useless unless there is an unbroken supply of equipment, drugs, and blood to carry out their functions. Delays in the provision of effective care once women have reached a referral facility, because of lacking supplies or equipment, can contribute significantly to maternal mortality (Thaddeus and Maine 1990). The simplest and most easily maintained equipment that is effective should be sought. Adequate training in equipment maintenance is as important as training in its use.

Maternity waiting homes may be a cost-effective option to overcome the difficulties of transporting women experiencing life-threatening emergencies, by bringing women within reach of hospitals before labor begins. There are costs to both women and the community that are associated with maternity waiting homes, however, and their acceptability to women has been shown to depend on community participation. Similarly, birthing centers may be a cost-effective option in urban areas where hospitals are overburdened by routine maternity care.

Upgrading the Skills of Health Providers and Delegating Responsibility

Safe motherhood relies on an adequate number—and quality—of primary and referral-level health workers. It also relies on the delegation of responsibility for medical treatment. Skilled birth attendants are *essential* to reduce maternal mortality. The International Confederation of Midwives, WHO, and UNICEF have recently concluded that midwifery is in crisis because there are not enough of them to support the primary level and provide life-saving skills pertinent to achieving the goal of reducing maternal mortality by 50 percent (WHO 1991). Furthermore, many midwives do not receive adequate education in their specialty to provide necessary emergency obstetric care (Walker 1992). In some contexts, therefore, significant improvements may be achieved by increasing the number of trained midwives, improving the midwifery skills of other health providers in the community, or providing outreach services from health facilities for maternity care. It is important that all staff whose skills have been upgraded through training have access to the necessary equipment and drugs and

receive adequate supervision within a short time after they complete training. Otherwise, they may lose the new skills and motivation they have acquired during training, because of a lack of practice or backup support.

Medical guidelines are sometimes too conservative to keep pace with new information, and the need to delegate responsibility to appropriate trained staff must be kept in mind. Successful delegation requires overcoming legislative and licensing obstacles, establishing new laws or regulations, conducting operations research, modifying basic training curriculums for health care providers, and—most important—ensuring supervision and accountability. In addition, skills training and delegation of maternity care functions must be based on the following elements: (1) the maternal health problems in a given community; (2) the perceptions and expectations of women and their families regarding maternal care; (3) the health worker actually assigned to maternal care in the district health system; (4) the most reliable, cost-effective type of health personnel who can be assigned to affect maternal mortality; and (5) the strategy for planning to provide safe maternity care (Kwast 1992).

Strengthening Intra- and Inter-Sectoral Coordination

Alarm and Transport Systems

Getting women to the nearest referral site when complications arise presents formidable problems in many developing countries. This problem can be tackled by bringing services closer to the people or people to services. Because of the costs of blood banks, laboratory facilities, and other obstetric functions, many countries will have to limit the number of such facilities and, instead, devote considerable attention to organizing an effective alarm and transport system—by improving roads, transport, and communications. Transport options—public or private—must be cheap, locally appropriate, and maintainable. Effective emergency transport systems may also be of general benefit to adult and child accident and injury victims. When ambulances or other vehicles are multipurpose, however, they may not be available where and when needed for obstetric patients. Strategies to ensure the full-time availability of such vehicles must be developed.

Women's Health and Status

To assure lasting gains in safe motherhood, the direct maternal health and family planning interventions must be complemented by efforts to improve women's general health, and educational and socioeconomic status. Safe motherhood can be an entry point for policies and programs designed to improve women's health and circumstances more broadly. This includes expanding women's access to education and training, providing them with opportunities to generate income, and working to eliminate some of the social, cultural, legal, and economic obstacles that prevent them from being able to make—and act on—decisions that influence their own sexuality and well-being.

For example, it is well documented that fertility falls most rapidly when women are educated—through the secondary level—and when effective, acceptable family planning services are available. Education encourages later marriage and greater use of contraception, thus limiting women's exposure to pregnancy and early childbearing (Schulz 1989). It is also likely that education helps reduce the risk of dying, once pregnant, by facilitating women's

ability to recognize health problems and seek care. This effect, however, has not yet been demonstrated clearly and would, in any case, be limited if women lack access to the medical care needed to manage complications.

The evidence suggests that female education, family planning, and maternity care operate synergistically, resulting in multiple, sustainable benefits, including a decline in maternal—and infant—mortality. A strategy combining these interventions in Sri Lanka led to a reduction in maternal mortality from 555 to 90 deaths per 100,000 live births in the last thirty years. Therefore, the Bank's policy and program support to increasing female education, particularly through the secondary level, is important in achieving the safe motherhood goals.

Maximizing Resources

Although the annual per capita costs of maternal health interventions alone are estimated (in chapter 5) at approximately $1, program cost implications will vary as a country moves toward industrialized health service delivery settings. Health planners and others with local experience will need to determine the effort and costs required to upgrade health facilities, train health care providers, and motivate the target population to use services. The costs of improving transport and communications systems will need to be considered. Improvements need not require mobilization of new funds where existing resources can be allocated more cost-effectively. In some settings, reliance on the private sector to provide some services may be efficient and allow public funds to be targeted to under-served groups. Private practitioners, pharmacies, and NGOs can also play important complementary roles in the organization, financing, and delivery of services.

Influencing Policy and Practice

Governments have a variety of policy instruments that can be used to promote safe motherhood programs. Some of these extend far beyond the usual activities of ministries of health.

Information, Education, and Communications

The use of information, education, and communications—to reach the public, policymakers, and health care providers—is fundamental to reducing maternal morbidity and mortality. Such activities can promote the development of—and encourage official support for—a comprehensive maternal health program and inter-sectoral coordination. They can also increase awareness of specific maternal health issues, such as adolescent pregnancy. A health communications strategy is an important advocacy tool for raising women's awareness of their entitlement to family planning and maternal health care services offered.

Regulation and Legislation

Government intervention may be needed to remove some legal barriers to the improvement of women's health status. Removing the legal constraints hindering access of unmarried women and adolescents to family planning services reduces the number of unwanted

pregnancies. Liberalizing abortion restrictions reduces the number of clandestine unsafe abortions. Legal reforms delaying age at marriage, changing inheritance laws, allowing teenagers to return to school after childbirth, and mandating female enrollment in education can be important steps for improving women's status, fertility patterns, and health. Delegation of responsibility for certain life-saving obstetric functions to midwives and nurses may require special legislation or state regulations.

Subsidies, User Fees, and Insurance

Sources and methods of funding safe motherhood services need to be determined as part of the structure for financing all health services in the country. Subsidies, user fees, and insurance are policy instruments available to the government to promote safe motherhood practices and—where appropriate—to discourage inefficient use of services. Subsidies can be effectively used for preventive care, including family planning, and some curative care services when such services produce gains for others—for example, maternity care benefits both mother and child. Subsidies for low-income women can be made available to private hospitals when they deal with obstetric emergencies. Subsidies or allowances can be provided to nurse midwives working in remote rural areas or urban slums. Community-based distribution or social marketing can be cost-effective ways of subsidizing family planning. Prenatal care, including tetanus toxoid immunization, can be exempt from charges—to encourage its use. Where insurance exists, coverage should include prenatal, delivery, and postpartum care.

Similarly, user fees for routine deliveries in hospitals where a high proportion of low-risk women elect to deliver in a hospital, despite other options, may help ensure that such scarce, specialized care is available to women at high risk or those suffering complications. Caution is needed, however, if fees are charged to low-income women. Recent research has shown that user fees, if not applied appropriately, can discourage use of essential health care services, especially by women (Ekwempu and others 1990). On a broader front, subsidies can be provided to girls to increase their enrollment in school.

The Role of the World Bank and Other International Agencies

The World Bank recognizes that good-quality maternal care and family planning services are key to successful human resource development. The World Bank's role in safe motherhood is to support member governments—in coordination with other international and nongovernmental agencies—in their efforts to formulate and implement policies and programs to reduce maternal mortality. This assistance involves policy dialogue, the strengthening of service delivery, and undertaking research (see box 4.1).

Principles of Bank Involvement

The Bank is committed to human resource development, poverty alleviation, and the promotion of sustainable growth. The reduction of maternal morbidity and mortality and expansion of socioeconomic opportunities for women are essential to achieving these goals. The Bank's strategy is to increase the quality and accessibility of maternal health and family planning services while also improving women's status in the longer term. The Bank has

Box 4.1 Innovative Approaches to Safe Motherhood: Examples from Recent Bank-assisted Projects

Bangladesh Fourth Population and Health Project (1991): This is a $600 million project financed by the Bank, numerous other donors, and the Government of Bangladesh. The project supports safe motherhood by strengthening family planning and other health services, including comprehensive maternal and neonatal health care; training traditional birth attendants; and upgrading health facilities to provide gynecological and obstetric services in urban centers and district hospitals.

Brazil Women's Reproductive Health Program (1991): Cofinanced by the Bank, UNDP, and the Government of Brazil, this $40 million project is designed to restructure the management and delivery of health services in northeast Brazil. The goal is to ensure the provision of prenatal, delivery, and postpartum care; family planning services; and screening and treatment for sexually transmitted diseases and breast and cervical cancers.

India Child Survival and Safe Motherhood Project (1991): Cofinanced by UNICEF, this project will serve an estimated 115 million poor women in rural areas and slums. The project supports the Government of India's Safe Motherhood Initiative by strengthening essential routine and emergency obstetric care at first-referral-level centers, strengthening community-based services by training traditional birth attendants and auxiliary nurse-midwives, promoting birth spacing and later marriage, and controlling nutritional anemia.

Indonesia Fifth Population Project (Family Planning and Safe Motherhood Project) (1991): This project supports the Government of Indonesia's program to lower fertility and maternal mortality. Through efforts involving the National Family Planning Coordinating Board and the Ministry of Health, it aims to improve the accessibility and use of family planning services, and to train and deploy community midwives, who will be based at the village level and will work with family planning workers, health workers, traditional birth attendants, and village groups to provide maternal care. The project uses IEC to target women, men, youth, and special groups with information about reproductive behavior and the role of women in the economy and society.

Niger Population Project (1992): Cofinanced with UNICEF and the Government of Belgium, this project will support the Government of Niger's efforts to increase contraceptive prevalence and reduce maternal mortality by strengthening the delivery of family planning and maternal and child health services. The program will improve access to—and the quality of—family planning services. It will also promote family planning and improvements in women's status by encouraging behavior that should reduce average family size and enhance women's capacity to participate effectively in socioeconomic development.

Tamil Nadu Integrated Nutrition Project II (1992): This project in India plans to integrate health and nutrition services to improve the nutrition and health status of preschool children and pregnant and nursing women. Part-time village workers will be trained and supported to improve their community's nutritional status.

Togo Population and Health Sector Adjustment Project (1991): This credit supports a comprehensive package of sector policy reforms that emphasize basic health and family planning services, particularly for poor and vulnerable groups. The project supports safe motherhood by improving the quality and accessibility of prenatal, delivery, and postpartum care, and encouraging NGO participation in maternal and child health and birth spacing programs.

three priorities for lending in this area—accessible family planning information and services, safe pregnancies, and increased opportunities for women.

Assuring that quality family planning information and services are available. Bank projects are designed to increase the coverage and effectiveness of family planning services worldwide. In addition to its health and economic benefits, family planning allows women more choice and opportunities.

Ensuring that each pregnancy is as safe as possible. The Bank can provide direct assistance to health programs by increasing training and deployment of midwives and other health care providers; strengthening community-based services for prenatal, delivery, and postpartum care; helping governments to establish or upgrade referral facilities to treat obstetric

complications; supporting efforts to strengthen transport and communications systems to link women with family planning services and maternal health care; and expanding programs to address women's health needs throughout the lifecycle. The Bank, because of its substantial lending program, may be better situated than other multilateral, bilateral, and nongovernmental agencies to provide help with investment in the health infrastructure.

Increasing opportunities for women. Education of girls is critical in breaking the vicious circle of poverty, ignorance, early marriage, high fertility, and high maternal mortality. Improving women's access to information, technology, resources, and employment—and prohibiting gender-based discrimination—can raise the productivity, income, and status of women and thus promote women's health.

Bank Operations

Since the Bank first began lending for health in FY81, it has increasingly emphasized support to programs for primary health care, population, nutrition, and education. In FY86, the overall lending program for health, population, and nutrition included nine projects with safe motherhood components; by FY92 there were seventy. Lending for population, health, and nutrition was $961.7 million in FY92 and is projected to exceed $2.1 billion for FY93. The Bank's work in safe motherhood has been complemented by support for projects that expand opportunities for women.

As the leading agency for economic development programs as well as the major assistance agency in population, health, and nutrition, the Bank can pursue and promote policy dialogue with senior government policymakers on family planning and maternal health.

In addition to the Bank's strong support for investments in the health infrastructure, virtually all current population, health, and nutrition operations provide support to strengthening the management and technical capacity of government institutions. Noteworthy effort has been made to build staffing capacity by training health care providers in maternal health and family planning services, supporting research institutions, and developing infrastructure.

Bank sector work has been at the forefront of the women's health field. Recent work in women's reproductive health in Brazil, for example, demonstrated the magnitude of women's health problems in that country, including a lack of prenatal care for most women and high rates of unsafe abortion—the lifetime induced abortion rate has been estimated at more than two abortions per woman. The sector report identified priority actions that could be undertaken by the Government of Brazil to address these problems. Similar work is being done in India. Such sector work provides the basis for policy dialogue, program planning, and the strengthening of national capacity in research and analysis on women's health. In this line, the Bank needs to place greater emphasis on supporting experiments or quasi-experiments within projects to determine what policies and interventions work.

Bank population and health projects can include support for local governments, NGOs, private sector groups, and community organizations. Such funds can help ensure that projects are socially and culturally appropriate for the women most in need of services, promote community participation, and offer governments the opportunity to scale up successful pilot interventions.

Social sector operations provide another opportunity to use Bank lending to strengthen maternal health and family planning. Such operations are multisectoral and facilitate coordination among the line ministries responsible for the social sector. They are therefore more comprehensive in their approach to poverty alleviation and institution building than those that focus exclusively on population, health, and nutrition. This is particularly important to safe motherhood programs, which require efforts beyond the health sector.

Donor Financing and Coordination

The Bank is only one of the many national and international agencies that need to join forces to reduce maternal morbidity and mortality in developing countries. To demonstrate the magnitude of the problem and mobilize action, the Safe Motherhood Initiative was launched by WHO, UNFPA, and the Bank at a conference in Nairobi, Kenya, with the goal of reducing maternal mortality by one-half by the year 2000. Since the conference, the Inter-Agency Group for Safe Motherhood (including the International Planned Parenthood Federation, The Population Council, United Nations Development Program, UNFPA, UNICEF, the World Bank, and WHO) has served as a forum for focusing global attention on the problem of maternal morbidity and mortality. The number of people and organizations active on behalf of the Initiative continues to grow.

On the demand side, however, the cohort of women entering reproductive age is increasing. Recent World Health Organization estimates show that in spite of a reduction in the risk of maternal mortality in some countries, the number of women in the developing world dying each year from pregnancy-related complications has increased (WHO 1992e). As a result, increases in the volume of maternal health and family planning services and in donor resources are required. Donor assistance remains particularly essential for countries where government budgets are pressed to meet sector needs, thus limiting privatization and cost-recovery opportunities.

External assistance continues to be particularly important for analytic research. WHO's Safe Motherhood Operational Research Program, which is funded by numerous donors, deals with epidemiologic studies and operational research on safe motherhood. However, a great deal more information is needed on women's reproductive health, the barriers to use of existing services, and the cost-effectiveness of services. More of this research needs to be carefully targeted in developing countries, and the findings disseminated to help other countries develop sustainable programs.

Bilateral agencies, NGOs, and other UN organizations besides the World Bank, provide support to safe motherhood. Within the United Nations system, member states have defined the role of WHO "as the directing and coordinating authority on international health work" (WHO and others February 1991). UNICEF is the lead agency for matters related to children and their needs. The primary objective of the United Nations Development Program (UNDP) is to support the efforts of developing countries to accelerate their economic and social development. The responsibilities of the United Nations Fund for Population Activities (UNFPA) have been defined as capacity building of member states to respond to needs in population and family planning; promotion of awareness of population problems; assistance to developing countries, at their request; and playing a leading role in the UN system in promoting and coordinating population programs.

More effective donor and government coordination on safe motherhood is needed at the country level to strengthen public and private sector capacity to improve women's health. Collaboration in program development and cofinancing of safe motherhood programs may offer governments a better opportunity to expand maternal health and family planning programs and maximize the benefits of external assistance. Bangladesh and India serve as recent examples of countries where the Bank has collaborated with multilateral, bilateral, and nongovernmental organizations to support country programs. In addition, many structural adjustment packages are now being approved with substantial women's health components and emphasis on maternal health. In Brazil, the government has been joined by the World Bank, UNDP, UNFPA, UNICEF, and Pan American Health Organization (PAHO) in an effort to restructure the management and delivery of health services, with an emphasis on women's health.

Chapter 5

The Costs of Safe Motherhood

There are a number of reasons for estimating the costs, effectiveness, and benefits of safe motherhood programs. Cost analysis is necessary to assess both the affordability of ongoing and proposed programs and the need to mobilize resources to finance these programs. Cost and cost-effectiveness analyses can also be used to help set priorities, choose among service delivery strategies, and allocate resources effectively. An estimation of the benefits of improved maternal health to families and communities can help rationalize resource allocation. These considerations should be especially important for policymakers, who must often weigh alternative program priorities against limited available resources.

A variety of cost estimates have been made for specific services or components of maternal care in different countries. For example, PAHO estimated costs for specific interventions in 1990 for the Latin American region ranging from $5 per pregnant woman for prenatal care, to $20 for normal delivery care in a birthing center, to $200 for surgical or normal delivery in a hospital. They also estimated a couple-year of family planning protection at $26 (PAHO 1990). In other service delivery programs the cost per couple-year of protection has ranged from less than $10 to more than $100. Costs for maternity care in Matlab, Bangladesh, have been estimated at $2,158 per maternal (and neonatal) death averted; the additional cost of reducing the maternal or neonatal death rate by one death is estimated to be $24,110 (Attanayake, Faveau, and Chakraborty 1991; see appendix 2 for descriptions of programs in Bangladesh, Bolivia, and Grenada).

This chapter has two purposes. The first is to illustrate the cost implications of the three types of approaches presented in chapter 3. The second is to offer a general methodology for estimating the costs of safe motherhood services. Readers who have no need for the information on cost-estimating methodology can skip that section, but should bear in mind the qualifications to the estimates provided in the illustrative costing exercise below.

Cost Implications for the Three Settings

The typological approach developed in this report is a step toward the systematic identification of appropriate safe motherhood services in different resource settings. Ideally, cost-effectiveness estimates for services suggested for these settings would be derived from representative countries or from regions within a country. There is, however, a lack of actual cost data, especially for comprehensive safe motherhood programs.

In the absence of systematic, country-based cost data, this chapter presents illustrative estimates of the health facility and staffing resources and related costs that might be needed to implement the program components outlined in chapter 3. It also assumes that the services would produce certain outcomes and provides illustrative costs per outcome. The exercise uses the estimating procedures and assumptions developed by Herz and Measham in *The Safe Motherhood Initiative: Proposals for Action* (1987), updated and revised. Actual, current data on unit costs for specific components are used wherever possible.

The specific costs and outcome measures presented here are illustrative and do not represent standards for estimating or judging the costs of specific interventions in specific settings. Nor do these estimates substitute for performing cost and effectiveness data collection and analysis in individual settings.

Existing Resources

The classifications describe the general features of each setting and suggest possible interventions, based on resource constraints and other factors (see table 3.1 in chapter 3). Cost estimates for those interventions are developed here, calculating available service delivery resources and then estimating the additional resources needed to carry out recommended interventions.

Table 5.1 shows a possible configuration of existing public sector health facility and staffing resources for each setting—assuming a population of 500,000, the approximate size of a district in many countries. This resource configuration would have to be modified to serve a dense urban population of 500,000 or a widely dispersed mountain population of 500,000.

Setting A, for example, with the least-developed health sector, might have only one health facility—a health center—and a district hospital that is inaccessible to many women and not adequately equipped for maternal care services. The health center is assumed to have six staff who provide maternal care services for an amount of time equivalent to 4.6 full-time-equivalent (FTE) personnel. This setting might also have 500 traditional birth attendants—1 per 1,000 population—and 300 community outreach workers.

By contrast, setting C, at the other end of the scale, is assumed to have two hospitals and twice the number of health centers as setting B, and to rely less on traditional care providers.

In table 5.1, "program management" includes personnel involved in planning, administration, management, and communications. The requirements for such staff increase as more resources become available and better management and administrative support is required to coordinate the health service delivery system.

The Interventions

Table 5.1 also illustrates the additional resources that might be needed to carry out the interventions suggested for each setting. For example, more new or upgraded health center and health post facilities are needed in setting A—where virtually none exists—than in the other two settings.

By contrast, setting B interventions may require adding maternity waiting homes, built by communities, as a low-cost approach to extending the availability of referral-level care. Setting C interventions require an increase in appropriately trained staff at the health center level to accommodate the desired shift toward these facilities and away from hospitals, which should focus on providing specialized care.

It is assumed that interventions in all settings will require in-service training for all existing and new health personnel involved in safe motherhood service delivery. Transport, pharmaceuticals, medical equipment, communications equipment, and supplies will also be needed in each setting and are included in the cost estimates discussed below.

Table 5.1 Estimated Public Sector Resources Required to Implement a Safe Motherhood Program in Three Settings, Each with a Population of 500,000, Ranging from A, Weakest Health Systems, to C, More-Developed Health Systems

Resources		*Setting* A	B	C
Existing safe motherhood resources				
Facilities	Hospitals	[a]	1	2
	Health centers	1	10	20
	Health posts	0	50	50
	Maternity waiting homes	0	0	0
Personnel	Village health/community outreach workers	300	200	0
	Traditional birth attendants	500	250	100
	Facility-based service delivery personnel	6	256	324
	Full-time equivalents	5	174	246
	Program management (FTE)	0	7	50
Added resources				
Facilities	Hospitals	[b]	[c]	0
	Health centers	2[d]	[c]	[e]
	Health posts	5	[c]	[e]
	Maternity waiting homes or birthing centers[f]	4	50	0
Personnel	Village health/community outreach workers	200	0	0
	Community outreach workers (for waiting homes)	0	50	0
	Facility-based			
	Service delivery personnel	36	0	100
	Full-time equivalent	30	0	70
	Program management (FTE)	7	42	20

a. Setting A has one hospital not easily accessible or adequately equipped for maternal care services.
b. One hospital, which is upgraded and made more accessible with improved transport.
c. There is no new construction, but all existing facilities—1 hospital, 10 health centers, and 50 health posts—are upgraded.
d. Setting A has one upgraded and two new health centers.
e. There is no new construction, but all existing health centers and health posts are upgraded.
f. The maternity waiting homes are built by the community.

Cost-Estimating Methodology

The proposed methodology presents a model illustrating selected economic, health, and demographic characteristics, the program structure, and related safe motherhood program costs. Although parameters are suggested for each of the three settings, the models do not fit any specific national or regional situation. It is estimated that with approximately $1 per capita for strengthening maternity care, 20 percent of maternal deaths are averted in setting A, 66 percent in setting B, and 80 percent in setting C. It is also assumed to result in a contraceptive prevalence rate in settings A, B, and C, respectively, of 16, 35, and 55 percent, and tetanus toxoid immunization coverage for women of reproductive age of 25, 60, and 80 percent.

Table 5.2 summarizes the epidemiological, economic, and demographic assumptions behind the analysis, as well as the costs and potential impact implied by the three

Table 5.2 Program Statistics and Estimated Public Sector Costs for Possible Safe Motherhood Program in Three Settings, Ranging from A, Weakest Health Systems, to C, More-Developed Health Systems

	Setting		
Existing program and interventions	*A*	*B*	*C*
Demographic, economic, and maternal health status indicators (pre-interventions)			
Per capita income ($)	100-200	201-999	1,000-1,500
Population	500,000	500,000	500,000
Women age 15-45	75,000	75,000	75,000
Births (annual)	22,500	20,000	15,000
Birth rate (per 1,000 women of reproductive age)	45	40	30
Infant mortality rate (per 1,000 live births)	100	70	40
Maternal deaths (annual number)	225	100	30
Maternal mortality ratio (per 100,000 live births)	1000	500	200
Contraceptive prevalence rate (%)	<5	<10	40
Tetanus toxoid immunization coverage (% of women age 15-45)	10	30	60
Annual operating costs of maternal health program (pre-intervention; dollars)			
Staff costs[a]	8,639	579,913	1,454,373
Related costs[b]	1,524	193,304	623,303
Total	10,163	773,218	2,077,676
Estimated annual cost of interventions (dollars)			
Operating costs			
Staff costs[a]	260,432	140,100	444,435
Related costs[b]	176,153	189,229	33,682
Subtotal	436,585	329,329	478,117
Annualized investment costs			
Initial training	4,042	30,500	27,750
Vehicles	68,100	68,000	2,000
Construction/upgrading/equipment	21,250	31,920	20,000
Subtotal	93,392	130,420	49,750
Total	529,977	459,749	527,867
Total annual program costs (existing and interventions; dollars)			
Operating costs	446,748	1,102,547	2,555,793
Investment costs (annualized)	93,392	130,420	49,750
Total	540,140	1,232,967	2,605,543
Maternal health status after interventions			
Births (annual)	19,125	13,400	9,300
Maternal deaths averted (annual)	45	66	24
Contraceptive prevalence rate (%)	16	35	55
Tetanus toxoid immunization coverage (% of women age 15-45)	25	60	80
Intervention costs (dollars)			
Per capita	1.06	0.92	1.06
Per woman age 15-45	7.07	6.13	7.04
Per pregnancy	28.00	34.00	57.00
Per maternal death averted	11,777.00	6,966.00	21,994.00
Per maternal and perinatal death averted	1,682.00	95.00	3,142.00

a. Staff costs include salaries and benefits.
b. Related costs include transport, in-service training, contraceptives, pharmaceuticals, and consumable equipment and supplies.

classifications (see appendix 8, table 2 for details of the cost estimates). The parameters for the existing services and proposed interventions are based on the specifications outlined in chapter 3 and on typical health-status indicators for countries with the indicated per capita income range.

Existing Costs

Table 5.2 presents the estimated annual staff salary and related operational costs of the service base for each setting. The costs of existing staff are derived from the estimated health facility and staff resources (FTEs) identified in table 5.2 and the typical 1991 salary costs for ministry of health medical and related staff in countries in the specified per capita income range.

Because salary costs are half or more of the costs of safe motherhood services, it is particularly important to collect actual data on salaries for the cost estimates specific to developing countries. Available information on salary costs for a range of developing countries suggests that the salaries of public sector health personnel may be lower than generally expected and do not necessarily vary as might be expected with per capita income levels. In addition, personnel benefits and allowances are not usually included in the salary levels listed in ministry of health operating budgets and have to be identified separately. The salary estimates used here, however, have been adjusted to include benefit costs and represent average levels for countries in the indicated per capita income range.

Intervention Costs

Table 5.2 also presents estimates of the annual operating costs and annualized investment costs associated with the suggested interventions. Operating costs comprise staff and related costs, which include in-service training, contraceptives, pharmaceuticals, consumable equipment and supplies, and transport (maintenance, repairs, and fuel for motorbikes and supervisory and emergency transport vehicles). These costs are derived from experience in safe motherhood projects, and, where no other more recent or comparable cost data were available, from Herz and Measham (1987), adjusted to the specifications of each typology.

Annualized investment costs include basic training, purchase of vehicles, and construction. For simplicity, some investment and start-up costs are not included in table 5.2. Although some initial and replacement training costs for health staff are included, full costs of basic, degree-based education of maternal health staff, and the costs for related curriculum revision are not. In addition, technical assistance and research costs are not included.

These estimates also attribute only a portion of the costs of family planning services to safe motherhood interventions—and they include the costs of contraceptives at a public sector cost instead of a commercial price. The full costs of family planning services in developing countries have been estimated at $1.00 to $1.25 per capita, at $10 to $20 per year per couple-year of protection using any method, and at $14 to $48 for an annual supply of contraceptives from commercial sources in developing countries (World Bank 1992). These complete costs of family planning activities should be taken into consideration in developing safe motherhood programs.

Finally, costs of services for abortions and related complications are not specifically included here because of the scarcity of data with which to estimate costs per service and

numbers of abortions demanded by the populations in question. Available data indicate, however, that an abortion in a hospital in setting C might cost $140 to $235, if performed on an inpatient basis, and from $65 to $150 on an outpatient basis. In setting B, these services might cost from $3 to $15 (Johnson and others 1992).

As greater emphasis is given to the diagnosis and treatment of sexually transmitted diseases, the cost of this element must also be estimated. Sexually transmitted diseases affect maternal health outcomes, and can accelerate the acquisition and spread of HIV. As HIV/AIDS is increasing exponentially in many countries—the doubling time of the epidemic ranges from approximately three years for heterosexual spread to eight months among female prostitutes—it follows that a carefully targeted immediate investment in preventive and clinical services can have a much greater long-term benefit than a more substantial input in three or five years (Potts and Anderson 1991).

Total Costs

Table 5.2 shows the annual program costs of the existing and added interventions, which make up the total annual costs of implementing and sustaining the entire effort. As discussed above, these costs primarily are public sector costs. The costs of traditional birth attendants' services—assuming that individuals compensate these workers—are not included, nor are community-based costs associated with building maternity waiting homes. In addition, the costs of staff reflect public sector salary costs, not private sector provider costs or fees.

Possible maternal health outcomes of the interventions in each setting are also indicated in table 5.2. The unit costs presented are only the additional costs of the interventions (excluding existing costs) and represent both the estimated costs of the interventions per capita and per maternal and perinatal death averted. Although not quantified here, it should be noted that family planning and maternity care interventions benefit health and development in ways other than saving mothers' and infants' lives. Thus, the benefits of the safe motherhood interventions are underestimated here.

Findings

The results of this analysis can be used to illustrate how the structure and level of public sector costs might vary from one setting to another. Given the assumptions and methodology adopted, however, it is not appropriate to use the results as evidence of the actual costs or cost-effectiveness of safe motherhood services in any given setting.

As indicated in table 5.2, estimated total annual costs of the suggested programs for a population of 500,000 range from $540,000 in setting A, to $1.2 million in setting B, to $2.6 million in setting C. Annual per capita costs of the total program—existing services plus interventions—range from $1 in setting A, to $2.50 in setting B, to $5 in setting C. The estimated annual per capita costs of the interventions alone—subtracting base costs—are about $1 in all three settings. Annual costs of the interventions per pregnancy are estimated at $28 in setting A, $34 in setting B, and $57 in setting C.

The costs of the interventions per maternal death averted range from $11,777 in setting A, to $6,966 in setting B, to $21,994 in setting C, assuming that 20 percent of the maternal deaths are averted in setting A, 66 percent in setting B, and 80 percent in setting C as a result

of the interventions. These assumptions follow those made in Herz and Measham (1987) on the impact of comparable services for a three-to-five-year effort in similar settings.

Over 7 million perinatal deaths are associated with women's health before and during pregnancy, with maternal complications and poor management during labor and delivery, resulting in almost 14 perinatal deaths for each maternal death. This analysis assumes that at least one perinatal death is averted when a mother's death is averted. On the basis of several studies, it is also conservatively assumed that at least five additional perinatal deaths could be prevented through a moderate-level safe motherhood program which includes improved delivery management and prenatal care and general improvements in women's health. On this basis, the intervention cost per maternal and perinatal death averted is estimated to range from $1,682 in setting A, to $995 in setting B, to $3,142 in setting C.

The cost per death averted may be lowest in setting B. But equity and other considerations justify efforts in resource-poor setting A where the needs are greatest, as well as in setting C, with its potential for more efficient and effective service delivery.

Next Steps

Efforts to assess the costs of interventions proposed by this typological approach point out a need for further work on data collection and analysis; specification of the most cost-effective approaches; and identification of ways to cut costs, improve efficiency, and mobilize resources to assure the sustainability of safe motherhood interventions.

Data Collection and Research

One major constraint to economic and financial analyses of maternal health programs is a lack of information on the relative effectiveness, impact, and cost of different interventions and on the causes, extent, and distribution of maternal morbidity and mortality. This lack of information makes it difficult to estimate the costs and cost-effectiveness of alternative interventions, and to assess the costs and benefits of undertaking safe motherhood programs compared with other health and development endeavors.

More baseline data collection and analysis, operational research, and demonstration projects are needed. On a more immediately practical level, field-based analyses, including quasi-experiments within projects, and operational research are also needed to identify approaches that represent effective allocation of resources to achieve safe motherhood program goals. The typological approach proposed in this report takes a first step toward the design of cost-effective interventions by emphasizing communications and training to increase awareness of dangers during pregnancy and enhance effective use of services; family planning services to avoid unwanted pregnancies; appropriate management of pregnancy and obstetric complications at the lowest level of care; and referral systems for more specialized care.

For some settings, it would also be appropriate to conduct specific cost-saving analyses and to identify ways to reduce costs that will not harm program outcomes—such as reducing inappropriately high rates of cesarean sections.

Financing Options

In addition to developing better analyses of cost-effective interventions and cost-saving measures, it will be increasingly important to identify appropriate financing and cost-recovery measures for safe motherhood programs. Observation suggests that couples will spend up to 1 percent of their annual per capita income on contraception; cost recovery is better explored in family planning than in maternity care. However, in virtually all settings, people are already paying for at least some maternal care services.

For example, people traditionally pay traditional birth attendants in cash or in kind for their services. People buy a variety of medicines, including contraceptives, and they often pay charges for hospital care, including deliveries. If charges were set to cover the estimated costs of the interventions suggested, they could be set at the average cost per pregnancy or delivery. As indicated above, these charges would range from $28 to $57 in the three settings. Abortion, although the most controversial aspect of fertility regulation, is also one of the first elements that can become financially self-sufficient.

Caution is needed, however, when fees are charged to low-income women for maternal care. One study in Zaria, Nigeria, revealed the results of inadequate planning when hospital fees were initiated. Between 1983—when charges were levied—and 1988, the number of deliveries fell by 46 percent and maternal deaths increased by 56 percent (Ekwempu and others 1990). In addition to ability to pay, promotion of the use of appropriate services and discouraging inappropriate use should be a factor in the setting of fees for maternal care. For example, fees for routine delivery at hospitals might be charged to promote use of lower-level facilities, which is consistent with the objective of reserving hospital care for women suffering complications.

Where insurance exists, consideration can be given to coverage of prenatal and maternity services. Such options would be especially relevant in middle-income countries, many of which are now developing new social insurance systems or reviewing their existing social insurance systems' coverage of health services. In some situations, insurance coverage strongly influences both the provision and use of health services. Good practices in maternal health services could be linked with an appropriate system of covered and noncovered services, graduated and targeted deductibles, and copayments to encourage appropriate use and more widely available maternity care.

The typological approach presented recognizes some of these financing options by assuming that communities will contribute the labor and materials to build waiting homes and by suggesting that cost-recovery methods be identified, especially where a significant number of private sector providers exist. Fee structures based on income; fee exemptions for certain services, such as tetanus toxoid immunization; and subsidies for certain maternity care services have been used successfully in some countries. Many governments have also chosen to target subsidies for family planning and essential obstetric care to women who cannot afford it. This will undoubtedly be necessary as safe motherhood programs are instituted. This is particularly important because these services produce externalities, benefiting the child as well as the mother. Further work will be needed to develop methods for coordinating program financing in specific settings to achieve program goals.

Chapter 6

Measuring Progress

Program monitoring and evaluation are an integral part of program delivery and essential to both building appropriate modifications into ongoing programs and determining whether programs achieve their objectives. Lack of baseline data as well as weak monitoring and evaluation systems covering safe motherhood components make it difficult to monitor program progress and assess impact and cost effectiveness. Bank projects have typically focused on project inputs and accountability issues, such as whether the project did what the appraisal report said it would do, rather than on outputs. In all Bank projects, more emphasis should be given to monitoring and evaluating outputs and thus advancing the goals of the national safe motherhood programs.

Measuring the impact of these programs is not, however, easy. Indicators of maternal mortality levels, such as the maternal mortality rate or ratio, are desirable for measuring trends and impact over time, as well as comparing different settings. However, it is difficult to measure maternal mortality under most circumstances. The relative infrequency of maternal deaths require that large populations be covered, which is costly, and even in developed countries, many maternal deaths go unreported. Information on maternal mortality is most useful when it is cause-specific, and yet misclassification of causes is common in both industrial and developing country settings.

Therefore, although the program goal may be to reduce maternal mortality, emphasis should be given to measuring the processes and factors that are known to reduce maternal mortality. Indicators of maternal and perinatal morbidity, as well as a wider variety of service delivery process indicators, may thus also be appropriate.

Process measurements inform program managers about the efficiency of service delivery and its potential effects on outcomes. Process indicators should be used to determine whether a program is functioning as intended, prior to conducting an impact evaluation (Graham and Campbell 1991; and Maine, McCarthy, and Ward 1992). Possible indicators for use in planning, monitoring, and evaluation of safe motherhood programs are outlined in table 6.1, at the end of the chapter. These are illustrative of the range and types of indicators that may be appropriate in different program and country settings.

Information Needs for Safe Motherhood

The relationship between measurement and information needs is essential to any discussion concerning the advantages and disadvantages of the various approaches for measuring maternal health (Graham and Campbell 1991). The first question program managers need to answer is "what is this information needed for?" The nature, scope, and quality of information required varies according to whether its principal use is for planning, implementation, monitoring, or evaluation.

Successful programs have timely flows of information—upward to program managers for supervision and management and downward to staff and clients for feedback. This flow

is critical to key management issues regarding whether the program is efficient, effective, relevant, and sustainable. Since regular and timely information is necessary for management purposes, monitoring and evaluation should not be an "add-on" or afterthought to a program, but rather an integral part of a program from its start. Monitoring and evaluation both require information to link program inputs with outputs or health outcome. Monitoring accepts the program design as given, focuses on compliance and may rely on data from a management information system covering the efficiency of service delivery and how resources are allocated. It is an ongoing system for receiving feedback. Evaluation, on the other hand, is used to provide information and judgment on progress toward the achievement of specific objectives and program outcomes.

Monitoring systems should always be as simple as possible, and data should not be collected unless they benefit the client or are used to improve management. For example, in setting A, a day register with one line for each client is often enough. And where formal maternity care is not used and births are in the home, periodic household interviews may be desirable to determine traditional health practices, the type of care received, and the health outcomes. Measuring family planning and maternal health begins with the "eligible" woman—15 to 49 years of age. Basic indicators for family planning services which are commonly used include the number of contraceptive users and volume and type of services provided. Maternity care programs must monitor women during pregnancy, labor, delivery, and the postpartum period. Indicators of the coverage and quality of care can be used.

Evaluation is strengthened if baseline data and information from ongoing monitoring are available so that the program can be assessed over the entire life of the project rather than at a single point in time. Evaluation usually includes special surveys and formal program reviews. Program results should be compared with previously set targets to determine the areas in which modifications are needed. Evaluation results can provide information about the program's future direction—for example, expansion or modification of services.

To supplement continuing supervision and to assist with program modifications or designs, periodic evaluations should be built into all safe motherhood programs to provide reliable information on progress toward achieving program objectives. Routine data on inputs and outputs, however, cannot provide all of the answers program managers need. Special surveys, cost-effectiveness analysis, and operational research can be conducted in association with sector and project work to provide additional information for planning and evaluation. Periodic surveys may be needed for better epidemiological, cultural, and service data. Cost-effectiveness analysis can be used to compare interventions and to indicate priorities for resource allocation. Operations research can be used both for collecting information as well as for testing alternative approaches of delivering services. For example, in Kenya a pilot demonstration program was used to demonstrate the cost-effectiveness of manual vacuum aspiration to treat women with first-trimester incomplete abortion (Johnson and others 1992). Program personnel should be closely involved in operations research and in the subsequent decisions concerning the introduction of innovative approaches.

Measurement Techniques and Sources of Data

Measurement techniques and data sources are closely linked. For example, hospital data may be a possible and appropriate *source*, and a record review may be the technique applied to derive a particular indicator, such as percentage of cases referred from a selected district.

Data sources for the planning, implementation, monitoring, and evaluation of programs include health facility data, patient records, service statistics, vital statistics registration, and other registration systems such as church records, population-based surveys, sentinel surveillance systems, and service reports. Measurement techniques include case histories, indirect methods (for example, the sisterhood method), death certificate review, focus groups, in-depth interviews, confidential inquiries, and observational methods.

In general, it is quicker and less expensive to evaluate data that are routinely available than to collect new data. Although in most developing countries available information may not be useful in determining maternal mortality or tracking trends in rates and ratios over time, it may be quite sufficient for examining the functioning and quality of health services and health outcomes. For example, routine data on stillbirths, low birthweight, or obstetric fistulae can be used as proxy indicators to measure the degree and level of maternal mortality, morbidity, and disability in an area. At the same time, while facility-based records—hospital records in particular—may be the most readily available source of information on maternity care, in most countries they do not constitute a representative sample of the overall population. One way to measure maternal deaths, capture birth-related events, and integrate mothers and children into the health system is to begin monitoring with the birth. Where delivery is assisted by trained attendants, the outcomes, their causes, and associated process variables may be reported by the attendants, as in Indonesia. However, women who do not use any services or who abort would not be reported, and these women are likely to be at high risk of death.

Selection and Use of Indicators

Each project or program will need to specify its objectives before appropriate indicators can be selected, and where possible, monitoring tools should be verifiable and comparable (Maine, McCarthy, and Ward 1992). Several impact and process indicators can assist countries in measuring progress toward making motherhood safer. Measures of the level of maternal mortality can be used for information on the frequency of maternal death and even the causes, but would not provide information on the effectiveness of specific interventions that could be used to improve service delivery. Process indicators are most effective when a causal link has been well established between an intervention and an outcome. For example, there are strong links between immunization of pregnant women with tetanus toxoid and preventing neonatal deaths from tetanus, and between access to cesarean section and preventing maternal deaths from obstructed labor. In some country and program settings, outcome indicators other than death may be useful for measuring program effectiveness and impact, such as the incidence of specific obstetric complications.

It is extremely important to interpret data accurately. Maternal mortality rates and ratios can be misleading if the sample size is small. The case fatality rate among cases of obstetric complications may increase in a hospital where referral and transportation systems from a village to a hospital are improved. Trends must also be interpreted with caution. The accuracy of reporting morbidity and mortality can result in artificial trends. For example, improvements in medical diagnostic equipment may lead to an artificial increase in the incidence of certain complications. Rapid feedback is also important to health planners and medical supervisors, and it is most useful if these program beneficiaries have been involved in the evaluation.

Examples of Impact Indicators

Maternal Mortality

Data on maternal deaths may be desired for measuring program effects over time or for comparing maternal mortality levels, trends, and causes in different locations. However, official estimates often grossly underestimate the number of maternal deaths, even in setting C countries. Studies of maternal mortality in Argentina, Brazil, China, Jamaica, and Mexico have indicated that an underestimation by 50 percent is common (Bobadilla, Fausto, and Karchmer, forthcoming).

When mortality is measured, the *rate* or the lifetime risk should be assessed—not just the ratio—to show the effects of family planning in addition to the effects of improved obstetric services. The probability of maternal death has two components: the probability of being pregnant (and thus at risk) and the probability of dying of pregnancy-related causes once pregnant. The maternal mortality ratio measures the latter—the obstetric risk or the number of maternal deaths in relation to live births (Fortney 1987; and Herz and Measham 1987) (see box 1.1 in Chapter 1).

Retrospective inquiries about deaths in a household during a specific period can also shed light on maternal deaths. For example, the "sisterhood method" asks men and women about their deceased adult sisters to ascertain whether death occurred during pregnancy, delivery, or the postpartum period (Graham, Brass, and Snow 1989). The sisterhood method may be used for determining a baseline for maternal mortality. The problems of costs, sample-size requirements, misreporting of the cause of death, and omission of deaths for social or cultural reasons pose barriers for all retrospective studies. But various adaptations of retrospective surveys have been successfully used in a number of country settings. One continuing problem is that abortion deaths are usually a significant proportion of maternal deaths but are not always captured by routine vital statistics or retrospective studies. Maternal audits by health providers and hospital administrators, including questions on the process leading to a woman's death, can help to identify causes of deaths and ways to improve care. Caution must be taken in such audits, however, to avoid condemnation of specific individuals.

Perinatal Mortality

The perinatal mortality rate can be used as a proxy indicator to monitor and evaluate programs that aim to reduce maternal mortality and morbidity. Although the perinatal mortality rate is not a substitute for the maternal mortality rate or ratio, perinatal mortality is associated with the causes of maternal death—such as obstructed labor and eclampsia—as well as with management during labor and delivery, and the health of the woman before and during pregnancy. For example, the woman's nutritional status and level of infection affect her and her child, and hypertension affects both of them during pregnancy. The advantage to using trends in the perinatal mortality rate as a proxy for maternal mortality trends is that perinatal deaths occur more frequently than maternal deaths—by a factor of fourteen. But monitoring perinatal mortality requires extensive local surveillance because stillbirths and early neonatal deaths are typically under-reported.

Examples of Process Indicators

Obstetric Complications

Appropriately treated complications are a desired outcome of a safe motherhood program, and one of the most important factors in reducing maternal mortality. A high proportion of appropriately treated complications to all complications would indicate an effective case detection, management, and referral system. Some demonstration projects have used this proportion as a proxy for maternal mortality rates because of the difficulties of measuring program impact on mortality. Using such a measure requires standardizing field definitions of complications and instituting protocols to determine criteria for appropriate treatment. Under these circumstances, this proportion, together with the percentage of facilities and staff using standardized referral protocols to manage obstetric complications, can serve as useful management tools at referral sites.

Other Service Indicators

Looking at safe motherhood more broadly, progress can be measured by assessing the coverage and quality of family planning, prenatal, delivery, and postpartum services, as well as by examining indicators related to morbidities not specific to pregnancy. In order to measure quality as well as coverage, specific indicators such as immunized pregnant women or anemic women taking iron supplements are more useful than only the proportion of women receiving any prenatal care. Likewise, measuring the proportion of women delivered by a "trained" attendant can be useful to a certain extent, although the meaning of "trained" attendant differs widely among settings. Other useful indicators are specific training skills, as well as personal or referral capacity to manage obstetric complications.

Possible Indicators for Assessing Progress in Safe Motherhood Programs

Those concerned with monitoring and evaluating safe motherhood programs may need to choose between impact and process indicators. It is much more difficult and expensive to use mortality impact indicators, and where the most important need is to assess the approach and effectiveness of program delivery and to monitor progress, health planners and program managers will find service indicators useful and data more readily available. The following process indicators represent a minimal set of useful measures for monitoring and evaluation:

- Percentage of reproductive-age women using contraceptives.
- Percentage of pregnant women who are immunized with tetanus toxoid.
- Percentage of pregnant women attending prenatal care who are diagnosed and treated for anemia, malaria, and sexually transmitted disease.
- Percentage of pregnant women delivering in health facilities who had a prenatal contact in the last trimester.
- Percentage of communities and health centers with referral links to facilities that provide emergency obstetrical care.
- Percentage of health staff trained and facilities equipped to manage obstetrical complications.

- Time interval from emergency referral to treatment at referral site.
- Proportion of appropriately treated complications to all complications (by type).
- Ratio of complicated obstetric admissions to all deliveries (by type of complication).

With more experience and research, it is likely that numerical standards will be defined for these indicators. In a given developing country, health professionals responsible for maternal health programs may be able to establish minimum standards for the country. Once minimum standards have been reached, the program can expand its objectives.

Information on maternal health—and more broadly, women's health—is lacking not just in developing but also developed countries. There is an urgent need for better data on the extent, causes, and distribution of maternal morbidity and mortality, the social impediments to improvements in women's health, the status of health delivery systems, and the relative effectiveness, impact, and cost of different interventions. Governments and donors need to assure that monitoring, evaluation, and research are integral parts of any health programs and that the appropriate methods and indicators are used in a way most meaningful to program managers, health providers, and women themselves.

Table 6.1 Indicators for Safe Motherhood—Impact Indicators

Variable	*Indicators*	*Measures*	*Source*
Maternal mortality	Number of maternal deaths	• The absolute number of deaths within a specified time period. Especially if accompanied by case histories, these numbers can be useful in understanding the magnitude and underlying causes of the problem in a particular setting. It is advantageous in situations where mortality and population are both low, and the denominator (number of reproductive-age women) is not available.	Community survey, hospital records, vital registration
	Maternal mortality ratio	• The number of women dying of childbirth (pregnancy, labor, or within 42 days of delivery) per 100,000 live births per year. The ratio represents obstetric risk—risk of death of a woman per birth. The denominator does not take into account that maternal deaths also occur with ectopic pregnancies, stillbirths, and spontaneous and induced abortions. Interventions that improve obstetric outcomes would reduce the ratio.	Community survey, hospital records, vital registration
	Maternal mortality rate	• The number of women dying of childbirth (pregnancy, labor, or within 42 days of delivery) per 100,000 women of reproductive age per year. The rate includes both the number of maternal deaths and the risks of pregnancy—the annual risk of motherhood. Interventions that affect fertility or obstetric outcome would affect the rate; different definitions of reproductive age have made comparisons difficult (for example, 15-45 or 15-49 years).	Survey, hospital records, vital registration
	Proportionate maternal mortality	• The ratio of number of maternal deaths to all deaths among women of reproductive age. It represents how important maternal mortality is as a cause of death among women of reproductive age.	Survey, hospital records, vital registration
	Lifetime risk of death	• The cumulative risk of death from motherhood; lifetime risk of death (LTR) is determined by the risk associated with pregnancy and the number of times a woman becomes pregnant. The risk is additive each time she becomes pregnant: $LTR = 1 - (1 - \text{MM Ratio})^{TFR}$ e.g., $1 - (1 - .005)^6 = .030$, or, 1 in 33 [assuming a MM Ratio of 500/100,000 live births and a total fertility rate of 6.0]	Survey, vital registration
	Case fatality rate	• Number of deaths from a specific maternity-related complication per 100 women suffering from that complication. It represents the severity of the condition as well as the effectiveness of management provided.	Hospital/clinic records, survey
Perinatal mortality	Perinatal mortality rate	• The number of fetal deaths (≥ 28 weeks) plus early neonatal deaths (< 7 days) per 1,000 total births per year	Community survey, hospital/clinic records
Healthy women and newborns	Positive or optimum health	• Ratio of women delivering without complications to those delivering with specified complications. • Percentage of postpartum women with chronic morbidities, such as obstetric fistula, uterine prolapse, and so on. • Percentage of newborns with normal birth weight ≥ 2,500 grams.	Hospital/clinic records, survey

Variable	*Indicators*	*Measures*	*Source*
Complications	Ratio of referral for complications	• The ratio of the number of women appropriately referred for treatment for a complication (or all complications) to the number with that complication (or all complications). • Proportion of all complications by location of occurrence (for example, village with or without traditional birth attendant or health center). • Proportion of women attending prenatal care who had unpredicted complications at delivery.	Hospital/clinic records
	Treatment/ complication proportion	• The proportion of women who received appropriate treatment for maternal complications of all women suffering from such complications. • Proportion of cesarean sections to all births.	
	Ratio of emergency/ booked deliveries	• The ratio of the number of women who deliver at hospitals on an emergency basis to the number of women who booked or desired delivery at that facility.	Survey, hospital/clinic records
Safe maternal and newborn management		• Proportion of births attended by trained staff - Midwife, nurse, physician - Traditional birth attendant (trained or untrained). • Proportion of all deliveries in homes, health centers, and hospitals. • Proportion of traditional birth attendants or families with knowledge of danger signs. • Proportion of families or traditional birth attendants with knowledge of where to go if danger sign is recognized. • Proportion of traditional birth attendants with interaction with health center staff. • Proportion of abortions to live births. • Ratio of fresh stillbirths (died during delivery) to macerated stillbirths (intrauterine death). • Percentage of stillbirths weighing ≥ 2,500 grams at birth. • Percentage of late neonatal deaths weighing ≥ 2,500 grams at birth. • Percentage of early neonatal deaths weighing ≥ 2,500 grams at birth.	Hospital/clinic records, community-based survey, census

Table 6.1 Indicators for Safe Motherhood—Process Indicators

Variable	*Indicators*	*Measures*	*Source*
Reproductive and health behavior	Age	• Proportion of births to women below 18 years or above 34 years. • Average age of mother at first birth. • Average age at first marriage.	Survey focus group, clinic/hospital records, interview of key informants
	Parity	• Proportion of all births that are first-order births. • Proportion of all births that are fourth- or higher-order births.	Census, survey
	"Wantedness" of pregnancy	• Proportion of pregnancies not intended.	
	Total fertility rate (TFR)	• The number of children that a woman would have at the end of her reproductive life if she survived to that age and experienced a given set of age-specific fertility rates. It is calculated by adding the age-specific fertility rates.	
	Contraceptive prevalence rate	• Percentage of married women age 15-49 using any form of family planning.	
	Utilization of health services	• Proportion of pregnant women who received any prenatal care from trained medical staff. • Proportion of pregnant women who received prenatal care before 20 weeks or after 38 weeks. • Proportion of pregnant women who had received adequate dosage of tetanus toxoid immunization. • Proportion of pregnant women who complied with iron and folate supplementation regimen. • Proportion of pregnant women who were referred who accepted referral. • Proportion of women who delivered who received postpartum care. • Proportion of women with low socioeconomic status using maternal services (such as delivery care).	
	Traditional practices	• Prevalence of traditional practices, such as gishiri cut, hot bath, female circumcision, taking medicine with oxytocic properties in labor, etc.	
Reproductive and health status	Prevalence of malaria, syphilis, diabetes, hyper-tension, and liver disease among pregnant women	• Percentage of pregnant women suffering from HIV, syphilis, gonorrhea, hypertension, diabetes, malaria, TB, CVA/rheumatic heart, and hepatitis.	Community survey, hospital records, health center records, epidemiological surveillance
	Anemia	• Percentage of women of reproductive age who are anemic. Moderate anemia: Hemoglobin 70-110 g% of blood. Severe anemia: Hemoglobin < 70 g% of blood.	Serology, community survey
	Nutrition	• Percentage of women of reproductive age weighing less than 38 kg before pregnancy or with arm circumference below standard norm. • Percentage of women gaining less than 1 kg/month during second and third trimester. • Percentage of women less than 150 cm tall.	Community survey, hospital records

Variable	*Indicators*	*Measures*	*Source*
Access to and quality of family planning and maternal services	Women's decision-making	• Percentage of women who are literate. • Percentage of girls enrolled in secondary school. • Percentage of women who can decide for themselves to seek health care. • Percentage of women who can travel alone outside their villages. • Percentage of women who can afford treatment, transport, and so on from their own resources.	Survey, focus group, in-depth study
	Information	• Percentage of men, women, mothers, and mothers-in-law aware of danger signs of pregnancy, labor, delivery, and postpartum. • Percentage of women who know where to go if complication arises.	Knowledge, attitudes, and practices study
	Transport of women	• Median distance to a functioning health facility. • Percentage of women who have access to emergency transport. • Percentage of women with access to an emergency communications system. • Median time to travel to a functioning health facility.	Time-motion study, community-based survey
	Availability of quality service	• Percentage of complications that were detected by prenatal surveillance. • Ratio of those who arrived at emergency referral facility to those referred. • Percentage of women with access to cesarean section. • Percentage of women who arrived at a health facility and received effective treatment (according to standard norms). • Mean waiting time at prenatal care clinics. • Percentage of women comprehending their treatment. • Percentage of women satisfied with treatment. • Percentage of high-risk women referred to health facilities equipped to provide emergency obstetric care. • Percentage of health facilities equipped to provide emergency obstetric care. • Lag between arrival of emergency at hospital and actual treatment. • Time between arrival at hospital and maternal deaths. • Ratio of midwives to population. • Availability of essential drugs (IV fluids, ergometrine, antibiotics) and equipment (functioning operating theater, vacuum extractor, anesthetic machine). • Percentage of women delivered in an institution with whom family planning is discussed. • Percentage of women with access to safe abortion services. • Percentage of women who receive contraceptive counseling after an abortion.	Observation interview with patients and providers, exit interviews, survey
	Knowledge, attitudes, and practices of health workers	• Proportion of health professionals able to perform life-saving obstetric functions. • Proportion of health workers trained in basic epidemiologic and statistical skills. • Proportion of health workers trained in communications skills. • Knowledge and attitudes of health workers toward reproductive health (for example, adolescent reproductive health, family planning, abortion). • Perceptions, beliefs, and attitudes of community health workers and traditional birth attendants of problems with birthing, danger signs, and responses.	

Appendix 1

Effective Maternal Health Care: Family Planning and Prenatal, Labor, Delivery, and Postpartum Care

Throughout their lives, women's health and health care affect their risk of maternal mortality and morbidity. The services that affect maternal mortality risks most directly, however, are family planning and maternity care during pregnancy and around the time of delivery. Existing knowledge about the biological efficacy, user and field setting effectiveness and cost-effectiveness of those services varies enormously. The area in which there is greatest certainty is family planning; a variety of methods with high biological efficacy are available, with considerable information about their suitability in different circumstances. Much is also known about effective interventions around the time of delivery to prevent maternal mortality from hemorrhage, sepsis, obstructed labor and hypertensive disorders of pregnancy, though questions remain as how best to implement them in diverse developing country settings. Good data on effective interventions in the prenatal period remain remarkably scarce, despite consistent evidence from ecological studies of lower mortality in women receiving prenatal care. Program strategies and the necessary balance between family planning, prenatal and delivery services to prevent maternal mortality will depend on local circumstances, including the main causes of mortality, levels of fertility and existing services.

In this paper, the effectiveness of care—contraception and abortion, prenatal care, and labor and delivery care—is reviewed. Postpartum care completes the effective maternal health package, including detection and treatment of postpartum hemorrhage and puerperal sepsis, as well as breastfeeding, nutrition and child spacing promotion.

Reduction of Risk through Birth Prevention

Family planning may reduce maternal mortality in several ways. It reduces maternal mortality by reducing exposure to pregnancy and therefore to risks associated with pregnancy and childbirth in the event of wanted births, and pregnancy and abortion when pregnancy is unwanted. Contraceptive use has no direct effect on the risk of death once pregnant; therefore, if all women were equally likely to adopt effective methods of contraception, irrespective of age, parity, and other determinants of obstetric risk, increasing contraceptive prevalence would not change the risk of death once pregnant, which is usually expressed as the ratio of maternal deaths to 100,000 live births (maternal mortality ratio). However, experience suggests that contraceptive prevalence often rises among older, higher parity women, or those at greatest risk of abortion, which means that family planning can help to reduce the maternal mortality ratio. This effect, however, is slightly offset by the fact that more educated, urban women with better access to services often have disproportionately high rates of contraceptive use and low maternal mortality ratios. A decline in fertility also means that first births, which are riskier, will increase as a proportion of all births. This means that increasing contraceptive prevalence could, in theory, actually lead to an increase in the maternal mortality ratio, even though the maternal mortality rate and lifetime risk of maternal mortality decline (Fortney 1987).

The successful Matlab MCH-FP project (described more fully in Appendix 4) primarily reduced the maternal mortality *rate* in Matlab by reducing the number of women who became pregnant. Births to women of high parity or older maternal age were reduced (but not eliminated), but the project had little or no impact upon other groups typically considered at high risk—young, multiparous and low parity women, who account for almost half of all maternal deaths (Koenig and others 1988). Clearly, the maternal mortality ratio cannot be used to measure the impact of family planning on maternal survival, once women are pregnant.

Family planning allows women to delay motherhood, space births and avoid unwanted, unplanned pregnancies. Family planning programs have raised contraceptive use throughout the developing world. Considerable unmet need for contraception remains, however. In a recent survey of developing countries it was found that at least 10 percent and as many as 40 percent of married women of reproductive age want to avoid a birth but are not contracepting.

Family planning choices are often the first element of primary health care that can be made available in a resource poor setting. Provision of basic non-clinical contraceptives requires minimal skill and can be handled by community-based providers with appropriate training. The risk/benefit ratio of using methods such as oral contraceptives is in favor of nearly all women in such a setting, and a variety of cost-effective, distribution systems can be set up, from social marketing to community-based distribution programs focused on vulnerable groups.

Methods vary in their clinical effectiveness, and couples vary in the degree to which they make proper use of them. There has been a gradual shift toward more effective and more long-term methods, especially sterilization. Worldwide, female sterilization is the leading method and now accounts for about half of all contraceptive use, but regional comparisons show substantial variations in method acceptance. The most popular method in China is the IUD; in Northern Africa, the pill; and in Latin America, female sterilization. Traditional methods account for over 10 percent of users (Bulatao 1992).

Although contraceptive methods are not without risk, the risks tend to be small, balanced by some health benefits, considerably outweighed by the risks of pregnancy and childbirth, and dwarfed by the risks of unsafe abortion. The health benefits and risks of each method vary by the individual circumstances and the medical condition of the user; careful counseling of users by family planning providers can further reduce the risks. The IUD, for example, is associated with pelvic inflammatory disease, mainly in women who are at risk of developing sexually transmitted diseases. Barrier methods are not as effective as some other methods in preventing pregnancy, but they have an important non-contraceptive benefit by protecting against HIV infection and sexually transmitted diseases (Bulatao 1992).

The effectiveness of family planning programs depends on several factors. First, there must be access to services. Second, services must be provided in both public and private health facilities and through community-based distribution networks. Third, there must be contraceptive diversity to meet varying family planning needs throughout the life cycle and for both women and men, and counseling must be offered by health care providers trained to respect clients concerns and sensibilities. Fourth, strategic management must take into account contraceptive demand, public and political support, the service delivery infrastructure and the logistical supply system. Fifth, collaboration with the private sector can

be an effective means of reaching many more people. And, finally, effective information, education and communication is essential.

Contraceptive services may also reduce maternal mortality by preventing unsafe abortion, a common consequence of unwanted pregnancy in areas where safe abortion is unavailable. Unsafe abortion causes at least 65,000 maternal deaths each year (estimates range up to 200,000), mainly because of infection and hemorrhage. Abortion is the major cause of death among reproductive-age women in parts of Latin America. Women who survive often suffer severe long-term illness and secondary infertility. An estimated 55 million unwanted pregnancies are terminated every year worldwide. About half of these are illegal, occur primarily in developing countries (Coeytaux, Leonard, and Bloomer 1992), and are likely to be unsafe and lead to sepsis, hemorrhage, and death. Vacuum aspiration abortion in the first twelve weeks after the last menstrual period is up to a thousand times safer than abortion by traditional means, which commonly consists of inserting a twig or some other foreign body in the cervix. Uterine evacuation, with a syringe and flexible plastic tube, can be performed in a primary health center.

The fact that women do resort to primitive abortion, even knowing it to be unsafe, is evidence of their strong desire to prevent unwanted, unplanned births. Women known to have had abortions are therefore likely to accept contraception, and should be targeted in family planning efforts. Provision of contraception will not do away with the demand for abortion entirely, however, and serious efforts to reduce maternal mortality need to include emergency medical and surgical services to treat the complications of unsafe abortion. In some developing countries, abortion is legal on request or for a variety of maternal and other indications, but services are inadequate and large numbers of abortions are carried out by untrained practitioners in unsanitary conditions. In these circumstances, complications could be avoided if abortions were performed safely. Improving service provision by trained staff, expanding use of the safer and cost-effective manual vacuum aspiration technique, and improving women's knowledge of and access to abortion (where legal) as well as contraceptive services, could substantially reduce maternal deaths. Women who have undergone abortion are clearly at high risk of unintended pregnancy. In contrast to postpartum women who may delay ovulation by breastfeeding, women who have undergone spontaneous or induced abortion are at immediate risk of pregnancy. On-site delivery of post-abortion family planning, including the provision of initial counseling and contraceptive methods following abortion, is essential.

Prenatal Care

There is a large body of evidence from routine statistics and special studies to suggest that women who have received prenatal care experience lower rates of maternal mortality (Huque and Koblinsky 1991). However, selection bias cannot be excluded as a possible explanation. Available evidence suggests that women at lower risk may be more likely to have access to or avail themselves of prenatal care. Confounding factors may also be partly responsible; women who use prenatal care may also make greater use of delivery services. In addition, little is known about the specific components of prenatal care which may reduce maternal mortality or serious morbidity.

Certain maternal conditions are amenable to treatment during the prenatal period. Ideally, important components of prenatal care should include hemoglobin measurement and

correction of anemia, blood pressure measurement (to help detect hypertensive disorders of pregnancy), and the diagnosis and treatment of reproductive tract infections (especially sexually transmitted diseases) and urinary tract infections. Depending on local prevalence levels, it may also be necessary to prevent, screen for, and treat malaria and other infectious or parasitic diseases. Immunization against tetanus, which has benefits for both mother and infant, is an essential component of prenatal care throughout the developing world (WHO 1989b).

Prenatal care can also play a role in identifying danger signs or predicting complications around delivery by screening for risk factors and arranging for appropriate delivery care when indicated. Risk assessment has proven most useful in the prediction of obstructed or prolonged labor based on height and previous poor obstetric history (for example, cesarean section, still birth), but much less useful for other complications (Winikoff 1991; Maine 1990; Rooney and Graham 1991). A history of previous postpartum hemorrhage or retained placenta may be indicative of a women at risk of postpartum hemorrhage.

Most routine prenatal procedures have never been subjected to rigorous study in developing or industrial countries. Given this level of uncertainty, very little can be said about the cost effectiveness of prenatal interventions. Good quality research in this area is urgently needed. Although unproven, the idea that surveillance in pregnancy to detect abnormalities and complications with subsequent treatment or referral for specialist care will improve outcomes for both mother and child is still attractive.

In many developing countries, women have only infrequent contact with health services. As such, the opportunity afforded by any contact with women should be maximized. Contact during pregnancy may initiate further contact, with longer term benefits for both women and their families. Thus, when women attend prenatal care, they should be provided with health education, in addition to the services outlined above. This education should include information that will facilitate recognition of danger signs such as bleeding, generalized edema (swelling), rupture of the membranes before term or labor, and other locally prevalent conditions. Information on appropriate care can be given, including where and from whom it is available. Community participation in planning for labor or emergencies, including making arrangements for transport or setting up maternity waiting homes, can be encouraged. Prenatal care also provides an opportunity for nutrition and AIDS education, motivation for family planning and education on appropriate neonatal care. The supportive context of prenatal care has proved very beneficial to women in industrial countries, and is likely to serve a similar function elsewhere (Oakley 1985).

Anemia

Anemia is very prevalent among women in developing countries, as a result of iron and/or folate deficiency and of malaria and other parasitic diseases. In 1982, WHO estimated that around 60 percent of pregnant women in developing countries (other than China) had nutritional anemia (Royston 1982). An update of this review in 1992 found that the level of maternal anemia remains essentially unchanged despite efforts in iron supplementation, fortification and dietary modification in the intervening years (WHO 1992e).

Anemia contributes to maternal mortality by making women more susceptible to infection and less able to withstand infection or the effects of hemorrhage. Anemia is known to give rise to considerable long-term morbidity in women, and at extreme levels may be

associated with low birth weight. Anemia during pregnancy may be aggravated by malaria, hookworm infection, and schistosomiasis. Death from anemia results from heart failure, shock, or infection due to lowered resistance. Effective prevention depends ultimately on lifelong nutrition of girls and women, and thus on agricultural and economic factors and food distribution patterns within communities and families. It can, however, be detected and treated simply and effectively during pregnancy.

Though the use of routine iron and folate supplementation in pregnancy has been abandoned in industrial countries where anemia and subclinical deficiency are rare, this approach almost certainly has a place in areas where they are common; acceptable doses of inexpensive oral supplements can prevent anemia from developing or treat mild to moderate disease. Supplements may, however, produce unpleasant side effects, such as nausea and constipation, and compliance may be poor, especially in the absence of symptoms of anemia, or where symptoms are accepted as normal in pregnancy (WHO 1990b).

Fortification of foods with iron has been found effective where there is a bioavailable iron source compatible with a suitable food vehicle. In India, for example, fortification of salt is feasible in those parts of the country where it is centrally processed. Sugar is an attractive vehicle in the Caribbean and Central America, and has been fortified successfully in Guatemala (Viteri and others 1981). In Chile, fortification of milk and cookies has been effective (INACG 1986), and in Thailand, fortified fish-based condiments have shown promise (Garby and others 1981).

Refractory or severe anemia may require more detailed investigation and treatment of underlying pathology at referral-level facilities. Iron can be given intra-muscularly or intravenously to ensure compliance and avoid gastro-intestinal side effects, but hemoglobin does not rise any more rapidly through this form of administration than through adequate oral therapy. Blood transfusion as a treatment for anemia is discouraged because of the serious dangers of blood borne infection of, notably, HIV, malaria, syphilis, and hepatitis B.

Infections during Pregnancy

Clearly, pregnant women are sexually active and at risk of sexually transmitted diseases, including HIV/AIDS. In the early development of prenatal care in most industrial countries, screening and treatment for syphilis were, and remain, routine. Even at the low levels of prevalence seen in most industrial countries, this is still a cost-effective intervention (Wang and Smaill 1989; Chalmers 1991). Many studies in developing countries have demonstrated high prevalence levels of both syphilis and gonorrhea in pregnant women, leading to considerable long-term morbidity in women, and to congenital disease and perinatal mortality. Researchers estimate that of those women who are currently pregnant, 10 to 15 percent have syphilis and two-thirds of all these pregnancies have an adverse outcome. In one study in Zambia, syphilis was the single most common cause of fetal wastage, which was halved by what was, in practice, a fairly incomplete program of screening and treatment (Hira and others 1990). Reliable screening tests exist for both syphilis and gonorrhoea, as do safe, effective treatments. Screening can be conducted in the clinic while women are attending and treatment started immediately. Unfortunately, screening and treatment of sexually transmitted diseases are not often regarded as core components of prenatal care and may only be available in special clinics. There are undoubtedly serious logistic obstacles to be overcome in implementing effective screening, treatment and contact tracing programs for all

pregnant women in developing countries. However, the potential rewards are great, and it is imperative that efforts be made in this area.

Women are at higher risk of AIDS because the two predominant modes of transmission of HIV infection are sexual and perinatal. A study in Uganda has shown the HIV infection rate for women to be approximately 1.4 times that of men, and the rate of HIV infection is greater at an earlier age among women (15-19 years) than among men (Berkeley, Naamara, and Okware 1989). Empirical evidence also shows the rate of transmission from male to female to be 2.5 times higher than from female to male (Clemetson and Moss 1991). The risk of transmission of AIDS is particularly high where high rates of sexually transmitted diseases, especially those which cause ulcerative lesions such as chancroid and syphilis, are found.

In the case of HIV, curative treatment is not available, and even treatment to delay the onset of symptomatic disease with antiviral drugs is not readily available or affordable in developing countries. However, some of the most effective strategies for sexually transmitted diseases are equally important for AIDS prevention. These include promoting education strategies that modify or eliminate risk behaviors; providing adequate diagnostic and treatment facilities for patients; limiting complications by early detection and adequate treatment; reducing the risk of infection during genital tract procedures through safe delivery procedures; reducing exposure to infection by offering health education; limiting further transmission through counseling and partner referral; and promoting condom use and targeting family planning programs more aggressively toward men.

The place of routine screening for HIV and other sexually transmitted diseases, especially chlamydia, is less clear. Prevention is of the utmost importance and is helped by targeting subgroups who practice risk behaviors. Health education about risks of transmission to partners and infants could follow from positive tests. The tests for chlamydia require high-level laboratory facilities not routinely available throughout developing countries. The most common consequence of chlamydia for the infant, neonatal conjunctivitis, can be prevented by routine use of tetracycline eye drops at birth. Long-term maternal ill health associated with chlamydia, including pelvic inflammatory disease and secondary infertility, require systemic antibiotic therapy.

Treatment of symptomatic urinary tract infections is important, and it has been shown that screening for asymptomatic bacteriuria, followed by appropriate antibiotic treatment, reduces the incidence of pyelonephritis in the mother, as well as the incidence of low weight and premature delivery (Wang and Smaill 1989; Chalmers 1991).

Depending on the local prevalence, screening and treatment for other important infectious diseases, including malaria and tuberculosis, should be included as essential components of prenatal care. Studies have shown that malaria is more prevalent in pregnant women than in non-pregnant women. Also, anemia during pregnancy may be aggravated by malaria infection. The increased risk of low birth weight babies and the risk of neonatal and infant mortality associated with low birth weight are of major concern in areas of endemic malaria. An antimalarial chemoprophylaxis investigation in Malawi found no difference in birthweights between women in a control group and women receiving chloroquine or mefloquine prophylaxis doses. The study concludes that the intervention of chemoprophylaxis may not be entirely effective in regaining the lost birthweight that is attributed to malaria infection during pregnancy (Steketee 1989).

Chorio-amnionitis and fetal infection and loss can be prevented through prompt referral of women with pre-term or pre-labor rupture of the membranes and prophylactic use of antibiotics.

Where hepatitis B is prevalent, vaccination of the infants of hepatitis B carriers is effective in preventing early infection and its long-term sequelae (Hall, Greenwood, and Whittle 1990). The incidence of viral hepatitis was twice as high for pregnant women than for nonpregnant women, in studies for Ethiopia and Iran (Royston 1989). It is also more serious, with case fatality rates up to three and a half times as high. Malnutrition increases the chances of contracting the disease, as well as its severity. A study of pregnant women in India with viral hepatitis found that 15 percent of the 156 women who were adequately nourished died, while 25 percent of the 76 women who were poorly nourished died (AbouZhar and Royston 1991). Premature labor, liver failure, and sever hemorrhage are common complications of severe hepatitis.

Risk Screening and Referral

An accepted aim of prenatal care is to assess the risk of complications in later pregnancy, labor or delivery and arrange for a suitable level of care. Though many systems of risk scoring of varying levels of complexity have been devised, most of the major problems which can lead to maternal mortality cannot be predicted with sufficient accuracy, except in the case of obstructed or prolonged labor (Winikoff 1991; Maine 1990). In addition, this type of "risk approach" for maternity care can only work if all women are screened by adequately trained personnel, and if appropriate referral services are acceptable and within their reach geographically, logistically and financially, as has been shown in a project in Yaounde, Cameroon (see appendix 4). Even where the risk approach works, however, the need for emergency care is not eliminated due to the unpredictability of many complications.

A history of prolonged labor in a multigravida with or without adverse outcomes, and short stature in relation to the local norms, are strong risk factors for obstructed labor. Cut off points for height and for number of previous births must be selected based on local circumstances to ensure that the maximum proportion of those who may develop problems are identified without overwhelming service capacity.

Labor, Delivery, and Postpartum Care

It is often difficult to assign a single underlying cause in cases of maternal death. Prolonged labor, particularly once the membranes are ruptured, predisposes both mother and infant to sepsis. Untreated obstructed labor proceeds to ruptured uterus and death from hemorrhage. Pre-eclampsia leads to eclampsia, at which stage the woman develops convulsions, rapidly loses consciousness and dies from brain hemorrhage or failure of the heart, kidney or liver. Retained products and puerperal sepsis lead to secondary postpartum hemorrhage. Despite the difficulties of assigning a single underlying cause of death, however, studies have tried to determine the major causes. Based on an estimate prepared by WHO in 1993 on the Global Burden of Disease, hemorrhage is reported to cause just over a quarter of direct obstetric deaths, induced abortion 13 percent, sepsis 15 percent, hypertensive disorders such as eclampsia about 12 percent, and obstructed labor and other causes each about 8 percent (WHO 1993). However, this pattern of mortality does not hold everywhere; as can be seen in

Table A1.1, the prevalence of the complications leading to maternal death varies greatly among countries.

Providers must be equipped to manage all obstetrical complications as well as their poor consequences. Most obstetrical complications can lead not only to death, but also to a myriad of problems for those who survive (for example, asphyxia and low birth weight among infants, prolapse and fistula among mothers). For example, both eclampsia and obstructed labor are not reported as often as postpartum hemorrhage as causes of maternal death, but the prevalence of these complications (or its precursors, pre-eclampsia and hypertension in the case of eclampsia) is high and variable by country, with significant consequences for the subsequent health of both the woman and the infant.

Some complications lead more rapidly to death than others. Postpartum hemorrhage can lead to death in a matter of hours, whereas for infection, eclampsia and obstructed labor, there are usually several days between the onset of complications and death (Maine 1990). This time factor needs to be taken into consideration when developing management protocols.

As abortion has been discussed above, the four main causes of maternal mortality associated with delivery—hemorrhage, hypertensive disorders of pregnancy, obstructed labor, and sepsis—are considered in turn here, on the assumption that preventing or treating them successfully will also reduce their sequelae.

Hemorrhage

Hemorrhage is more common among multiparous women, following unsafe abortion, in cases of antepartum hemorrhage, prolonged labor or retained placenta, or among women with a history of problems in delivering the placenta. Community-based studies indicate that postpartum hemorrhage follow an estimated 2 to 8 percent of all deliveries in developing countries (Koblinsky and others 1992). A WHO Technical Working Group concluded that it follows 10 to 20 percent of deliveries in the absence of oxytocics (WHO 1990d).

The scope for prevention of postpartum hemorrhage is enormous. There is conclusive evidence from good quality randomized control trials that routine active management of the third stage of labor, including parenteral (usually intra-muscular) oxytocics, reduces the incidence of postpartum hemorrhage and the need for transfusion by 60 percent (Elbourne 1991; Chalmers 1991; WHO 1990d). One of the trials did show an increase in the incidence of retained placenta (Begley 1990), and, overall, the routine use of oxytocics was associated with an increased risk of elevation in blood pressure. Nonetheless, active management with an intra-muscular oxytocic following delivery and as soon as the attendant is sure that the pregnancy is not multiple, is recommended for all institutional deliveries, as well as for home deliveries conducted by skilled attendants (WHO 1990d; FIGO 1991). The stability of oxytocic drugs in conditions of storage in developing countries, and their efficacy when administered by other routes, such as orally or by rectal suppositories, are the subjects of current research (Chalmers 1991; WHO 1990c; WHO 1990d).

The relative effectiveness and safety of the use of oxytocics by trained birth attendants in home deliveries will vary from place to place and with their level of training. A risk approach has been advocated, in which those judged to be at high risk of hemorrhage (particularly those with previous third stage complications), are referred for institutional delivery, with active management and prophylactic oxytocics, while low risk women are allowed to deliver at home (where these are not available). It is not easy to predict all cases of hemorrhage, however, and most cases of postpartum hemorrhage occur in women who cannot be identified prospectively as being at increased risk as such, and as the potential gain in hemorrhages and deaths averted through use of oxytocin is large, there is an urgent need

Table A1.1 Maternal Mortality and Morbidity: Causes, Prevalence, and Consequence in Developing Countries

Causes	*Prevalence in Pregnant Women*		*Consequences*
Septic abortion	NA; estimated >25,000,000 unsafely induced abortions	(a)	*Death:* 70,000-200,000 women (est.) *Morbidity:* Women: Permanent disability Infertility
Postpartum hemorrhage	10-20% 2.0-2.2% 2.4% 5.0% 1.9% 8.0% 6.0 %	WHO (est.) (b) China (c,d) Jamaica (e) India (f) Indonesia (g) Malawi (h) Bangladesh (i)	*Death:* 104,000 women (est.) *Morbidity:* Women: Anemia
Eclampsia *Pre-eclampsia* *Hypertension*	< 1% 0.1-3% 11.0% 1.7% 4.0% 10% 15%	(j) Indonesia, Burma, Thailand, India (k) China (c) China (d) Jamaica (e) Jamaica (e) China (d)	*Death:* 60,000 women (est.) *Morbidity:* Women: Paralysis Blindness Chronic hypertension Kidney damage Infant: Prematurity Asphyxia
Obstructed labor	11% 1.2% 0.3% 2.3% 1.3% 13%	India (f) India (k) Burma (k) Brazil Jamaica (e) Bangladesh (l)	*Death:* 40,000 women (est.); fetal deaths *Morbidity:* Women: Fistula Prolapse Sepsis Infant: Asphyxia Birth injury Infection
Puerperal sepsis/infection (reproductive tract infections not included in studies)	1.1% 8.0% 1.0% 5.0%	India (m) India (f) China (c) Bangladesh (i)	*Death:* 40,000-115,000 women (est.) 750,000 neonates (tetanus) *Morbidity:* Women: Infertility Pelvic inflammatory disease Ectopic pregnancy Infant: Pneumonia Neonatal sepsis

Source: Mortality estimates are based on percentages in the review of eleven population-based studies (Maine 1990). Prevalence estimates are based on the following: (a) Coeytaux, Leonard and Bloomer 1992; (b) WHO 1990d; (c) Li, Ai-Mei and Jing-ru 1982; (d) Yan and others 1989; (e) Department of Child Health 1989; (f) Gordon, Gideon and Wyon 1965; (g) Alisjahbana 1991; (h) Bullough, Msuku and Karonde 1989; (i) Stewart and Whittaker 1991; (j) Koblinsky and others 1992; (k) Perera and Lwin 1984; (l) Araujo and others 1983; (m) Datta and others 1980.

for information on the type of training required to help trained birth attendants administer oxytocin safely and effectively.

Successful treatment of postpartum hemorrhage relies on prompt action to stop bleeding and replace lost blood. Most primary postpartum hemorrhage results either from failure of the uterus to contract and remain contracted or from retained placenta (partial or complete). WHO has recommended that midwives be trained to perform manual removal of the placenta, because the results in terms of blood loss, infection and mortality are best when this is done within an hour of delivery (WHO 1991b).

First aid for atonic uterus includes external bimanual uterine massage, and putting the baby to the breast immediately to induce uterine contraction. The effectiveness of these measures is not clear. Intravenous or intra-muscular oxytocic drugs are highly effective, and it may be possible to make these available in peripheral health centers. Nevertheless, persistent bleeding may require further medical or surgical intervention, including laparotomy and/or hysterectomy, which are only available in referral centers. Late postpartum hemorrhage is usually secondary to infection and/or retained products, and may require a combination of surgical evacuation and antibiotics as well as resuscitation with intravenous fluids and blood replacement.

Intravenous volume replacement with normal saline or colloidal solutions should be available as peripherally as possible for rapid resuscitation. Blood transfusion is undoubtedly lifesaving when large volumes of blood have been lost. As such, typed and cross-matched blood for transfusion is an essential part of any safe motherhood program. Ensuring the collection and availability of safe, reliable blood for transfusion poses particular problems at primary care facilities in most developing countries, where blood and blood products need to be refrigerated or frozen until needed. To avoid the need for collection and storage of blood products "walking blood banks" are under study in some areas to enhance availability. These are individuals in the community who are identified as blood donors, ready to donate directly to a patient in need—with the blood "stored" at body temperature in the donor until the moment of need. This intervention does not automatically overcome the risks of infection, which still need to be addressed. However, ABO dipsticks designed for out of hospital blood typing and dipsticks for detecting HIV antibody have recently been developed and are almost ready for distribution. These will be very important in typing and screening blood for HIV.

Hypertensive Disorders of Pregnancy

These include eclampsia and pre-eclampsia and are part of a syndrome that begins with pregnancy-induced hypertension. Early stage pre-eclampsia, characterized by high blood pressure, generalized edema (swelling), and excess protein in the urine, may arise in the second or third trimester and is most common among primiparas. Eclampsia is characterized by very high blood pressure, convulsions, and possible cerebral hemorrhage. Untreated pre-eclampsia leads to eclampsia in less than 1 percent of pregnant women, but the condition is serious and the outcome poor. Immediate transfer and treatment, including expedited delivery, are required. Between 5 and 17 percent of eclampsia victims die, and those who survive may suffer paralysis, blindness, or chronic hypertension and kidney damage. As eclampsia can happen at any time during the latter part of pregnancy, it can and often does result in fetal death or the birth of a premature infant at high risk of death. Hypertension and pre-eclampsia can also result in low-birth-weight infants or fetal death. The frequency of the occurrence of both hypertension and pre-eclampsia varies markedly among countries, with high levels of hypertension during pregnancy (10 to 15 percent) noted in Chinese studies (Li, Ai-Mei and Jing-ru 1982; Yan and others 1989) and in Jamaica (Department of Child Health 1989). Even these levels are low, however, when compared with population-

based studies that focused solely on blood pressure during pregnancy. In the United Kingdom, in both 1958 and 1970, more than one quarter of pregnant women were hypertensive (Butler and Bonham 1963; Chamberlain and others 1978). In Cuba in the late 1970s, 22 percent of pregnant women were hypertensive (Ochoa Rojas 1981).

The detection and management of hypertensive disorders of pregnancy depend on a continuum of services from prenatal care through routine and emergency care around the time of delivery. The degree to which severe pre-eclampsia and eclampsia can be prevented by good prenatal care is not clear. There is increasing evidence, however, that low dose aspirin, taken beginning early in pregnancy can prevent pre-eclampsia in women at high risk (Chalmers 1991).

Rates of maternal death from eclampsia and pre-eclampsia are proportionately high in areas of the world where improvements in basic maternity services have reduced rates of death from infection and hemorrhage. It is clear that the case fatality rate is lower when women with these disorders are looked after by specialists in well-equipped units. However, controversy remains over what specific treatment to control blood pressure and convulsions is best. Some contend that the treatment of choice for pre-eclampsia during labor is magnesium sulphate, administered intra-muscularly or intravenously. Others feel that sedation may be helpful and suggest the possibility of supplying barbiturates in small doses to be supplied by midwives to selected women at risk. Much of the reduction in fatalities in industrialized countries may be attributed to improved medical support for the critically ill patient and the increased use, effectiveness and safety of methods of expediting delivery, including induction of labor and operative delivery.

Community-level care should consist of supportive care of the unconscious or convulsive patient, and transfer to a referral center. Whether anticonvulsant or antihypertensive therapy should be given before transfer, and, if so, which type, is not clear and will depend in part on the level of skill of community-based health care workers (Chalmers 1991; Duley 1990). Trials of prevention and treatment of severe disease are underway in several developing countries (WHO 1990c; Chalmers 1991 personal communication).

The most basic requirement for adequate attention to hypertension in pregnancy is blood pressure monitoring by trained personnel during prenatal care. The serial measurement of blood pressure is not always simple, but it is an important measurement. Training of health care providers to take blood pressure measurements in a reliable, unbiased fashion can be difficult. In-service training to maintain accuracy in recording measurements and intelligent interpretation of results and subsequent diagnosis are important factors in the prevention of eclampsia.

In addition, community education should be conducted to improve knowledge of the danger signs of severe pre-eclampsia and the importance of seeking care immediately in the case of convulsions. Where blood pressure screening is not possible, use of other indicators for referral should be explored. For example, urine dipsticks can be used to screen for protein uria, an indicator of pre-eclampsia.

Obstructed Labor

Between 1 and 13 percent of pregnant women suffer prolonged or obstructed labor (Koblinsky and others 1992) though the level of obstructed labor varies by country. Prolonged labor can lead to death 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 twelve hours. Treatment requires forceps or ventouse delivery, cesarean section, or symphysiotomy. Obstructed labor can result not only in maternal death, but in fetal death due to infection, birth injury, or asphyxia. Operative delivery to relieve

obstructed labor is one of the recognized essential obstetric functions which should be available at the first-referral level hospital to which women are referred in emergencies. Lack of access to timely operative delivery for women in developing countries, most of whom deliver in homes which may be far from any health facility, leads to many preventable deaths. Strategies to overcome these problems include prenatal risk screening to ensure that women at high risk of obstructed labor are booked to deliver in hospital, and early detection and referral of women for whom labor is not progressing at a normal rate.

Prevention of obstructed labor due to abnormal lie might, at least in theory, be possible through detection of transverse or oblique lie and external cephalic version at term. Studies of external cephalic version at term, but not before, for breech presentation have shown a reduction in subsequent breech delivery and the need for cesarean section (Chalmers 1991; Hofmeyr 1989). However, there is insufficient evidence from trials to determine the effect of external cephalic version on the much rarer conditions of transverse and oblique lie. The ability of trained birth attendants or other staff below the level of trained midwife to detect these abnormalities, even if women are seen in the last month of pregnancy, has not been well documented.

Prolonged labor is not always due to cephalo-pelvic disproportion and does not inevitably end in obstructed labor. However, whatever its cause, prolonged labor is also associated with increased risk of postpartum hemorrhage and infection and long-term sequelae such as vesicovaginal fistula, indicating a need for referral for higher-level care (see box A1.1). Use of the partograph to monitor the progress of labor has been shown to be effective in detecting prolonged labor and improving decision making. The partograph enables health staff to assess the progress of labor by tracking cervical dilation against the passage of time. Cervical assessment is recommended on a four-hourly basis. Use of the partograph by midwives in peripheral low-technology units facilitates early transfer. In referral hospitals, it assists decision making for operative delivery or other interventions, and improves communication (WHO 1988; Leigh 1986).

In a recently-conducted WHO multicenter trial on the use of the partograph covering 35,000 births, the mean number of vaginal examinations during labor was 1.39. Adherence to an agreed management protocol was found to be associated with many advantages, including a reduction in vaginal examinations (and the associated risk of infection) and improved outcomes of labor (Kwast 1992 personal communication).

The partograph has been successfully used by maternal and child health aides (who have 18 months training in addition to primary education) in Sierra Leone (Leigh 1986). Simpler, less invasive methods of assessing the progress of labor are needed for use by trained birth

Box A1.1 Vesicovaginal Fistula: A Chronic Maternal Morbidity

One of the worst consequences of childbirth is vesicovaginal fistula (VVF) or holes that develop between the vagina and urinary tract and/or rectum. VVF is commonly due to obstructed labor, which is most common among women who are stunted due to chronic malnutrition or untreated infections in childhood and adolescence, or among women experiencing their first pregnancy at a young age, prior to complete pelvic growth. Women who suffer VVF continuously leak urine, and sometimes feces. They typically become social outcasts; divorced and rejected, they often travel long distances in search of treatment. The numbers of women afflicted with VVF are unknown. Hospitals statistics show that the prevalence is particularly high in sub-Saharan Africa, with most patients being very young, short-statured primiparae coming from rural areas where health services are scarce. In an area of northern Nigeria, 300 new cases come to the gynecology clinic for treatment each month (Tahzib 1989). In Ethiopia, one hospital has done 15,000 repairs in about 25 years. In India, the numbers are decreasing with the development of peripheral maternity services and improved communications. In Nepal, Bangladesh and Northern Pakistan, the prevalence of VVF continues to be high. In other Asian countries, Oceania and South America prevalence does not appear to be high; there have been reports of obstetric fistulae from several Eastern Mediterranean countries, however (Cottingham and Royston 1991).

attendants in home deliveries. Rules for referral based on length of time, for example 24 or 12 hours, as measured by the sun, are used in some trained birth attendant training programs. No formal evaluation of the effectiveness of this method has been identified. Community awareness and support for transfer of women in prolonged labor is crucial.

Though cesarean section is seen as the definitive treatment for obstructed labor, there are situations in which other forms of operative or assisted delivery may be equally successful and easier and safer to make available at the peripheral level. Recent studies and reviews in developing countries have suggested that the morbidity associated with symphysiotomy has been overestimated (Duale and others 1990; Gebbie 1974; van Roosmalen 1987 & 1990) and, unlike cesarean section, the procedure helps rather than threatens the next pregnancy. Retrospective hospital series comparing symphysiotomy and cesarean section have found the former to be associated with lower maternal mortality (Gebbie 1974; van Roosmalen 1990). There is a need for studies comparing the immediate and long-term outcome of cesarean section and symphysiotomy in truly comparable, unbiased samples of women with obstructed labor. At the same time, some of the dangers of cesarean section may also have been overestimated. The rates of subsequent uncomplicated vaginal delivery are surprisingly high, even when cesarean section is performed in cases of disproportion (Chalmers, Enkin and Kierse 1989). However, this cannot be equated with safety in subsequent home deliveries in remote rural areas.

Symphysiotomy is undoubtedly a simpler operation, requiring a lower level of surgical skill, and equipment. However, the need for skills and equipment, as well as for guidelines and sound judgement, must not be underestimated. With proper training, it may be possible to perform symphysiotomy at a more peripheral level than cesarean section. It may also be performed by general physicians and nurse-midwives; training obstetric nurses or midwives to perform cesarean sections has been successful in some developing countries (White and others 1987). This potential may be limited by legal and licensing constraints but is an alternative strategy to improve provision of emergency life-saving services in remote areas.

Delay in delivery not due to absolute disproportion or abnormal lie may be overcome by forceps or ventouse (vacuum extraction) delivery. A recent review of trials comparing the two procedures has shown that ventouse leads to fewer maternal injuries (Chalmers 1991). Their relative safety in terms of long-term effects on the infant are not yet clear. Ventouse systems using suction from a foot pump and designed for easy maintenance in developing countries have been developed.

Sepsis

Sepsis is particularly common after unsafe abortion or following long, complicated deliveries. Frequent vaginal examinations, any surgery and use of instruments and lack of sterile techniques increase the risks. Pre-existing genital infections—reproductive tract infections—may also increase the risks. Those who survive infection face increased risk of pelvic inflammatory disease, infertility, and ectopic pregnancy. Although fever is the most easily diagnosable sign of infection, measurement of fever alone greatly underestimates the prevalence of maternal sepsis. One type of infection, tetanus, is estimated to cause 30,000 maternal (Fauveau and others 1992) and 750,000 neonatal deaths each year (WHO 1991c).

Clearly, there is scope for prevention of a large proportion of sepsis around the time of delivery, by improvement in standards of hygiene in routine care. Frequent vaginal examinations during labor contribute significantly to sepsis. As such, keeping interventions and vaginal examinations to a minimum would prevent some cases. Another preventive measure is the provision of "clean delivery" for all women. Basic aseptic technique is simple in facilities with adequate supplies of water, soap and disinfectant. One of the primary aims

of trained birth attendant training programs throughout the developing world is to promote clean delivery in the home through education and provision of basic supplies such as sterile razor blades and washable plastic sheets (WHO 1987). It is, however, difficult to ensure cleanliness in all deliveries, particularly where access to clean water is limited. Evaluation of training shows that trained birth attendants can be taught the importance of cleanliness, but that their practice does not always reflect this knowledge, particularly when training courses are short and do not include a practical "on the job " element (WHO 1986).

Other effective strategies to prevent sepsis include:

- Referring women with pre-term prolonged rupture of membranes (longer than 12 hours) to a referral-level facility for assessment.
- Use of prophylactic antibiotics following pre-labor rupture of membranes (longer than 12 hours) (Kierse and others 1989; WHO 1991c).
- Transferring women with prolonged labor (longer than 12 hours) to a referral-level facility.
- Evacuating retained placental fragments promptly.

Early detection and timely use of antibiotics for postpartum sepsis reduces the risk of mortality or long-term sequelae (FIGO 1991). Therefore, educating trained birth attendants, women, their families, and community health workers to recognize the early signs of sepsis and seek medical care may be lifesaving. Scheduling timely postpartum visits may also be useful. Postpartum care to detect infection is as important for those who deliver in institutions as it is for those who deliver at home. Women in hospitals are often discharged within less than two days, so that the first signs of infection may only appear after they have left.

In some areas, trained birth attendants or community health workers are able to begin treatment with antibiotics before referral, to avoid delay. Higher-level care is needed to assess the need for evacuation of retained products, or more extensive surgical intervention in advanced cases. Parenteral antibiotics, laboratory facilities to identify pathogens and intensive medical support may also be needed.

Summary

An effective program to prevent maternal deaths will include many services at the community, health center and referral level, all of which must be coordinated to ensure their effective functioning. Preventing the main causes of maternal death will require a spectrum of services including prenatal and delivery care, family planning, and treatment for the complications of unsafe abortion, with provision of safe abortion where possible. The greatest improvements will be seen where comprehensive and integrated care are provided. It is, however, possible to identify the most promising first line of attack for each main cause of maternal death:

- Family planning can reduce maternal deaths from all causes, by reducing the fertility rate, and, especially, unwanted pregnancies, and thus unsafe abortion. Further reductions in deaths from unsafe abortions can be achieved through provision of emergency treatment for complications and safe alternative services.
- In addition to managing hypertensive disorders of pregnancy, and assessing the risk of complications at delivery (particularly obstructed labor), health care during the prenatal period can improve the health of women and their infants through routine screening and treatment for sexually transmitted diseases, urinary tract infections, and locally prevalent infectious and parasitic diseases, particularly malaria.

- Prophylactic iron and folate supplements are recommended where anemia from these deficiencies is common, with screening and treatment for severe or refractory anemia.
- Tetanus toxoid immunization is highly effective in reducing neonatal deaths from tetanus as well as the 30,000 estimated maternal tetanus deaths yearly (Fauveau and others 1992).
- Health education during the prenatal or other periods may increase awareness of danger signs (such as bleeding, pre-labor rupture of the membranes, and generalized edema (swelling), offer information about appropriate treatment, including where, how and when to obtain it, and encourage community planning for routine and emergency care, including communication and transport. The most important component of prenatal care, however, is likely to be referral services for women, in case they are needed.
- A proportion of the cases of obstructed labor can be predicted, well before labor, from previous obstetric history and height, so that arrangements can be made for adequately supervised labor with access to operative delivery if required. The use of the partograph in labor leads to earlier diagnosis of prolonged labor and more timely intervention or transfer, which can improve the survival chances of mother and infant.
- Hemorrhage is largely unpredictable, but can be prevented by routine active management of the third stage of labor by skilled birth attendants using oxytocic drugs. Operational research is underway on ways of making such management available in home deliveries by trained birth attendants. Effective treatment includes rapid manual removal of retained placenta, oxytocic drugs, intravenous fluids, blood transfusion, and surgery.
- Sepsis at delivery can be prevented by minimizing vaginal examinations and ensuring clean delivery practices. The latter can be promoted through education of women, training of trained birth attendants and other health care staff and provision of adequate equipment and supplies. Early detection of puerperal sepsis depends on careful postpartum surveillance of women at home.
- Deaths from hypertensive diseases of pregnancy are the most difficult to prevent. Promising evidence for prevention of pre-eclampsia with low dose aspirin or calcium supplements is accumulating from large multicenter randomized control trials. This may become the most effective intervention to reduce mortality, especially in women at high risk and areas of high prevalence if women are seen early in pregnancy. Though the choice of treatment for advanced disease is still under investigation, it is clear that care in referral centers reduces mortality. As such, early detection, education to promote recognition of danger signs, and referral are necessary.

Appendix 2

Country Examples of Safe Motherhood Programs

- *Bangladesh*—Posting Trained Midwives in Rural Bangladesh: The Matlab Maternity Care Project
- *Bolivia*—Improving Maternal and Perinatal Health in Urban and Periurban Cochabamba: Project Summary and Projected Costs
- *Brazil*—Training and Learning from Traditional Birth Attendants in Northeast Brazil: The PROAIS Project
- *Cameroon*—Risk Screening and Referral
- *Ethiopia*—Community Obstetrics and Maternity Waiting Homes
- *The Gambia*—Training Traditional Birth Attendants: The Farafenni Project
- *Grenada*—Public Sector Maternity Care: Summary and Associated Expenditures
- *Guatemala*—A Rural Case Management Strategy: The Quetzaltenango Project
- *Indonesia*—Regionalization of Care in West Java
- *Tunisia*—Strengthening and Expanding Family Planning and Maternal and Child Health Services within the Basic Health Care System
- *Zaire*—The Karawa Health Zone Project
- *Zambia*—Integrating Prenatal Care with Syphilis Control
- *Zimbabwe*—Expanding Access to Maternity Care

Bangladesh—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 in the intervention area 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 was 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 faced when pregnant, however, remained high, as reflected in a maternal mortality ratio of 550 per 100,000 live births. In addition, unsafe, induced abortion remained 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 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 with an obstetrical specialist on staff.

The Matlab MCH-FP area was divided into a control and intervention district, comparable in terms of socioeconomic, demographic, and specific health indicators. 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 traditional birth attendants, 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.
- 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 traditional birth attendants, 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. 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 9 percent of cases the midwife herself delivered the baby, and in 4 percent she attended the delivery but allowed the traditional birth attendant or a female paramedic to perform the delivery. In 2 percent of cases, the midwife was on her way. 19 percent of the women attended by midwives were referred to the Matlab clinic. Of the 1,712 women visited postpartum, 3 percent were referred to the clinic.

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 traditional birth attendant. 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 prenatal 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 socioeconomic status.

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. 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 expenses 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 1991a; Fauveau and others 1991b; Fauveau and Chakraborty, 1988; Stewart 1991)

Bolivia—Improving Maternal and Perinatal Health in Urban and Periurban Cochabamba: Project Summary and Projected Costs

The goal of the USAID-supported Cochabamba project, which was launched in 1991, is to reduce maternal and perinatal mortality rates in urban and periurban areas of Cochabamba, Bolivia. An estimated 91,000 women of reproductive age, of whom approximately 19,400 become pregnant each year, live in the Cochabamba area, which has an estimated total population of 1,000,000. In 1989, maternal mortality was estimated at 480/100,000 live births and perinatal mortality at 110/1,000.

The Cochabamba project takes a comprehensive approach with a focus on preventive prenatal and postnatal care, institutional delivery care, use of trained personnel for home deliveries, and the provision and promotion of low-cost contraceptive services. The majority of the project's interventions are aimed at raising awareness of maternal health problems and building demand for available services.

Specific project components include: (1) baseline and evaluative research; (2) information, social marketing, education and communication activities and materials development; and (3) in-service training for both public sector and NGO health professionals in the provision of family planning information and services, prenatal assessment, and management of high risk obstetrical cases.

The project is coordinated by and implemented through NGOs already working in maternal and infant health in and around Cochabamba. In addition, a long-term resident advisor provides technical assistance to the overall effort.

The following chart summarizes estimated costs, as indicated in the proposed project budget, for the three year project. The estimates include costs of locally-recruited staff, local contractors, expatriate consultants, travel, per diem, equipment, commodities, and other direct costs.

	Total budgeted cost (US$)	*Percent of total*
Research and Investigations	$328,032	21
Information, Education, and Communication, Social Marketing	510,402	33
In-service Training	119,370	8
NGO Family Planning Service Provision	212,749	14
Project Management	364,520	24
Total	$1,535,073	100

(MotherCare Project: Taylor and others 1990)

Brazil—Training and Learning from Traditional Birth Attendants 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 US$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 Professor 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 hospital care did so for problems that did not require such care. Worse, many women suffering severe complications requiring hospital care arrived too late and too ill to be saved.

Birth attendants selected by rural community leaders have been 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 has been 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 traditional birth attendants 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 from the rafters, or wrap their arms around their husband's neck, for leverage. Several types of maternity huts are in operation. The most

simple consists of a small mud room attached to the traditional birth attendant's home and equipped with a small bed or hammock. Such units handle two to six deliveries per month and cost US$50 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 traditional birth attendants 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 traditional birth attendants 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 benefited 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 traditional birth attendants. While it is clear that enormous gains have been made from training and delegating responsibility to traditional birth attendants in this project, its success has relied on effective referral-level facilities, a functioning referral system, and extensive supervision by health professionals.

(Bomfim 1991; Araujo and others 1993; Janowitz and others 1985)

Cameroon—Risk Screening and Referral

The maternal mortality ratio in the 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 5 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 the 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 they 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 contributed to 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, however, and its use, which would be unnecessarily complicated, has not been taught to the midwives. 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 40 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 socioeconomic 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 sociocultural factors that affect the acceptability of contraception among women at high risk; and determining 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 sociocultural 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 1991; Nasah and others 1991)

Ethiopia—Community Obstetrics and Maternity Waiting Homes

Attat Hospital, a 55-bed rural community-based establishment in Central Ethiopia, covers a population of 1.5 million. The hospital's catchment area contains 300,000 people who are one to two days's walk from access to transport in case of an emergency.

The hospital's immediate target area for implementation of a primary health care program includes 15 villages with a population of about 15,000 located within a radius of 12 kilometers (equivalent to some two hours walking). Each village has a development committee of five people which meets monthly with a representative of the hospital's public health team. A women's group concerned with social and community development exists in every village as well. These groups have initiated small income-generating projects for women, and constructed wells and toilets with a subsequent decrease in diarrheal disease. Natural family planning methods are gradually being accepted and practiced in the area.

A maternity care system with efficient access to the Attat Hospital was organized through the area's functioning primary health care program. Thirteen traditional birth attendants and 13 village health workers were trained and worked in village health posts. Prenatal clinics are conducted in three villages by the traditional birth attendants and nurse-midwives from the hospital. Pregnant women at high risk are identified and referred to the "tukul", a maternity waiting home located near Attat Hospital, approximately two weeks before their expected date of delivery. High risk criteria include poor obstetric history—preterm labor, operative delivery, fistula, referral for retained placenta, and referral for hemorrhage, puerperal fever; and present pregnancy—hemorrhage, raised blood pressure, malpresentation (transverse/twins/priapara breech), severe anemia, and very young, very short primipara.

The maternity waiting home was built in the style of a local house and provides pregnant women with a temporary residence where they can be observed prior to delivery. All the labor and the majority of construction materials for the home were provided by the community. All women who use the facility are accompanied by a relative, bring their own food and buy firewood locally. While in residence, the women attend the hospital's prenatal clinic and are visited by a hospital nurse once a day. The home contains 15 beds and the average length of stay is 15 days.

During 1987, 151 women were admitted to the maternity waiting home. All the women had received prenatal care either in the hospital or the outreach clinics. Seventy-two women admitted to the home had unfavorable obstetric histories; 39 others had complications during the index pregnancy. The remaining 40 were not identified as being especially high risk (17 grandmultipara, 10 primigravida, 1 lived very far away, 12 unknown) but they wished to be near the hospital when they went into labor.

Of the 72 women with unfavorable obstetric history, one went home prior to delivery and 34 had cesarean sections. Of 15 women with a previously ruptured uterus, seven were delivered abdominally; the other eight were delivered vaginally under close supervision. Of the women with previous stillbirths, all had livebirths. Some of these women had two, three or four prior stillbirths.

There were 13 maternal deaths among women admitted directly from their homes to the hospital (MM ratio: 2,120/100,000 live births) but none among those who entered the maternity home first. Causes of maternal death included ruptured uterus, eclampsia, hepatic coma, severe sepsis and placenta previa. The stillbirth rate for direct hospital admissions was ten times higher than for maternity home admissions (253.5 vs. 28.2 per 1,000 births). Of the four stillbirths which did occur in the maternity home, intrauterine death had occurred in two of the cases prior to their arrival. There were no ruptured uteri nor craniotomies among the women admitted via the home.

(Poovan and others 1990)

The Gambia—Training Traditional Birth Attendants: 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. 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 birth attendant. Most villages with over 400 people are now served by a government-trained birth attendant.

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 traditional birth attendants 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 1982-83. 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 birth attendants were selected for training. The birth attendants, most of whom were elderly, illiterate, and already served as untrained birth attendants, received the standard, 10-week government training course. They were supplied with birth kits, which include clean dressings, scissors, string, oral ergometrine and disinfectant. Traditional birth attendants 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 on 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: (1) monthly morbidity surveys during pregnancy; (2) 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 (3) 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 traditional birth attendants. A small proportion (4 percent) of deliveries in non-PHC villages were also attended by traditional birth attendants 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 traditional birth attendants 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, 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 traditional birth attendants 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 traditional birth attendants.
- The traditional birth attendants 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, traditional birth attendants 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 1991; Greenwood and others 1990)

Grenada—Public Sector Maternity Care: Summary and Associated Expenditures

Maternal and perinatal mortality is relatively low in Grenada despite limited use of advanced medical technologies. There were six maternal deaths in 1987-1988, among 5737 live births, or a ratio of 104 per 1,000,000 live births.

A network of seven primary health care centers and 29 smaller visiting stations provide prenatal care. An estimated 75-100 percent of women use these services, with an average of 5-6 prenatal visits per woman. Ambulance services are available at two health centers and at the island's three small hospitals. Almost 90 percent of all births are performed by nurse-midwives, with physicians attending the more complicated cases. About 90 percent of all births occur in medical facilities.

The following table shows estimated maternity care expenditures in the proposed 1991 Ministry of Health operating budget. Estimates are shown for two of the hospitals—the main General Hospital, and one of the smaller hospitals, Princess Alice—and for all the health centers and visiting stations. For the purposes of these estimates, cost allocation was based on an analysis of utilization records. Selected unit costs are also shown.

	General Hospital	Princess Alice Hospital	Community Health Centers
Budgeted Annual Operating Costs for Maternity Care, 1991 (US dollars, converted at 2.7EC = $1.00)			
Personnel			
Medical staff salaries	$39,803		
Nursing staff salaries	73,500		
Other hospital staff salaries	104,475		
Other direct and indirect personnel costs	75,934		
Subtotal, personnel	293,712	$29,804	$274,199
Supplies	74,156	8,264	39,855
Overhead	3,870	NA	6,321
Medicines:	NA	NA	NA
Total	$371,738	$38,068	$320,375
Estimated Selected Unit Costs of Maternity Care			
Normal delivery (@1.8 day hospital stay)	$90	$44	
Operative delivery (@8 day hospital stay)	391	198	
Pregnancy complications (@7 day hospital stay)	342	174	
Obstetrical bed day	49	25	
Prenatal care patient			$130-173
Prenatal visit			21-25

(MotherCare Project, Laukaran 1990)

Guatemala—A Rural Case Management Strategy: The Quetzaltenango Project

Maternal mortality estimates in Guatemala range from 100-144 (government estimates) to 1,000-1,700 (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 in turn are responsible for supervising traditional birth attendants 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 traditional birth attendants 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 Panamá (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 (6 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 traditional birth attendants, who recognized 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).

Traditional birth attendants, who attended 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 of 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 traditional birth attendants 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 traditional birth attendant 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 traditional birth attendants 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 traditional birth attendant 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.

Traditional birth attendant training materials are being revised based on specific, priority obstetric/perinatal complications and the specific tasks the traditional birth attendants 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 traditional birth attendants themselves. The traditional birth attendant 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 traditional birth attendants 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 traditional birth attendants and district health staff to identify training needs and discuss the problems traditional birth attendants confront. Traditional birth attendants 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 traditional birth attendant to remain with the mother in hospital, as well as implementing 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.

(MotherCare Project: Schieber 1991)

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. Though traditional birth attendant training has been undertaken on a wide scale since the 1970s, it has failed to improve pregnancy outcomes. The training and supervision of traditional birth attendants 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 traditional 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 traditional birth attendant training using the risk approach. Ninety percent of all deliveries in the sub-district are carried out by traditional birth attendants, some of whom are

men. According to government policy, traditional birth attendants 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 traditional birth attendants and other attending health staff, to improve traditional birth attendant 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 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 with the hospital environment. In the control area, traditional birth attendants 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. Traditional birth attendants trained in the risk approach referred 22 percent of women, compared to only 8 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, which was probably due 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 prenatal, 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 traditional birth attendants and the village midwife and coordinated by the village head and village committee. The huts will be equipped to provide prenatal care (equipment will include 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 for 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 subdistrict 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 5 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.

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 traditional birth attendants to trained midwives in village-level delivery care. The program is also expected to show that the training and posting of midwives must be supplemented by improvements at 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 1991; Alisjahbana and others 1991; Alisjahbana and Thouw 1991)

Tunisia—Strengthening and Expanding Family Planning and Maternal and Child Health Services within the Basic Health Care System

Tunisia has made significant progress on the demographic transition and is a trailblazer in the provision of family planning services on the African continent and within the Arab world. A substantial rise in the age at marriage (from 19 to 24 years for females) linked with improvements in female education and employment before marriage have all contributed to the recent decline in fertility levels from 7.1 to 3.5 children per woman. Abortion is legal in Tunisia, and the number of abortions has remained virtually constant over the last 15 years, demonstrating that the decline in fertility is due in large part to family planning services. Contraceptive prevalence is over 64 percent in some parts of the country, yet because of uneven distribution in contraceptive use based on regions and schooling, the needs for contraceptive use are not yet satisfied.

Studies suggest that maternal mortality is about 100 per 100,000 women for Tunisia as a whole but is as high as 1,000 per 100,000 in rural areas. Although almost 60 percent of all deliveries are assisted, studies indicate that a large proportion of maternal mortality can be prevented by timely referral to appropriate levels of care.

To reach populations in remote geographical areas of the country and those in the poorest social strata, the government is developing an integrated approach to delivering family planning and maternal and child health services by improving access to basic health care services. Safe motherhood is one of the key objectives of this strategy. The program provides all women with better access to family planning services and all pregnant women with access to prenatal care and safe deliveries through midwives and obstetrical nurses and a quality referral system to higher levels of care. Although all women will receive at least one visit for prenatal care, women identified with high-risk pregnancies will receive follow-up visits. Services at the first-referral level of care are being improved through the provision of equipment and the refurbishing of district hospitals, diagnostic centers, and rural maternity centers.

To increase the coverage of postpartum visits for mothers and children, the Faculty of Medicine in Sousse has developed a maternal and child health and family planning program.

The doctor or midwife who attends the birth schedules a postpartum visit for the mother and her infant forty days after the birth. (In Tunisia, this marks the end of the traditional period of seclusion of the mother and her newborn.) The mother is seen by an obstetrician and the child by a pediatrician. The proportion of women and infants who receive postpartum care as well as family planning and other essential health services has increased substantially as a result of this program.

(Voltaire and Weissman 1993)

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. 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, traditional birth attendants 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. Traditional birth attendants 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 and a third year of training in either public health or midwifery. 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. Traditional birth attendants 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 traditional birth attendant training. Traditional birth attendants 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 traditional birth attendants are not usually called to assist before delivery, 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. Traditional birth attendants 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 traditional birth attendants, and investigating the use of visual aids to enhance risk assessment; ensuring that traditional birth attendants have a plan of action before emergencies arise; and developing a system to ensure that traditional birth attendants 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 traditional birth attendants are more accepted by the community as sources of care than formal health system staff, and recommends community-based health education to increase awareness of danger signs, help overcome fears of referral, and promote the development of community-initiated emergency protocols. In addition, formal health system staff need to improve collaboration with traditional birth attendants 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 traditional birth attendants. 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 1991; Duale and others 1991; Hermann and Duale 1990; White, Thorpe and Maine 1987; Smith and others 1986)

Zambia—Integrating Prenatal Care with Syphilis Control

High rates of maternal syphilis, ranging from 4 percent in Rwanda to 26 percent in The Gambia, have been reported in Africa. The consequences of maternal syphilis—spontaneous abortion, perinatal or infant death, congenital syphilis—are dire, and are estimated to occur in 5 to 8 percent of all pregnancies in Africa that survive until the second trimester. The consequence of untreated syphilis for the mother, including death from syphilis of the cardiovascular or nervous system, can also be devastating .

In their work in Lusaka, Zambia, Dr. Subhash Hira and colleagues found that 8 percent of prenatal clients tested positive for syphilis, of whom 58 percent had adverse pregnancy outcomes, including abortion, stillbirth, prematurity, low birthweight, and congenital syphilis. Given the magnitude of this problem, the availability of a relatively inexpensive screening tool that can be used while the woman is attending the clinic (the plasma reagin test, RPR) and the existence of an effective treatment (one injection of benzathine penicillin), an intervention study was implemented to determine the impact of prenatal care-based syphilis control on these adverse outcomes. Measured against a baseline as well as a control group,

the interventions (health education plus screening and treatment for maternal syphilis) were found to be very effective, bringing about a 66 percent reduction in adverse outcomes within approximately one year.

While the interventions were successful, they could have been even more so. Unfortunately, not all women who attended the prenatal clinics received the intervention, even under study conditions:

- Only about 60 percent of women received syphilis screening in the study centers.
- Only 15 percent of women received a second screening in their third trimester (third trimester screening is necessary because women can become infected or re-infected with syphilis during late pregnancy and still pass it on to the fetus).
- Only about half of those who tested positive were treated.

Why did the interventions not reach their potential? The time required to change beliefs and practices was probably underestimated, as is often the case. Early prenatal care is not valued in most developing countries, a fact that also continues to be a problem in some developed countries.

Another possible explanation pertains to the administration of prenatal care: routine prenatal test diagnoses are only useful if staff are well-supervised and -motivated to respond to positive test results. Conditions such as high blood pressure, anemia, and poor weight gain can signal potential complications during pregnancy, yet are often overlooked by clinic staff. There are multiple reasons for such oversight: clinic staff may serve multiple functions and may be occupied with more immediate problems (measles, fevers, diarrhea); medication is lacking (e.g., iron folate tablets); and health care providers are unsure of treatment protocols. In addition, the use of education as the sole means of preventing a condition such as high blood pressure is often not acceptable to the patient or to the provider. While these reasons may not be the primary explanation for the sub-optimal implementation of the Zambia demonstration project, they may well describe the environment in which care was provided in the study clinics.

The findings of the Zambian demonstration project strongly indicate the need for further trials of a prenatal care-based syphilis control intervention which focus on health education, screening, and treatment in areas where prevalence of maternal syphilis is high. In addition, the study highlights the need for building in "checks" to ensure that prenatal services function as planned, i.e. that women are screened for syphilis and other danger signs during pregnancy, and then treated accordingly; their partners must also be screened and treated

(Hira and others 1990).

Zimbabwe—Expanding Access to Maternity Care

Zimbabwe has made impressive gains in providing health services to its 10 million people during the decade since independence in 1980. Basic health care services have been extended to cover the rural population, over 80 percent of the children are fully immunized, malnutrition has declined substantially, and rural water supply and sanitation projects have been undertaken throughout the country. Modern contraceptive prevalence of over 40 percent of women of reproductive age is the highest in Sub-Saharan Africa. Nevertheless,

there are still underserved populations. Maternal mortality rates remain unacceptably high for rural women. Although more than 90 percent of expectant mothers attend antenatal clinics, over 30 percent of the deliveries are unattended and the leading causes of maternal deaths are infection, hemorrhage and abortion.

The government has emphasized primary health care and has organized the public and nongovernmental institutions plus some private facilities into a four-tiered system of national health service delivery. Basic health care, including family planning is extended to the community level through a network of rural hospitals, local health centers and community workers. At the second level, district hospitals serve as the first line of referral. Next, at the third level, there are eight provincial and four general hospitals which provide specialist services as well as obstetrics, gynecology and pediatric care. Five central hospitals serve as national referral facilities.

The Government of Zimbabwe, facing severe fiscal constraints and recognizing the importance of strengthening the country's primary health care infrastructure and services, developed a program to improve service delivery in the health, population and nutrition sectors. The government's program, which is supported by a consortium of donors led by the World Bank and including UNFPA and donor agencies from Norway, Denmark, Sweden, the United Kingdom, and the European Community, aims to strengthen maternal health by improving coverage of antenatal, delivery and postnatal services, ensuring that facilities are properly equipped and staff adequately trained, improving communication and transport links for patients being referred to higher levels of care, improving and expanding family planning and nutrition programs, and providing better health education to parents and children. In order to better understand the magnitude and consequences of the problem of maternal deaths in Zimbabwe, the Zimbabwe Medical School is conducting a community-based study on maternal mortality.

In a special effort to reach underserved populations living in rural areas, the government has targeted sixteen districts to receive a package of rural health facility upgrading, transport, communications, and health manpower development. The aim of this is to ensure that each family has access to a rural health center within eight kilometers, offering a full range of preventive and outpatient curative care, equipped to perform uncomplicated deliveries, and supported by a district hospital able to provide the full range of first-line referral services.

The program is providing pregnant women with improved access to safe deliveries through trained nurse midwives, a quality referral system, and emergency obstetric care. The project is strengthening basic and postbasic training for nurses, midwives, and community midwives in midwifery skills. The aim is to increase the percent of nurses trained in midwifery to 50 percent overall and 60 percent in rural health centers and hospitals. The skills of practicing midwives are being improved through better supervision and on-the-job training that ties skill development to the demands of the job.

Standard equipment for emergency obstetric care, including essential routine delivery equipment, is being provided to facilities in the 16 project districts. In addition, an emergency referral system, including four-wheel drive vehicles, ambulances, motorcycles, and a point-to-point radio communication system is being installed in those areas without access to telephone lines to support the transfer of patients, routine supervisory systems, and pharmaceutical distribution.

(World Bank 1992)

Appendix 3

The Role of the Midwife

The midwife is a person who:

- By her/his training has the competence and skills to provide reproductive health care as an independent and interdependent practitioner in the maternity care team.
- By regulatory mechanisms is entitled and protected to practice in the spheres defined by the content of midwifery.

1. Provision of care of high technical competence:
   - Prenatal, labor and delivery, postnatal care
   - Family planning
   - Newborn and infant care

2. Provision of the following essential obstetric functions:
   - Repair of vaginal and cervical lacerations
   - Performance and repair of episiotomy
   - Vacuum extraction
   - Administration of IV fluids, blood
   - Emergency evacuation of uterus
   - Manual removal of placenta
   - Emergency treatment of severe pre-eclampsia, eclampsia
   - Administration of IM and IV antibiotics
   - Family planning functions: prescription of oral contraceptives, insertion of IUD and Norplant

3. Provision of social and psychological support, counseling, and education of clients, families, and communities, based on norms and values appropriate to the society.

4. Provision of leadership in matters of safe motherhood including the areas of administration, management, leadership, and research.

Source: WHO 1990a.

Appendix 4

Maternity Center Facilities and Equipment

The facilities and equipment listed are recommended by the World Health Organization (WHO). A more detailed description of surgical and medical supplies and facilities is found in WHO (1991a). The facilities and equipment listed here would be suitable for a maternity center in a catchment area of 100,000 people, with an expected 4,000 deliveries a year. Since outpatient facilities and equipment are commonly shared between general outpatients and various specialties, the requirements for space, equipment, and supplies for outpatients are not included in this appendix.

Space Requirements

Maternity ward

Three 8-bed rooms with 3 toilets per room
Treatment room
Equipment store
Bathrooms
Nurses' bay and station
Shower rooms
Sluice room
Room for cleaners/domestic staff
Staff cloakroom plus 2 toilets
Pantry/ward kitchen
Corridor space
Trolley bay

Labor and delivery suite

Labor/delivery room (for 6-8 beds)
Eclampsia room (optional)
Sluice room
Nurses' bay
Admission/examination and preparation room
Side-room laboratory
Cleaners' room
Cleaners' room
Store for consumable items
Store for non-consumable items
Toilets
Shower room
Waiting area for relatives
Recovery room (for 4-6 beds)

Operating suite

Sterilizing room with store		Toilets, male and female	2
Main operating room		Scrub-up post	
Staff changing rooms, male and female	2	Anesthetic rooms	
Trolley bay		Office	
Shower rooms, male and female	2	Recovery room	

Items of Furniture and Equipment

Maternity ward (8-bed ward)

Beds	8	Wash basins	2
Chairs	8	Mobile screens	3
Bedside lockers	8	Air-conditioner or fans (optional)	
Overbed tables (optional)	8	Toilets	3

Beds should be standardized—a convenient size is 200 x 100 cm. Spring beds, initially comfortable, sag in the middle later. For this reason, the preference is for hoop iron mesh riveted to frames; such beds ventilate well and do not sag with age. The mattress should be about 10 cm thick.

Treatment room

Cupboard unit and work top	1	Wash-basin with elbow-operated taps	1
Wall cupboards	3	Autoclave or sterilizer (optional)	1
Shelves, hooks		Stands for intravenous fluid drips	4
Examination couch	1	Sphygmomanometers	4
Stool	1	Binaural stethoscopes	4
Trolley	1	Thermometers	
Bins	2	Suction machine	1
Paper-towel dispenser or equivalent	1		

Bathroom

Freestanding bath	1	Handrail	1
Chair	1	Hooks for clothes and towels	

Shower room

Same as bathroom, except that shower replaces bath.

Sluice room

Bedpan drier	1	Storage for specimen-testing equipment	
Bedpan washer	1	Working space	
Bedpan sterilizer	1	Small sink	1
Ventilated cupboard for specimens	1	Wash-basin	1

Nurses' station

Table	1	Refrigerator	1
Chairs	4	Notice board	1
Trolley for patients' records	1	Cabinet	1
Storage for stationary		Bookcase	1
Wall cupboards	2	Wash-basin	1

Nurses' bay

Office table	1	Dwarf wall (can be used as work-top)	
Chairs	2	Clock	1

Room for cleaners and domestic staff

Cleaning sink, domestic sink, draining board, locker, storage for brushes and brooms, bins, duster rack, cupboard for cleaning materials.

Staff cloakroom and toilets

Toilets	2	Toilet-paper racks	2
Wash-basins	2	Clothes hooks	3
Bins	2	Lockers	
Mirrors	2		

Pantry or ward kitchen

Water boiler	1	Cupboard for snacks and beverages	1
Boiling plate	1	Sink	1
Refrigerator	1	Draining board	1
Cupboard for crockery		Working surface	1
and cutlery	1	Bins	2

Labor and Delivery Suite

Admission room

Examination couch	1	Chairs	2
Wash-basin	1	Cupboard unit with work-top	1
Scrub-up units with elbow		Wall cupboards	3
operated taps	2	Trolleys	2
Bin	1	Fetal stethoscope	1
Towels/paper towels		Thermometer	1
Stands for intravenous		Sphygmomanometer	1
fluid drips	3	Binaural stethoscope	1
Writing table	1		

Nurses' bay

Office table	1	Notice board	1
Chairs	3	Cabinet	1
Dwarf wall (can be used as work-top)		Bookcase	1
		Wash-basin (optional)	1
Storage for stationary		Small refrigerator	1
Wall cupboard	1		

Labor and delivery room

Delivery beds with rods and stirrups for lithotomy position	8	Sphygmomanometers	4
		Binaural stethoscopes	4
Surgeon's stools	8	Fetal stethoscopes	8
Wash-basins with elbow-operated taps	2	Mobile adjustable angled lamps	3
Trolleys	8	Neonatal resuscitation trolley or shelf	1
Cupboards for storage of sterile packs for various forms of vaginal delivery	2	Oxygen cylinders	
		Cupboard for resuscitation equipment	1
Bins	8	Air-conditioner or fan (optional)	1
Wall clock with seconds hand	1	Suction machine (if not available in separate eclampsia room)	1
Thermometers	8		

Eclampsia room (optional)

Same as for one-bedded delivery room with these additions:

Side railings for delivery bed	1
Suction machine	1

Sterilizing facility

Small autoclave or sterilizer (in labor room or other area)	1

Shower room, cleaners' room, sluice room

As described for maternity ward.

Side-ward laboratory

Laboratory sink	1	Cupboards for reagents	
Wash-basin	1	Refrigerator (if needed for storage of blood and cross-matching requirements)	1
Laboratory bench with writing space	1		

Store for consumables

Shelves, racks, cupboards

Store for non-consumables

Shelves, racks, hooks

Operating Suite

Main operating theater

Operating table	1	Swab rack	
Operating stools	2	Containers for used swabs and instruments	
Ceiling-mounted shadowless lamp, with 5 lamps or bulbs	1	Suction apparatus	1
Pedestal-mounted shadowless lamp, run off storage batteries in emergencies	1	Sterilizer, fuel operated (35 x 38 cm, 139 liter)	1
Trolleys for instruments	3	Sterilizer drum (20 x 10 x 6 cm)	1
Stands for intravenous fluid drips	2	Kerosene stove	1
Air-conditioners (optional)	2	Forceps (Cheatle) 26.5 cm	1
Cupboards, shelves, drums for linen		Sterilizer forceps 20 cm	1
Diathermy apparatus	1	Neonatal resuscitation trolley (optional)	1

The operating table must be sufficiently sturdy to support the heaviest patient, and yet be movable, easy to tilt into the head-down position and easy to clean, and permit a patient to be placed in the lithotomy position. The trolley for surgical instruments is best made of stainless steel, with flat surfaces and no guard railings. The recommended shelves and cupboards are for storage of packs of sterile, autoclaved surgical instruments, wrapped individually and made into sets designed for particular operations. One set of cupboards should be located near where the anesthetic team is customarily stationed.

Sterilizing room and store

Small autoclaves, cupboards and shelves for sterile store, large tables for sorting and packaging, drums and changing and toilet facilities. The instruments to be autoclaved should have first been cleaned in their respective wards. The same applied to linen, which should be laundered before being sterilized. On the whole, in a district hospital setting small-capacity autoclaves are preferable. They take a shorter time to run than large-capacity autoclaves, and are therefore less damaging to soft items like linen and dressings. For this reason, it is more efficient to use a small autoclave several times a day than to use a large machine once daily. Proper maintenance of autoclaves is imperative.

Staff changing rooms

Lockers	2	Row of hooks	
Mirrors	2	Mackintoshes	10
Wash-basins	2	Large laundry baskets for gowns (scrub suits)	
Towels		Shower rooms, male and female	2
Shelves for clean gowns (scrub suits), masks and caps		Toilets, male and female	2

Trolley bay

Scrub-up post

Sink units with elbow-operated taps	2	Bowls containing antiseptic solution	
Soap		Scrub-up hand brushes	

Anesthetic room

Sink and drainer	1	Trolley	1
Work-top	1	Anesthetic gases	
Cupboard for storage of drugs and instruments	2	Anesthetic machines (EMO draw-over type)	2
Writing table or shelf	1	Stool	1

Recovery room

Trolley(s)	
Sphygmomanometer	1
Stethoscopes	2

Office

Writing desk with cupboards underneath	1	Notice board	1
Chairs	3	Crockery and cutlery for light refreshments	
Low table	1	Small refrigerator	1

Appendix 5

Behavior Change: The Role of Information, Education, and Communications in Safe Motherhood Programs

Women's lives can be saved and their health improved if communities, families and women themselves can be motivated to adopt life-saving and health-promoting practices, including utilization of health services in a timely and appropriate manner, compliance with treatment and referral, and effective home-care. Since 1987, the major safe motherhood information, education and communication activities have been related to advocacy and the policy dialogue process, with the objective of encouraging international and national decision makers and program planners to put safe motherhood on their agendas. These information, education, and communications activities have increased awareness of the dimensions and consequences of maternal mortality and morbidity, and have had some impact in the expansion of activities in the policy and program areas. However, if change is to come, safe motherhood-related information, education, and communications activities must move from policy-level advocacy to community-level action. Although there has been little experience to date in either pilot or national level safe motherhood information, education, and communications programs, a great deal can be learned from information, education, and communications activities in the areas of family planning and child survival. Following are suggested guidelines drawn from the safe motherhood information, education, and communications projects that have been implemented and from information, education, and communications programs in other areas.

What Role Can Information, Education, and Communications Play in a Safe Motherhood Program?

Information, education, and communications activities can serve various functions in a safe motherhood program, including:

- Advocacy for new policies and programs, or to ensure that the women's health perspective is incorporated into the policymaking and programming process.
- Institutional strengthening in such areas as client counseling to improve the quality of services and, hence, to improve utilization.
- Program support to inform people about services or products, to improve demand and utilization.
- Motivation for health promotive behaviors, increased utilization of family planning services, improved maternal diet, compliance with referrals and recommendations, and exclusive breastfeeding of newborns.

Information, education, and communications activities are critical any time a program is focussed on modifying the practices of program beneficiaries (women) or program personnel (health workers) or on generating demand for underutilized services.

What Should the Expectations Be for the Information, Education, and Communications Components of Safe Motherhood Programs?

All maternal health problems could benefit if information, education, and communications activities were included as part of the programmatic solution. Information, education, and communications can help prevent maternal mortality, or, more broadly, be used to enhance maternal health and nutritional status, as well as the health of the newborn.

Prevention of Maternal Mortality

In prevention of maternal mortality, information, education, and communications aims to improve early recognition of danger signs, problems and emergencies by women, family members and communities; and improve knowledge of the services available to respond to these problems, whom to contact, how to contact them, and the means available to travel to the facility.

Knowing about danger signs is of little use unless one also knows what to do in response. The community must know what available services have to offer in terms of both emergency and non-emergency care. In many settings, it is not enough to ensure that the woman is informed, since she is not always in a position to make decisions about her care, particularly in emergencies. Influential people in the home and community must also know what to do.

Reminder sheets/cards can be produced with visual depictions of the danger signs of pregnancy and delivery and visual cues that indicate when and where treatment should be sought. These cards, which can be distributed by outreach and clinic-based health care providers, can be discussed and left with pregnant women, their husbands, mothers-in-law and others who would be in a position to detect a problem and assist in seeking care.

At the district hospital in Port Harcourt, *Nigeria*, the incidence of women diagnosed with vesicovaginal fistulae, a common sequelae of prolonged labor, is alarmingly high. Prolonged labor was also suspected of contributing to maternal mortality. A radio campaign was developed to alert women and communities to the dangers of a labor lasting longer than 24 hours. During the several years following the radio campaign, the incidence of vesicovaginal fistulae decreased significantly at the hospital serving women within the catchment area of the radio messages. There was no corresponding decrease of vesicovaginal fistulae at hospitals outside the reach of the radio campaign (Harrison 1986).

As part of a maternal health project in rural *Bangladesh*, a three-pronged strategy is being put into place to respond to pregnancy and interpartum problems, with support from Save the Children-USA and the USAID-funded MotherCare Project. Families will be made aware of key danger signs and of the importance of timely compliance with emergency referral. traditional birth attendants will work with the formal health system in identifying and counseling their "at risk" clients. And, women's savings groups will explore the creation of emergency transport funds for pregnant constituents (Winnard 1991).

Information, education, and communications can also motivate communities to mobilize available resources and develop organized responses when maternal health problems and emergencies occur. This includes organizing transportation networks, as well as ensuring that these services are known and used.

Linking women in need with private and public, human and financial resources within or outside the community is key to supporting emergency referral networks. A note of caution: it does no good to set up community-level emergency support if referral-level facilities are not equipped to handle the emergencies.

In Faisalabad, *Pakistan*, postpartum hemorrhage is a major cause of maternal mortality. Over 80 percent of births are attended by traditional birth attendants. An emergency ambulance service was created by the Punjab Medical College to bring lifesaving treatment to women with postpartum complications. Despite the high maternal death rate, the service was poorly utilized. An intensive campaign to increase awareness of the ambulance service was undertaken, targeting lady health visitors, traditional birth attendants, doctors, and influential community members. On the advice of traditional birth attendants, expectant mothers were included as an audience for the second phase of the campaign. Expectant mothers requested that elder female family members be educated, as they often discouraged utilization of referral services. The campaign disseminated information through television, radio, newspapers, billboards, and posters and at Mohalla meetings (street camps). Within a year of the communication campaign, requests for the service had increased significantly (Bashir 1991).

In rural areas around Accra, *Ghana*, communication efforts are targeted to commercial transport workers. They usually are unwilling to transport emergency cases or charge substantially higher prices to do so. The campaigns aims to increase their awareness of maternal health problems and their critical role in saving women's lives (Ward personal communication 1991).

Information, education, and communications also aims to motivate traditional birth attendants to use safe births kits, adopt safe birth and postpartum practices, refer women in a timely manner when problems occur, and decrease harmful traditional practices.

Generally, traditional birth attendants are receptive to learning new skills, especially if it will increase their prestige and therefore their client base. Often, informing women what they should expect from their traditional birth attendant will give an added incentive to traditional birth attendants to offer a particular service or to use such tools as safe birth kits. Ensuring that traditional birth attendants refer women with problems to the health care system depends on the relationship between the traditional birth attendants and that system. Each of these issues—traditional birth attendants' receptivity to training, informing women what to expect from traditional birth attendants and improving the relationship between traditional birth attendants and the health system—is an information, education, and communications challenge. When marketing safe motherhood kits, commercial advertising (e.g., radio messages) and an easily recognized brand image can be devised.

In *Bangladesh*, traditional birth attendants' unhygienic birth practices result in high rates of neonatal deaths and relatively high levels of maternal deaths from tetanus. As a result a "user-approved" safe birth kit which would be acceptable to the family and traditional birth attendant was developed. The initial concept was pre-tested with pregnant women, family members, and traditional birth attendants. Blue and red were chosen as the predominant kit colors, an additional razor blade was added at the request of traditional birth attendants so they would not have to use the same blade to cut the umbilical cord and their fingernails, an illustration of a healthy mother and healthy baby became the logo, and the price was pre-printed on the kit to reduce anticipated discrepancies in the eventual cost to consumers (Christian Commission for Development in Bangladesh/PATH 1990).

In rural Quetzaltenango, *Guatemala*, where over 75 percent of all births are attended by traditional birth attendants, maternal mortality is high. Studies conducted by the Instituto Nutricional de Centroamérica y Panamá (INCAP) found the following problems: lack of recognition of and response to high-risk pregnancies and births by traditional birth attendants, injection of oxytocics to "enhance" labor, and lack of confidence in government health services for referral of complications. An innovative "Guatemalan solution" to improve maternal and newborn health is being tested. The program will focus on improving traditional birth attendants' technical and counseling skills through use of a participatory, experiential training approach; increasing the capability of district-level health staff to identify and manage obstetric problems; improving communication and referral between traditional birth attendants and other maternal health care providers; and increasing knowledge of risk, danger signs, and obstetric emergencies at the community level (Schieber 1991) (see appendix 2, Quetzaltenango Project).

Information, education, and communications also promotes awareness and use of maternity waiting homes or birthing facilities near transport or referral-level facilities where these exist.

If the design of the maternity waiting home/birthing facility has been worked out with potential beneficiaries, and if community leaders and health care providers recognize the utility of the waiting home, it will be credible and better utilized.

In Tanjungsari, *Indonesia*, a pilot project is experimenting with the use of community birthing centers. The centers are on main roads and have access to transport to referral facilities in the larger cities. Preliminary qualitative research indicates that a number of issues would influence women's use of the facilities. For example, women prefer delivery in the squatting position; hence the beds that were originally bought for the centers are being removed. In Tanjungsari, community leaders have encouraged women to use the new facility, which has led to fairly high level of utilization (Alisjahbana 1991).

Improving the Health Status of Women and Newborns

In improving the health status of women and newborns, information, education, and communications should aim to promote awareness and use of family planning services by men and women; and promote healthy behaviors by women and families during pregnancy and the postpartum period, such as improved diet and immediate and exclusive breastfeeding.

Promoting healthy behavior by women necessitates enhancing their ability to follow through on what is being promoted. Therefore, it is important that the specific action to take is clear, that a recognized benefit is offered and that the obstacles they face in changing their behavior are addressed. As stated previously, information, education, and communications programs should focus concurrently on influential household members and community decision makers in order to promote behavior change among women. For instance, husbands and mothers-in-law often play a key role in determining the diet of pregnant women. Putting the newborn to the breast, a practice rooted in many varying birthing traditions, provides another example; establishing consensus among the "keepers" of those traditions is essential to the success of activities aiming to promote immediate and exclusive breastfeeding.

As part of the USAID-assisted Integrated Child Development Services Program in *India*, action cards were developed and given to women as soon as they recognized they were

pregnant. The cards covered basic actions pregnant women should take during pregnancy, such as eating more food, going to a feeding center for additional food, if necessary, taking iron tablets, and obtaining tetanus toxoid injections. Radio spots were addressed to men and mothers-in-law to help women follow this advice (Griffiths 1991).

In *Thailand*, a study investigated the effects of improving the education and counseling of pregnant women regarding diet and weight gain during pregnancy in a controlled setting. A sample of 603 pregnant women in a Khmer refugee camp were assigned to an intervention group and 580 to a control group. The control group participated in a pre-existing educational program, and received rations, supplements, and non-interactive and non-judgmental feedback on weight gain. The intervention group received discriminating feedback about weight gain and counseling on how to increase weight gain and participated in discussions on actions they could take to improve pregnancy outcomes. Knowledge improved among women in the intervention group and their attitudes toward weight gain changed. The incidence of low birth weight infants decreased, weekly weight gain improved, and support from spouses, which was found to be an important factor behind improving the women's nutritional status, also improved. These effects were noted only for those women who attended classes for more than three months (Roesel and others 1990).

Information, education, and communications should also increase awareness of the need for and increased use of formal public (and private, if available) maternal care, both for preventive and curative services.

Offering a desired product, whitewashing walls, adding room dividers, offering more than one health service, and changing the hours of service delivery are among the many service modifications which can meet the women's needs and preferences. To be effective, such improvements must be based on what current and potential service users think of existing services. Research into the attitudes and behaviors of service providers is also important to enhancing understanding of the modifications required to improve the quality of care. Once an "improved" service is available, information, education, and communications activities can be used to promote it and generate demand.

In Cochabamba, *Bolivia*, formative research conducted among clinic personnel and community members highlighted vast differences in their perceptions of existing services (see discussion below on Cochabamba). Based on the results of this research, clinics will offer more privacy, ensure greater respect for women's cultural perspective and try to maintain a warmer temperature. Following delivery, care providers will return the mother's placenta to her for burial; previous neglect of this important tradition had discouraged women from delivery in the clinics (CIAES 1991).

The Center for Child Survival, University of *Indonesia*, has undertaken a project to increase access to and consumption of iron and folate tablets to reduce maternal anemia. Besides increasing the supply of iron and folate tablets among the usual public sector clinic dispensers, traditional birth attendants have been identified as new private sector distributors. Radio spots, a reminder sheet for the woman, and counseling cards, which tell women where to obtain the tablets, why and how to take the tablets, and what to do about side effects, have been developed to create demand and increase compliance (Moore and others 1991).

Information, education, and communications should also promote awareness and use of alternative safe birth facilities, when these exist.

Promoting use of alternative facilities is particularly important in settings where the majority of women deliver in hospitals, leading to overcrowding and associated problems related to quality of care. Some women could deliver safely in alternative facilities. Information, education, and communications can be used to help make this an attractive option.

In urban *Jamaica,* rising demand for hospital delivery has resulted in overcrowding and reduced quality of care. However, pregnant women in rural areas, often at greater risk due to higher parity, underutilize the available option of hospital or midwife-attended home delivery. The Ministry of Health proposed the creation of alternative community-level birth locations for anticipated normal childbirths in urban areas and to increase attended deliveries among high-risk rural women. Qualitative research assessed the determinants of women's choice of childbirth location and attendant, the acceptability of the option of midwife-attended births in maternity rooms attached to community clinics, and the factors that would motivate pregnant women to change birth location (Wedderburn and Moore 1990).

Although few women could identify specific intrapartum risks or dangers, they perceived hospital care to be more safe and to offer better access to emergency care, leading them to prefer hospital deliveries. Privacy, personal attention and social support were stated prerequisites for use of the proposed alternative birth locations. Poor attitudes of maternal health care providers were identified as a source of dissatisfaction of rural women with hospital birth and a major barrier to prenatal care use. Based on the study results, the Ministry of Health has revised plans for the locations of several proposed pilot maternity rooms. A media campaign to address documented barriers to improved maternal health care use, and in-service education of maternal health care providers to improve counseling skills, are being considered (Wedderburn and Moore 1990).

Information, education, and communications can also train modern maternal health care providers in the public (and private) sectors to improve the management of maternal health problems and enable them to counsel women more effectively.

Counseling is the process during which most service users make decisions to comply with or disregard instructions, prescriptions and health-promotive advice. Effective counseling is not didactic. It must be based on an understanding of the perspectives, needs and limitations of service users, and should aim to provide them with full information on the health alternatives available to them. Effective counseling also involves discussing and negotiating with clients the most appropriate and effective healthy behaviors to follow under their particular set of circumstances. If counseling is not a cornerstone of programs designed to bring clients and service providers together, all efforts may be wasted and even have a negative impact on service use.

MotherCare and the Federal Ministry of Health in *Nigeria* have developed a project that focuses on the training of midwives in lifesaving skills and caring and attentive counseling. The increased quality of care brought about by the project will be promoted by an information, education, and communications campaign, which will inform people where they can find the improved facilities and service providers. Initial formative research has supported the premise that service use was limited and that both demand generation and improved quality of care were needed (Conroy 1991).

In addition, information, education, and communications should advocate an awareness of the need for and effectiveness of incorporating women's preferences into the design and promotion of family planning and maternal health services.

Formative research can help to bring the preferences of women and influential family members, community decision makers, and health care providers, to light. These perspectives are the basis of any effective information, education, and communications program. Formative research is usually qualitative in technique, employing focus group discussions, in-depth interviews and observation to determine what people think, how they behave, and, more importantly, why.

The MotherCare-supported Cochabamba Reproductive Health Services Project in *Bolivia* illustrates the importance of formative research. Faced with underutilization of what seemed to be extensive and convenient maternal health services, the project conducted a qualitative study to shed light on the beliefs and practices of the low income urban and periurban population of Cochabamba, as well as those of health care providers. The study exposed near absolute dichotomy between women's beliefs and practices and those of health care providers. For instance, women stated a preference for private, warm and enclosed rooms for delivery, but health centers offered impersonal, crowded, cold and ventilated environments. Women preferred delivering in the vertical position, while health providers favored horizontal delivery. Several additional differences were identified and prioritized, based both on important community practices rejected by the health system and health service practices rejected by the community. Improved case management, training and information, education, and communications interventions will be designed to help modify the practices of both the community and the medical service system and help bring them closer together, with the objective of improving quality of care and service utilization, and maternal health (CIAES 1991; Restrepo 1991).

What Are Specific Maternal Health Topics for each Target Audience?

While specific themes for information, education, and communications in maternal health will vary somewhat across settings depending on maternal health needs, available infrastructure and other contextual factors, the uniformity of themes that will need to be addressed is striking. While general themes will be similar, their details and the manner in which related information, education, and communications programs are implemented will vary on a setting-specific basis, and according to the target audience being addressed. Depending on the project's broad goal, the specific problems being addressed, and the role(s) identified for information, education, and communications in a program, planners should think about undertaking communication activities for at least three main audiences: communities (especially women), health care providers—both traditional and "modern"—and policymakers/program planners.

Following is a list of basic topics that should be considered for each of the three main audience groupings. It is important, however, that the inclusion of any topic in a program be based on, and tailored to, the local problem and local perceptions.

Community Level

- Promote healthy behaviors directly to women, families and communities.
  - Family planning
  - Early recognition of maternal health problems, danger signs, and risks
  - Recognition and treatment of STDs and HIV prevention

    - Appropriate self care (diet, rest)
    - Maternal tetanus toxoid immunization
    - Compliance with advice or medical regimens prescribed, for example iron supplementation, completion of treatment regimens or referral for additional care, and contact tracing (STDs)
    - Breastfeeding and an appropriate transition to artificial contraception
- Promote recommended/appropriate use of maternal health care:
    - Timely, regular use of recommended source of preventive prenatal and postpartum care
    - Use of trained birth attendant and hygienic birth practices
    - Timely use of recommended source of treatment for prenatal, intrapartum, or postpartum conditions
    - Use of recommended birth locations (including birth centers) and attendant
- Determine parameters of and promote an "improved product":
    - Form and source of iron and folate supplementation
    - Alternative birth location/birth attendant
    - Redesigned maternal care locations, schedules, practices
    - Safe birth kit and other innovative community-level technologies
- Increase community awareness and organization
    - Development of community emergency transportation schemes and other means to increase women's access to needed care
    - Promote acceptance of alternative service provision (maternity huts, traditional birth attendant distribution of iron and folate tablets)
    - Develop mechanisms to increase women's role in family planning and maternal health care decisionmaking
    - Improved acceptance of fee-for-service or co-payment

Maternal Health Care Providers

Traditional health care providers

- Promote beneficial practices
    - Promote family planning
    - Encourage safe, hygienic birth techniques
    - Increase recognition of prenatal, intrapartum, and postpartum danger signs
    - Promote use of safe birth kits
    - Improve timeliness of referral to recommended source of additional care
    - Encourage provision of additional maternal health services (iron and folate tablet distribution)
- Discourage unsafe birth practices and other practices which harm maternal health:
    - Eliminate harmful delivery practices
    - Decrease use of labor-enhancing drugs
    - Reduce incidence of female circumcision
    - Decrease use of unsafe abortion techniques

Modern health care providers

- Promote family planning counseling and service delivery
- Improve ability to provide quality maternal health care:
  - Increase priority assigned to maternal care/components of care
  - Improve counseling skills
  - Improve recognition of risk factors, treatment of problems and appropriate referral for additional care
  - Improve awareness of and attitude toward traditional beliefs and practices of service users
  - Maintain traditional breastfeeding intervals
  - Improve acceptance of referrals from traditional practitioners

Policymakers and program planners

- Promote development of comprehensive family planning and maternal health programs, including communication strategies:
  - Increase awareness of need for and benefits of improved maternal health care policy and programs to policymakers, health and media professionals, and public interest groups
  - Increase awareness of the health benefits of family planning
  - Increase networking and disseminate state-of-the-art information about successful maternal health care activities in other countries
  - Promote intersectoral coordination and increase awareness of specific maternal care issues (e.g., components, quality and required coordination of maternal care; appropriate delegation of clinical tasks)
  - Increase awareness of the need for and effectiveness of incorporating women's preferences into the design and promotion of family planning and maternal health services
  - Institute "awareness campaigns" to promote female education

How Cost-effective Are Information, Education, and Communications Programs in the Area of Safe Motherhood?

Currently there is no specific information on the cost-effectiveness of safe motherhood information, education, and communications components, but estimates can be made from other areas, such as nutrition, health and family planning. Efforts in these areas have shown that information, education, and communications activities, when implemented systematically and when based on the consumer's point of view, can be highly effective, and at limited cost. Communication efforts have led, for example, to significantly higher rates of: a) contraceptive use, b) caloric and protein intake of young children, c) use of oral rehydration salts, and d) use of improved facilities, such as the village-level integrated health service delivery posts in Indonesia. The changes in practices brought about as a result of information, education, and communications efforts have led to improvements in the nutritional status of young children, lower fertility rates and lower diarrhea mortality rates among children. It is likely that similar results could be achieved in the area of safe motherhood.

On a per beneficiary basis, the cost of information, education, and communications interventions are among the lowest. Though the research, printing and even media costs associated with information, education, and communications are by no means cost free, they are far lower than those of drugs, food or medical equipment. And, although information, education, and communications as a sole intervention can be effective, when combined with other interventions, there is a synergistic effect—both investments become more effective. In addition, by implementing an information, education, and communications component that encourages families, communities and health services to do more or to utilize their own resources better, more expensive program elements can be better targeted. The biggest waste of resources associated with health care programs occurs when drugs are supplied but not taken and when services are available but underutilized. Information, education, and communications helps to provide a sound return on investment in health services.

Lessons Learned

• Establish a clear mandate for information, education, and communications activities from the outset of project design. Too often, information, education, and communications activities are added late and suffer from improper development. Likewise, the impact of other program activities is not maximized, because they have not had communications support, or because the consumer's perspective, often solicited by the communication team, had not been included, requiring major, costly adjustment mid-project.

• Carefully diagnose the overall sociocultural environment into which maternal health communications will fit. This will prevent programs from excluding an important influential, attempting to change practices not amenable to change for deep-rooted cultural reasons, and insensitivity to the position of women in certain social contexts.

• Undertake well-designed qualitative research to provide women's perspectives on maternal health issues, as well as those of other important influentials such as traditional birth attendants, health workers, husbands, and mothers-in-law. While this may appear costly at the outset of the program, it helps avoid expensive mid-project correction. Since epidemiologic concerns are generally not the concerns of women, and women's perception of their physiology may be far different from the western model, the success of a program is dependent on the extent to which each set of priorities can be modified to create a set of priorities shared by both program planners and potential beneficiaries. This qualitative research should inform all aspects of the project—not just the information, education, and communications activities.

• Pretest messages and modify in light of experience.

• Take a comprehensive, strategic approach to addressing women's health problems. Seldom is there one answer. The strength of a program often resides in planning multiple but complementary actions all focused on a common objective. The outcome of combining the consumer and medical perspectives on a problem should form the basis of this comprehensive strategy.

• Focus the information, education, and communications activities on modifying or strengthening practices. Too often, information, education, and communications programs provide program beneficiaries with abundant and good information, but it does not lead to action; the beneficiaries often do not receive a clear indication of the aspects of the

information that are most important, or how it is relevant to their lives. The information provided must be targeted and clear in terms of the actions people should take, and why.

• Information, education, and communications strategies should move beyond conventional health education approaches because women often do not utilize services, and may have low literacy skills and different perceptions of problems. The use of innovative means to reach women and creative message expression have been elements of most successful programs.

• Involve maternal health care workers in the redesign of maternal health services based on women's preferences. While not necessarily an information, education, and communications strategy, programs that use qualitative research to involve health workers in revamping services often improve their empathy with women and, hence, their communication with women and women's families. Improving this communication, either indirectly or through training, is key to ensuring quality of care and women's satisfaction with services.

• Mix locally planned and run activities with a centrally run and managed information, education, and communications program. This lesson seems particularly critical to women's health programs, since so many of the activities needed to reduce maternal mortality require both community involvement—to find locally viable solutions—and the involvement of the medical community—to ensure the availability and quality of services. From the outset, information, education, and communications programs must operate on both levels and build in flexibility and funds for local activities.

Appendix 6

Maternal and Perinatal Health Assessment

Maternal and Perinatal Health Status

- What is the estimated fertility rate, contraceptive prevalence rate, maternal mortality rate or ratio, infant mortality rate, neonatal mortality rate, and perinatal mortality rate for urban and rural areas?
- What is the prevalence of the following morbidities:
  - Anemia
  - Malaria
  - Hepatitis
  - Tuberculosis
  - Reproductive tract infections (HIV, syphilis, gonorrhea)
  - Hypertension
  - Diabetes
- What are the principal causes of death in hospital/in the community of women, stillbirths, neonates?
- What is the relative importance of each of the following as an immediate cause of death:
  - Maternal mortality:
    - Abortion complication
    - Eclampsia
    - Hemorrhage
    - Puerperal infection
    - Obstructed labor
    - Other pre-existing conditions and infectious processes
    - Anemia as a factor
    - Maternal undernutrition and workload as a factor
  - Perinatal/neonatal mortality:
    - Birth injury
    - Asphyxia
    - Prematurity/low birth weight (rate in hospital)
    - Sepsis (general, acute lower respiratory infection, other)
    - Neonatal tetanus
    - Complicated labors (prolonged, obstructed, breech, transverse)
    - Mismanagement of labor

- Why do women and infants die of these causes? What are the factors surrounding pregnancy, management of labor and delivery, and care of the newborn that contribute to high mortality rates?
- What is the cesarean section rate?
- What are the fresh stillborn levels (died during delivery) and macerated levels (intrauterine deaths)?

- What is the ratio of emergency deliveries to scheduled registered deliveries in hospitals?

Utilization

- What are the patterns of service utilization for
  - Family planning
  - Prenatal care
  - Assisted delivery (home, clinic or hospital)
  - Postpartum care for mother and newborn
- Why don't women use modern medical services?
- When do they use them?
- Which danger signs are recognized? For what and from whom do women and their families seek care?

Access

- How physically accessible are services to the population (e.g., distance, transport, etc.)?
- How are resources allocated and family planning, maternity and neonatal care organized?
- What are the physical constraints to use of family planning, prenatal/postnatal services?
- What are the sociocultural constraints to service use?
- What are the costs to clients of care?

Pregnancy/Birth/Neonatal Home Care

- What is the role of the traditional birth attendant, members of the family?
- What are the common practices that contribute to poor outcome? (prenatal, birth, postpartum)
- What are the common home birth practices?
  - Management of labor
  - Use of oxytocics and other methods for speeding labor
  - Perceptions of duration of labor
  - Cord care—are there safe birth kits available for families?
  - Neonatal care (warming, feeding, swaddling, and the like)
- What are the pregnancy and postpartum taboos and prescriptions for behavior that affect outcome?
- What are the beliefs and conditions that dictate these practices?
- What are the breastfeeding patterns?
  - Immediate
  - Exclusive
  - When are other liquids and solids introduced? What are they? Why?

Content and Quality of Clinical Care (Ministry of Health, nongovernmental organizations)

- What government regulations and practices govern which level of worker has responsibility for types of relevant work (e.g., cesarean sections, manual removal of placenta)?
- What does prenatal care consist of?
  - What information and services are provided?
  - Are women screened for risk using a standard tool? (get copy)
  - When found to be high risk, are there high risk clinics?
- Are food supplementation programs targeted to pregnant women? And if so by what criteria?
- What is the national goal for prenatal care (# of visits)?
- What is the average number of visits per woman prior to delivery? On average, when do they initiate visits?
- What are the roles of the different health providers?
- Is there a functioning referral system?
  - Are there norms, protocols, forms available? If non-functional, why?
  - Is there a means of communication between levels, of transport?
- Who handles obstetrical emergencies (urban/rural)? Have they had training for this? Are there norms, protocols, forms available?
- Does postnatal care routinely include:
  - Advice on breastfeeding/family planning/neonatal care?
  - Physical exam of mother and infant?
  - Food/iron supplementation?
- What are the attitude and practices of health providers on:
  - Abortion?
  - Adolescent fertility?
- What is the relationship between the Ministry of Health, the hospitals, the public health facilities (health posts, health centers, hospitals), the private sector providers, and the community health agents?

Community Outreach/Promotion/Education

- Is there any outreach into the community to find and monitor pregnant and postpartum women? Who conducts it? How often?
- What is the role of the traditional birth attendant, community health worker or clinic-based staff?
- What educational materials exist on (get copies and analyze):
  - Pregnancy/prenatal care
  - Safe birth
  - Postpartum care
  - Care of newborn
  - TT immunization
  - Prevention and treatment of sexually transmitted disease (STD)

- Maternal nutrition
- Anemia
- Breastfeeding
- Family planning

Human Resources Development

- What are health providers taught about family planning, maternal and perinatal health?
- What materials are used for training? Assess the adequacy of those materials.
- How do traditional birth attendants and other health providers rate their own knowledge and skills? How do their superiors rate their skills?
- What types of additional training do they ask for?
- What organizations and training entities have on-going training in family planning and maternal health? Get copies of curricula and manuals, if possible.

Women's Status

- What are the school enrollment and literacy rates for women?
- What is their rate of participation in the formal labor force?
- What is their level of isolation from information and health services (e.g., religious, cultural)?

Nongovernmental Organizations, Women's Groups, and Other Channels for Education and Services

- Are there women's groups at the community level?
- What is their principal function?
- Are they or have they been used for health education? or as community support for maternal or other health interventions?
- What role are nongovernmental organizations playing in education and services? What is their relationship with the Ministry of Health?
- Do they have the capacity to take on additional maternal health activities?

Other Programs in this Field

Describe the on-going and planned programs of the Ministry of Health, other national organizations, and those of the international agencies that are relevant to family planning and maternal and perinatal health.

For each include:

- Location
- Time frame
- Implementing organization as well as funding organization(s)
- Purpose
- Goals
- Current status

For All of the Above

- Identify existing research and information that has been collected and try to obtain copies of reports for review.
- Identify local experts and resource persons who could be used in training/ programming in maternal health.
- Identify materials (management information system, health education) that have been developed that could be duplicated and used.
- Identify innovative programs and techniques that have been tried with apparent success in the country; these make good case studies and presentations in workshops, and may be replicable.
- Identify programs that could be tapped to strengthen on-going family planning and maternal health activities.

Appendix 7

Issues Related to Maternal Anthropometry

Anthropometry is the science of measuring the size and proportion of the human body. In pregnancy, such measurements as maternal height, weight gain, or arm circumference are good predictors of birth weight, infant survival, obstructed labor and the postpartum status of women's health. But how big should a mother be for the best outcome? Should recommendations be the same for developing and developed country women?

To seek answers and identify the best measurements for use now in preventive field programs, USAID, MotherCare, the World Health Organization (WHO), and the Pan American Health Organization (PAHO) sponsored the first-ever international conference on "Maternal Anthropometry for Prediction of Pregnancy Outcome," at PAHO, April 23-25, 1990. The meeting brought together over 50 experts from developed and developing country field programs, universities, research institutions and organizations interested in maternal nutrition including UNICEF, the World Bank, and NCHS, in addition to the sponsors. Consensus was reached on a number of indicators. Research priorities identified will now be pursued by analyzing existing data under a USAID, S&T/H grant to WHO for safe motherhood activities. Proceedings of the conference were published as a PAHO Scientific Publication (Krasovec and Anderson 1991).

Important recommendations for immediate field use are:

- Pre-pregnancy weight and weight gain in pregnancy are both critical and additive in their effect on pregnancy outcome. Equal emphasis should be given to assuring that both are normal. Mothers should be weighed and counselled at the many opportunities present during child survival activities like immunization or growth monitoring, as well as during prenatal care.[1]
- Although desirable, serial weighing of women over the course of pregnancy is not feasible in many developing countries. A satisfactory alternative is to measure weight merely twice, at least a month apart, anytime during the second or third trimester. The exact week of pregnancy need not be known. A gain of less than one kg per month is the danger signal, with no weight gain or weight loss being even more severe and calling for immediate action, such as food supplementation directly for the woman.
- Of all measurements sufficiently predictive of pregnancy outcome, arm circumference is the most feasible to implement everywhere now. The same cut-off point can be used to identify undernutrition in or out of pregnancy and ranges from 21-23.5 cm depending on the country or region. Because of the simplicity of arm circumference technology, which requires only an inexpensive tape, women can measure each other in their own homes and use the information for their own empowerment. With arm circumference, there is no country program, survey or

1. A chart that shows relative risk as a function of weight-for-height and weight gain for both underweight and overweight women is now being used to target supplementary food in prenatal care programs in several countries in Latin America (Rosso and Mardones 1988).

evaluation which need remain in the dark any longer about women's nutritional status.

- Nutrition counselling and strategies for subsidized supplementation feedings are needed when pregnant and lactating women are identified with substandard nutritional status. Schools, health centers or community-based development programs can be used for counselling and meal distribution programs.

Appendix 8

Technical Notes and Tables

Table 1 Safe Motherhood Scorecard

Table 2 Cost: Summary Worksheet of Estimated Costs of Safe Motherhood Interventions in Three Different Settings.

A. Demographic, economic and maternal health status indicators (pre-intervention)

B. Existing annual operating costs (pre-intervention)

C. Estimated annual costs of interventions

D. Maternal health status after interventions

E. Total annual program costs (existing plus interventions)

Table 1 Safe Motherhood Scorecard for Developing Countries

Problem	*Pregnant Women*	*Newborns*
Death[a]	495,000	7,000,000 (perinatal)
Pregnancy-related morbidities		
Acute[b]	54,000,000 (est.)	Asphyxia[c] 3,600,000 Low birth weight[d] 21,000,000
Chronic		
Prolapse[e] (women under 45)	9% (Philippines) 10% (Syria) 19% (Colombia) 25% (Pakistan) 56% (Egypt)	Infection[f] 5% of live births
Fistula	Not known	
Associated		
Malaria	Not known	
Diabetes	Not known	
Hepatitis	Not known	
Unhealthy women		
Nutrition[g]		
Stunted	500,000,000 (est.)	------> Low birth weight
Underweight (pregnancy weight)	56-63% (India)	------> Low birth weight
Anemia	71,000,000	------> Low birth weight/ prematurity ------> Vulnerable to infections
Iodine deficiency	250,000,000	------> Cretinism
Infections[h]		
Syphilis	3-22% (Sub-Saharan Africa)	------> Fetal death (40%) ------> Congenital syphilis (33-40%)
Gonorrhea	0.5-22% (Sub-Saharan Africa)	------> Ophthalmia neonatorum (30-47%)
Chlamydia	4-20 % (Sub-Saharan Africa)	------> Ophthalmia neonatorum (25-50%) ------> Pneumonia (5-10%)
Bacterial vaginosis	10-19% (Sub-Saharan Africa)	------> Prematurity/low birth weight (20-25%)
AIDS[i]	2,400,000 (Sub-Saharan Africa)	------> HIV/AIDS/death (25%)

Source: (a) Lopez 1990; (b) Koblinsky and others 1992; (c) Shah 1990; (d) Tafari 1981; (e) Omran and Standley 1976, Omran and Standley 1981, Zurayk 1991; (f) Bartlett and others 1991; (g) Leslie 1991, Anderson 1989; (h) Schultz and others 1992; (i) Chin 1990.

Table 2 Summary Worksheet of Estimated Costs of Safe Motherhood Interventions in Three Different Settings, Ranging from A, Weakest Health Systems, to C, More-Developed Health Systems

A. Demographic, economic, and maternal health status indicators (Pre-intervention)

	Setting		
	A	*B*	*C*
Population	500,000	500,000	500,000
Women age 15-45	75,000	75,000	75,000
Births (annual)	22,500	20,000	15,000
Birth rate (per 1,000 women of reproductive age)	45	40	30
Infant mortality rate (per 1,000 live births)	100	70	40
Maternal deaths (annual)	225	100	30
Maternal mortality ratio (per 100,000 live births)	1,000	500	200
Contraceptive prevalence rate (%)	<5	<10	40
Tetanus immunization coverage (% of women age 15-45)	10	30	60

B. Existing annual operating costs of maternal health program (pre-interventions)

	Setting		
	A	*B*	*C*
Staff and costs			
Hospital			
Number of full-time equivalent staff	0	8.5	17.0
Average salary costs of full-time equivalent staff	--	$3,795	$5,313
Average salary costs per hospital	--	$32,258	$90,321
Number of hospitals	0	1	2
Subtotal: annual hospital staff costs	$0	$32,258	$180,642
Health Center			
Number of full-time equivalent staff	4.6	4.6	4.6
Average salary costs of full-time equivalent staff	$1,878	$3,131	$4,383
Average salary costs per health center	$8,639	$14,400	$20,162
Number of health centers	1	10	20
Subtotal: annual health center staff costs	$8,639	$144,003	$403,236
Health Post			
Number of full-time equivalent staff		2.4	2.4
Average salary costs of full-time equivalent staff		$3,063	$4,289
Average salary costs per health post		$7,351	$10,292
Number of health posts	0	50	50
Subtotal: annual health post staff costs	$0	$367,560	$514,620
Community/Village Level			
Number VHWs/outreach workers	300	200	100
Number trained birth attendants	500	250	250
Subtotal: annual community/village level costs (assume communities pay all salary costs)	$0	$0	$0
Program Management			
Number of full-time equivalent staff	0	7.1	50.0
Average salary costs of full-time equivalent staff	--	$5,084	$7,118
Subtotal: annual program management staff costs	$0	$36,093	$355,875
Total staff costs[a]	$8,639	$579,913	$1,454,373
Related costs: percentage of annual program operating costs	15%	25%	30%
Total related costs[b]	$1,524	$193,304	$623,303
Total existing annual operating costs	$10,163	$773,218	$2,077,676

a. Staff costs include salaries and benefits.
b. Related costs include transport, in-service training, contraceptives, pharmaceuticals, and consumable equipment and supplies.

C. Estimated annual costs of interventions

	Setting		
	A	*B*	*C*
Operating Costs			
Staff Costs			
Service Delivery			
Number of full-time equivalent staff	230	50	70
Average salary costs of full-time equivalent staff	$1,040	$300	$4,316
Subtotal: annual service delivery salary costs	$239,085	$15,000	$302,085
Program Management			
Number of full-time equivalent staff	7.0	42.1	20.0
Average salary costs of full-time equivalent staff[a]	$3,050	$2,972	$7,118
Subtotal: annual program management salary costs	$21,347	$125,100	$142,350
Total staff costs	$260,432	$140,100	$444,435
Related Costs			
Transportation	$64,430	$31,900	$0
Training	$14,835	$52,068	$12,078
Pharmaceuticals, equipment, and supplies	$88,500	$96,250	$20,000
Other contingencies (5% of columns ABC)	$8,388	$9,011	$1,604
Total related costs	$176,153	$189,299	$33,682
Total operating costs	$436,585	$329,329	$478,117
Investment Costs (annualized)			
Initial training	$4,042	$30,500	$27,750
Vehicles	$68,100	$68,000	$2,000
Construction/upgrading/equipment	$21,250	$31,920	$20,000
Total investment costs	$93,392	$130,420	$49,750
Total annual costs of interventions	$529,977	$459,749	$527,867

a. Average salary costs of full-time equivalent staff reflect differences in level and composition of the staff. The type of staff and their salary will vary by setting.

D. Maternal health status after interventions

	Setting		
	A	B	C
Births (annual)	19,125	13,400	9,300
Percent of original-level of maternal deaths averted	20	66	80
Contraceptive prevalence rate (%)	16	35	55
Tetanus immunization coverage (% of women age 15-45)	25	60	80

E. Total annual program costs (existing plus interventions)

Operating costs			
Staff costs	$269,070	$720,014	$1,898,808
Related costs	$177,678	$382,533	$656,985
Total operating costs	$446,748	$1,102,547	$2,555,793
Investment costs (annualized)	$93,392	$130,420	$49,750
Total annual program costs	$540,140	$1,232,967	$2,605,543
Intervention cost per unit			
Cost per capita	$1.06	$0.92	$1.06
Per woman age 15-45	$7.07	$6.13	$7.04
Per pregnancy	$27.71	$34.31	$56.76
Per maternal death averted	$11,777.26	$6,965.89	$21,994.46
Per maternal and perinatal death averted	$1,682.47	$995.13	$3,142.07

Bibliography

AbouZahr, Carla, and Erica Royston. 1991. *Maternal Mortality: A Global Factbook.* Geneva: World Health Organization.

Agarwal, Bina, T.D. Bare, M.L. Henriques, I. Mathews, M. Chainery-Hesse, J. Ariffin, D. Ghaid, R. Jolly, C. McAskie, and F. Stewart. 1990. *Engendering Adjustments for the 1990s: Report of a Commonwealth Expert Group on Women and Structural Adjustment.* London: Commonwealth Secretariat.

Aitken, I.W., and B. Walls. 1986. "Maternal Height and Cephalopelvic Disproportion in Sierra Leone." *Tropical Doctor* 16:132-34.

Alisjahbana, A. 1991. "Regionalization of Care in West Java." Presentation at the Workshop on Guidelines for Safe Motherhood Programming, November 17-21. The World Bank/MotherCare, Washington, D.C.

Alisjahbana, A., Emelia Suroto-Hamzah, Suganda Tanuwidjaja, Sambas Wiradisuria, and Bakir Abisujak. 1983. "Perinatal Mortality and Morbidity Survey and Low Birth Weight." Final Report no. 5, *The Pregnancy Outcome in Ujung-Berung, West-Java.* Fakultas Kedokteran Universitas Padjadjaran, Bandung, Indonesia.

Anderson, Mary Ann. 1989. "The Relationship Between Maternal Nutrition and Child Growth in Rural India." PhD. dissertation, School of Nutrition, Tufts University.

Araujo, G., L. Araujo, B. Janowitz, S. Wallace, and M. Potts. 1983. "Improving Obstetric Care in Northeast Brazil." *PAHO Bulletin* 17(3):233-42.

Attanayake, Nimal, Vincent Faveau, and J. Chakraborty. 1991. "Cost Effectiveness Analysis of Matlab MCH-FP Project in Bangladesh, 1986-89." International Center for Diarrhoeal Disease Research, Bangladesh.

Azefor, Michael, P. Daly, and R. Leke. 1991. "Safe Motherhood in Francophone Africa: A Review of Progress to Date." Report of a meeting in Abidjan, Côte d'Ivoire on September 10-12, 1991. The World Bank, Washington, D.C.

Bang, Rani. 1991. "How Women and Men Perceive RTIs, the Impact on Women's Lives and How Women Seek to Manage RTIs." Presentation at the National Council of International Health, June 23-26, Arlington, Virginia.

Bartlett, Alfred, Maria Elizabeth de Bocaletti, and Marco Antonio Bocaletti. 1991. "Neonatal and Early Postneonatal Morbidity and Morality in a Rural Guatemalan Community: The Importance of Infectious Diseases and Their Management." *Pediatric Infectious Diseases Journal* 10:752-57.

Bashir, Altaf. 1991. "Maternal Mortality in Pakistan: A Success Story of the Faisalabad District." *IPPF Medical Bulletin* 25:2.

Begley, C.M. 1990. "A Comparison of Active and Physiological Management of the Third Stage of Labor." *Midwifery* 6:3-17.

Berkley, S., W. Naamara, and S. Okware. 1989. "Surveillance for AIDS in Uganda." *AIDS* 3(February):79-85.

Bobadilla, Jose-Luis, Sandra Reyes Fausto, and Samuel Karchmer. Forthcoming. "The Magnitude and Causes of Maternal Mortality in Mexico City, 1988-1989." National Institute of Public Health. Mexico City.

Bomfim, S. 1991. "The PROAIS Project in Brazil." Presentation at the Workshop on Guidelines for Safe Motherhood Programming, November 17-21. The World Bank/MotherCare, Washington, D.C.

Brems, Susan, and Alan Berg. 1988. "'Eating Down' during Pregnancy: Nutrition, Obstetric and Cultural Considerations in the Third World." UN Advisory Group on Nutrition Discussion Paper. ACC Sub-Committee on Nutrition. New York.

Brennan, Maureen. 1992. "Training Traditional Birth Attendants." *Postgraduate Doctor Africa* 11(1):16.

Bullough, Colin H.W., Rose S. Msuku, and Lucy Karonde. 1989. "Early Suckling and Postpartum Haemorrhage: Controlled Trial in Deliveries by Traditional Birth Attendants." *The Lancet* (September):522-25.

Butler, N.R., and D.G. Bonham. 1963. *Perinatal Mortality: The First Report of the 1958 British Perinatal Mortality Survey.* Edinburgh: E. & S. Livingstone. pp. 86-100.

Commonwealth Association for Mental Handicap and Development Disabilities (CAMHADD). 1990. "CAMHADD Global Workshop 'Towards Global Strategy on Prevention and Management of Birth Asphyxia through Maternal and Newborn Care at Primary Health Care Level in Developing Countries,' New Delhi (India), 28 January-3 February 1990." *Newsletter* 10:4.

Campbell, Oona M.R., and Wendy Graham. 1991. *Measuring Maternal Mortality and Morbidity: Levels and Trends.* London: London School of Hygiene and Tropical Medicine, Maternal Health and Child Epidemiology Unit.

Chalmers, I. 1991. *Oxford Database of Perinatal Trials.* Version 1.2; desk issue 6. Oxford: Oxford University Press.

Chalmers, I., M. Enkin, and M.J. Kierse, eds. 1989. *Effective Care in Pregnancy and Childbirth.* Oxford: Oxford University Press.

Chamberlain, G. 1978. "British Births 1971." *Obstetric Care* 2:80-107 (London: Heinemann).

Chen, L., M.C. Gesche, S. Ahamed, A.I. Chowdhury, and W.H. Mosley. 1974. "Maternal Mortality in Rural Bangladesh." *Studies in Family Planning* 17(5):243-51.

Chi, I.C., T. Agoestina, and J. Harbin. 1981. "Maternal Mortality at 12 Teaching Hospitals in Indonesia: An Epidemiological Analysis." *International Journal of Gynecology and Obstetrics* 24:259-66.

Chin, James. 1990. "Current and Future Dimensions of the HIV/AIDS Pandemic in Women and Children." *The Lancet* 336:221-24.

Christian Commission for Development in Bangladesh/PATH. 1990. "Operations Research: Safe Birth Kit Development: Field Evaluation Report [August]." Dhaka.

CIAES (Center for Health Research, Consultation and Education). 1991. "Qualitative Research on Knowledge, Attitudes, and Practices Related to Women's Reproductive Health." Working Paper no. 9, July. MotherCare, Arlington, Virginia.

Clemetson, D., and G.B. Moss. 1991. "Association of Cervical Ectopy with Heterosexual Transmission of HIV: Results of a Study with Couples in Nairobi, Kenya." *Journal of Infectious Disease* 164(3):588-91.

Coeytaux, Francine M., Ann H. Leonard, and Carolyn M. Bloomer. 1992 (forthcoming). "Abortion." In M. Koblinsky, J. Timyan, and J. Gay, eds., *The Health of Women: A Global Perspective.* Boulder, Colorado: Westview Press.

Conroy, C. 1991. MotherCare Proposal to the Federal Ministry of Health. Nigeria.

Cottingham, J., and E. Royston. 1991. *Obstetric Fistulae: A Review of Available Information.* WHO/MCH/MSM/91.5. Geneva: World Health Organization.

Datta, K.K., R.S. Sharma, P.M.A. Razack, T.K. Ghosh, and R.R. Arora. 1980. "Morbidity Patterns Amongst Rural Pregnant Women in Alwar, Rajasthan—A Cohort Study." *Health and Population—Perspectives & Issues* 3(4):282-92.

Department of Child Health. 1989. *The Perinatal Mortality and Morbidity Study, Jamaica, Final Report.* Mona, Jamaica: University of the West Indies.

Duale, S. 1991. "The Karawa Health Zone Project." Presentation at the Workshop on Guidelines for Safe Motherhood Programming. November 17-21. The World Bank/MotherCare. Washington, D.C.

Duale, S., C. Hermann, T. Petrick, and P. Lampe. 1990. "A follow-up Study of Pregnancy Outcome in Women with Symphysiotomy Versus Cesarian Section in Zaire." The International Center for Research on Women, Washington, D.C.

Duley, L. 1990. *Maternal Mortality and Eclampsia: An Assessment of Levels and Possible Interventions.* Report prepared for Safe Motherhood Research Programme, World Health Organization. Oxford: National Perinatal Epidemiology Unit, Radcliffe Infirmary.

Ekwempu, C.C., D. Maine, M.B. Olorukoba, B. Essien, and M.N. Kisseka. 1990. "Structural Adjustments and Health in Africa." *Lancet* 336(7):56-57.

Elbourne, D.R., ed. 1991. "Active vs. Conservative Third Stage Management. Overview Record Number 5352." In I. Chalmers, ed., *Oxford Database of Perinatal Trials.* Version 1.2, disk issue 6, Autumn.

_____. 1991. "Prophylactic Oxytocics in Third Stage of Labour. Overview Record Number 2964." In I. Chalmers, ed., *Oxford Database of Perinatal Trials.* Version 1.2, disk issue 6, Autumn.

Fauveau, V. 1991. "Matlab Maternity Care Program." Review paper prepared for the Department of Population and Human Resources, World Bank, Washington, D.C.

Fauveau, V., K. Stewart, S.A. Khan, and J. Chakroborty. 1991. "Effect on Mortality of Community-based Maternity Care Programme in Rural Bangladesh." *Lancet* 338:1183-86.

Fauveau, V., M. Mamdani, M. Koblinsky, and R. Steinglass. June 1992. "Maternal Tetanus: Magnitude, Epidemiology and Control of a Neglected Cause of Maternal Mortality." *International Journal of Gynecology and Obstetrics* 40:3-12.

Feifer, Chris. 1990. "Maternal Health in Jamaica." Policy, Research and External Affairs Working Paper. WPS 539. World Bank, Washington, D.C.

FIGO (International Federation of Gynecology and Obstetrics). 1991. "Report of Joint FIGO/WHO Pre-Congress Workshop on Women's Perspectives and Participation in Reproductive Health." Singapore.

Fortney, J.A. 1987. "The Importance of Family Planning in Reducing Maternal Mortality." *Studies in Family Planning* 18(2):109-14.

Fortney, J.A., and E. Whitehorne. 1982. "The Development of a High Risk Index for Fetal Outcome." *American Journal of Obstetrical Gynecology* 145(5):501-08.

Garby, L., and S. Areekul. 1974. "Iron Supplementation in Thai Fish sauce." *Ann. Trop. Med. Parasitol*: 467-76.

Garcia, Marito, and Mashid Lofti. 1991. "Trends in Women's Nutritional Status: Some Indications for Public Policy." International Food Policy Research Institute, Washington, D.C.

Gebbie, D.A.M. 1974. "Symphysiotomy." *Tropical Doctor* 4:69-75.

Gertler, Paul, Omar Rahman, Chris Feifer, and Deanna Ashley. 1991. "High Risk Pregnancies at Maternal Health Services in Jamaica." Rand Corporation, Santa Monica, California. Prepared for the World Bank.

Gish, Oscar, and Godfrey Walker. 1977. "Transport and Communication Systems in Health Services." *Tropical Doctor* 7:119-22.

_____. 1978. "Alternative Forms of Transport and their Use in the Health Services of Developing Countries." *International Journal of Health Services.* 4:633-651.

Gordon, John E., Helen Gideon, and John B. Wyon. 1965. "Complications of Childbirth and Illnesses During the Puerperium." *The Journal of Obstetrics and Gynecology of India* 15(2):159-67.

Graham, Wendy J., W. Brass, and R.W. Snow. 1989. "Estimating Maternal Mortality: The Sisterhood Method." *Studies in Family Planning* 20:125-35.

Graham, Wendy J., and Oona M.R. Campbell. 1991. *Measuring Maternal Health: Defining the Issues.* London: London School of Hygiene and Tropical Medicine.

Greenwood, A. 1991. "The Farafenni Project." Presentation at the Workshop on Guidelines for Safe Motherhood Programming, November 17-21. The World Bank/MotherCare. Washington, D.C.

Greenwood, A.M., B.M. Greenwood, A.K. Bradley, K. Williams, F.C. Shenton, S. Tulloch, P. Byass, and F.S.J. Oldfield. 1987. "A prospective survey of the outcome of pregnancy in a rural area of The Gambia." *Bulletin of the World Health Organization* 65(5):635-643.

Greenwood, A.M., A. K. Bradley, P. Byass, B.M. Greenwood, R.W. Snow, S. Bennett, and A.B. Hatib-N'Jie. 1990. "Evaluation of a primary health care programme in The Gambia. I The Impact of trained traditional birth attendants on the outcome of pregnancy." *Journal of Tropical Medicine and Hygiene* 93:58-66.

Griffiths, Marcia. May 1989. "Status of the NHED Component." Trip Report to John Snow, Inc., USAID/New Delhi and GOI.

Griffiths, Marcia, Mona Moore, and Michael Favin. 1991. *Communicating Safe Motherhood: Using Communications to Improve Maternal Health in the Developing World.* Background paper prepared for The Workshop on Guidelines for Safe Motherhood Programming, November 17-21. The World Bank/MotherCare. Washington, D.C.

Hall, A.J., B.M. Greenwood, and H. Whittle. 1990. "Practice in Developing Countries." In R.E. Moxon, ed., *Modern Vaccines, Current Practice and New Approaches: A Lancet Review.* London: Edward Arnold.

Harrison, K.A. 1986. "Literacy, Parity, Family Planning, and Maternal Mortality in the Third World." *Lancet* (ii):865-66.

Haub, C., M.M. Kent, and M. Yanagishita. 1991. *1991 World Population Data Sheet.* Washington, D.C.: Population Reference Bureau, Inc.

Heaver, Richard, and Arturo Israel. 1986. *Country Commitment to Development Projects.* World Bank Discussion Paper 4. Washington, D.C.

Hermann, Carol B., and Sambe Duale. 1990. "Improving Maternity Care Services in the Karawa Health Zone of Zaire." The International Center for Research on Women, Washington, D.C.

Herz, Barbara, and Anthony R. Measham. 1987. "The Safe Motherhood Initiative: Proposals for Action." World Bank Discussion Paper 9. Washington, D.C.

Herz, Barbara, K. Subbarao, Masooma Habib, and Laura Raney. 1991. "Letting Girls Learn: Promising Approaches in Primary and Secondary Education." World Bank Discussion Paper 133. Washington, D.C.

Hira, Subhash K., Ganapati J. Bhat, Davy M. Chikamata, Benjamin Nkowane, George Tembo, Peter L. Perine, and Andre Mehus. 1990. "Syphilis Intervention in Pregnancy: Zambian Demonstration Project." *Genitourinary Medicine* 66:159-64.

Hofmeyr, G.J. 1989. "Breech Presentation and Abnormal Lie in Late Pregnancy." In I. Chalmers, M. Enkin, and M. Kierse, eds., *Effective Care in Pregnancy and Childbirth.* Oxford: Oxford University Press. Pp. 653-665.

Högberg, Ulf, and Stig Wall. 1986. "Secular Trends in Maternal Mortality in Sweden from 1750 to 1980." *Bulletin of the World Health Organization* 64(1):79-84.

Hord, Charlotte, Henry P. David, France Donnay, and Merrill Wolf. 1991. "Reproductive Health in Romania: Reversing the Ceausescu Legacy." *Studies in Family Planning* 22(4):231-40.

Huque, A., A. Zahidul, and Marjorie A. Koblinsky. 1991. *Levels, Trends and Consequences of Maternal Mortality and Morbidity.* Background paper prepared for the Workshop on Guidelines for Safe Motherhood Programming, November 17-22. The World Bank/MotherCare. Washington, D.C.

INACG (International Nutritional Anemia Consultative Group). 1986. *Combating Iron Deficiency in Chile: A Case Study.* New York: The Nutrition Foundation.

Jamison, Dean, and W. Henry Mosley, eds. (forthcoming). *Disease Control Priorities in Developing Countries.* New York: Oxford University Press for the World Bank.

Janowitz, Barbara, Sylvia Wallace, Galba Araujo, and Lorena Araujo. 1985. "Referrals by Traditional Birth Attendants in Northeast Brazil." *American Journal of Public Health* 75(7):745-48.

Johnson, Brooke R., J. Benson, J. Bradley, A. Rabago, C. Zambrano, L. Okoko, L. Rasqez, P. Quioz, and K. Rogo. 1992. "Costs and Resource Utilization for the Treatment of Incomplete Abortion with Dilation and Curettage and Manual Vacuum Aspiration in Kenya, Mexico, and Ecuador." International Projects Assistance Service (IPAS), Carrboro, N.C.

Kasongo Project Team. 1984. "Antenatal Screening for Fetopelvic Dystocias. A Cost-Effectiveness Approach to the Choice of Simple Indicators for Use by Auxiliary Personnel." *Journal of Tropical Medicine and Hygiene* 87:173-83.

Kaunitz, Andrew M., C. Spence, T.S. Danielson, R.W. Rochat, and D.A. Grimes. 1984. "Perinatal and Maternal Mortality in a Religious Group Avoiding Obstetrical Care." *American Journal of Obstetrics and Gynecology* 150(7):826-31.

Kierse, M.J.N., A. Ohlsson, P.E. Treffers, and H.H.H. Kanhai. 1989. "Prelabour Rupture of Membranes Preterm." In I. Chalmers, M. Enkin, and M. Kierse, eds., *Effective Care in Pregnancy and Childbirth.* Oxford: Oxford University Press. Pp. 666-93.

Koblinsky, M.A., O.M.R. Campbell and S. Harlow. 1992 (forthcoming). "Mother and More: A Broader Perspective on Women's Health." In M. Koblinsky, J. Timyan, and J. Gay, eds., *The Health of Women: A Global Perspective.* Boulder, Colorado: Westview Press.

Koblinsky, M.A., with C. Rooney, M. Griffiths, Z. Huque, C. Leighton, B. Kwast, and A. Tinker. 1992. "Programming for Safe Motherhood." The World Bank/MotherCare, Washington, D.C.

Koenig, M.A., V. Fauveau, A.I. Chowdhury, J. Chakraborty, and M.A. Khan. 1988. "Maternal Mortality in Matlab, Bangladesh: 1976-85." *Studies in Family Planning* 19(2):69-80.

Krasovec, Katherine, and Mary Ann Anderson, eds. 1991. *Maternal Nutrition and Pregnancy Outcomes: Anthropometric Assessment.* PAHO Scientific Publication no. 529, Washington, D.C.

Kwast, Barbara. 1991. "Safe Motherhood: A Challenge to Midwifery Practice." *World Health Forum* 12:1-20.

_____. 1992. "Midwives: Key Rural Health Workers in Maternity Care." *International Journal of Gynecologists and Obstetricians* 38(suppl.):59-515.

Leigh, B. 1986. "The Use of the Partogram by Maternal and Child Health Aides." *J. Tr. Ped.* 32:107-10.

Leke, R. 1991. "The Risk Approach in Cameroon." Presentation at the Workshop on Guidelines for Safe Motherhood Programming, November 17-21. The World Bank/MotherCare. Washington, D.C.

Leslie, Joanne. 1991. "Women's Nutrition: The Key to Improving Family Health in Developing Countries?" *Health Policy and Planning* 6(1):1-19.

Lettenmaier, R.N., L. Liskin, C.A. Church, and J.A. Harris. 1988. "Mothers' Lives Matter: Maternal Health in the Community." *Population Reports* Series L:1-32.

Li, Bo-ying, Dong Ai-Mei, and Zhuo Jing-ru. 1982. "Outcomes of Pregnancy in Hong-qiao and Qi-yi Communes." *American Journal of Public Health Supplement* 72:30-32.

Llewellyn-Jones, D. 1965. "Severe Anemia in Pregnancy." *Australian and New Zealand Journal of Obstetrics and Gynecology* 5:191-97.

Lopez, Alan D. 1990. "Causes of Death: An Assessment of Global Patterns of Mortality around 1985." *World Health Statistics Quarterly* 43(2). Geneva: World Health Organization.

Loudon, Irvine. 1991. "On Maternal and Infant Mortality 1900-1960." *Society for the Social History of Medicine* 4:29-73.

Lundsgaard Hansen, P., J.A. Collins, A.S. David West, C.G. Lopez, Z.S. Hantchef, F. Lothe, and E. von Steffens. 1983. "Use of Plasma Volume Substitutes and Plasma in Developing Countries." *Bulletin of the World Health Organization* 61:7-22.

Maine, Deborah. 1990. *Safe Motherhood Programs: Options and Issues.* New York: Columbia University Center for Population and Family Health.

Maine, D., J. McCarthy, and V. Ward. 1992. "Guidelines for Monitoring Progress on the Reduction of Maternal Mortality." UNICEF, New York.

McCarthy, J., and D. Maine. 1992. "A Framework for Analyzing the Determinants of Maternal Mortality." *Studies in Family Planning* 23(1):23-33.

MCWAP. 1992. "Maternal and Child Welfare Association of Pakistan: Progress Report from January 1-March 31, 1992." Geneva.

Measham, Diana, M. Koblinsky, and A. Tinker. 1992. "Toward the Development of Safe Motherhood Guidelines." Department of Population and Human Resources, The World Bank, Washington, D.C.

Montquin, J.M., Robert Gagnon, Carmen Rainville, Luc Giroux, Gilles Amyot, Rolland Bilodeau, and Pierre Raynauld. 1987. "Maternal and Neonatal Outcomes in Pregnancies with No Risk Factors." *CMAJ* 17:728-32.

Moore, Mona, Pandu Riono, and Siti Pariani. May 1991. "A Qualitative Investigation of Factors Influencing Use of Iron Folate Tablets by Pregnant Women in West Java: A Summary of Findings." Working Paper No. 13. MotherCare, Arlington, Virginia.

MotherCare. 1991. "Is Perinatal Mortality a Useful Indicator of Maternal Mortality?" *MotherCare Matters* 2(1):9.

Nasah, B.T., R.J. Leke, A.S. Doh, J. Kamdom Moyo, J. Fomulu, and O.M. Njikam. 1991. "The Risk Approach for Reducing Maternal Mortality: The Yaounde Experience." *International Journal of Gynecology and Obstetrics* 36:195-201.

Oakley, Ann. 1985. "Social Support in Pregnancy: The 'Soft' Way to Increase Birthweight?" *Soc. Sci. Med* (21)11:1259-68.

Ochoa Rojas, F.R. 1981. "Investigación Perinatal (perinatal investigation)." Instituto de Desarrollo de la Salud, Gentifico Tecnica, Havana.

Omran, A.R., and C.C. Standley. 1976. "Family Formation and Maternal Health." *Family Formation Patterns and Health* (Geneva: World Health Organization): 335-72.

_____. 1981. "Family Formation and Maternal Health." *Further studies on family formation patterns and health.* (Geneva: World Health Organization): 271-302.

PAHO (Pan American Health Organization). 1990. "Plan de Acción Regional para la Reducción de la Mortalidad Materna en las Américas." Washington, D.C.

Perera, Terence, and Khing Maung Lwin. 1984. "Perinatal mortality and morbidity." *SEARO Regional Health Papers* 3:1-72.

Piotrow, Phyllis T., and others. 1990. *Strategies for Family Planning Information, Education, and Communication.* Baltimore, Md: The Johns Hopkins University, Center for Communication Programs, School of Hygiene and Public Health.

Poovan, P., F. Kifle, and B. Kwast. 1990. "A Maternity Waiting Home Reduces Obstetric Catastrophes." *World Health Forum* 11:440-45.

Potts, M., R. Anderson, and M.C. Boily. 1991. "Slowing the Spread of Human Immunodeficiency Virus in Developing Countries." *Lancet* 338:608-13.

Restrepo Estrada, Sonia. 1991. "Cochabamba, Bolivia. Informe de Viaje no. 1, 26 agosto - 6 septiembre 1991." MotherCare/The Manoff Group, Washington, D.C.

Rochat, R.W. 1987. "Table 2: Estimated Lifetime Chance of Dying from Pregnancy-Related Causes, by Region, 1975-84." In A. Starrs, ed., *Preventing the Tragedy of Maternal Deaths: A Report on the International Safe Motherhood Conference, Nairobi, February 1987.* Washington, D.C.: The World Bank. Pg. 13.

Roesel, C., T. Schaffter, S. Durongdej, and L. Tokmoh. 1990. "Effect of Weight Gain Feedback on Pregnancy Outcome." International Center for Research on Women, Washington, D.C.

Rooks, Judith, Norman L. Weatherby, Eunice K.M. Ernst, Susan Stapleton, David Rosen, and Allen Rosenfield. 1989. "Outcomes of Care in Birth Centers: The National Birth Center." *The New England Journal of Medicine* 321(26):1804-11.

Rooney, Cleone. 1991. "World Bank Guidelines on Safe Motherhood in Developing Countries: Outline of Effective Care at Delivery for Safe Motherhood." Background paper prepared for Workshop on Guidelines for Safe Motherhood Programming, November 17-21. The World Bank/MotherCare, Washington, D.C.

Rooney, Cleone, and Wendy Graham. 1991. "A Review of the Evidence on the Effectiveness of Antenatal Interventions in Developing Countries, with Regard to Maternal Health Outcomes." World Health Organization, Geneva.

Rooth, G., and E. Kossel, eds. 1992. "Workshop on Obstetric and Maternity Care: Delegation of Responsibilities in Maternity Care in Developing Countries." *International Journal of Gynecology and Obstetrics* 38(suppl.):51-585.

Rosso, P., and F. Mardones. 1988. "Gràfica de Incremenu de Peso para la Embarazada." Chilean Ministry of Health, Santiago.

Royston, E. 1982. "The Prevalence of Nutritional Anaemia in Women in Developing Countries: A Critical Review of Available Information." *World Health Statistics Quarterly* 35:52-92.

Royston, E., and S. Armstrong. 1989. *Preventing Maternal Deaths.* Geneva: World Health Organization. Pp. 1-233.

Safe Motherhood Newsletter. 1991. No. 6. Geneva: World Health Organization.

Saxenian, Helen. 1990. "Brazil: Women's Reproductive Health." The World Bank, Washington, D.C.

Schieber, Barbara. 1991. "The Quetzaltenango Project." Presentation at the Workshop on Guidelines for Safe Motherhood Programming, November 17-21. The World Bank/MotherCare, Washington, D.C.

Schieber, Barbara, Hernan Delgado, and Alfred Bartlett. 1990. "High Risk Management in the Rural Highlands." Guatemala City: Instituto Nutricionel de Centroamérica y Panama (INCAP).

Schulz, Kenneth F., Joanne M. Schulte, and Stuart M. Berman. 1992 (forthcoming). "Maternal Health and Child Survival: Opportunities to Protect Both Women and Children from the Adverse Consequences of Reproductive Tract Infections." In *Reproductive Tract Infections: Global Impact and Priorities for Women's Reproductive Health.* New York: Plenum Publishing Corp.

Schulz, T.P. 1989. "Returns to Women's Education." WPS001. World Bank, Population and Human Resources Department, Washington, D.C.

Shah, P.M. 1990. "Birth Asphyxia: A Crucial Issue in the Prevention of Developmental Disabilities." *Midwifery* 6:99-107.

Sivard, Ruth L. 1985. *Women...A World Survey.* Washington, D.C.: World Priorities. Pp. 1-44.

Sloan, N.L., and E.A. Jordon. 1992. "The Prevalence of Maternal Anemia in Developing Countries." Working Paper 7b. The MotherCare Project, Arlington, Virginia.

Smith, J.B., N.F. Burton, G. Nelson, J.A. Fortney, and S. Duale. 1986. "Hospital Deaths in a High Risk Population: Karawa, Zaire." *International Journal of Gynecological Obstetrics* 24:225-34.

Steketee, Richard. 1989. "Recent Findings in Perinatal Malaria." Working paper for the XIX International Congress of Pediatrics, July 23-28. Paris, France.

Stewart, K. 1991. "The Matlab Project." Presentation at the Workshop on Guidelines for Safe Motherhood Programming, November 17-21. The World Bank/MotherCare, Washington, D.C.

Stewart, Kate, and Maxine Whittaker. 1991. "Methodological Issues in Defining Female Morbidity: A Case Study from the Maternity Care Project, Matlab, Bangladesh." Paper presented at the 18th annual NCIH International Health Conference, June 1991, Arlington, Virginia.

Tafari, Nebiat. 1981. "Low Birthweight: An Overview." In D.B. Jelliffe and E.F. Patrice Jeliffe, eds., *Advances in International Maternal and Child Health.* Oxford: Oxford University Press. Pp. 105-27.

Tahzib, Farhang. 1989. "An Initiative on Vesicovaginal Fistula." *Lancet* (June 10):1316-17.

Thaddeus, Sereen, and Deborah Maine. 1990. *Too Far to Walk: Maternal Mortality in Context.* New York: Columbia University, Center for Population and Family Health.

Tinker, Anne. 1991a. "Maternal Health: Program Cost and Effectiveness." Speech presented at the Berzelius Symposium. Stockholm, Sweden.

_____. 1991b. "Safe Motherhood: From Advocacy to Action." *Finance and Development* (December): 18-20.

Tinker, Anne, and May Post. 1991. "The Influence of Maternal Health on Child Survival." Speech prepared for the American Public Health Association (November). Washington, D.C.

USAID (United States Agency for International Development). 1991. *Child Survival 1985-1990: A Sixth Report to Congress on the USAID Program.* Washington, D.C.: USAID.

United States Bureau of the Census Center for International Research, Health Studies Branch. 1992. "Recent HIV/Seroprevalence Levels by Country." *Research Notes* 4.

van Roosmalen, J. 1987. "Symphysiotomy as an Alternative to Cesarean Section." *International Journal of Gynaecologists and Obstetricians* 25:451-58.

_____. 1990. "Safe Motherhood: Cesarean Section or Symphysiotomy?" *American Journal of Obstetrics and Gynecology* 163(1):1-4.

Viteri, F.E., E. Alvarez, J. Bulux, O. Pineda, and R. Bartres. 1981. "Iron Fortification in Developing Countries." In A.E. Harper and G.K. Davis, eds., *Nutrition in Health and Disease and International Development: Symposia from the XII International Congress of Nutrition. Progress in Clinical and Biological Research.* New York: Alan R. Liss. 77:345-54.

Voltaire, Claire, and Juliana Weissman. 1993. Personal communication.

Walker, Godfrey, D. Ashley, A. McCaw, and B. Wesley. 1986. "Maternal Mortality in Jamaica." *Lancet* 1: 486-88.

Walker, J. 1992. "Report from the Second ICM/WHO/UNICEF Pre-Congress Workshop on Midwifery Education: Action for Safe Motherhood." *International Journal of Gynecologists and Obstetricians.*

Wallace, H.M., and K. Giri. 1991. *Health Care of Women and Children in Developing Countries.* California: Third Party Publishing.

Wang, E., and F. Smaill. 1989. "Infection in Pregnancy." In I. Chalmers, M. Enkin, and M. Kierse, eds., *Effective Care in Pregnancy and Childbirth.* New York: Oxford University Press. Pp. 534-64.

Ward, Victoria, Deborah Maine, James McCarthy, Joe Wray, and Angela Kamara. 1991. "Indicators of Success in Programs Designed to Improve Maternal Morbidity and Mortality." Columbia University, Center for Population and Family Health. New York.

Wasserheit, Judith. 1990. "Reproductive Tract Infections." In *Special Challenges in Third World Women's Health.* New York: International Women's Health Coalition Publications. Pp. 1-15.

Wasserheit, Judith, and King K. Holmes. 1992. "Reproductive Tract Infections: Special Challenges for International Health Policy, Programs, and Research." In *Reproductive Tract Infections: Global Impact and Priorities for Women's Reproductive Health.* New York: Plenum Press.

Weatherly, N. 1992. "Antepartum Assessment of Intrapartum Risk: National Birth Center Study." Paper presented at the conference, A Reassessment of the Concept of Reproductive Risk in Maternal Care at Family Planning Services, The Population Council, February 12-13, New York.

Wedderburn, Maxine, and Mona Moore. November, 1990. "Qualitative Assessment of Attitudes Affecting Childbirth Choices of Jamaican Women." Working Paper no. 5, MotherCare, Arlington, Virginia.

White, S.M., R.G. Thorpe, and D. Maine. 1987. "Emergency Obstetric Surgery Performed by Nurses in Zaire." *Lancet* 2:612-13.

Winikoff, Beverly, Charles Carignan, Elizabeth Bernardik, and Patricia Semeraro. 1991. "Medical Services to Save Mothers' Lives: Feasible Approaches to Reducing Maternal Mortality." Working Paper no. 4, Population Council, New York.

Winnard, Kim. 1991. "MotherCare/Save the Children Bangladesh Project: The Social Marketing/Information, Education, Communication Process and Progress." Trip report. MotherCare, Arlington, Virginia.

World Bank. 1991. "Gender and Poverty in India." World Bank, Washington, D.C.

World Bank. 1992. "Effective Family Planning Programs." Department of Population and Human Resources, Washington, D.C.

World Health Organization. 1977. "Definitions and Recommendations." In *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death.* Geneva: World Health Organization. (1):763-64.

_____. 1986. "The Potential of the Traditional Birth Attendant." No. 95. Geneva.

_____. 1987. *Guide for the Use of Simple Birth Kits at the Community Level.* MCH/87.4. Geneva: WHO, Maternal and Child Health Division.

_____. 1988. *The Partograph: A Managerial Tool for the Prevention of Prolonged Labour.* Doc. WHO/MCH/88.3. Geneva.

_____. 1989a. *Coverage of Maternity Care: A Tabulation of Available Information.* FHE/98.2. Geneva: WHO, Division of Family Health.

_____. 1989b. "Maternal and Child Health: Regional Estimates of Perinatal Mortality." *Weekly Epidem. Rec* 24:184-86.

_____. 1990a. *Human Resource Development for Maternal Health and Safe Motherhood.* WHO/MCH/HRD 90.1. Geneva: WHO, Maternal and Child Health & Family Planning, Division of Family Health.

_____. 1990b. "Iron Supplementation During Pregnancy: Why Aren't Women Complying?" Doc. WHO/MCH/90.5. Geneva.

_____. 1990c. "Maternal Health and Safe Motherhood Program. Progress Report, 1987-1990." Doc. WHO/MCH/90.11. Geneva.

_____. 1990d. *The Prevention and Management of Post Partum Hemorrhage.* WHO/MCH/90.7. Geneva.

_____. 1991a. "Essential Elements of Obstetric Care at the First Referral Level." ISBN 92 N. Geneva.

_____. 1991b. *Midwifery Education: Action for Safe Motherhood.* WHO/MCH/91.3. Geneva: WHO, Maternal and Child Health Division, Division of Family Health.

_____. 1991c. "New Estimates of Maternal Mortality." *Weekly Epidem. Rec.* 66:345-48.

_____. 1991d. "Progress on the Global Plan for NNT Elimination." 14th Meeting of the Global Advisory Group. Geneva.

_____. 1992a. "The Global Burden of Disease." Contribution to the *World Development Report 1993* (unpublished). Geneva.

_____. 1992b. "Child Health and Development: Health of the Newborn." Report of the Director-General to the Forty-Fifth World Health Assembly. Doc. No. A45/27. Geneva.

_____. 1992c. "Current and Future Dimensions of the HIV/AIDS Pandemic." World Health Organization, Global Programme on AIDS, Geneva.

_____. 1992d. *International Statistical Classification of Diseases and Related Health Problems.* Tenth Revision. ICD-10. Geneva.

_____. 1992e. "The Prevalence of Anemia in Women: A Tabulation of Available Information." WHO/MCH/MSM 92.2. Geneva.

_____. 1992f. *World Health Statistical Annual.* Geneva.

World Health Organization and UNFPA. 1987. *Ministry of Health Evaluation of the Traditional Birth Attendant Programme in Malawi.* Final Report. Geneva: World Health Organization.

World Health Organization and UNICEF. 1992. "Low Birth Weight: A Tabulation of Available Information." Maternal Health and Safe Motherhood Programme, Doc. no. WHO/MCH/92.2. World Health Organization, Geneva.

Yan, R.Y., B. McCarthy, H. Ye, C. Qu, L. Zhu, T. Chen and D. Kowal. 1989. "The Risk of Approach in Perinatal Health Shunyi County, People's Republic of China." *U.S. Department of Health and Human Services*, publication no. HHS 89-8412. Washington, D.C.

Zurayk, Huda, ed. 1991. "Study on Reproductive Morbidity in Rural Giza: Description of Study and Results of First Phase of Analysis." Report for The Population Council, Cairo, Egypt.

Distributors of World Bank Publications

ARGENTINA
Carlos Hirsch, SRL
Galeria Guemes
Florida 165, 4th Floor-Ofc. 453/465
1333 Buenos Aires

AUSTRALIA, PAPUA NEW GUINEA, FIJI, SOLOMON ISLANDS, VANUATU, AND WESTERN SAMOA
D.A. Books & Journals
648 Whitehorse Road
Mitcham 3132
Victoria

AUSTRIA
Gerold and Co.
Graben 31
A-1011 Wien

BANGLADESH
Micro Industries Development Assistance Society (MIDAS)
House 5, Road 16
Dhanmondi R/Area
Dhaka 1209

Branch offices:
156, Nur Ahmed Sarak
Chittagong 4000

76, K.D.A. Avenue
Kulna 9100

BELGIUM
Jean De Lannoy
Av. du Roi 202
1060 Brussels

CANADA
Le Diffuseur
C.P. 85, 1501B rue Ampère
Boucherville, Québec
J4B 5E6

CHILE
Invertec IGT S.A.
Americo Vespucio Norte 1165
Santiago

CHINA
China Financial & Economic Publishing House
8, Da Fo Si Dong Jie
Beijing

COLOMBIA
Infoenlace Ltda.
Apartado Aereo 34270
Bogota D.E.

COTE D'IVOIRE
Centre d'Edition et de Diffusion Africaines (CEDA)
04 B.P. 541
Abidjan 04 Plateau

CYPRUS
Center of Applied Research
Cyprus College
6, Diogenes Street, Engomi
P.O. Box 2006
Nicosia

DENMARK
SamfundsLitteratur
Rosenoerns Allé 11
DK-1970 Frederiksberg C

DOMINICAN REPUBLIC
Editora Taller, C. por A.
Restauración e Isabel la Católica 309
Apartado de Correos 2190 Z-1
Santo Domingo

EGYPT, ARAB REPUBLIC OF
Al Ahram
Al Galaa Street
Cairo

The Middle East Observer
41, Sherif Street
Cairo

FINLAND
Akateeminen Kirjakauppa
P.O. Box 128
SF-00101 Helsinki 10

FRANCE
World Bank Publications
66, avenue d'Iéna
75116 Paris

GERMANY
UNO-Verlag
Poppelsdorfer Allee 55
D-5300 Bonn 1

HONG KONG, MACAO
Asia 2000 Ltd.
46-48 Wyndham Street
Winning Centre
2nd Floor
Central Hong Kong

INDIA
Allied Publishers Private Ltd.
751 Mount Road
Madras - 600 002

Branch offices:
15 J.N. Heredia Marg
Ballard Estate
Bombay - 400 038

13/14 Asaf Ali Road
New Delhi - 110 002

17 Chittaranjan Avenue
Calcutta - 700 072

Jayadeva Hostel Building
5th Main Road, Gandhinagar
Bangalore - 560 009

3-5-1129 Kachiguda
Cross Road
Hyderabad - 500 027

Prarthana Flats, 2nd Floor
Near Thakore Baug, Navrangpura
Ahmedabad - 380 009

Patiala House
16-A Ashok Marg
Lucknow - 226 001

Central Bazaar Road
60 Bajaj Nagar
Nagpur 440 010

INDONESIA
Pt. Indira Limited
Jalan Borobudur 20
P.O. Box 181
Jakarta 10320

IRELAND
Government Supplies Agency
4-5 Harcourt Road
Dublin 2

ISRAEL
Yozmot Literature Ltd.
P.O. Box 56055
Tel Aviv 61560

ITALY
Licosa Commissionaria Sansoni SPA
Via Duca Di Calabria, 1/1
Casella Postale 552
50125 Firenze

JAPAN
Eastern Book Service
Hongo 3-Chome, Bunkyo-ku 113
Tokyo

KENYA
Africa Book Service (E.A.) Ltd.
Quaran House, Mfangano Street
P.O. Box 45245
Nairobi

KOREA, REPUBLIC OF
Pan Korea Book Corporation
P.O. Box 101, Kwangwhamun
Seoul

MALAYSIA
University of Malaya Cooperative Bookshop, Limited
P.O. Box 1127, Jalan Pantai Baru
59700 Kuala Lumpur

MEXICO
INFOTEC
Apartado Postal 22-860
14060 Tlalpan, Mexico D.F.

NETHERLANDS
De Lindeboom/InOr-Publikaties
P.O. Box 202
7480 AE Haaksbergen

NEW ZEALAND
EBSCO NZ Ltd.
Private Mail Bag 99914
New Market
Auckland

NIGERIA
University Press Limited
Three Crowns Building Jericho
Private Mail Bag 5095
Ibadan

NORWAY
Narvesen Information Center
Book Department
P.O. Box 6125 Etterstad
N-0602 Oslo 6

PAKISTAN
Mirza Book Agency
65, Shahrah-e-Quaid-e-Azam
P.O. Box No. 729
Lahore 54000

PERU
Editorial Desarrollo SA
Apartado 3824
Lima 1

PHILIPPINES
International Book Center
Suite 1703, Cityland 10
Condominium Tower 1
Ayala Avenue, Corner H.V. dela Costa Extension
Makati, Metro Manila

POLAND
International Publishing Service
Ul. Piekna 31/37
00-677 Warzawa

For subscription orders:
IPS Journals
Ul. Okrezna 3
02-916 Warszawa

PORTUGAL
Livraria Portugal
Rua Do Carmo 70-74
1200 Lisbon

SAUDI ARABIA, QATAR
Jarir Book Store
P.O. Box 3196
Riyadh 11471

SINGAPORE, TAIWAN, MYANMAR, BRUNEI
Information Publications Private, Ltd.
Golden Wheel Building
41, Kallang Pudding, #04-03
Singapore 1334

SOUTH AFRICA, BOTSWANA
For single titles:
Oxford University Press Southern Africa
P.O. Box 1141
Cape Town 8000

For subscription orders:
International Subscription Service
P.O. Box 41095
Craighall
Johannesburg 2024

SPAIN
Mundi-Prensa Libros, S.A.
Castello 37
28001 Madrid

Librería Internacional AEDOS
Consell de Cent, 391
08009 Barcelona

SRI LANKA AND THE MALDIVES
Lake House Bookshop
P.O. Box 244
100, Sir Chittampalam A. Gardiner Mawatha
Colombo 2

SWEDEN
For single titles:
Fritzes Fackboksforetaget
Regeringsgatan 12, Box 16356
S-103 27 Stockholm

For subscription orders:
Wennergren-Williams AB
P. O. Box 1305
S-171 25 Solna

SWITZERLAND
For single titles:
Librairie Payot
1, rue de Bourg
CH 1002 Lausanne

For subscription orders:
Librairie Payot
Service des Abonnements
Case postale 3312
CH 1002 Lausanne

TANZANIA
Oxford University Press
P.O. Box 5299
Maktaba Road
Dar es Salaam

THAILAND
Central Department Store
306 Silom Road
Bangkok

TRINIDAD & TOBAGO, ANTIGUA BARBUDA, BARBADOS, DOMINICA, GRENADA, GUYANA, JAMAICA, MONTSERRAT, ST. KITTS & NEVIS, ST. LUCIA, ST. VINCENT & GRENADINES
Systematics Studies Unit
#9 Watts Street
Curepe
Trinidad, West Indies

TURKEY
Infotel
Narlabahçe Sok. No. 15
Cagaloglu
Istanbul

UNITED KINGDOM
Microinfo Ltd.
P.O. Box 3
Alton, Hampshire GU34 2PG
England

VENEZUELA
Libreria del Este
Aptdo. 60.337
Caracas 1060-A

Recent World Bank Discussion Papers *(continued)*

No. 172 *Japanese National Railways Privatization Study: The Experience of Japan and Lessons for Developing Countries.* Koichiro Fukui

No. 173 *The Livestock Sector in Eastern Europe: Constraints and Opportunities.* Cornelis de Haan, Tjaart Schillhorn Van Veen, and Karen Brooks

No. 174 *Assessing Development Finance Institutions: A Public Interest Analysis.* Jacob Yaron

No. 175 *Resource Management and Pastoral Institution Building in the West African Sahel.* Nadarajah Shanmugaratnam, Trond Vedeld, Anne Mossige, and Mette Bovin

No. 176 *Public and Private Sector Roles in Agricultural Research: Theory and Experience.* Dina L. Umali

No. 177 *The Regulatory Impediments to the Private Industrial Sector Development in Asia: A Comparative Study.* Deena Khatkhate

No. 178 China: Reforming Intergovernmental Fiscal Relations. Ramgopal Agarwala

No. 179 *Nippon Telegraph and Telephone Privatization Study: Experience of Japan and Lessons for Developing Countries.* Yoshiro Takano

No. 180 *China's Reform Experience to Date.* Peter Harrold

No. 181 *Combatting AIDS and Other Sexually Transmitted Diseases in Africa: A Review of the World Bank's Agenda for Action.* Jean-Louis Lamboray and A. Edward Elmendorf

No. 182 *Privatization Problems at Industry Level: Road Haulage in Central Europe.* Esra Bennathan and Louis S. Thompson

No. 183 *Participatory Development and the World Bank: Potential Directions for Change.* Bhuvan Bhatnagar and Aubrey C. Williams, editors

No. 184 *Agricultural Research in Southern Africa: A Framework for Action.* Andrew Spurling, Teck Y. Pee, Godwin Mkamanga, and Christopher Nkwanyana

No. 185 *Military Expenditure and Economic Development: A Symposium on Research Issues.* Edited by Geoffrey Lamb with Valeriana Kallab

No. 186 *Efficiency and Substitution in Pollution Abatement: Three Case Studies.* Dennis Anderson and William Cavendish

No. 187 *The State Holding Company: Issues and Options.* Anjali Kumar

No. 188 *Indigenous Views of Land and the Environment.* Shelton H. Davis, editor

No. 189 *Poverty, Population, and the Environment.* Stephen D. Mink

No. 190 *Natural Gas in Developing Countries: Evaluating the Benefits to the Environment.* John Homer

No. 191 *Appropriate Macroeconomic Management in Indonesia's Open Economy.* Sadiq Ahmed

No. 192 *Telecommunications: World Bank Experience and Strategy.* Bjorn Wellenius and others

No. 193 *Information Systems Strategies for Public Financial Management.* Hywel M. Davies, Ali Hashim, and Eduardo Talero

No. 194 *Social Gains from Female Education: A Cross-National Study.* K. Subbarao and Laura Raney

No. 195 *Towards a Sustainable Development: The Rio de Janeiro Study.* Edited by Alcira Kreimer, Thereza Lobo, Braz Menezes, Mohan Munasinghe, and Ronald Parker

No. 196 *Eastern Europe in Transition: From Recession to Growth?: Proceedings of a Conference on the Macroeconomic Aspects of Adjustment, Cosponsored by the International Monetary Fund and the World Bank.* Edited by Mario I. Blejer, Guillermo A. Calvo, Fabrizio Coricelli, and Alan H. Gelb

No. 197 *Korean Industrial Policy: Legacies of the Past and Directions for the Future.* Danny M. Leipziger and Peter A. Petri

No. 198 *Exporting High-Value Food Commodities: Success Stories from Developing Countries.* Steven M. Jaffee with the assistance of Peter Gordon

No. 199 *Borrower Ownership of Adjustment Programs and the Political Economy of Reform.* John H. Johnson and Sulaiman S. Wasty

No. 200 *Construction Practices for Social Infrastructure in the Sahel.* Bernard Abeillé and Jean-Marie Lantran

No. 201 *Urbanization, Agricultural Development, and Land Allocation.* Dipasis Bhadra and Antônio Salazar P. Brandão

The World Bank

Headquarters
1818 H Street, N.W.
Washington, D.C. 20433, U.S.A.

Telephone: (202) 477-1234
Facsimile: (202) 477-6391
Telex: WUI 64145 WORLDBANK
RCA 248423 WORLDBK
Cable Address: INTBAFRAD
WASHINGTONDC

European Office
66, avenue d'Iéna
75116 Paris, France

Telephone: (1) 40.69.30.00
Facsimile: (1) 40.69.30.66
Telex: 640651

Tokyo Office
Kokusai Building
1-1 Marunouchi 3-chome
Chiyoda-ku, Tokyo 100, Japan

Telephone: (3) 3214-5001
Facsimile: (3) 3214-3657
Telex: 26838

12468 POP 100
0-8213-2468-3
MAKING MOTHERHOOD SAFE
400000008486
$10.95

ISBN 0-8213-2468-3