

PN. ABN-887
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**MATERNAL MORTALITY:
LEVELS, TRENDS AND DETERMINANTS**

WORKING PAPER: 10

November, 1991

JN 11/21/85

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**Paper Prepared for the Workshop on
Guidelines for Safe Motherhood Programming
The World Bank and MotherCare
November 18-22, 1991
Washington, D.C**

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**The Agency for International Development
Contract #DPE-5966-Z-00-8083-00
Project #936-5966**

TABLE OF CONTENTS

INTRODUCTION	3
LEVELS, TRENDS AND CONSEQUENCES OF MATERNAL MORTALITY AND MORBIDITY	4
Measures of maternal mortality	4
Levels of maternal mortality	5
Trends in maternal mortality	7
Causes of deaths	8
Maternal morbidity	10
Consequences of maternal deaths	11
Impact on children	11
Impact on family income	11
ROOTS OF THE PROBLEM	12
CONCEPTUAL FRAMEWORK	14
Proximate Determinants	15
Intermediate Determinants	16
Distant Determinants	17
CLASSIFICATION OF COUNTRIES	18
EVIDENCE SUPPORTING THE CONCEPTUAL FRAMEWORK	22
Variation of Maternal Mortality	22
Prediction of Maternal Mortality	23
INDICATORS	24
CONCLUSION	29
REFERENCES	31
ANNEX I Data Sheet	35
ANNEX II Stepwise Regression	37

TABLE OF CONTENTS (Contd.)

TABLES		
Table-1:	Selected Measures of Maternal Mortality by Region /Sub-region, 1975-84	6
Table-2:	Number of Countries Classified by Maternal Mortality Ratio and Total Fertility Rate	19
FIGURES		
Figure-1:	Maternal Mortality Trends in Countries With Low Maternal Mortality Ratio and Low Total Fertility Rate	7
Figure-2:	Maternal Mortality Trends in Countries With High Maternal Mortality Ratio and High Fertility Rate	7
Figure-3:	Impact of Maternal Deaths on Childhood Mortality in Bangladesh	12
Figure-4:	Conceptual Framework of Maternal Mortality	15
Figure-5:	Distribution of Countries by Maternal Mortality and Fertility	20
Figure-6:	Coverage of Prenatal Care and Delivery in Countries with Low Maternal Mortality and Low Fertility	21
Figure-7:	Coverage of Prenatal Care and Delivery in Countries with High Maternal Mortality and High Fertility	21
Figure-8:	Proportion of Variation in Maternal Mortality Explained by Key Variables	23

A. **INTRODUCTION:**

Death of women during pregnancy, delivery and puerperium is a major public health problem in developing countries. The joy of 128 million births every year is saddened by the death of 500,000 women in the world, 99 percent of which are in developing countries. The bulk of the problem is concentrated in Africa and South Asia, where the risk of child bearing is compounded by high fertility, low literacy, poverty and lack of maternity services. On average, one woman dies every minute from maternity-related causes. Although there has been decline in child mortality in recent years, the gap between maternal mortality ratios in the developed and developing countries remains wider than for any other health indicator. This disparity could be as much as 200, and in isolated cases, it has been reported at even 500. While the numbers may seem small in comparison with infants dying, risk of death accumulates for women for each pregnancy: The life-time risk of death from pregnancy and child birth for a woman in Africa is 1 in 18 while this risk is 1 in 10,000 for a woman in northern Europe.

The consensus that these deaths are unnecessary and could be prevented or reduced considerably triggered the launch of the Safe Motherhood Initiative by international and regional organizations including The World Bank, The World Health Organization and The United Nation's Fund for Population Activities in 1987. The primary goal has been to reduce maternal morbidity and mortality by at least half by the year 2000. Since 1987, policy support and allocation of resources by donor agencies and governments have increased and efforts are underway to move rapidly toward action.

The justification for these efforts to improve maternal health is not only humanitarian but also economic. In the developing world, where three-fourths of the world's population live, women contribute to more than fifty percent of the production of food. Women are the sole breadwinners in twenty five percent of families in the world and the number of women-headed households is increasing rapidly. Women work longer hours than men and constitute one third of the world's official labor force. They provide health care to 70 to 80 percent population in the developing world in addition to their caring and loving role at home. It is also realized that survival of mothers is necessary for the survival of children.

A number of factors are responsible for high maternal mortality in developing countries. These are grouped into proximate, intermediate and distant factors. Using data from 69 countries, an analysis shows that coverage of delivery by trained personnel and level of fertility of a country explains maternal mortality to a large extent. Distant factors, such as female education affect maternal mortality by improving delivery coverage by trained personnel and reducing fertility.

B. LEVELS, TRENDS AND CONSEQUENCES OF MATERNAL MORTALITY AND MORBIDITY:

Measures of maternal mortality

Maternal mortality is defined as "death of women during pregnancy or within 42 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" (WHO, 1979). The magnitude of maternal mortality can be expressed by several measures:

- absolute number of maternal deaths
- maternal mortality ratio
- maternal mortality rate
- proportionate mortality ratio
- life-time risk of death

These measures are described in section-G (INDICATORS).

The most accurate way of measuring maternal mortality is through a population-based study, yet such studies are scarce. The reasons for this are:

- maternal death is a relatively rare event and one needs a large sample size to get a reasonable number of deaths (50 or more) for a meaningful analysis;
- difficulty in validation of the mortality report of causes of death in societies where the majority of deaths take place at home and no system of death certificates exists;
- routine surveys usually consist of interviews with living mothers on health status and survival history of their children, and miss women who died in childbirth.

Hospital-based studies over- or under-estimate mortality, depending on coverage of maternal deaths and live births. Maternal health status is considered to be worse in societies where modern medical care is non-existent or inadequate and hence hospital

reports could be an under-estimate. However, one might argue that coverage of maternal deaths could be higher than coverage of live births in hospitals in settings where most births take place at home. The generalizability of hospital-based estimates depends upon what proportion of births take place in the hospitals in a given population.

One way to circumvent the problem of measuring maternal mortality is to use various sources of data--community surveys, hospital register, key informants, etc.

Levels of maternal mortality

Maternal mortality ratios, which measure the obstetric risk of pregnancy, vary substantially among developing countries. If we only looked at community level studies, this range is very broad: Thirteen population-based micro-level studies suggest maternal mortality ratios of 110 for Jamaica to 2362 for Gambia (Campbell and Graham 1991).

Based on country reports provided to WHO (WHO 1986), a frequency distribution of maternal mortality ratios shows that 36 countries fall below a ratio of 150, 13 countries have a ratio between 150 and 300, while 20 countries have ratios above 300 per 100,000 live births (Table-2). These mortality cutoff points were selected because research has shown that less than 10 percent of all female deaths are due to maternal causes at levels of maternal mortality ratios below 150 per 100,000 live births. The proportion increases to 20 percent when the ratio is between 150 and 300 and to 30 percent at levels above 300 per 100,000 live births (Boerma 1987).

Women in Africa suffer the most maternal deaths followed by those in Asia (640 and 420/100,000 live births respectively). Women in developed countries have ratios that are significantly less: 43 in North America and 21 in Europe (Herz and Measham 1987). Maternal mortality ratios, total fertility rates and life-time risk of dying from maternity-related causes by region and sub-region are presented in Table-1.

Table-1

**SELECTED MEASURES OF MATERNAL MORTALITY
By Regions/ Sub-regions, 1975-1984**

Regions / Sub-regions	Maternal Mortality Ratio (Per 100,000 live births)	Total Fertility Rate	Lifetime Risk of Maternal Death
AFRICA	640	6.3	1 in 21
North	500	6.0	1 in 28
East	660	6.8	1 in 19
Middle	690	6.1	1 in 20
West	700	6.4	1 in 19
South	570	5.2	1 in 29
ASIA	420	3.7	1 in 54
East	55	2.1	1 in 722
Southeast	420	4.5	1 in 44
Middle	650	4.9	1 in 26
Southwest	420	5.8	1 in 34
SOUTH AMERICA	288	4.0	1 in 73
Temperate	110	3.1	1 in 244
Tropical	310	4.1	1 in 66
NORTH AMERICA	43	2.6	1 in 744
USA & Canada	7.7	1.7	1 in 6366
Caribbean	220	2.7	1 in 140
Middle	240	4.8	1 in 72
EUROPE	21	1.9	1 in 2089
Northern	4.7	1.8	1 in 9850
Western	15	1.7	1 in 3268
Southern	19	1.8	1 in 2437
Eastern	44	2.0	1 in 947
OCEANIA	236	2.5	1 in 141
Australia & New Zealand	9.1	1.9	1 in 4805
P.N.G & Fiji	728	5.5	1 in 21
USSR	37	2.4	1 in 939

Source: Herz and
Measham 1987

Trends in maternal mortality

Despite this picture of regional variation in maternal mortality, several developing countries have achieved low maternal mortality. These include Sri Lanka (95 per 100,000 live births), China (25), Chile (55), Costa Rica (26), Mauritius (52) and Cuba (32). The maternal mortality ratio of Sri Lanka declined from 555 per 100,000 live births in 1955 to 95 in 1980. Cuba is a unique example where maternal mortality declined consistently from 140 per 100,000 live births in 1962 to 32 in 1984. This decline is strongly associated with the increased mean number of prenatal visits per birth and proportion of hospital deliveries. Costa Rica achieved a maternal mortality ratio of 26 per 100,000 live births in 1983 from a ratio of 95 in 1970. Chile experienced a substantial reduction in maternal mortality between the years of 1970 and 1983 -- from 168 to 55 per 100,000 live births. Family planning, a raised age at marriage, equitable health care system, and universal female education, are the sectoral interventions adopted by these low mortality countries (Lettenmaier et al. 1988; Cardoso 1986). But in other countries where maternal mortality is high, it has remained high for long period.

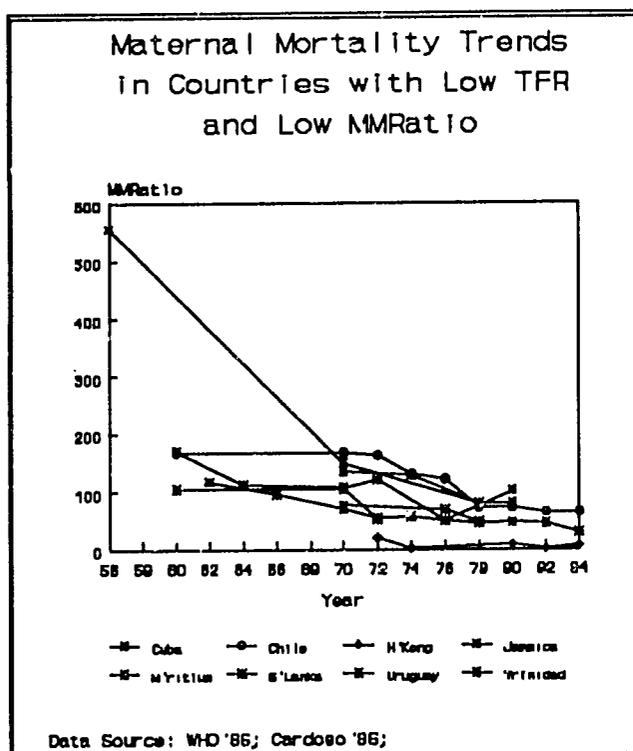


Figure-1

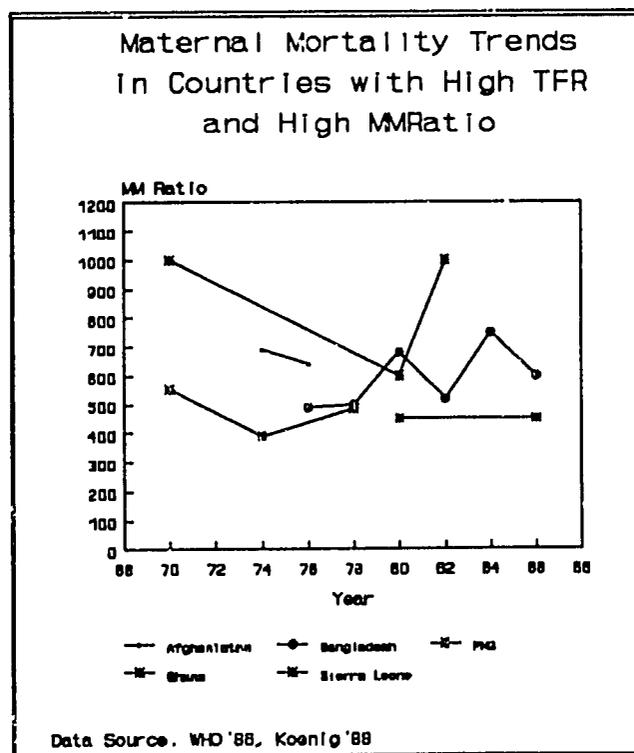


Figure 2

Figures-1 and 2 contrast maternal mortality trends of selected developing countries. Countries that have achieved low maternal mortality and fertility have had a history of low mortality since the early 60s with the maternal mortality ratios continually declining in the 70s and 80s. Data for high maternal mortality and high fertility countries were not available to the authors for comparison for the same time period. However, the maternal mortality ratios of these countries have remained above 400 per 100,000 live births for over a decade.

Causes of deaths

The causes of maternal deaths are presented in Box 1.

Box-1: The Causes of Maternal Mortality in Developing Countries

About three-quarters of maternal deaths in developing countries are direct obstetric deaths, that is they result "from obstetric complications of the pregnant state (pregnancy, labor, and peripartum), from intervention, omissions, incorrect treatment, or from a chain of events resulting from any of the above" (WHO, 1979). The remaining quarter of maternal deaths are from causes that are related to or aggravated by pregnancy or its management, such as malaria, hepatitis, diabetes, anemia, rheumatic heart disease, or complications from anesthesia and blood transfusion. Of the direct obstetric deaths, hemorrhage contributes a little over a quarter, induced abortion a fifth, eclampsia about 17 percent and obstructed labor and infection each about one-tenth. Other causes are associated with approximately 15 percent of these deaths (Maine 1991).

Hemorrhage is not very predictable although it is more common among multiparas, following unsafe abortion and in cases of retained placenta. It requires obstetric first aid to slow bleeding and rapid transfer and treatment, as death may ensue in less than two hours. Treatment includes blood transfusion, other clinical measures and, when necessary, manual removal of the placenta. Reducing the prevalence of anemia may reduce the prevalence of hemorrhage-related mortality. From community-based studies, post-partum hemorrhage is estimated to follow 2-8 percent of all deliveries in developing countries (Koblinsky et al. 1992), although a WHO Technical Working Group concluded that PPH varies between 10 and 20 percent in the absence of oxytocics at delivery (WHO 1990). Hemorrhage is the leading cause of maternal mortality (28 percent).

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 technique increase the risks. Pre-existing genital infections (eg. reproductive tract infection) may also increase the risks. Treatment requires antibiotics, and, in serious cases, surgical intervention, including possible hysterectomy. Those who survive infection face increased risk of pelvic inflammatory disease, infertility, and ectopic pregnancy. While fever is the most easily diagnosable sign of infection, measurement of fever alone highly underestimates the prevalence of maternal sepsis. Even so, in two community-based studies, between 3-10 percent of pregnancies were accompanied by fever (Koblinsky et al. 1992). Tetanus is another well-known sign of infection, one that results in approximately 30,000 maternal (Fauveau et al, in preparation) and 750 thousand neonatal deaths (WHO, 1991) each year. Prolonged rupture of the membranes is a well-known predisposing factor to both maternal and fetal infection, but numbers are unknown. It is also a risk factor for birth asphyxia.

Eclampsia and preeclampsia are a syndrome that begin with pregnancy-induced hypertension. Early stage pre-eclampsia, characterized by high blood pressure, generalized edema, and protein in the urine, may arise in the second or third trimester and is most common among primiparas. The frequency of occurrence of both hypertension and pre-eclampsia varies markedly between countries, with high levels of hypertension during pregnancy (10-15 percent) noted in Chinese studies (Li et al., 1982; Yan et al., 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 a quarter of pregnant women were hypertensive (Butler and Bonham, 1963; Chamberlain et al., 1978) while 22 percent of pregnant Cuban women suffered the same in a study in the late 1970s (Ochoa Rojas, 1981).

Untreated pre-eclampsia may lead to eclampsia, which occurs in one percent or less of pregnant women. Eclampsia is characterized by very high blood pressure, convulsions, and possible cerebral hemorrhage. Immediate transfer and treatment, including expedited delivery, are required. Prognosis is poor: five to 17 percent of eclampsia victims die, and those who survive may suffer paralysis, blindness, or chronic hypertension and kidney damage. As eclampsia can happen at any time during the latter part of pregnancy, it could and does often result in fetal death or premature infants at high risk of death. Hypertension and pre-eclampsia can also result in low birth weight infants or fetal death.

Prolonged labor is commonly caused by cephalo-pelvic disproportion leading to obstructed labor in young and/or undernourished and stunted women with small pelvises, by weak uterine contractions in multiparas, by deformities or abnormal positions of the fetus, and by abnormalities of the cervix or vagina which are sometimes caused by female circumcision. In South Asia, two community-based studies have shown that between 11-13 percent of pregnant women have prolonged or obstructed labor. Community-based studies in four other sites gave prevalence of between 0.3-1.3 percent (Koblinsky et al. 1992). Prolonged labor can lead to mortality through blood loss, often due to ruptured uterus, dehydration, or metabolic disturbances. In general, transfer and treatment are required if labor continues for more than 24 hours. Treatment requires forceps or ventouse delivery, cesarean section, or symphysiotomy. Obstructed labor can result not only in maternal death, but in fetal death through infection, birth injury, or asphyxia.

Unsafe abortion causes 115,000-200,000 maternal deaths each year, due primarily to infection and hemorrhage. Women who survive often suffer severe long-term morbidity and secondary infertility. The prevalence of unsafe abortion is not known. An estimated 55 million unwanted pregnancies are terminated every year worldwide. About half of these are illegal and occur primarily in developing countries (Coeytaux et al., 1992). These 27 million abortions are more likely to be unsafe and lead to sepsis, hemorrhage and death.

Maternal morbidity

While it is now known that an estimated 500,000 women die each year in childbirth, it is not so well appreciated that millions of women suffer morbidities and long-term disabilities related to their pregnancy.

Maternal morbidity can be grouped into three categories:

- (a) acute or short-term complications--those which occur during pregnancy, delivery or in the postpartum period, such as, hemorrhage, infection, obstruction, pregnancy induced hypertension and eclampsia;
- (b) chronic problems--those that may become obvious only some time after childbirth, such as, uterine prolapse and fistula (vesico-vaginal or recto-vesical), and
- (c) associated illnesses--those which occur or progress rapidly in the presence of pregnancy, such as hepatitis, malaria, diabetes, or hypertension.

Based on one small study in rural India (Datta et al. 1980), it is often stated that for every maternal death, there are 16.5 illnesses resulting from childbirth, yielding 8.3 million maternal illnesses each year world wide. A recent literature review showed that this is a gross underestimate: There are 100 acute morbidity episodes for every maternal death--an estimated 62 million women suffer maternal problems annually (Koblinsky et al. 1992). Approximately 9-15 percent of pregnancies, or 23 million women, require higher

level emergency obstetric care.

None of the eleven community-based studies on which these estimates are based, however, report the full spectrum of maternal health problems; only acute morbidities, typically undefined and collected by a variety of methods, are included. Chronic problems resulting from pregnancy and childbirth and associated illnesses remain uncounted.

Measurement of maternal morbidity is a formidable task. Definitions of morbidities that are useful in the field, identification of the at-risk population, and validation of self-reported problems, are major hurdles yet to overcome.

Considerable confusion in measuring maternal morbidities is also caused by the time period of "illness": Whereas the maternal period is limited to pregnancy and 42 days after birth as per WHO's current definition, many of the maternal health problems begin or continue beyond this period. Yet removal of the time limitation poses a problem in determining when a woman is "exposed" to the risk of maternal morbidity, and in selection of an "unexposed" group to compare her risk of morbidity (Campbell and Graham 1991).

Consequences of maternal deaths

Impact on children

"The death of a mother is almost always a death sentence for her infant and often for her other children up to the age of ten as well, especially if they are girls" (Tinker 1991).

In rural Bangladesh, 75 percent of babies whose mothers had died of maternal causes, failed to survive through the first year. Compare this with the rate of 10 percent for babies whose mothers survived at least 90 days after giving birth, as shown in Figure-3 (Koenig 1988). Several mechanisms might play a role in those survival differentials. Well nourished, healthier mothers, who themselves are more likely to survive, are less likely to have infants with low birth weight: Nearly 21 million low birth weight infants are born each year in developing countries. These infants are five times more likely to die of infectious diseases, three times more likely to die of diarrhea, and seven times more likely to die from respiratory infections (WHO 1989).

Impact on family income

Death of a woman of reproductive age brings economic hardship to a poor or lower middle class rural family as the family loses her contribution to household production of

wealth. Women in Africa produce most food necessary for a household and women in Bangladesh raise vegetables or small animals, despite being secluded from the males. It is the woman who cooks for the family, fetches water from a tube-well or pond, cleans the house, serves the food and cares for the sick at home. If this work were converted into a dollar value, death of a woman of reproductive age would mean a substantial financial burden on the family. The situation would be worse if

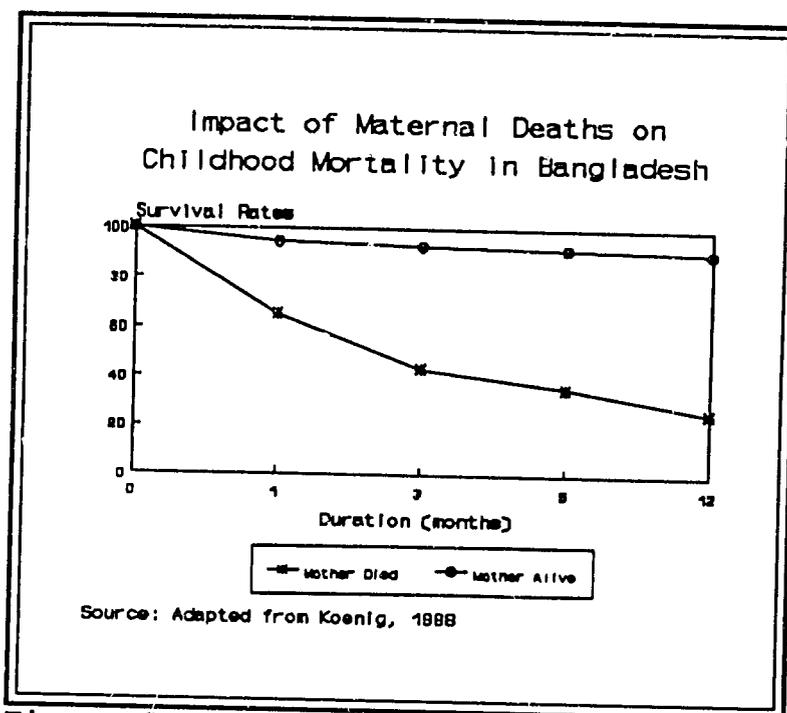


Figure 3

the house was headed by a woman who dies. It is estimated that the unpaid labor of women in the household, if translated into dollar value, would add about \$4 trillion to the world's annual economic product (Sivard 1985).

C. ROOTS OF THE PROBLEM

Although the immediate causes of maternal morbidity and mortality are medical, the underlying forces that determine the course are socio-economical and cultural. The socio-economic and cultural forces must act through a set of intermediate variables, such as the health and reproductive behavior of women, their health status and access to health services. However, it is not clear which set of socio-economic variables are the best predictors of maternal morbidity or mortality, the commonly used ones being income, education, nutritional status, fertility and status of women. The interaction of some of these predictors with maternal mortality is less direct than others.

One particularly confusing predictor is the status of women. Despite increased focus on the status of women in recent years, the concept remains elusive--it refers to different things to different people. Some identify "status" with women's prestige, some with women's autonomy, while others with access and control of income and resources by women (Epstein 1982; Dyson et al. 1983; Dixon 1975). This multidimensionality of

status of women has hindered researchers from evolving a single operational definition. Moreover, the interaction between gender and social/economic class confounds the relationship between status of women and maternal mortality. The dimensions of status of women--prestige, autonomy, and access and control of income and resources--also vary depending on the woman's stage in her life cycle. For example a new bride may not hold any control over household resources, while the mother-in-law may be able to exert substantial control. Status of women is context-dependent because what is considered "prestige" or "autonomy" in one society may not be adequate to fulfill the definition in another society or setting.

Status of women could affect maternal and child mortality through several ways:

(1) Nutrition

- ◆ feeding women last is a cultural practice often leading to malnutrition in Bangladesh (study by Chen et al.1981);
- ◆ physical work (low paying job) during pregnancy among the poor may lead to calorie deficiency as the women have to spend extra energy for the physical work (Jacobson 1991);

(2) Fertility

- ◆ high fertility norm increases the likelihood of higher mortality;

(3) Access to resources

- ◆ women may not have rights to use resources when health care is needed for them or their children. A study from Bangladesh revealed that only 22 to 63 percent women said that they could take their sick child for treatment on their own (Koenig et al. 1989);

(4) Women's isolation

- ◆ women's level of isolation may prevent them from receiving health care information and/or services. The study from Bangladesh showed that only 4 to 28 percent women said they could travel outside of village alone (Koenig et al. 1989).

D. CONCEPTUAL FRAMEWORK:

While maternal health has its roots in socio-economic and cultural features of the society in which a woman lives, these factors work through more intermediate determinants, such as the health and reproductive behavior of the women, their health and nutritional status, and access to and quality of family planning and maternal health services (McCarthy & Maine 1991; Wong 1991; Ward et al. 1991; Walsh et al. 1989). These intermediate variables must operate through changing the fertility behavior of the women (shifting the age at pregnancy, reducing the number, or unwantedness of pregnancies), preventing complications of pregnancy or from unsafe abortion, managing the complications of pregnancy when they arise, or providing safe delivery. Maternal mortality is finally determined at the interface between the nature and severity of the complications of pregnancy and the availability of effective management for such complications. We suggest the following conceptual framework for maternal mortality, adapted from McCarthy and Maine (1991).

The outcomes of interest for a Safe Motherhood Program include:

- Maternal mortality
- Chronic maternal morbidity
- Healthy mother and baby

Leading to these outcomes are the following proximate determinants:

- Pregnancy as a woman must first be pregnant to experience any of these outcomes;
- Pregnancy-, abortion-, or childbirth-related complications or acute morbidities, or conditions aggravated by pregnancy; and
- Management of pregnancy, delivery, and puerperium (whether they be normal or complicated).

These determinants, in turn, are dependent on the health and nutritional status of the woman, her reproductive and health behaviors, and access to and quality of family planning and maternal health services. It is through these variables that the distal cultural and socio-economic factors operate to impact on maternal mortality.

Proximate Determinants:

Proximate determinants are the immediate causes of the outcome variables, in this case, maternal mortality, chronic maternal morbidity, or a healthy mother and baby. Although pregnancy is a precondition for any of these outcomes, its use as a proximate determinant is justified by the fact that women vary in their risk of getting pregnant, and that pregnant women face varied risks of complications. The complications of pregnancy include the major threats to a woman's survival: hemorrhage, sepsis and shock from unsafe abortion, hypertensive diseases of pregnancy, obstructed labor, other infections, ectopic pregnancy and embolism. These account for approximately 75 percent of maternal deaths. The remaining deaths are due to indirect causes aggravated by pregnancy including malaria, hepatitis, anemia, hypertension, diabetes and rheumatic heart disease. The prognosis of these complications depends on the health and nutritional status of the woman, the severity of the complications and the safety and effectiveness of the management undertaken.

Whether a woman will die or survive depends on such critical factors as how long she can sustain the insult, how soon medical treatment begins and how adequate the treatment is.

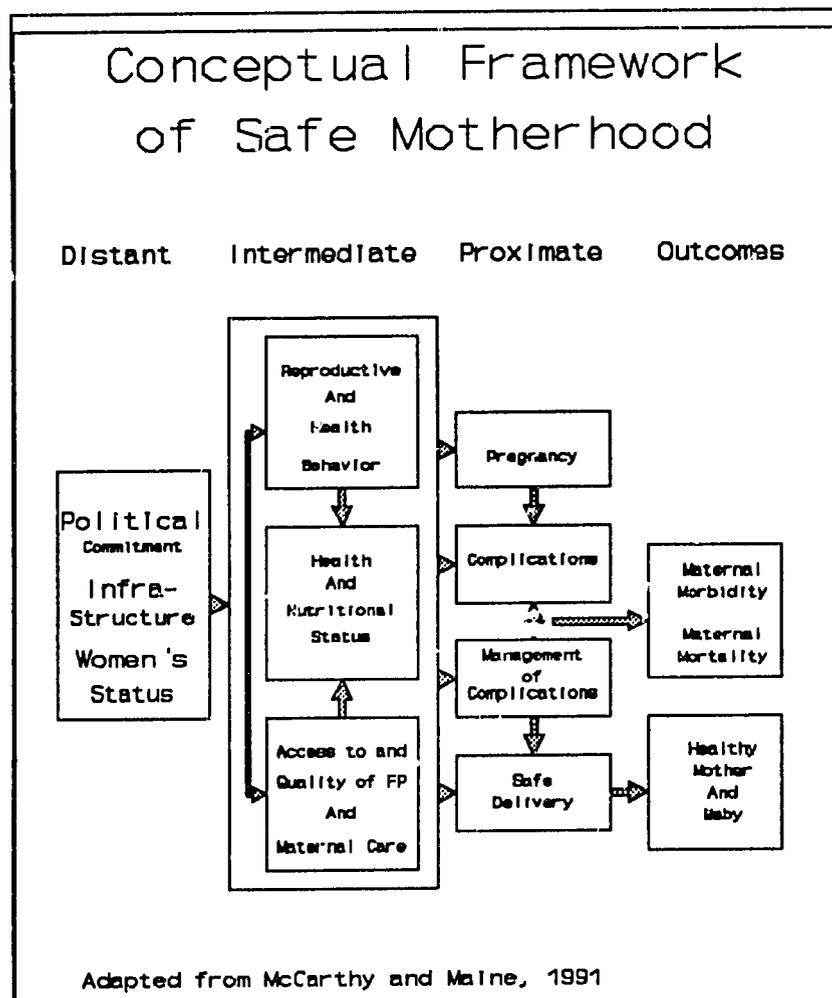


Figure 4

Intermediate Determinants:

We have suggested three sets of intermediate determinants which are interrelated and influenced by social, economic and cultural factors of the women and the society as a whole.

Reproductive and health behavior

Age and parity at pregnancy, wantedness of pregnancy, awareness of danger signs during the maternal period and appropriate use of services in response, utilization of prenatal and delivery services, and the practices of women during pregnancy and delivery, are the major reproductive and health behavior that influence the outcome of pregnancy-- both maternal and perinatal mortality. Women younger than 19 and older than 34 years are at higher risk of poor pregnancy outcome. Very young women have immature pelvises and thus suffer more from obstructed labor and ruptured uterus while older women are less capable of bearing the burden of pregnancy due to pre-existing conditions, such as hypertension, diabetes, and a debilitating nutritional status. Women having their first and fourth or more pregnancies are at higher risk of adverse pregnancy outcome than those having second or third pregnancies. Age and parity have been shown to have independent effects on pregnancy outcome-- both on maternal and perinatal mortality. Wantedness of pregnancy, perhaps the least studied, may have a substantial negative effect on pregnancy outcome, particularly through unsafe abortion and suicide. Utilization of prenatal and delivery care has been studied extensively. Although increasing skepticism is voiced with regard to the role of prenatal care in preventing maternal mortality, its contribution to reducing certain conditions during pregnancy (eg. syphilis) and to reducing perinatal mortality are well documented. Women's practices during pregnancy and delivery are crucial to designing effective program interventions. Typically knowledge of symptoms of complications during pregnancy and childbirth is low, not only by pregnant woman, but also by family members who might be in a position to determine whether care is sought for her. This delays the decision to refer the woman to appropriate care. Lack of knowledge on the provider's side about these same danger signs may delay attending a woman in serious condition.

Health and nutritional status of women

Conditions aggravated by pregnancy include poor nutrition, anemia, certain infections (eg. malaria) and others. Poor nutrition in adolescence, for example, may lead to an immature pelvis and obstructed labor during childbirth. Anemic women are less capable of withstanding the insult of hemorrhage and hence more prone to death from hemorrhage than non-anemic women (Lettenmaier et al. 1988; Belsey and Royston

1987). Women suffering from hypertension, diabetes, liver disease, malaria are at higher risk of dying during pregnancy and childbirth than those free from these diseases (Walsh et al. 1989).

Access to and quality of family planning and maternal care

Access to health services implies not only the presence of facilities but information to women about its availability, means to reach the service facilities and services of such quality that can assist women adequately. First, information on family planning and availability of family planning and abortion services influence the reproductive behavior of the women toward planned motherhood. Family planning affects maternal mortality by reducing the sheer number of pregnancies. Whether it reduces the number of high risk pregnancies in practice is debatable and subject to further research.

If women are to make use of routine and emergency maternal services, they need to know when and where to seek help. This information may facilitate the decision to seek appropriate medical help sooner. Second, although it is true that when people realize that a family member is seriously ill, they will seek medical help at a cost they can afford, the rising costs of medical care in many developing countries pose a threat to effective utilization of medical services by the poor. Third, women may not be able to reach a health facility or hospital in time if there is no transport. A significant proportion of maternal deaths occurs on the way to a hospital. Fourth, once a woman reaches a medical facility, the critical issue is that she receive effective medical interventions. Qualified providers with both technical and interpersonal skills, adequate medical and surgical requisites (blood, plasma, i/v fluids, antibiotics, anesthesia, surgical instruments, etc.) and a willingness to undertake emergency procedures, are necessary for quality services.

Distant Determinants:

Unlike infant mortality, the relationship between commonly used socio-economic variables and maternal mortality has not been subject to rigorous study. Although it is known that people's risk of dying is influenced by the general conditions of the society in which they live, studies concerning the effect of general socio-economic factors on maternal mortality are less revealing. Such factors as women's education, employment in paid jobs, their access to and control of income and household resources, their level of isolation, and poverty at individual and/ or societal level have been suggested as contributory to high level of maternal morbidity and mortality (WHO 1989). Education influences the health and reproductive behavior of the women, such as delayed age at marriage, being pregnant

for a limited number of times, and practicing good habits during pregnancy, delivery and puerperium. These result in good health and nutritional status of women (Harrison 1980; Kwast et al. 1984; London et al. 1985). Educated women are more likely to have better access to prenatal and delivery care, particularly when there is any complication, as they are more likely to live near facilities that can deal with such problems; they are more likely to be aware of such complications also than the non-educated women (Lettenmaier et al. 1988).

In many societies, employment in a paid job is likely to put a woman in a position where she would be viewed as a major source of income and prosperity for the family and thus would receive necessary support during pregnancy and sickness. Employed women have more access to income and household resources than unemployed women. However, employment in low paid, physically demanding jobs could be detrimental to women's health and nutrition during pregnancy because of the need for higher levels of energy (Jacobson 1991).

Women's level of isolation, both in decision-making and in mobility, also plays a major role in their access to prenatal, natal and postnatal care, particularly care during emergencies. Both woman and their families may not have information on danger signs during the maternal period, or they may not know where to access help.

E. CLASSIFICATION OF COUNTRIES:

Using WHO (1986) data on maternal mortality and Columbia University data on fertility from 69 countries (Ross 1988), countries have been classified into three categories according to their maternal mortality ratios: <150, 150--300, and >300; and cross-classified by total fertility rates of <3.0, 3.0--5.0 and >5.0 (Table-2 and Figure-7). The classification system has resulted in nine categories of countries:

- (1) low mortality and low fertility
- (2) low mortality and moderate fertility
- (3) low mortality and high fertility
- (4) moderate mortality and low fertility
- (5) moderate mortality and moderate fertility
- (6) moderate mortality and high fertility
- (7) high mortality and low fertility
- (8) high mortality and moderate fertility
- (9) high mortality and high fertility.

It is not surprising that not a single country has low fertility and high maternal mortality.

Thailand is the only example that has a moderate maternal mortality despite low fertility. The reverse appears not to hold, however. Although we have no information about data quality, there are 12 countries with high TFRs but low maternal mortality. Approximately 50 percent of the countries (36) have achieved a maternal mortality ratio of below 150; 12 have also achieved low fertility and another 13 have achieved moderate fertility (Table-2). Countries that have high maternal mortality are often those that also have high fertility (the exceptions are three countries that are in fertility transition: India, Peru and Paraguay). Twelve countries have moderate maternal mortality with high or moderate fertility.

Again, based on WHO data (1989) we have matched data on the percentage of women using any prenatal care and percentage of deliveries attended by trained manpower against each of the 69 countries (Figure-5). This reveals another important but not surprising observation that countries with low maternal mortality are those with the highest percentage of prenatal care use and deliveries attended by a trained person, with a few exceptions (Figure-6). Countries that have the highest maternal mortality ratios are those that have the lowest percentage of prenatal care and attended delivery (Figure-7).

This classification is a logical first step in deciding program strategy and resource allocation for a country. Countries that have achieved low maternal mortality despite moderate to high fertility will be further benefitted from an effective family planning program, while countries that have moderate to high mortality and fertility need effective interventions aimed at improved obstetric outcome, including an effective family planning program.

Table-2: Countries cross classified by Maternal Mortality Ratio and Total Fertility Rate

		Maternal Mortality Ratio (per 100,000 LB)			
		<150	150--300	>300	Total
Total Fertility Rate	<3.0	11	1	0	12
	3.0--5.0	13	4	3	20
	>5.0	12	8	17	37
	Total	36	13	20	69

Data sources: WHO, 1986; WHO, 1989; Ross et al., 1988

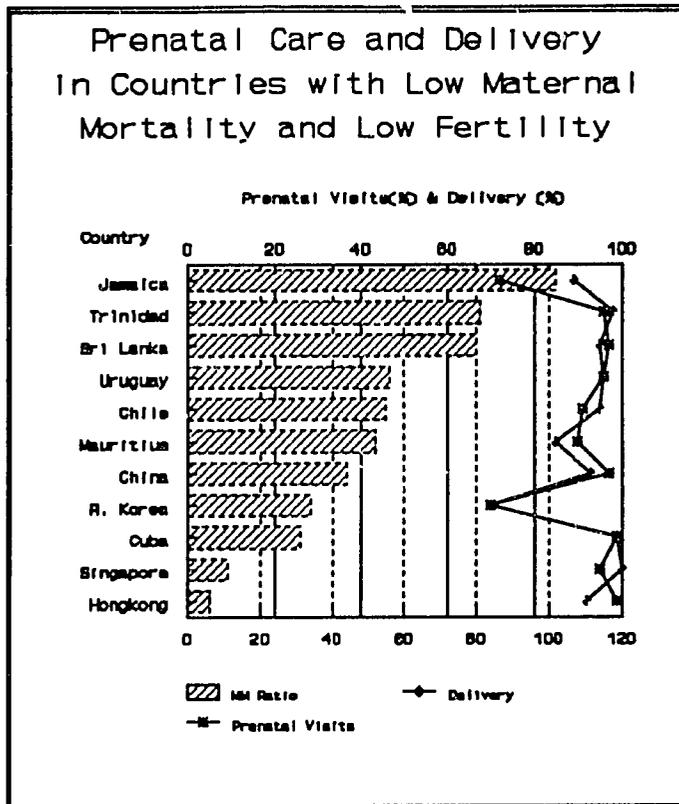


Figure-6

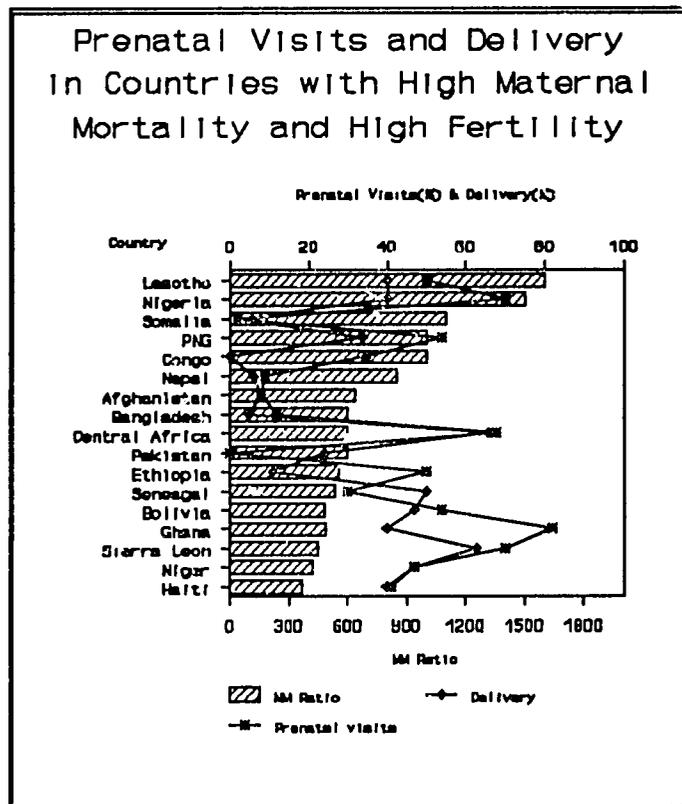


Figure-7

F. **EVIDENCE SUPPORTING THE CONCEPTUAL FRAMEWORK**

We have examined the conceptual framework in light of data from the 69 countries. A limitation is the quality and availability of data on both maternal mortality and the variables responsible for variation of the maternal mortality. Step-wise multiple regression techniques are used to determine the effect of the explanatory variables on maternal mortality while controlling for other variables in the model. The variables of interest are described below:

Dependent variables:

MMRatio = Number of maternal deaths per 1000 live births
MMRate = Number of maternal deaths per 1000 women of reproductive age

Explanatory variables:

PRENATAL = Percent of pregnant women receiving at least one prenatal visit
DELIVERY = Percent of deliveries conducted by trained personnel
TFR = Total Fertility Rate
DOCTOR = Number of doctors per 10,000 population
NURSE = Number of nurses per 10,000 population
F_EDUC = Percent of female enrolled in secondary schools
GNP = Per capita gross national product
URBAN = Percent of urban population
W_LABOR = Women aged 15-64 in labor force as a percent of all women aged 15-64

The data for the 69 countries are appended in annex-I.

Variation of Maternal Mortality

A substantial portion of the variation in the maternal mortality ratios of the 69 countries can be explained by two proximate and intermediate determinants from the conceptual model: percent of deliveries conducted by trained personnel (DELIVERY) and the total fertility rate (TFR) of these countries. As shown in Figure-8, the TFR explains 43 percent of the maternal mortality rate and 3 percent of the ratio. DELIVERY explains 35 percent of the ratio and 9 percent of the rate. Together they explain 52 percent of the variation in the maternal mortality rate (MMRate) and 38 percent of the variation in maternal mortality ratio (MMRatio). The effect of other variables is insignificant in the presence of these two variables.

Although PRENATAL and DELIVERY individually explain 18 percent and 28 percent of variation respectively for the maternal mortality ratio, the effect of PRENATAL is attenuated in the presence of DELIVERY. Since prenatal care and delivery are highly correlated, their presence together in the model causes a multicollinear effect and hence the variable PRENATAL has been excluded from the final statistical model.

The percent of females enrolled in secondary school (F_EDUC) explains 51 percent of the variation of the Total Fertility Rates (TFR) and 39 percent of the variation in the use of trained attendance at delivery (DELIVERY).

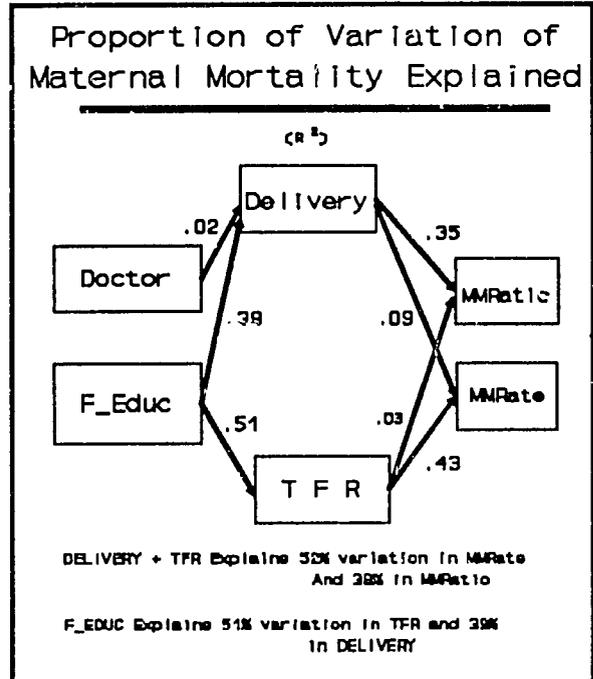


Figure-8

Prediction of Maternal Mortality

Using the stepwise regression technique, the regression coefficients and their standard errors were calculated in order to predict the change in maternal mortality with unit change in the explanatory variables while controlling the effect for potential confounders. The analysis suggests that one percent in delivery by trained attendants will reduce the maternal mortality ratio by 6.1 per 100,000 live births and maternal mortality rates by 1.1 per 100,000 women of reproductive age. A unit decrease in TFR will reduce the maternal mortality rate by 12.8 per 100,000 women of reproductive age. As anticipated, the effect of TFR on the maternal mortality ratio is negligible. The regression analysis also suggests that a unit increase in female enrollment in secondary schools (F_EDUC) will increase the coverage of attended delivery by 0.68 percent points and will decrease fertility (TFR) by .046 units. The effect of education on DELIVERY and TFR is statistically significant, although the magnitude of prediction is not necessarily substantial.

Note that the data used in this analysis are extrapolated from a number of sources and their quality is variable. They are macro in nature and should not be used to address individual needs. However, the findings may be applicable to countries comparable to the ones we have investigated.

This analysis supports the thesis put forward in the conceptual framework that both the supply and demand sides of the equation for Safe Motherhood programming are important and need to be strengthened.

G. INDICATORS:

The selection of indicators within a conceptual framework should be based on appropriateness, reliability, validity, sensitivity and specificity of the measures. We present indicators in line with the conceptual model and begin with outcome indicators. The selection of indicators depends on the type of questions one would like to address. For example, for measuring the effect of family planning program on maternal mortality, one would use maternal mortality rate, rather than ratio, the former being more sensitive to fertility decline.

Variables	Indicators	Measures	Source
OUTCOME <i>Maternal Mortality</i>	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 of the problem in a particular setting. It is advantageous in situations where mortality and population both are low, and the denominator is not available.	Community survey, hospital records, vital registration, death certificate
	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, i.e., risk of death of woman per birth. Does not take into account in the denominator that maternal deaths also occur with stillbirth, spontaneous and induced abortion, and ectopic pregnancies. Interventions aimed at improved obstetric outcomes would reduce the ratio.	Community survey, hospital records, vital registration, death certificate
	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 number of maternal deaths and risk of pregnancy, i.e., annual risk of motherhood. Any interventions that affect fertility and/ or obstetric outcome would affect the rate. Problem is associated with definition of reproductive age group.	Survey, hospital records, vital registration, death certificate
	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, death certificate
	Life-time risk of death (LTR) ¹	The cumulative risk of death from motherhood. 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	Survey, vital registration
	¹ Herz and Measham 1987	$LTR = 1 - (1 - MM \text{ Ratio})^{TFR} = 1 - (1 - .005)^6 = .030$, that is, 1 in 33 [assuming a MM Ratio of 500/100,000LB and a TFR of 6.0]	

Variables	Indicators	Measures	Source
	Case Fatality Rate	Number of deaths from a specific maternity-related complication per 100 women suffering from that complication. It represents severity of the condition as well as the effectiveness of management provided.	Hospital records
<i>Health mother and baby</i>	Positive or optimum health ² ² Graham and Campbell 1990	Percent of women fully breastfeeding at 4 months postpartum of those whose infants survived to at least 4 months Ratio of women delivering without complications to those with complications Percentage of women with optimum weight gain, i.e., no more than 13 kg and no less than 6 kg from pre-pregnancy to delivery	Hospital records, survey
PROXIMATE DETERMINANTS <i>Pregnancy</i> (Several proxy measures can be used)	Number of live births General Fertility Rate (GFR) Total Fertility Rate (TFR)	This the number of live births in a population in a given time period The number of live births per 1,000 women of reproductive age. The total number of births, regardless of age of mother, is used as numerator and the female population 15 to 44 years is employed in the denominator. GFR is a better measure than Crude Birth Rate (CBR) since it avoids some of the possible effects of abnormal age or sex distributions of CBR, but will still be affected by age distribution of women within 15 to 44 years. It should only be used in situations where age specific births can not be obtained. This is 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.	Census, survey Census, survey
<i>Complications of pregnancy</i>	Incidence Rate per 100 women-years at risk Prevalence Rate per 100 women-years at risk Duration per episode Relative Risk/ Odds Ratio	Episodes of complications during a year per 100 pregnant or postpartum women-years at risk. Incidence measures risk of disease (complication). Problems related to calculating incidence rate are identification and definition of complications, selection bias and non-response. Existence of complications during a year per 100 pregnant or postpartum women-years at risk. Total time (days, months or years) suffered divided by the number of episodes. Relative Risk can be calculated for women with specific risk factors by taking the ratio of incidence of complications among women with the risk factors to those without the risk factor. It is used to determine the association between of a factor and a complication.	Survey, hospital records Survey, hospital records survey, hospital record Prospective or retrospective study

Variables	Indicators	Measures	Source
	Attributable Risk	It is the difference between incidence of complications among the exposed and the incidence of complications among the unexposed.	Prospective or retrospective study
<i>Management or Treatment of complications</i>	Treatment/Complication Ratio	It is the ratio of the number women received treatment for maternal complications to the number of women who suffered from such complications	Survey, hospital records
	Case Fatality Rate	Number of deaths from a specific maternity related complications per 100 women suffered from that complication.	
INTERMEDIATE DETERMINANTS <i>Reproductive and health behavior</i>	Age	Proportion of births to women below 19 years or above 34 years	Survey Focus group, clinic records, interview of key informants
Parity		Proportion of first order births	
		Proportion of fourth or higher order births	
Spacing		Proportion of births with less than 24 months spacing	
Wantedness of pregnancy		Proportion of pregnancies not intended	
Utilization of health services		Proportion of pregnant women received prenatal care by number of visits	
		Proportion of pregnant women received 2 doses of Tetanus Toxoid immunization	
Traditional practice		Proportion of births attended by trained manpower -By Trained TBA, Midwife, Nurse, doctor	
		Proportion of delivery took place in health facilities	
<i>Health and Nutritional status</i>	Anemia	Percent of women of reproductive age anemic Moderate anemia : Hemoglobin 70—110 g/l of blood Severe anemia : Hemoglobin <70 g/l of blood	

Variables	Indicators	Measures	Source
	Nutrition	<p>Percent of women of reproductive age weighing less than 38 kg before pregnancy³</p> <p>Percent of women gaining less than 1kg/month during second and third trimester</p> <p>³ In considering the most appropriate cut-off points for a program, the following factors should be considered (Krasovec and Anderson 1991):</p> <ul style="list-style-type: none"> -Distribution of the indicator -Prevalence of the risk factor -Prevalence of the outcome -Relationship between the indicator and the outcome (sensitivity and specificity distribution) -Programmatic considerations such as the resources available and the type of interventions to be employed. 	Community survey, hospital records
	Prevalence of malaria, diabetes, hypertension, liver disease among the pregnant women	Percent of pregnant women suffering from hypertension, diabetes, malaria and hepatitis	Community survey, hospital records
<i>Access to and quality of family planning and maternal services</i>	Women's decision-making	<p>Percent of women who can decide for themselves to seek health care</p> <p>Percent of women who can travel alone outside their villages</p> <p>Percent of women who can afford the cost of treatment and transportation</p>	Survey, focus group, indepth study
	Information	<p>Percent of men and women aware of danger sign and symptoms of pregnancy, labor, delivery, and puerperium</p> <p>Percent of women know where to go if complication arises</p> <p>Percent of women who understood advice given</p>	KAP study
	Transportation of women	<p>Median distance to the functioning health facility</p> <p>Percent of women who have access to an ambulance</p> <p>Percent of women who have access to a transport</p> <p>Median time to travel to the functioning health facility</p>	Time-motion study

Variables	Indicators	Measures	Source
	Availability of quality service	Percent of complications that were detected by prenatal surveillance Ratio of arrival to referral Ratio of death to referral Percent of women who arrived at a health facility and received effective treatment (definition of effective treatment has to be set) Mean waiting time Percent of women satisfied with the treatment	Observation, interview with patients and providers

CONCLUSION

The high toll of maternal deaths in developing countries is uncalled for and can be averted with existing technology and knowledge. Yet a large proportion of women in many developing countries are deprived of the life-saving technologies either because they are not in place or because the prevailing socio-cultural practices thwart their use when they, in fact, exist. Efforts to intervene to reduce maternal deaths and suffering are justified on humanitarian and firm economic grounds. Women contribute to more than fifty percent of the world's production of food, feed twenty five percent of families and provide health care to seventy and eighty percent of the population in the developing countries.

Anecdotal and empirical evidence suggests that family planning, raised age at marriage, equitable health care system, and increased female education have been pivotal in reducing maternal mortality in several countries. The analyses presented in this paper from sixty nine developing countries suggest that a considerable reduction in maternal deaths can be made by two interventions: fertility reduction and increased coverage of delivery by trained personnel. However, utilization of these services requires careful designing of programs and investment to ensure demand generation for use of services. Educating women is an important way of increasing utilization of services, as well as making women aware of when and where to seek help.

The challenge for Safe Motherhood is to assist national governments to adapt lessons learned from various demonstration projects into the implementation of a national Safe Motherhood Program effectively and efficiently.

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DATA SHEET

NAME	TFR ¹	MMRATIO ²	MMRATE ³	PRE ⁴	DELI ⁵	F_EDUC ⁶	GNP ⁷	URBAN ⁸	W_LABOR ⁹	NURSE ¹⁰	DOCTOR ¹¹
Singapore	1.6	0.11	0.012	95	99	73	7410	99	32	16.9	7.6
Hongkong	1.8	0.06	0.005	99	92	72	7620	94	80	41.6	9.3
Cuba	1.9	0.31	0.029	99	99	79	1864	71	22	27.1	13.8
China	2.1	0.44	0.056	97	93	31	300	53	55	6.2	9.9
Mauritius	2.4	0.52	0.054	90	85	48	1200	41	25	4.9	5.2
Chile	2.4	0.55	0.091	91	95	69	1320	85	26	27.0	8.1
R. Korea	2.5	0.34	0.035	70	70	88	2024	71	69	17.2	8.6
Uruguay	2.6	0.56	0.078	90	96	60	1860	56	35	20.0	11.1
Trinidad	2.6	0.81	0.111	96	98	85	5120	68	38	30.5	10.5
Thailand	2.7	2.70	0.367	50	52	40	810	22	73	14.0	1.6
Sri Lanka	2.8	0.80	0.117	97	95	74	373	21	29	7.7	1.8
Jamaica	2.8	1.02	0.169	72	89	60	880	52	51	20.4	4.8
Panama	3.1	0.90	0.163	89	89	63	2223	53	32	25.6	10.0
Costa Rica	3.2	0.26	0.046	68	96	45	1420	47	24	22.2	10.4
Malaysia	3.2	0.59	0.109	65	82	53	1859	42	38	10.0	5.2
Argentina	3.2	0.85	0.133	80	87	69	2350	86	31	10.0	17.0
Brazil	3.4	1.54	0.289	75	83	45	1810	74	24	20.4	9.2
Indonesia	3.4	3.00	0.459	26	31	34	512	30	33	7.9	1.0
Columbia	3.5	1.26	0.217	65	51	49	1230	69	27	15.1	8.0
D.R.Korea	3.6	0.41	0.066	78	68	60	1388	65	40	20.0	23.3
Domin. Rep	3.6	0.56	0.104	95	90	12	710	59	13	8.2	5.7
S.R.Vietnam	3.6	1.10	0.194	99	99	56	161	22	63	16.0	10.5
Burma	3.6	1.35	0.307	75	65	10	190	24	46	1.9	2.0
Turkey	3.6	2.07	0.356	50	50	28	1022	60	51	9.7	7.2
India	3.6	5.00	0.825	50	35	23	258	27	41	5.8	3.4
Venezuela	3.7	0.65	0.145	68	96	49	2930	84	26	20.0	14.3
Philippines	3.9	0.80	0.162	54	52	71	581	42	41	3.7	1.5
Mexico	3.9	0.81	0.154	83	94	53	1850	72	21	11.4	8.5
Peru	4.4	3.14	0.747	46	44	21	1130	70	24	11.1	9.6
Paraguay	4.4	4.69	1.200	65	22	29	880	47	27	10.0	6.8
Ecuador	4.6	2.20	0.519	49	27	53	1160	55	24	16.4	12.2
Mongolia	4.8	1.40	0.271	99	51	92	854	52	43	31.2	13.6
El Salvador	5.1	0.74	0.227	23	35	26	820	44	23	10.7	3.5
P.N.G	5.2	10.00	1.800	54	34	9	690	16	10	11.4	1.6
Pakistan	5.3	6.00	1.812	30	24	11	350	24	29	2.0	3.4
Laos-PDR	5.4	0.02	0.004	25	15	15	138	18	71	18.8	7.3
Nicaragua	5.5	0.65	0.209	90	80	48	837	59	25	18.8	6.7
Honduras	5.5	0.82	0.233	20	50	36	740	43	15	14.9	6.6
Haiti	5.5	3.67	0.660	41	40	16	324	28	70	4.4	1.4
Bangladesh	5.5	6.00	1.230	12	5	11	159	16	20	1.1	1.6
Kuwait	5.7	0.18	0.033	99	99	79	14480	95	11	50.0	15.6
Guatemala	5.7	1.05	0.288	14	34	16	930	39	15	11.7	4.6
Lesotho	5.7	16.00	3.280	50	40	26	410	20	72	2.5	0.5
Cent.Afr.Re	5.8	6.00	1.260	68	66	6	290	27	83	3.3	0.3
Nepal	5.8	8.50	1.929	9	6	11	142	9	60	2.1	0.3
Madagascar	6.0	3.00	0.984	33	62	30	230	24	74	2.7	1.0
Bolivia	6.0	4.80	1.584	54	47	34	540	51	24	4.0	6.5
Congo	6.0	10.00	2.400	35	35	5	1040	40	43	10.5	0.7
Algeria	6.1	3.00	0.750	27	15	53	2594	51	7	33.3	4.3

NAME	TFR ¹	MMRATIO ²	MMRATE ³	PRE ⁴	DELI ⁵	F_EDUC ⁶	GNP ⁷	URBAN ⁸	W_LABOR ⁹	NURSE ¹⁰	DOCTOR ¹¹
Sierra Leon	6.1	4.50	1.057	70	63	3	310	32	43	9.1	0.7
Angola	6.3	1.13	0.395	27	15	4	470	28	9	9.8	0.5
Botswana	6.4	3.00	1.287	82	52	27	840	26	73	14.3	1.4
Ghana	6.4	4.84	1.461	82	40	27	379	33	56	14.7	0.5
Cape Verde	6.5	1.34	0.420	99	50	1	460	27	20	1.0	1.0
Senegal	6.5	5.30	1.409	30	50	8	420	38	54	4.9	0.5
Somalia	6.5	11.00	2.640	2	2	12	280	36	37	6.5	0.6
Ethiopia	6.6	5.56	1.312	50	11	8	120	13	47	1.8	1.3
Afganistan	6.6	6.40	2.374	8	8	4	240	9	21	1.0	0.7
Dem. Yemen	6.7	1.00	0.358	39	32	3	515	28	4	5.0	0.3
Zambia	6.7	1.06	0.327	88	60	12	316	49	41	13.5	1.4
Syria	6.8	2.80	0.926	21	37	47	1516	50	10	11.2	7.9
Mauritania	6.9	0.68	0.163	99	85	10	440	45	10	8.5	5.2
Uganda	6.9	3.00	1.047	90	40	8	230	10	46	3.2	1.1
Malawi	7.0	2.50	0.847	37	45	2	160	12	54	1.0	0.8
Tanzania	7.1	0.80	0.272	85	60	3	240	31	50	1.8	0.4
Niger	7.1	4.20	0.970	47	47	4	240	19	11	21.7	0.3
Nigeria	7.1	15.00	3.630	70	40	7	640	35	53	11.1	1.5
Rwanda	7.3	2.10	0.777	85	22	1	282	7	85	2.7	0.3
Kenya	7.9	1.68	0.552	40	28	15	300	23	44	5.8	1.0

- 1 Estimated TFR for 1985-90; Ross et al., 1988
2 Maternal Mortality Ratio/1000 live births; WHO, 1986
3 Maternal Mortality Rate/1000 live births, calculated by the authors
4,5 Percent of pregnant women received at least one prenatal visit and percent of delivery attended by trained personnel; WHO, 1989
6 Percent of females enrolled in secondary school; Ross et al., 1988
7 Per Capita Gross National Product in 1986; World Bank, 1988; Population Reference Bureau, Inc. 1988
8 Percent of urban population in 1984; Ross et al, 1988
9 Women aged 15-64 in the labor force as a percent of women population aged 15-64 in 1980; Sivard, 1985
10 Number of nurses per 10,000 population in 1984; World Bank, 1989
11 Number of doctors per 10,000 population in 1984; World Bank, 1989

STEPWISE REGRESSION

Stepwise Procedure for Dependent Variable MMRATIO/1000 Live Births				
Variable	Regression Co-Efficient	Standard Error	F-Stat	P Value
INTERCEPT	6.32	0.74	71.33	0.0001
DELIVERY	-0.06	0.01	26.79	0.0001

Stepwise Procedure for Dependent Variable MMRATE/1000 WRA				
Variable	Regression Coefficient	Standard Error	F-Stat	P-value
INTERCEPT	1.60	0.17	87.08	0.0001
DELIVERY	-0.011	0.003	10.33	0.0020
TFR	0.128	0.060	4.55	0.0366

Stepwise Procedure for Dependent Variable DELIVERY (%)				
Variable	Regression Coefficient	Standard Error	F-Stat	P-value
INTERCEPT	31.62	4.50	49.31	0.0001
F_EDUC	0.68	0.14	11.93	0.0010

Stepwise Procedure for Dependent Variable TFR				
Variable	Regression Coefficient	Standard Error	F-Stat	P-value
INTERCEPT	6.400	0.230	750.63	0.0001
F_EDUC	-0.046	0.005	71.71	0.0001

The remaining variables as mentioned in Annex-I were automatically excluded from the model because of their insignificant effect on respective dependent variables.