



# Safe Motherhood Model

## Version 1

**A Computer Program to Examine  
the Impact of Maternal Health Services  
on the Maternal Mortality Ratio**

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Spectrum System of  
Policy Models

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By Lori Bollinger and Emily Sonneveldt  
Futures Group, a Constella company

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January 2006

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# I. Introduction

## A. Description of the Spectrum System

### 1. Components

The POLICY Project and its predecessor projects have developed computer models<sup>1</sup> that analyze existing information to determine the future consequences of today's population programs and policies. The new Spectrum Policy Modeling System consolidates previous models into an integrated package containing the following components:

- **Demography (DemProj)** – A program to make population projections based on (1) the current population, and (2) fertility, mortality, and migration rates for a country or region.
- **Family Planning (FamPlan)** – A program to project family planning requirements in order for consumers and/or nations to reach their goals of contraceptive practice or desired fertility. This model also includes the Post-Abortion Care module, or PAC, which examines the costs of providing post-abortion care and the resulting impact on the maternal mortality ratio.
- **Benefit-Cost** – A program for comparing the costs of implementing family planning programs, along with the benefits generated by those programs.
- **AIDS (AIDS Impact Model – AIM)** – A program to project the consequences of the AIDS epidemic.
- **Condom Requirements (CR)** – A program to forecast national condom requirements for both family planning and HIV/AIDS prevention, focusing on the critical groups at risk in the population.
- **Socioeconomic Impacts of High Fertility and Population Growth (RAPID)** – A program to project the social and economic consequences of high fertility and rapid population growth for sectors such as labor force, education, health, urbanization, and agriculture.

*Spectrum consolidates DemProj, FamPlan (including PAC), Benefit-Cost, AIM, CR, RAPID, SMM, and PMTCT models into an integrated package.*

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<sup>1</sup> The terms "model" and "module" are used interchangeably in the Spectrum manuals to refer to the computer programs within the system.

- **Safe Motherhood Model (SMM)** – A program to assist in allocating effectively the resources associated with reducing the maternal mortality ratio.
- **Prevention of Mother-to-Child Transmission (PMTCT)** – A program to evaluate the costs and benefits of programs to reduce mother-to-child transmission of HIV.

## 2. Software Description

Spectrum is a Windows-based system of integrated policy models. The integration is based on DemProj, which is used to create the population projections that support many of the calculations in the other components—FamPlan, Benefit-Cost, AIM, CR, RAPID, SMM, and PMTCT.

Each component has a similarly functioning interface that is easy to learn and use. With little guidance, anyone who has a basic familiarity with Windows software will readily be able to navigate the models to create population projections and to estimate resource and infrastructure requirements. The accompanying manuals contain instructions for users and equations for persons who want to know exactly how the underlying calculations are computed.

### B. Uses of Spectrum Policy Models

*Policy models are designed to answer a number of “what if” questions. The “what if” refers to factors that can be changed or influenced by public policy.*

Policy models are designed to answer a number of “what if” questions relevant to entities as small as local providers of primary health care services and as large as international development assistance agencies. The “what if” refers to factors that can be changed or influenced by public policy.

Models are commonly computerized when analysts need to see the likely result of two or more forces that might be brought to bear on an outcome, such as a population’s illness level or its degree of urbanization. Whenever at least three variables are involved (such as two forces and one outcome), a computerized model can both reduce the burden of manipulating those variables and present the results in an accessible way. Some of the policy issues commonly addressed by the Spectrum set of models include:

- the utility of taking actions earlier rather than later. Modeling shows that little in a country stands still while policy decisions are stalled and that many negative outcomes can accumulate during a period of policy stasis.

*A set of policies under consideration may not be acceptable to all stakeholders.*

- the evaluation of the costs vs. the benefits of a course of actions. Modeling can show the economic efficiency of a set of actions (i.e., whether certain outcomes are achieved more effectively than under a different set of actions), or simply whether the cost of a single set of actions is acceptable for the benefits gained.
- the recognition of interrelatedness. Modeling can show how making a change in one area of population dynamics (such as migration rates) may necessitate changes in a number of other areas (such as marriage rates, timing of childbearing, etc.).
- the need to discard monolithic explanations and policy initiatives. Modeling can demonstrate that simplistic explanations may bear little relationship to how the “real world” operates.
- the utility of “door openers.” A set of policies under consideration may not be acceptable to all stakeholders. Modeling can concentrate on favored goals and objectives and demonstrate how they are assisted by the proposed policies.
- that few things in life operate in a linear fashion. A straight line rarely describes social or physical behavior. Most particularly, population growth, being exponential, is so far from linear that its results are startling. Modeling shows that all social sectors based on the size of population groups are heavily influenced by the exponential nature of growth over time.
- that a population’s composition greatly influences its needs and its well being. How a population is composed—in terms of its age and sex distribution—has broad-ranging consequences for social welfare, crime rates, disease transmission, political stability, etc. Modeling demonstrates the degree to which a change in age and sex distribution can affect a range of social indicators.
- the effort required to “swim against the current.” A number of factors can make the success of a particular program harder to achieve; for example, the waning of breastfeeding in a population increases the need for contraceptive coverage. Modeling can illustrate the need for extra effort—even if simply to keep running in place.

## C. Organization of the User Manuals

Each manual begins with a discussion of what the model does and why someone would want to use it. The manual also explains the data decisions and assumptions needed before the model can be run, and possible sources for the data. It defines the data inputs and outputs. The manual contains a tutorial, information on the methodology behind the model, a glossary, and a bibliography.

## D. Information about the POLICY Project

The POLICY Project is a USAID-funded activity designed to create a supportive environment for family planning and reproductive health programs through the promotion of a participatory process and population policies that respond to client needs. To achieve its purpose, the project addresses the full range of policies that support the expansion of family planning and reproductive health programs, including:

- national policies as expressed in laws and in official statements and documents;
- operational policies that govern the provision of services;
- policies affecting gender roles and the status of women; and
- policies in related sectors, such as health, education and the environment that affect populations.

*The POLICY Project is implemented by the Futures Group in collaboration with Research Triangle Institute (RTI) and the Centre for Development and Population Activities (CEDPA).*

More information about the Spectrum System of Policy Models and the POLICY Project is available from:

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<http://www.FuturesGroup.com>

or

POLICY Project  
U.S. Agency for International Development  
Office of Population and Reproductive Health  
1300 Pennsylvania Avenue  
Washington, DC 20523 U.S.A.  
Telephone: (202) 712-5787 or -5839

## E. What Is the Safe Motherhood Model?

Each year, over 500,000 women die of causes relating to pregnancy and childbirth. Many of these deaths could be prevented through appropriately targeted interventions. Even when there is agreement on the need to reduce maternal mortality, there is often little agreement on which areas could best be improved.

The Safe Motherhood Model (SMM) is a tool that can be used to improve the understanding of how changes in maternal health services can avoid maternal deaths. Some of the questions the model can ask are:

- Where should effort be focused to yield the greatest reduction in maternal mortality?
- How much would it cost to reach a certain level of maternal mortality?
- How much of a reduction in maternal mortality is feasible in the next few years?
- What can be learned from the performance of a similar country?

The SMM estimates the impact of various scores from the Maternal and Neonatal Program Effort Index (MNPI) on the maternal mortality ratio (MMR). The MNPI is an index consisting of 81 different maternal and neonatal health services that have been evaluated by reproductive health experts around the world. The SMM uses the current scores for an individual country to represent the current situation of the delivery of these health services in a country.

The components of the MNPI can be split conceptually into two major types of functions: support functions and service delivery functions. There are six main support functions:

Policy  
Budget  
Monitoring  
Training  
Private effort  
Health promotion

Note that training in this context is general training; training specific to service delivery is included in the capacity service delivery functions.

The service delivery functions can be aggregated into five blocks:

- Fertility regulation services
- Facility capacity
- Adequacy of antenatal care
- Adequacy of delivery care
- Access to services

A schematic of the model can be seen in Figure 1 below. The support functions interact both with other support functions and with the service delivery functions to determine the MMR. The service delivery functions also have direct impacts on the MMR. Socioeconomic context has a separate, independent effect on the MMR in the model.

Another set of questions relates to the costs of the interventions contained in the SMM. Cost information from the World Health Organization's (WHO's) Mother-Baby Package (MBP) model<sup>2</sup> can be combined with other cost information from national strategic plans in order to answer these questions.

## **F. Why Use the Safe Motherhood Model?**

The SMM is intended to (1) support priority-setting dialogue by providing a tool to analyze strategic plans for safe motherhood, with increased efficiency in the use of funding resources, and (2) create a better dialogue between all stakeholders regarding safe motherhood priorities.

The SMM does not provide all of the answers. It is intended to assist planners in understanding the effects of funding levels and allocation patterns on maternal mortality. The model can help planners understand how funding levels and patterns can lead to reductions in maternal mortality. It does not, however, calculate the "optimum" allocation pattern or recommend a specific allocation of resources between interventions.

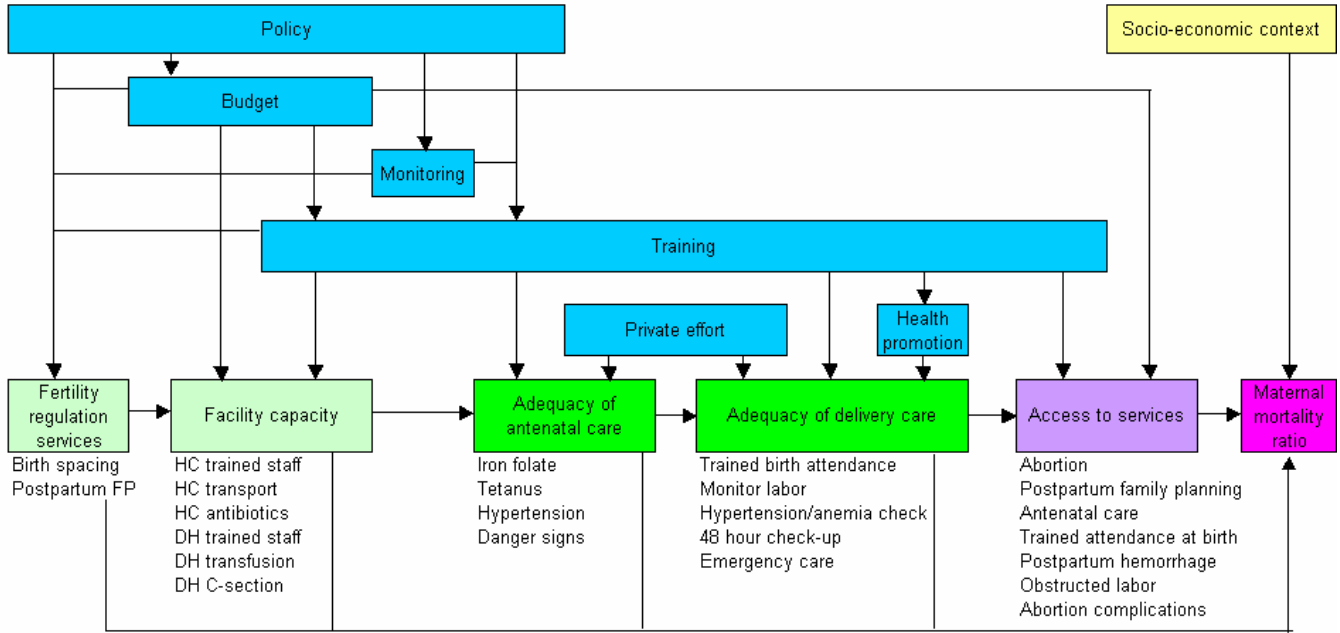
The SMM is intended for use by national programs to explore the effects of different funding levels and patterns on goals to reduce maternal mortality. The model is generally used by a multidisciplinary team composed of participants with various areas of expertise

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<sup>2</sup> The model, which is in an Excel workbook, and its documentation can be downloaded from: <http://www.who.int/reproductive-health/economics/intro.html>.

(demography, epidemiology, health finance, planning) representing different aspects of society (government, civil society, private sector, donors). A technical team works together to implement the model for the first time. The model is then used in interactive workshops with planners and stakeholders to explore the effects of different program configurations on health outcomes. Through this interaction participants gain a better understanding of the dynamics of funding and impact. This prepares them to develop realistic budgets and goals that reflect their priorities.

Figure 1: Schematic of the model



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## II.

# Steps in Implementing SMM

Two modules of Spectrum must be completed in order to utilize the Safe Motherhood Model (SMM), along with the SMM itself. Within FamPlan, the Post-Abortion Care (PAC) sub-module needs to be implemented as well. Complete descriptions of these two modules, and the process of applying them, can be found in the individual manuals for each of the modules at:

<http://www.futuresgroup.com/>

Select “Quick Link to Free Software” from the right-hand side of the web page, and then “Spectrum” in order to access the manuals and to download the Spectrum software.

In addition, both the ‘Current’ and the ‘Standard’ workbooks of WHO’s Mother-Baby Package (MBP) costing spreadsheet must be completed as well. Information on the spreadsheet, as well as the model itself, can be found at:

<http://www.who.int/reproductive-health/economics/intro.html>

In general, there are five key steps in making projections using Spectrum. The amount of time spent on each step may vary, depending on the application, but most projection activities will include at least these five steps.

1. **Collect data.** Information on data to make population projections, family planning method and source mix, post-abortion care, maternal health, and various costing elements are all necessary. Complete details are given in each of the relevant manuals.
2. **Make assumptions.** Each of the modules has assumptions associated with it that must be made. For example, in FamPlan, assumptions about the future levels of family planning and method mix are necessary. Full descriptions of the necessary assumptions can be found in each manual.
3. **Enter data.** Once the data are collected and decisions made about projection assumptions, the data must be entered into the Spectrum program.

4. **Examine projections.** Once the projection is made, it is important to examine the outputs carefully. Careful examination of these indicators can act as a check to ensure that the data and assumptions were understood and entered correctly into the computer program. This careful examination is also required to ensure that the consequences of the assumptions are fully understood.
5. **Make alternative projections.** Many applications require alternative projections. Once the base projection has been made, the program can be used to quickly generate alternative projections as the result of varying one or several of the model assumptions.

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# III.

## Inputs for SMM

As discussed above, two different Spectrum modules must be completed first, DemProj and FamPlan (including the PAC component), along with the WHO Mother-Baby Package, before the Safe Motherhood Model is run.

There are four sets of inputs required by the SMM: proposed budgets by component, MNPI scores, the MMR, and two socioeconomic variables. The MNPI scores will be discussed first, then the components of the budget, followed by the MMR and the socioeconomic variables.

### A. Eighty-one MNPI Items

The Maternal and Neonatal Program Effort Index (MNPI) is a research instrument designed to measure national efforts directed to improving the health of mothers and infants. It was applied first in 1999 for 49 developing countries, including the eight largest countries that account for two-thirds of the population of the developing world. It is based on an 81-item questionnaire with subdivisions for different components. Scoring of the questions is on a 0–5 scale, converted to a 0–100 percent range. The questionnaire is completed in each country by expert respondents drawn from various institutions and professional specialties.

Scores for each of the 81 items are used as inputs to the SMM, and are displayed in the “MNPI” tab of the “Data” box. The items as they appear on the screen are listed below, along with a short description of each one. Note that “Health Center” refers to the first level of care, while “District Hospital” refers to a higher level of care, one with greater clinical capacity. The complete MNPI questionnaire can be found in Appendix A.

***Manage postpartum hemorrhage:*** All health centers have skilled staff in place who can manage postpartum hemorrhage

***Administer antibiotics intravenously:*** All health centers have skilled staff in place who can administer antibiotics intravenously

***Manually remove retained placenta:*** All health centers have skilled staff in place who can perform manual removal of retained placenta

***Perform manual vacuum aspiration or electric suction:*** All health centers have skilled staff in place who can perform vacuum aspiration of the uterus, using MVA (manual vacuum aspiration) or an electric suction device

***Use partograph to determine when to refer:*** All health centers have skilled staff in place who can use a partograph to determine when to refer

***Have transport arranged for obstructed labor:*** All health centers have transportation arrangements to quickly move a woman with obstructed labor to a district hospital

***Have adequate antibiotic supplies:*** All health centers have adequate antibiotic supplies on hand (sufficient supplies of the correct types)

***Provide all functions listed for health centers:*** All district hospitals have skilled staff in place who can provide all functions listed above for health centers

***Perform blood transfusions:*** All district hospitals have skilled staff, in place, who can perform blood transfusions (and have adequate supplies of safe blood on hand)

***Perform cesarean section (C-section) or other operative delivery:*** All district hospitals have skilled staff in place who can perform Cesarean section or other operative delivery (e.g., forceps delivery or craniotomy)

The following eight items are scored first for rural areas, and then for urban areas, accounting for a total of 16 items on the MNPI input screen:

***Treatment for postpartum hemorrhage:*** The percentage of pregnant women who have adequate access to treatment for postpartum hemorrhage during or soon after delivery (rural/urban)

***Management of obstructed labor:*** The percentage of pregnant women who have adequate access to management of obstructed labor (rural/urban)

***Treatment of abortion complications:*** The percentage of pregnant women who have adequate access to treatment of abortion complications (rural/urban)

***Provision of safe abortion services:*** The percentage of pregnant women who have adequate access to the provision of safe abortion services, or menstrual regulation (rural/urban)

***Antenatal care:*** The percentage of pregnant women who have adequate access to antenatal care during pregnancy (rural/urban)

***Delivery care by trained professional attendant:*** The percentage of pregnant women who have adequate access to delivery care by a skilled professional attendant (rural/urban)

***Postpartum family planning services:*** The percentage of pregnant women who have adequate access to postpartum family planning services (rural/urban)

***District hospitals open 24 hours:*** The percentage of pregnant women who have adequate access to district hospitals that are open 24 hours / day (rural/urban)

***Receive iron folate tablets for anemia:*** At antenatal visits, all pregnant women receive iron folate tablets for anemia

***Are examined for hypertension and treated:*** At antenatal visits, all pregnant women are both examined for hypertension and treated as needed

***Are examined for syphilis and treated:*** At antenatal visits, all pregnant women are both examined for syphilis and treated as needed

***Receive needed tetanus injections:*** At antenatal visits, all pregnant women receive needed tetanus injection(s)

***Are informed about danger signs:*** At antenatal visits, all pregnant women are informed about danger signs of obstetric and newborn complications and are assisted in planning for any emergency

***Are offered voluntary HIV counseling and testing:*** At antenatal visits, all pregnant women are offered voluntary counseling and testing for HIV

Note: The following items refer to all deliveries and infants throughout the country, not just those in facilities.

***Are seen by trained professional attendant:*** At delivery, all women are attended by a professionally skilled attendant

***Have labor monitored:*** At delivery, all women have their labor monitored

***Are checked for hypertension, anemia, infection:*** At delivery, all women are checked for signs of hypertension, anemia, or infection

***Can receive emergency obstetric care:*** At delivery, all women are able to receive emergency obstetric care as needed

***Are scheduled for a checkup in 48 hours:*** At delivery, all women are provided an appointment for a check-up within 48 hours of delivery

***Are encouraged to immediately start breastfeeding:*** At delivery, all women are encouraged to immediately start breastfeeding the newborn (within one hour of birth)

***Are counseled on umbilical cord care:*** At delivery, all women are counseled on umbilical cord care

***Have mouth and nasal passageways cleared:*** All infants have their mouth and nasal passageways cleared

***Are dried and kept warm:*** All infants are dried and kept warm immediately after birth

***Receive prophylactic eye treatment:*** All newborns receive prophylactic treatment for their eyes

***Have umbilical cord cut with clean blade:*** All newborns have their umbilical cord cut with a clean blade

***Receive DPT injection at 3 months:*** All newborns receive a DPT injection at 3 months

***Are scheduled for subsequent immunizations:*** All newborns are scheduled for subsequent immunizations

***Routinely offer family planning postabortion:*** All health centers routinely offer family planning after abortion cases

***Routinely offer family planning postpartum:*** All health centers routinely offer family planning at postpartum visits

***Have contraceptive pills regularly in stock:*** All health centers have contraceptive pill supplies regularly in stock

***Have progestin-only pills for breastfeeding women:*** All health centers have progestin-only pills for breastfeeding women

***Can insert intrauterine devices:*** All health centers have skilled staff, in place, who can insert intrauterine devices

***Routinely offer family planning postabortion:*** All district hospitals routinely offer family planning after abortion cases

***Routinely offer family planning postpartum:*** All district hospitals routinely offer family planning at postpartum visits

***Have contraceptive pills regularly in stock:*** All district hospitals have contraceptive pill supplies regularly in stock

***Can insert intrauterine devices:*** All district hospitals have skilled staff, in place, who can insert intra-uterine devices

***Can offer sterilization to females:*** All district hospitals can offer sterilization to female clients

***Can offer sterilization to males:*** All district hospitals can offer sterilization to male clients

***Adequate Ministry of Health policies:*** Ministry of Health policies toward pregnancy and delivery services are adequate

***Consultation with stakeholders:*** Policies are developed through adequate consultation with interested parties such as other ministries, NGOs, private practitioners, and women's groups

***Appropriate personnel allowed to provide services:*** Policies are reasonable and fair concerning which personnel can provide maternal health services (e.g., trained midwives can perform a wide range of medical procedures)

***Treatment favored for abortion complications:*** A favorable policy exists toward the treatment of complications of abortions, including complications seen from illegal abortions

***High-level policy reviews and action plans:*** Policies are vigorously implemented through regular high-level reviews and updated action plans

***Maternal services director highly placed:*** The director for maternal health is placed at a high administrative level

***Officials publicly support safe pregnancy:*** High officials in the government, including the Ministry of Health, issue frequent statements to the press and public to support improvements for safe pregnancy and delivery

***Adequate budget:*** The government budget for safe pregnancy, delivery, and postpartum care (for facilities, personnel, supplies, etc.) is adequate for the needs, whether from the Ministry of Health, provincial government, or donor support

***All services and drugs free:*** All services and drugs are provided free to all clients

***Active private sector:*** The private sector (doctors, midwives, clinics, maternity homes) is active and covers a substantial share of pregnancy and delivery cases

***Media educate about complications:*** The national program uses the mass media to educate the public about symptoms of pregnancy complications and safe places for childbirth

***Media educate about harmful practices:*** Also, the national program uses the mass media to educate the public about harmful home practices for pregnancy care, delivery, and postpartum care (home remedies and birthing customs, etc.)

***Community organizations educate public:*** Community-level organizations take part in systematic programs to educate the public about safe pregnancy and delivery

***Educational materials at facilities:*** The Ministry of Health supplies adequate educational materials (posters, pamphlets, etc.) to delivery facilities to instruct clients about safe practices

***Curricula include hands-on training:*** Medical curricula include hands-on clinical training in obstetric care, including management of several deliveries

***Midwife-nurse refresher training in 5 years:*** All midwives and nurses in health centers have received refresher training for safe pregnancy and delivery care within the last 5 years

***Doctor refresher training in 5 years:*** Doctors in health centers have received refresher training for safe pregnancy and delivery care within the last 5 years

***New midwives, nurses trained in 6 months:*** Newly hired midwives and nurses for health centers receive training for safe pregnancy and delivery care within the first 6 months

***New doctors trained for normal deliveries:*** Newly hired doctors receive special in-service training for normal deliveries

***Routine reports on cases, facilities:*** A routine statistical system (using facility-based information) provides good periodic information on supplies, personnel, deliveries, Cesarean sections, and cases of complications

***National statistics monitored, analyzed:*** Regularly monitor and analyze results from the routine statistics (above) at the national level

***Surveys of maternal events:*** Recent surveys provide data on maternal events (pregnancies, deliveries, attendants and sites for deliveries, estimates of maternal deaths, etc.)

***Updated listing of emergency facilities:*** An updated listing exists of facilities that can treat obstetric emergencies

***Statistics used for decisions and strategy:*** Ministry administrators systematically use statistical information for decisions and reconsideration of strategies for reducing maternal mortality

***Case-fatality reviews in each hospital:*** Each hospital follows a regular procedure to review and learn from every case of a maternal death in the facility

## **B. Twenty-four MNPI Components**

For the purposes of the model, the 81 MNPI items are aggregated into 24 different components, using unweighted averages, based on factor analysis described in detail

elsewhere.<sup>3</sup> The relationship between the items and components, using the labels from the “**Score**” screen for the components, are:

***Policy:***

Adequate Ministry of Health policies  
Consultation with stakeholders  
Appropriate personnel allowed to provide services  
Treatment favored for abortion complications  
High-level policy reviews and action plans  
Maternal services director highly placed  
Officials publicly support safe pregnancy

***Budget:***

Adequate budget

***Monitoring:***

Routine reports on cases, facilities  
National statistics monitored, analyzed  
Surveys of maternal events  
Updated listing of emergency facilities  
Statistics used for decisions, strategy  
Case-fatality reviews in each hospital

***Training:***

Curricula includes hands-on training  
Midwife-nurse refresher training in 5 years  
Doctor refresher training in 5 years  
New midwives, nurses trained in 6 months  
New doctors trained for normal delivery

***Health promotion:***

Educational materials at facilities

***Private effort:***

Active private sector  
Community organizations educate public

***Birth spacing:***

Can insert intrauterine devices (health center/hospital)  
Have contraceptive pills regularly in stock (health center/hospital)

***Postpartum FP services:***

Routinely offer family planning postabortion (health center/hospital)

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<sup>3</sup> Bulatao, R.A. and J.A. Ross. 2001. “Dimensions of Ratings of Maternal and Neonatal Health Services: A Factor Analysis.” MEASURE Evaluation Working Paper WP-01-40. Chapel Hill, University of North Carolina.

Routinely offer family planning postpartum (health center/hospital)

Can offer sterilization to females, males (hospital)

***Health center personnel, risk identification:***

Manage postpartum hemorrhage

Administer antibiotics intravenously

Manually remove retained placenta

Perform MVA or electric suction

Use partograph to determine when to refer

Have adequate antibiotic supplies

***Health center personnel, transport:***

Have transport arranged for obstructed labor

***Hospital personnel, hemorrhage, sepsis:***

Manage postpartum hemorrhage

Administer antibiotics intravenously

Manually remove retained placenta

Perform MVA or electric suction

Use partograph to determine when to refer

Have adequate antibiotic supplies

***Hospital personnel, transfusions, C-sections:***

Perform blood transfusions

Perform Cesarean section or other operative delivery

***Quality of antenatal care, iron folate, tetanus:***

Receive iron folate tablets for anemia

Receive needed tetanus injections

***Quality of antenatal care, hypertension, danger signs:***

Are examined for hypertension and treated

Are informed about danger signs

***Delivery care, skilled attendance:***

Are seen by trained professional attendant

Have labor monitored

Are checked for hypertension, anemia, infection

Are scheduled for a checkup in 48 hours

***Delivery care, emergency obstetric care:***

Can receive emergency obstetric care

***Access to postpartum FP (rural/urban):***

Adequate access to provision of safe abortion services

Adequate access to postpartum family planning services

***Access to antenatal care (rural/urban):***

Adequate access to antenatal care

***Access to trained attendance (rural/urban):***

Delivery care by trained professional attendant

***Access to delivery treatment (rural/urban):***

Treatment for postpartum hemorrhage

Management of obstructed labor

Treatment of abortion complications

These components are, in turn, mapped into the budget categories of the WHO MBP. These components are displayed on the “Proposed Budget” screen of the data inputs, and the “Budget” display screen. This mapping procedure is described in detail in Chapter VI, the methodology chapter.

### **C. Budget Inputs**

The budget inputs displayed on the “Proposed Budget” screen are based on categories in the WHO MBP. Initial values, listed in the “Current” column, are derived directly from the results of the “Current” MBP workbook that is linked to the existing scenario. Cells for future budget entries are set to zero, and may be filled in by the user. It is not necessary to fill in these budget line items, however; the Interactive Display, discussed below, provides a way for a budget to be specified in an interactive fashion.

Each of the budget line items, and its relationship to the MBP, is explained here.

***Policy:*** Expenditures on policy development and advocacy efforts for safe motherhood. The current value is calculated as 1 percent of total service delivery expenditures, but may be changed.

***Monitoring:*** Expenditures on the monitoring and evaluation of the safe motherhood program. The current value is calculated as 1 percent of total service delivery expenditures, but may be changed.

***Training:*** Expenditures on general training efforts related to the safe motherhood program, not including training efforts carried out at the facility level. The current value is calculated as 4 percent of total service delivery expenditures, but may be changed.

***Health promotion:*** Expenditures on providing health informational materials at facilities. The current value is

calculated as 2 percent of total service delivery expenditures, but may be changed.

***Private effort:*** Expenditures by the government to promote private sector participation in the safe motherhood arena. The current value is calculated as 0.3 percent of total service delivery expenditures, but may be changed.

***Birth spacing:*** Expenditures on the service delivery of contraceptives used for birth spacing. The current column is the sum of direct and overhead costs in the MBP for condoms, Depo Provera, IUD, Norplant, and oral contraceptives.

***FP for limiting family size:*** Expenditures on the service delivery of contraceptives used for limiting family size. The current column is the direct and overhead costs in the MBP for sterilization.

***Antenatal care:*** Expenditures on the service delivery of antenatal care utilized in the country. The current column is the direct and overhead costs in the MBP for antenatal care.

***Postabortion care:*** Expenditures on the service delivery of postabortion care, including costs of treating abortion complications and costs of providing postabortion family planning, as calculated in the PAC module of FamPlan.

***Delivery with skilled attendance:*** Expenditures on the service delivery of normal deliveries that include attendance by a skilled birth attendant. The current column is the direct and overhead costs in the MBP for normal delivery care.

***Postpartum care:*** Expenditures on the service delivery of postpartum care. The current column is the direct and overhead costs in the MBP for postpartum care.

***Emergency obstetric care: Hemorrhage:*** Expenditures on the service delivery of treating hemorrhage, *except* expenditures on transport associated with treating hemorrhage, which is included in a separate line item. The current column is the direct and overhead costs in the MBP for treating hemorrhage, minus the transport costs associated with this treatment.

***Emergency obstetric care: Obstructed labor:*** Expenditures on the service delivery of treating obstructed labor, *except* expenditures on transport associated with treating obstructed labor, which is included in a separate line item.

The current column is the direct and overhead costs in the MBP for treating obstructed labor, minus the transport costs associated with this treatment.

***Emergency obstetric care: Sepsis:*** Expenditures on the service delivery of treating sepsis, *except* expenditures on transport associated with treating sepsis, which is included in a separate line item. The current column is the direct and overhead costs in the MBP for treating sepsis, minus the transport costs associated with this treatment.

***Emergency obstetric care: Transport:*** Expenditures on emergency transport for treating hemorrhage, obstructed labor, and sepsis. The current column is the sum of the direct and overhead costs in the MBP for transport costs associated with these treatments.

***Infrastructure/access: Antenatal care:*** Expenditures on capital costs for providing antenatal care. The current column is the capital cost in the MBP for antenatal care.

***Infrastructure/access: Postabortion care:*** Expenditures on capital costs for providing postabortion care. The current column is the capital cost in the MBP for treating abortion complications.

***Infrastructure/access: Delivery with skilled attendance:*** Expenditures on capital costs for providing normal deliveries with skilled attendance. The current column is the capital cost in the MBP for normal deliveries.

***Infrastructure/access: Postpartum care:*** Expenditures on capital costs for providing postpartum care. The current column is the capital cost in the MBP for postpartum care.

***Infrastructure/access: Emergency obstetric care:*** Expenditures on capital costs for providing emergency obstetric care. The current column is the capital cost in the MBP for hemorrhage, obstructed labor, and sepsis care.

## **D. MMR**

***Maternal Mortality Ratio:*** The number of maternal deaths per 100,000 live births. The estimates here are derived from Hill et al. (2000).

## **E. Socioeconomic Variables**

***Per capita Gross National Income (GNI):*** Gross national income divided by midyear population. GNI is the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad. The default values are from the World Development Indicators database, available at:

<http://devdata.worldbank.org/data-query/>

***Net Primary Enrollment Rate – Females:*** The ratio of the number of female children of official primary-school age (as defined by the national education system) who are enrolled in school to the total female population of official primary-school age. The default values are from the World Development Indicators database, available at:

<http://devdata.worldbank.org/data-query/>

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# IV.

## Projection Outputs

The components of the MNPI score, which are the outputs in the “Score” display screen and the “Profile of Effort Chart,” are described in detail in Chapter III, the chapter describing inputs. The components of the “Budget” display screen are described in the methodology chapter below. The other outputs are:

- **Maternal mortality ratio.** The number of maternal deaths per 100,000 live births.
- **Number of maternal deaths.** The number of women who die from any cause related to or aggravated by pregnancy or its management during pregnancy and childbirth, or who die within 42 days of termination of pregnancy.
- **Number of maternal disabilities.** The number of women who are disabled from any cause related to or aggravated by pregnancy or its management during pregnancy and childbirth. It is calculated as 25 \* the number of maternal deaths.

---

# V.

## Program Tutorial

This tutorial covers the key steps in installing and running Spectrum and the module for the Safe Motherhood Model (SMM). It assumes that you have an IBM-compatible computer running Windows 95 or higher and that you are familiar with the basic operation of Windows programs and terminology.

### A. Before You Get Started

First, you will need to run DemProj and FamPlan (including the PAC sub-module in FamPlan), both parts of the Spectrum system of policy models; please refer to their respective manuals for more information. These manuals can be found at:

<http://www.futuresgroup.com>

Then, you will need to collect data and make certain decisions before running the model, including implementing the WHO Mother Baby Package (MBP). Note that the WHO MBP is itself a separate model; complete documentation for the MBP model, as well as the model itself, can be found at the web site <http://www.who.int/reproductive-health/economics/intro.html>.

Both the 'current' MBP file and the 'standard' MBP file, as described in the MBP documentation, must be completed to use in the SMM. The 'current' MBP file describes the current status of interventions and expenditures in a country, while the 'standard' MBP file calculates the cost of interventions that the country would implement in an ideal world. Note that this 'standard' file is referred to in the SMM (and below) as the 'ideal' file.

### B. Installing the Spectrum Program

The Spectrum program is distributed on floppy diskettes, CD-ROMS or through the internet at <http://www.futuresgroup.com>. It must be installed on a hard disk before it can be used. Spectrum will operate on any computer running Windows 95 or later version. It requires about 10MB of hard disk space.

To install the Spectrum program, follow the directions below. <sup>4</sup>

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<sup>4</sup> To remove the Spectrum program from your hard disk, run the unwise.exe program located in the Spectrum directory.

**Installing from floppy diskettes:** Insert the first diskette into your disk drive. Select "Start" from the task bar. Then select "Run" from the pop-up menu. In the dialogue box that appears, type the file name "a:\SpecInstall.exe" and press "Ok." (If the install disk is in floppy disk drive b, then use the file name "b:\SpecInstall.exe"). Follow the instructions on the screen to complete the installation.

**Installing from a CD-ROM.** Insert the CD-Rom into your CD-ROM drive. The installation program should start automatically. If it does not, select "Start" from the task bar, then select "Run" from the pop-up menu. In the dialogue box that appears, click on Browse, and find the file SpecInstall.exe. Then press "Ok."

**Installing from the Internet.** Start your internet browser and go to [www.FuturesGroup.com](http://www.FuturesGroup.com). Click on "Software" and then "Spectrum." Next click on "Spectrum download" (single executable file). From the dialogue box that appears next, select "Save." Select a location for the file. Once the file has been downloaded, click on that file and follow the instructions.

## **C. Creating a New Projection**

### **1. Starting the Spectrum Program**

To start Spectrum:

- a. Click the "Start" button on the task bar.
- b. Select "Programs" from the pop-up menu.
- c. Select "Spectrum" from the program menu.

Alternatively, you can use Windows Explorer to locate the directory c:\spectrum" and double click on the application file named "spectrum" or the file named "spectrum.exe."

### **2. Opening Demographic and Family Planning Projections**

The Safe Motherhood Model (SMM) in Spectrum requires a demographic projection prepared with DemProj and a family planning projection prepared with FamPlan; the three modules work together in an iterative fashion. For example, the demographic projection provides the number of women of reproductive age to FamPlan and FamPlan calculates the total fertility rate and provides it to DemProj. This information then is used in the SMM to estimate the number of deliveries over the time of the projection. Therefore, before using SMM you should prepare a demographic projection using DemProj and a family

planning projection using FamPlan, including the postabortion care (PAC) sub-module. For more information on these modules consult *DemProj: A Computer Program for Making Population Projections* and *FamPlan: A Computer Program for Projecting Family Planning Requirements*, available at:

<http://www.futuresgroup.com>

The first step in preparing the Safe Motherhood projection is to open the existing demographic and family planning projections.

1. Select the "File" from the menu bar.
2. From the pull-down menu that appears, select "Open projection."
3. All pre-existing projections that can be loaded will be listed here. Select the relevant projection files from the "Open" dialogue box and press "Ok."

### 3. Adding the Safe Motherhood Module to the Projection

Once the demographic projection is open you need to change the configuration to indicate that the Safe Motherhood module will be used as well. To do this, select "Edit" from the menu bar and then "Projection" from the pull-down menu.

You will see the "Project manager" dialogue box. It will look similar to the display shown below.

Projection manager

Projection title: Sample      First Year: 1990      Final Year: 2000

Projection file name: C:\Documents and Settings\Lori\My Documents\SM model\Sample.

Demographic Projection (DemProj)      Easyproj

Active modules

- Adolescents (NewGen)
- Family planning (FamPlan)
- AIDS (AIM)
- RAPID
- Benefit-Cost (BenCost)
- PMTCT
- Goals
- Condom Requirements
- Safe Motherhood

Ok      Cancel

The following information is displayed.

**Projection title:** The title will be printed at the top of all printed output and will be used to identify the projection if more than one projection is loaded at a time. If so desired, you can change the title to reflect the projection you are about to prepare.

**Projection file name:** This is the name that will be used to store all data files associated with this projection. Note that, if you want to change the file name as well, you cannot change it here. To change the file name, you must do so from the "File" pulldown menu. Click on "Ok" in the current screen to exit, then select "File" and "Save projection as" to save the projection to a new name.

**First Year:** This is the first year of the projection, determined in the DemProj projection, and cannot be changed.

**Final Year:** This is the final year of the projection, determined in the DemProj projection, and cannot be changed.

**Active modules:** These radio buttons (or options) let you select other modules that will be used with the demographic and family planning projections. You should select the "Safe Motherhood" module by clicking on the check box next to the name. This choice adds the Safe Motherhood module to this projection.

Once all the information is entered for this dialogue box, click on the "Ok" button. You can always return to this screen and change some of the information by selecting "Edit" from the menu bar and then "Projection" from the pull-down menu.

## **D. Entering the Projection Assumptions/Inputs**

### **1. About the Editors**

Each editor in SMM is similar. At the very top of the screen, the variable name appears. At the bottom of the screen are the special edit keys. "Duplicate" allows you to copy information from one cell, column, or row to another; "Interpolate" allows you to enter a beginning and ending number and have the computer calculate numbers for the intervening intervals.

To use the "Duplicate" button,

1. Highlight (select) the range (column, row, or cells to be affected). The first cell in the range should be the value you want to copy.
2. Extend the range to the last year by using the mouse (hold down the left button and drag the range) or the keyboard (hold down the shift key and use the arrow keys).
3. Click on the "Duplicate" key to copy the value at the beginning of the range to all the other cells in the range.

**To use the "Interpolate" button,**

1. Enter the beginning and ending values in the appropriate cells.
2. Highlight the entire range from beginning to end.
3. Click on the "Interpolate" key to have the values interpolated and entered into each of the empty cells.

When you have finished entering all the necessary data for the component into the editor,

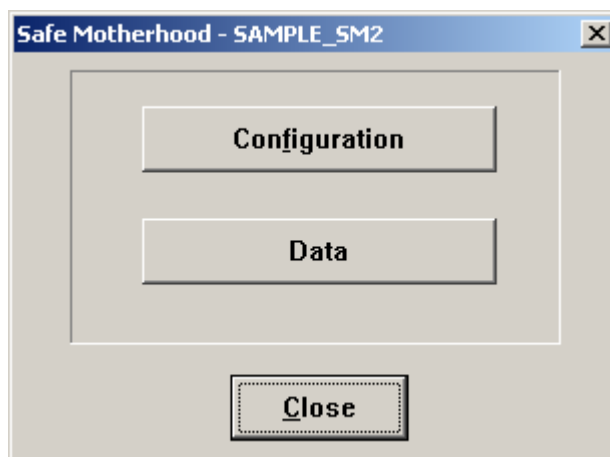
1. Click the "Ok" button to return to the initial dialogue box.
2. Click the "Close" button to complete the editing process.

The "Cancel" button allows you to exit the editor without making any changes to the data.

**2. Specifying the Safe Motherhood Model Projection Parameters/Inputs**

For readers who feel they need additional review or explanations of the terms found in this section, Chapter III and the glossary of this manual may be useful.

The inputs for the safe motherhood projection are entered by selecting "Edit" from the menu bar and "Safe Motherhood" from the pull-down menu. A dialogue box like the one shown below will appear.



Click on the button "Configuration." A safe motherhood configuration dialogue box, like the one shown below, will appear.

The screenshot shows a dialog box titled "Configure - Sample" with a close button in the top right corner. The main content area is titled "Safe Motherhood Model Setup" and is organized into several sections:

- Scale for Budget Figures:** Three radio buttons are present: "Units", "Thousands" (which is selected), and "Millions".
- Use Budget or Score:** Two radio buttons: "Budget" (selected) and "Score".
- Equation Form:** Two radio buttons: "Levels" (selected) and "Changes".
- Use PAC Model:** Two radio buttons: "Yes" (selected) and "No".
- Year Selection:** Two dropdown menus labeled "First Year of Analysis" and "Last Year of Analysis", both currently set to "1990".
- Local currency name:** A text input field containing "US Dollars".
- File Selection:** Two text input fields labeled "Current Mother Baby Package" and "Ideal Mother Baby Package", each followed by a "Browse.." button.
- Buttons:** At the bottom of the dialog are "Ok" and "Cancel" buttons.

From this Configuration dialogue box you choose how you want to display your projection and specify the link to the WHO MBP current and ideal files. The components are as follows:

- **Scale for Budget Figures.** Three options are available for budget figures. The scale can be set so the expenditures are displayed in units, thousands, or millions of units of the currency specified in the DemProj module. As discussed above, make sure that the currency and units in this model agree with the currency and units that are in the WHO MBP, DemProj, and FamPlan. For example, if the currency in SMM is in thousands, ensure that the scale for population inputs in DemProj is also in thousands.
- **Use Budget or Score.** Choose whether you would like to use the budget or score sheet to show the outputs of the module, described further below. This can be changed at any time.
- **Equation Form.** There are two choices of functional form in this model—levels and percent change. The choice of which form to use is specified here. These

forms are discussed further in the methodology section below.

- **Use PAC Model.** This option must be set to “Yes” in the current version of the SMM.
- **First Year of Analysis.** Use the pull-down menu to select the first year of the analysis. The selection will include only the years that were specified in the demographic projection.
- **Last Year of Analysis.** Use the pull-down menu to select the last year of the analysis. The selection will include only the years that were specified in the demographic projection.
- **Local currency name.** Initially, the currency displayed will be the currency that was entered in the DemProj projection. The currency entered needs to be the same as that used in the WHO MBP. If the currency is changed here, make sure to change it in DemProj as well.
- **Current Mother Baby Package.** Click on the browse button to locate the ‘Current’ file of the WHO MBP. Once the file is located, either double click on the file name or select the file and then click “Open” in the dialogue box. This will enable the data in the WHO MBP to be read by the Safe Motherhood module.
- **Ideal Mother Baby Package.** Click on the browse button to locate the Ideal, or ‘Standard’ file of the WHO MBP. Once the file is located, either double click on the file name or select the file and then click “Open” in the dialogue box. This will enable the data in the WHO MBP to be read by the Safe Motherhood module.

Once you have completed all of the information in the configuration dialogue box, click the “Ok” button to close this dialogue box.

### 3. Entering Safe Motherhood Data

In the “Safe Motherhood” dialogue box (reached by selecting “Edit” from the menu bar and “Safe Motherhood” from the pull-down menu or, from the Configuration dialogue box, by simply selecting “Ok” and then “Data” from the dialogue box), select “Data” to enter data for the SMM. This will display an editor like the one shown below.

Budget (Thousands) - Sample

Edit

Proposed Budget | MNPI | MMR | Socioeconomic

Policy

Program Component	Current	1996	1997	1998	1999	2000
Policy	3.38	0.00	0.00	0.00	0.00	0.00
Monitoring	3.38	0.00	0.00	0.00	0.00	0.00
Training	13.52	0.00	0.00	0.00	0.00	0.00
Health promotion	6.76	0.00	0.00	0.00	0.00	0.00
Private effort	1.01	0.00	0.00	0.00	0.00	0.00
Service delivery						
Birth spacing	24.38	0.00	0.00	0.00	0.00	0.00
FP for limiting family size	4.86	0.00	0.00	0.00	0.00	0.00
Antenatal care	152.81	0.00	0.00	0.00	0.00	0.00
Postabortion care	14.26	0.00	0.00	0.00	0.00	0.00
Delivery with skilled attendance	71.04	0.00	0.00	0.00	0.00	0.00
Postpartum care	36.06	0.00	0.00	0.00	0.00	0.00
Emergency obstetric care						
Hemorrhage	2.56	0.00	0.00	0.00	0.00	0.00
Obstructed labor	16.06	0.00	0.00	0.00	0.00	0.00
Sepsis	15.52	0.00	0.00	0.00	0.00	0.00
Transport	0.48	0.00	0.00	0.00	0.00	0.00
Infrastructure/access						

Ok Cancel Duplicate Interpolate MNPI Database

For each of the inputs required for the projection, there is a tab near the top of the screen.

1. To enter data for any of these assumptions, click on the appropriate tab to display the editor for that variable.
2. Then click anywhere inside the editor to make it active.

***Proposed Budget***

Budget (Thousands) - Sample

Edit

Proposed Budget | MNPI | MMR | Socioeconomic

Policy

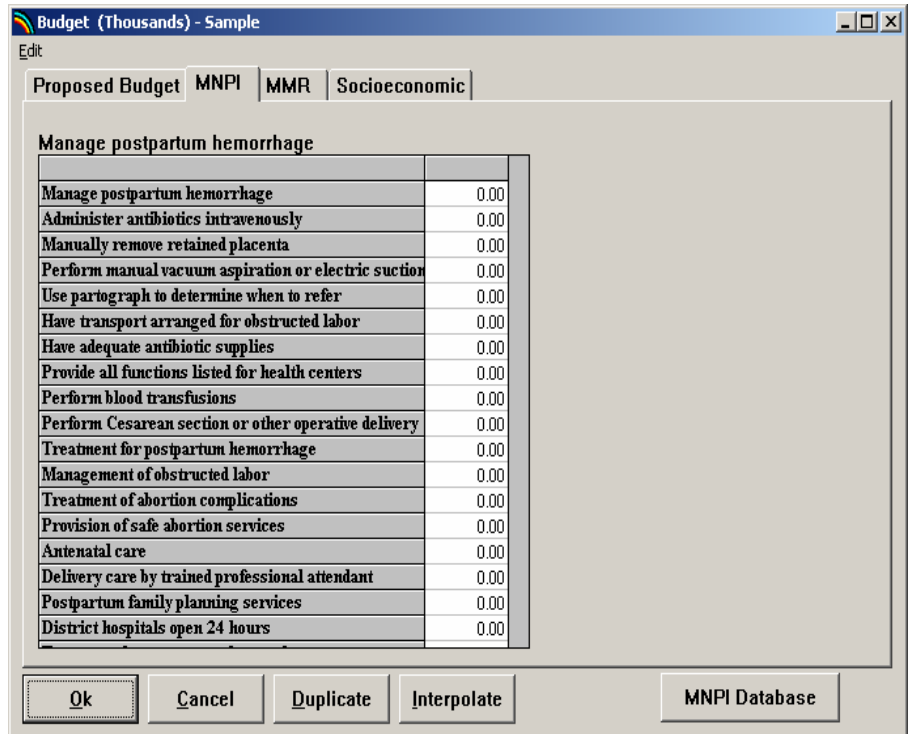
Program Component	Current	1996	1997	1998	1999	2000
Policy	3.38	0.00	0.00	0.00	0.00	0.00
Monitoring	3.38	0.00	0.00	0.00	0.00	0.00
Training	13.52	0.00	0.00	0.00	0.00	0.00
Health promotion	6.76	0.00	0.00	0.00	0.00	0.00
Private effort	1.01	0.00	0.00	0.00	0.00	0.00
Service delivery						
Birth spacing	24.38	0.00	0.00	0.00	0.00	0.00
FP for limiting family size	4.86	0.00	0.00	0.00	0.00	0.00
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Postabortion care	14.26	0.00	0.00	0.00	0.00	0.00
Delivery with skilled attendance	71.04	0.00	0.00	0.00	0.00	0.00
Postpartum care	36.06	0.00	0.00	0.00	0.00	0.00
Emergency obstetric care						
Hemorrhage	2.56	0.00	0.00	0.00	0.00	0.00
Obstructed labor	16.06	0.00	0.00	0.00	0.00	0.00
Sepsis	15.52	0.00	0.00	0.00	0.00	0.00
Transport	0.48	0.00	0.00	0.00	0.00	0.00
Infrastructure/access						

Ok Cancel Duplicate Interpolate MNPI Database

1. The column labeled "Current" displays the estimate of the current expenditures in the country, based on the information provided in the current MBP WHO file. The other columns will contain data about projected budgets, but must be entered.
2. Click somewhere inside the editor to make the scroll bar appear.
3. Scroll to the right or left to see all of the years.
4. The data can be input or changed by clicking in any of the boxes and entering a new amount.

### **MNPI**

When you have finished with this screen, click on the "MNPI" tab at the top of the screen to move to the next editor. The following screen will appear:



1. Click somewhere inside the editor to make the scroll bar appear.
2. Scroll up or down to see all of the MNPI items.
3. MNPI scores can either be entered manually or from the MNPI Database, which contains values for the countries surveyed in the 1999 round of the MNPI. To enter the scores manually, click in each box next to a question and enter the score. To enter from the MNPI Database, click the "MNPI Database" button in the lower right hand corner. This will display an editor like the one below.



1. Use the pull-down menu, and select a country by highlighting it.
2. Click "OK" to close the editor. You will return to the MNPI editor, where the MNPI scores now appear.

When you have finished with this screen, click on the "MMR" tab at the top of the screen to move to the next editor.

### **MMR**

The screenshot shows a software window titled "Budget (Units) - SAMPLE\_SM2". Inside the window, there are four tabs: "Proposed Budget", "MNPI", "MMR", and "Socioeconomic". The "MMR" tab is selected. Below the tabs, the word "Uganda" is displayed. Underneath "Uganda", there is a table with two columns. The first column contains the text "Maternal mortality ratio" and the second column contains the numerical value "505.00". At the bottom of the window, there are five buttons: "Ok", "Cancel", "Duplicate", "Interpolate", and "MNPI Database".

If the MNPI Database was used to supply the scores for the MNPI items on the previous screen, the database also supplies the MMR for the same country. The MMR can also be entered manually. To enter the scores manually, click in the box next to "Maternal mortality ratio" and enter the number.

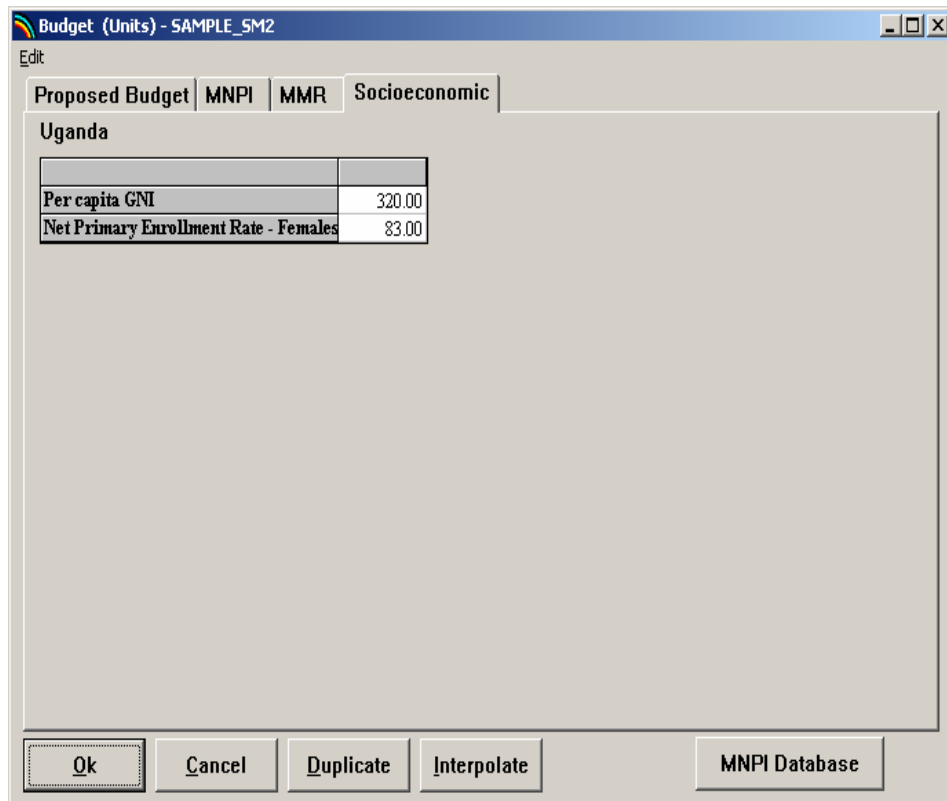
If the MNPI Database was not used in the previous screen for MNPI scores, and you want to use it to provide the default value for a particular country's MMR, click the "MNPI Database" button in the lower right hand corner of the screen. This will display an editor like the one below:



1. Use the pull-down menu, and click on a particular country to select that country.
2. Click "Ok" to close the editor. You will return to the MMR editor.

When you have finished with this screen, click on the "Socioeconomic" tab to move to the next editor.

### *Socioeconomic*



Again, if the MNPI Database was used in either of the previous screens, the default values for the Socioeconomic variables will appear in this screen.

If the values do not appear, the two socioeconomic variables, Per capita GNI and Net Primary Enrollment Rate for Females, can either be entered manually or from the MNPI Database. To enter the information manually, click in the box next to either "Per capita GNI" or "Net Primary Enrollment Rate – Females" and enter the information. To enter from the MNPI Database, click the "MNPI Database" button in the lower right hand corner. This will display an editor like the one below.



1. Use the pull-down menu to select a country.
2. Click "Ok" to close the editor. You will return to the Socioeconomic editor. This information is now entered.

#### **4. Leaving the Safe Motherhood Data Editors**

Once you have entered the necessary information,

1. Leave the Safe Motherhood editor by clicking the "Ok" button in any of the editors. When you click the "Ok" button, the program will record your changes and return to the "Safe Motherhood" dialogue box.
2. Click the "Close" button, and you will return to the main program.

#### **5. Saving the Input Data**

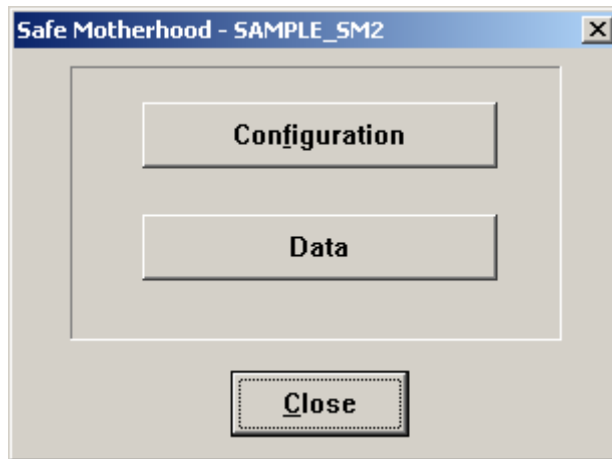
Once you have entered the projection assumptions, it is a good idea to save the data onto your hard disk. To do this, select "File" from the menu bar and "Save projection" from the pull-down menu. The data will be saved using the file name you specified above.

### **E. Making the Projection**

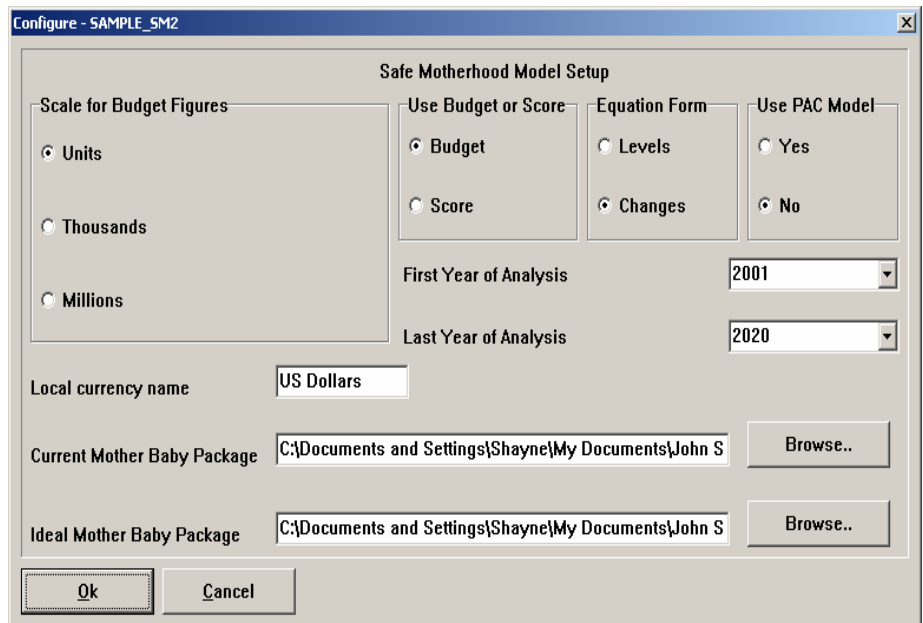
Whenever you enter data for a new projection or edit the assumptions, SMM will note that the data have been changed. The next time you try to display an indicator it will inform you that the data may have changed and ask if you want to recalculate the projections. Normally, you should answer "Yes" to this question. SMM will then make the projection. This will only take a few seconds. Once the projection is made, you will not be asked this question again, unless you return to the edit screens.

### **F. Examining the Output**

The output from the SMM is an interactive display that contains various elements. To use the interactive display you need to first decide if you want to use the "Budget" or "Score" page (see Chapter IV for a description of these outputs). To choose to view one of these two pages, you must return to the Configuration dialogue box. Click "Edit" from the menu bar and "Safe Motherhood" from the pull-down menu. A dialogue box like the one shown below will appear.



Click on the button "Configuration." A Safe Motherhood configuration dialogue box, like the one shown below, will appear.



When looking at the "Score" page, the radio button next to "Score" must be checked. You can then proceed with the analysis.

After examining the "Score" page, in order to work on the "Budget" page, you must return to this configuration dialogue box and select "Budget." Note that it will not be possible to manipulate the "Score" page while "Budget" is checked.

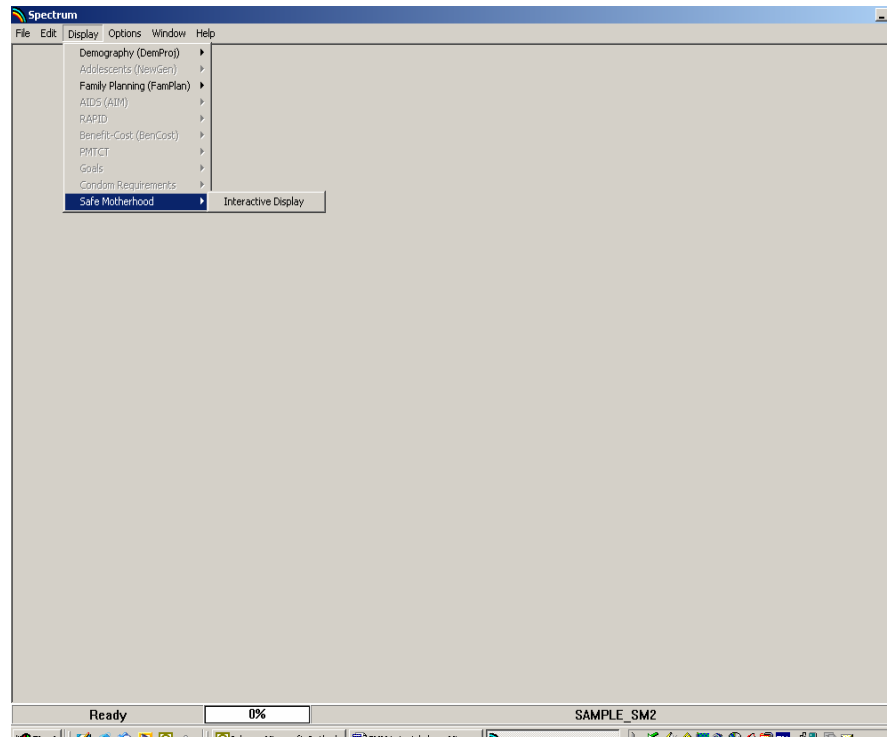
### *Score*

To work on the interactive display page using "Score":

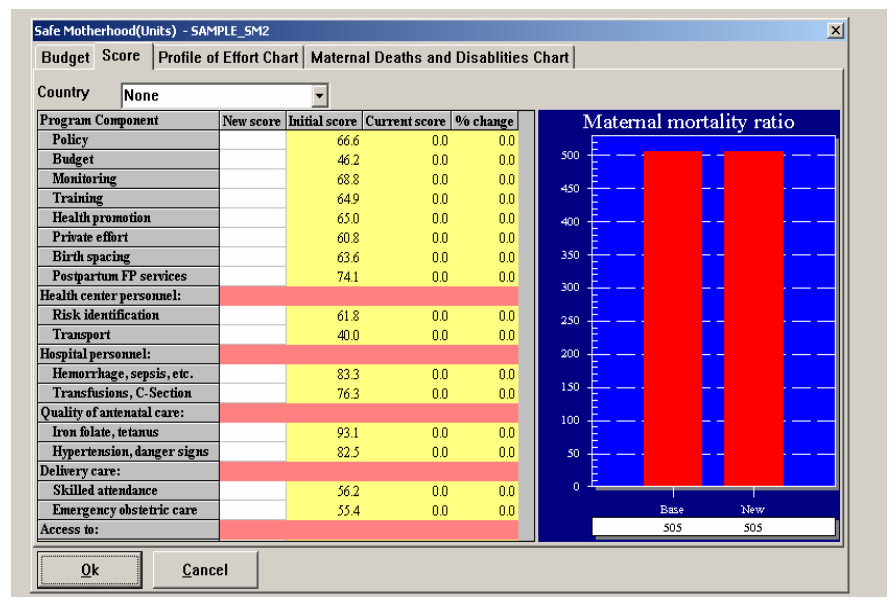
1. Select "Score" under "Use Budget or Score."

2. Click "Ok"

To see the results of the projection, select "Display" from the menu bar. From the pull-down menu, select "Safe Motherhood" and then select "Interactive Display."

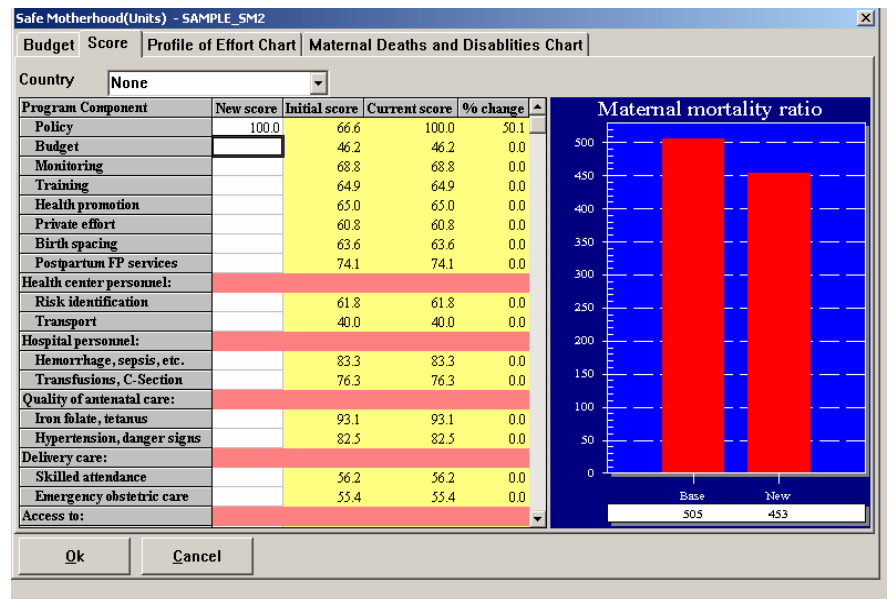


The interactive display will look something like the one below.



The first column lists the program components from the MNPI that are included in the SMM. The second column is the interactive column that you will use to change the

MNPI scores in order to see the resulting impact. The third column displays the most recent MNPI scores that are either from the MNPI database or that have been entered manually. The fourth column displays the implications for the MNPI component scores after you make changes in the “New score” column, that is, after considering the synergistic effects of the model (see Chapter VI for more details). The fifth column reflects the percentage change between the “Initial score” and “Current score” columns. For example, if the score for Policy increases from 66.6 to 100, the new values in the “Current score” and “% change” columns would look like the following:



There are a number of ways to use the interactive display to examine the impact of different scores on the MMR in your country.

To enter or change scores manually:

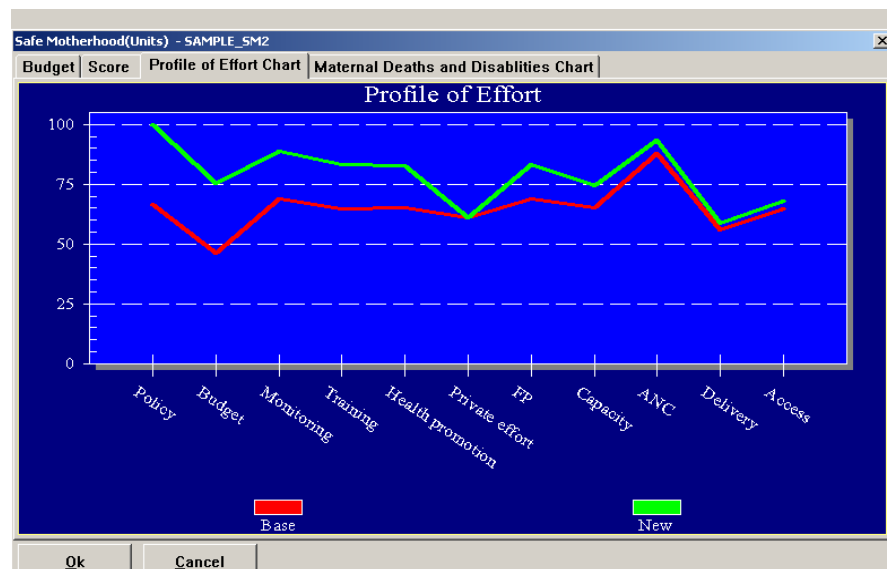
1. Click on any box in the “New Score” column.
2. Enter a score.
3. Either click the down arrow or “enter” on your keyboard. This can be done in some or all of the boxes.
4. To clear the amounts you have entered, click on the “Country” pull-down menu and chose “None.” This will clear the “New Score” column.

Another way to use the interactive display is to ask what the country's MMR would be if the scores were those of another country. To do this, select the other country using the pull-down menu next to "Country." The MNPI scores from the comparison country are then read into the "New Score" column. Note that the resulting MMR will not be the same as the MMR in the comparison country, because of the influence of the socioeconomic variables in the model.

Once you are finished entering your proposed scores you can display the results of these changes.

Displaying your Changes:

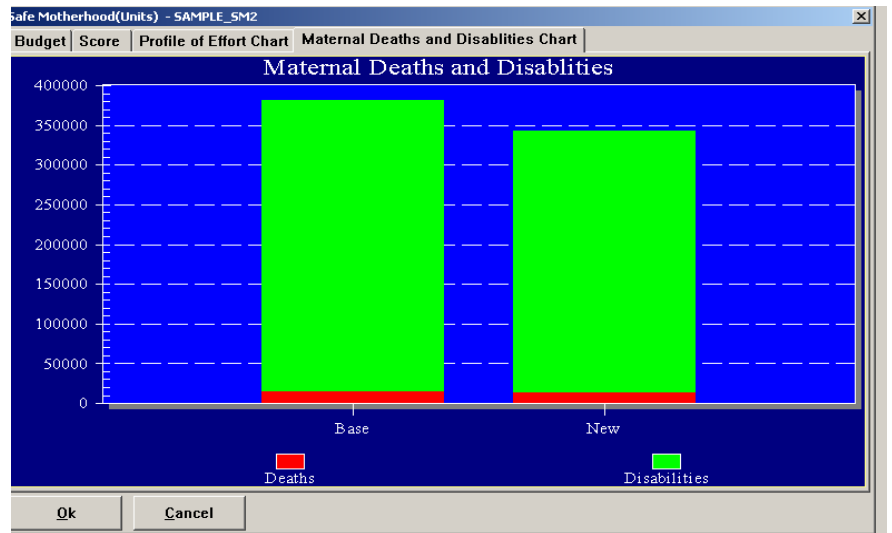
1. The "Maternal mortality ratio" graph is displayed on the interactive screen, and shows the results of changing the scores on the MMR.
2. The impact of the new scores on the individual MNPI component scores can be viewed by clicking on the "Profile of Effort Chart" tab. A graph will appear that looks something like the following:



This graph shows the differences in profile of effort for the initial scores (labeled "Base") and the current score (labeled "New"). Note that the "New" score takes into account the interactive nature of the model, that is, it displays the total impact of the change in scores, after including any synergistic effects.

3. Further results can be seen by clicking on the "Maternal Deaths and Disabilities Chart" tab. A

graph will appear that looks something like the following:

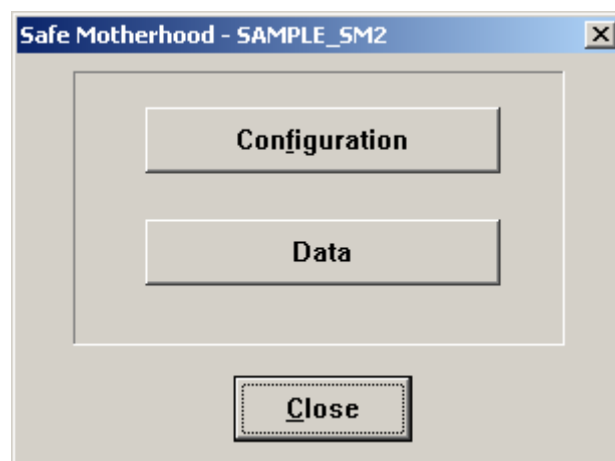


This graph shows the differences in maternal deaths and disabilities for the initial situation and the scenario you created on the score page.

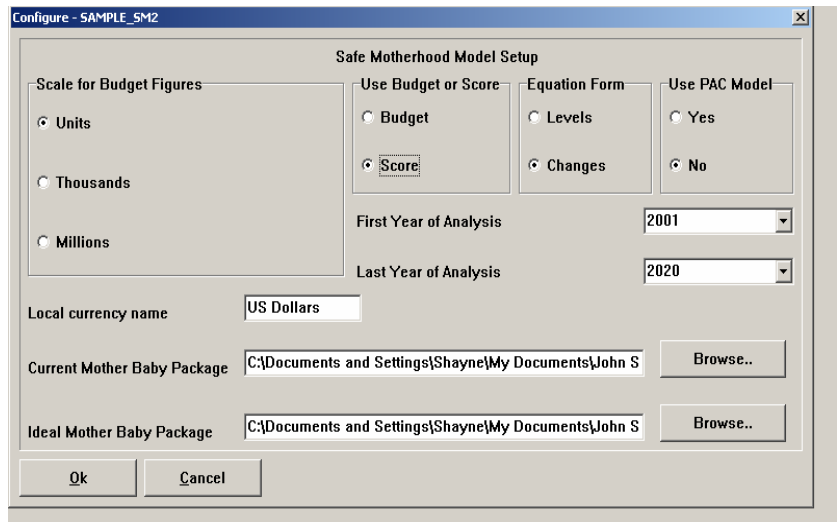
When you have finished with this screen, click "Ok" to exit.

### ***Budget***

To use the "Budget" interactive display page, you must return to the Configuration dialogue box. Click "Edit" from the menu bar and "Safe Motherhood" from the pull-down menu. A dialogue box like the one shown below will appear.

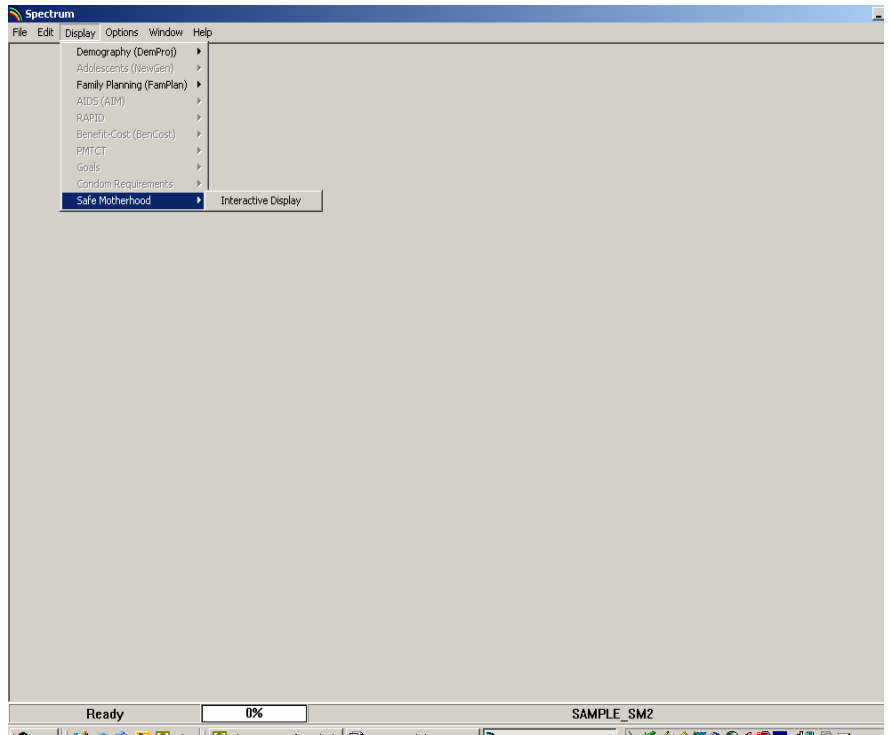


Click on the button "Configuration." A Safe Motherhood configuration dialogue box, like the one shown below, will appear.

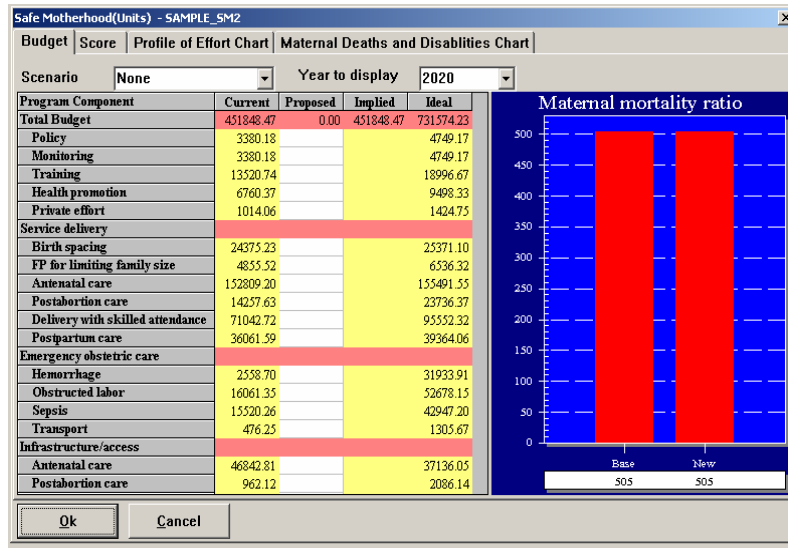


1. Select "Budget" under "Use Budget or Score."
2. Click "Ok."

To access the interactive display for the budget screen, select "Display" from the menu bar. From the pull-down menu select "Safe Motherhood" and then select "Interactive Display", as shown below.



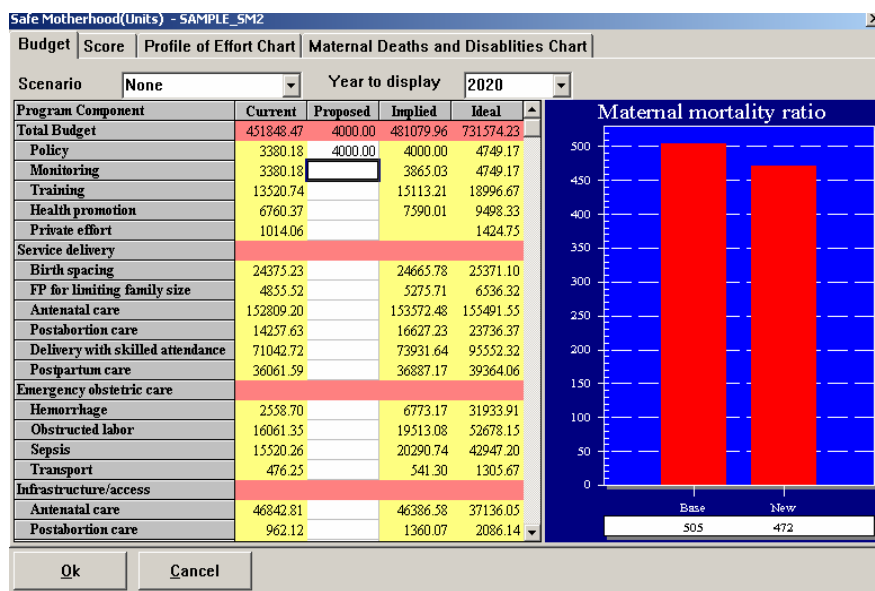
The interactive display will look something like the one below:



The first column lists the possible interventions that can be funded that are included in the SMM. The second column displays the estimated current expenditures in the initial year of the strategic plan, based on the results from the current MBP (see Chapter VI for more details). The third column is the one that you will use to change the annual budget to create different budget scenarios.

Because of the synergistic nature of the model, changes to one budget item imply changes in another budget item. For example, fully funding the Policy component increases the score for Policy, which in turn increases scores for some of the other components (see Chapter VI for more details). Thus, implementing a policy change has budgetary implications for funding other line items as well. These implications are reflected in the fourth column, labeled "Implied." This column shows the implications for the overall budget after you make the desired changes to the proposed annual budget.

For example, if the amount devoted to Policy increases from 3380.18 to 4000.00, the new values in the implied column would look like the following:



Finally, the fifth column indicates how much it would cost to fund fully an “Ideal” safe motherhood program, based on the Standard or Ideal MBP.

From this Interactive Display you can choose a scenario and year to display.

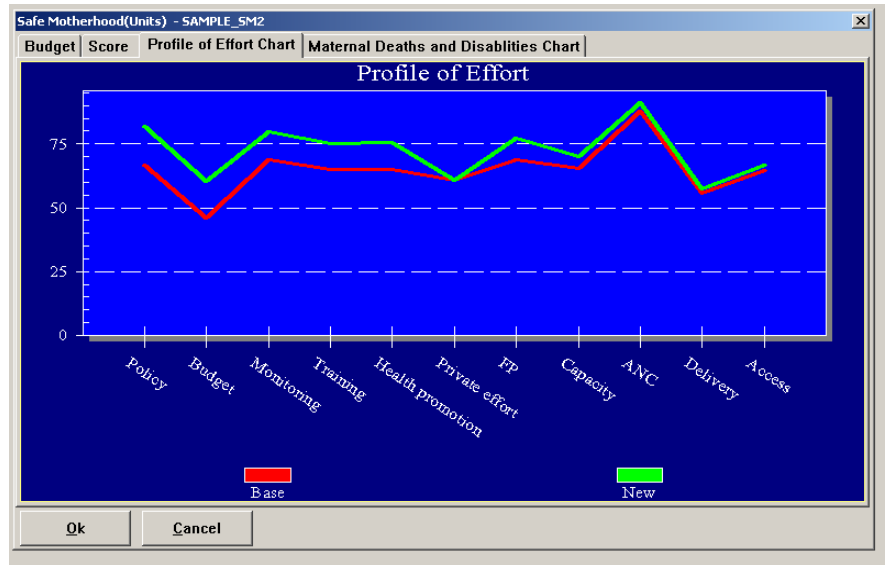
- **Scenario.** Using the pull-down menu next to “Scenario” you can select different options. Selecting the “Full cost” option will make all the proposed costs equal to the ideal costs. You can also select a country for comparison. The countries included in the list are those that have MNPI scores.
- **Year.** Using the pull-down menu next to “Year” you can select which year to display. The years listed are determined in the Configuration screen of the SMM.

You can also enter or change expenditures manually:

1. Click on any box in the “Proposed” column.
2. Enter an amount.
3. Either click the down arrow or “enter” on your keyboard. This can be done in some or all of the boxes.
4. To clear the amounts you have entered, click on the “Scenario” pull-down menu and chose “None.” This will clear the “Proposed” column.
5. Once you are finished entering your proposed expenditures you can display the results of these changes.

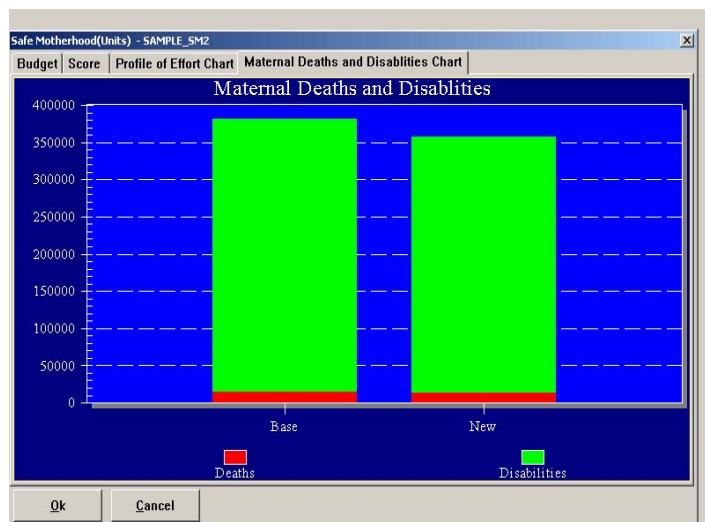
Displaying your Changes:

1. The “Maternal mortality ratio” graph is shown on the interactive display screen, and displays the results of changing the expenditure levels on the MMR.
2. Additional results can be viewed by clicking on the “Profile of Effort Chart” tab. A graph will appear that looks something like the following:



This graph shows the differences in the MNPI component scores for the current (“Base”) situation and the scenario you created on the budget page (“New”).

3. Further results can be seen by clicking on the “Maternal Deaths and Disabilities Chart” tab. A graph will appear that looks something like the following:



This graph shows the differences in maternal deaths and disabilities for the current or base situation and the scenario you created on the budget page, labeled “New.”

When you have finished with this screen, click "Ok."

## **G. Saving the Projection**

It is always a good idea to save the projection whenever you make a change to any assumptions. To save the projection without changing the name, choose "File" from the menu bar and "Save projection" from the pull-down menu.

To save the projection with a different name, chose "File" from the menu bar and "Save projection as" from the pull-down menu. You will then have a chance to specify a new file name for the projection. Normally when you save the projection with a new name you should also change the projection title. This step will avoid confusion if you have both projections loaded at the same time.

## **H. Closing a Projection**

To close a projection that has already been opened,

1. Choose "File" from the menu bar and
2. "Close projection" from the pull-down menu.

Closing a projection just removes it from the computer's active memory; it does not erase it from the hard disk. You can open the projection again at any time.

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# VI.

## Methodology

There are two stages in the methodology of the SMM. The first stage estimates the impact of changes in the MNPI component scores on the MMR, including consideration of socioeconomic variables. The second stage connects the WHO Mother-Baby Package with the SMM, by mapping the categories of the MBP to the MNPI items, and calculating the current versus the ideal expenditures required for current and ideal service delivery scenarios.

### A. Impact of MNPI scores on the MMR

The methodology and statistical tests that were followed to develop this part of the model are described in detail elsewhere.<sup>5</sup> The final results of the model are presented here.

Briefly, a series of block recursive equations are estimated, with various support functions affecting service delivery, which in turn affect access to services. The final equation predicting overall access to services then determines the MMR, along with two socioeconomic variables, per capita GNI and net female primary enrollment rate.

Support functions, such as policy and budget, are assumed to be important in the quality of the capacity of health centers and district hospitals. If the capacity is high, however, it is assumed that this will not ensure adequacy of care; instead, capacity is assumed to be an input into the quality of two types of service delivery—antenatal and delivery care. Finally, if access to facilities is limited, high quality of service delivery will have no impact on the MMR. Thus, the final step in constructing the access variable used in the final MMR equation is to assume that the service delivery variables predict access.

Two types of specifications were explored in the estimation process: a levels specification and a specification using percentage change, based on the recall data in the 1999 MNPI round.

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<sup>5</sup> Bulatao, R. 2001. “Effects of Maternal Health Services on Maternal Mortality: A Simulation Model.” Available at: [www.futuresgroup.com](http://www.futuresgroup.com).

The various functional relationships between MNPI components are listed below. The average value for each of the 24 MNPI components is shown in Appendix B, Table 1. The complete set of regression results for each relationship for the levels specification can be seen in Appendix B, Table 2, including coefficients, standard errors, level of statistical significance, and R-squared statistics for each equation. Equation set 3 is the final set of equations used in the “Levels” specification of the SMM. The regression results for the percentage change specification can be seen in Appendix B, Tables 3 and 4. The final set of equations used is set 4, with the exception of the fertility regulation-avoidance equation, which uses the equation in set 6. Note that Policy is the only MNPI component exogenous to the system.

1. Budget = f (Policy)
2. Monitoring = f (Policy, Budget)
3. Training = f (Policy, Monitoring)
4. Health promotion = f (Budget, Training)
5. Private effort = f (Policy, Training)
6. Fertility regulation, prevention = f (Budget, Health promotion)
7. Fertility regulation, avoidance = f (Budget, Private effort)
8. Health center risk identification = f (Budget, Private effort)
9. Health center treatment = f (Budget, Private effort)
10. Hospital risk identification = f (Private effort, Health center risk id)
11. Hospital treatment = f (Private effort, Health center treatment)
12. Antenatal prevention = f (Training, Fertility regulation - prevention)
13. Antenatal risk identification = f (Training, Hospital risk id)
14. Delivery risk identification = f (Private effort, Antenatal risk id)
15. Delivery treatment = f (Private effort, Hospital treatment)

16. Urban access, avoidance = f (Fertility regulation – avoidance)
17. Rural access, avoidance = f (Fertility regulation – avoidance)
18. Urban access, prevention = f (Antenatal prevention)
19. Rural access, prevention = f (Antenatal prevention)
20. Urban access, risk identification = f (Delivery risk id, Urban access – prevention)
21. Rural access, risk identification = f (Delivery risk id, Rural access – prevention)
22. Urban access, treatment = f (Delivery treatment, Urban access – risk id)
23. Rural access, treatment = f (Delivery treatment, Rural access – risk id)

The final four equations —urban/rural access for risk identification and treatment—are aggregated into one final variable, “Access to services,” which is used in the MMR equation. The equations are aggregated by first weighting the urban and rural access statistics by the appropriate urban/rural population percentage in each country, and then averaging the risk identification and treatment access statistics. Various sensitivity analyses on these weighting schemes were performed, and are described thoroughly in the working paper cited above. The final result is that the coefficient of the “Access to services” variable in the MMR equation is very robust relative to any changes in weighting structures.

The regression results on which the final MMR equation is based can be seen in Table 5 of Appendix B; in the end, the results based on the 1995 maternal mortality ratio are used in the SMM. The functional relationship is:

$$24. \text{MMR} = f(\text{GNI per capita, Net female primary enrollment ratio, Access to services})$$

## **B. Adding in the Costing Component**

Another set of questions relates to the costs of the interventions contained in the SMM. As described above, cost information from the WHO Mother-Baby Package (MBP) model can be

combined with other cost information from national strategic plans in order to answer these questions.

The MBP model estimates costs for both the current status of service delivery, and a standard, or ideal, delivery of maternal and neonatal health services in a country. The amount currently spent includes consideration of current practices, coverage rates, and unit costs, while the ideal model estimates the amount that should be spent to reach best practices, ideal coverage rates, and appropriate unit costs. Note that the model calculates direct, recurrent, and capital costs.

Once the MBP model is completed, the SMM incorporates the cost information by linking the two MBP workbooks on the Configure screen. The SMM assumes that both the current budget from the MBP model and the current MNPI score represent the current situation in a country. The ideal budget is assumed to represent full coverage of all components, and if fully implemented, each MNPI component is assumed to reach a perfect score of 100. Adding money to the current budget thus increases the MNPI score proportionately; this MNPI score increase then translates into a decrease in the MMR via the equation described in section A above. Note that even if all interventions were fully funded, with all MNPI components receiving a perfect score, the MMR would not drop to zero, due to the impact of socioeconomic context in the SMM.

For example, assume that the current expenditures on antenatal care equal US\$6 million, and the current MNPI score for antenatal care is 64. Assume further that, in an ideal world, with full coverage for an ideal protocol (including, for example, four visits of 20 minutes each, along with the provision of certain supplements such as vitamins and malarial prophylaxis), the ideal expenditure would be US\$11 million. This ideal expenditure would result in a score of 100 for the MNPI antenatal component, which would in turn translate into a reduction in the MMR, via equation (24) above.

If, however, the ideal expenditure cannot be fully funded, then the score does not increase to 100, but instead increases only proportionately. Continuing with the example in the above paragraph, if only US\$8.5 million is available for antenatal care, or half of the increase that is needed, then the score for antenatal care will only increase by half the distance to 100—that is, from 64 to 82 (i.e.,  $64 + (100-64)/2$ ).

## C. Mapping the Budget Items to the MNPI Components

In order to translate changes in the budget to changes in the MNPI component scores, increases in various budget line items are used to calculate increases in component scores. Sometimes the budget line item increases are used for more than one component; the implicit assumption is that the impact of increases in budget expenditures for the particular line item is distributed equally among the MNPI components.

The budget line items are mapped to the MNPI components in the following way, using the format "*MNPI Components*: Budget line item":

*Policy*: Policy budget line item

*Budget*: Based on the relationship between the total proposed annual budget and the ideal annual budget

*Monitoring*: Monitoring budget line item

*Training*: Training budget line item

*Health promotion*: Health promotion budget line item

*Private effort*: Private effort budget line item

*Birth spacing services*: Birth spacing budget line item

*Postpartum FP services*: Sum of birth spacing and FP for limiting family size budget line items

*Health center personnel / Risk identification*: Delivery with skilled attendance budget line item

*Health center personnel / Transport*: Emergency obstetric care / Transport budget line item

*Hospital personnel / Hemorrhage, sepsis, etc.*: Sum of Emergency obstetric care / Hemorrhage and Emergency obstetric care / Sepsis budget line items

*Hospital personnel / Transfusions, C-section*: Sum of Emergency obstetric care / Hemorrhage and Emergency obstetric care / Obstructed labor budget line items

*Quality of antenatal care / Iron folate, tetanus*: Antenatal care budget line item

***Quality of antenatal care / Hypertension, danger signs:***

Antenatal care budget line item

***Delivery care / Skilled attendance:*** Sum of Delivery with skilled attendance and Postpartum care budget line items

***Delivery care / Emergency obstetric care:*** Sum of all Emergency obstetric care budget line items, including Hemorrhage, Obstructed labor, Sepsis, and Transport

***Access to Postpartum FP (urban/rural):*** Infrastructure/access to postpartum care budget line item

***Access to Antenatal care (urban/rural):*** Infrastructure/access to antenatal care budget line item

***Access to Trained attendance (urban/rural):***

Infrastructure/access to Infrastructure/access to delivery with skilled attendance budget line item

***Access to Delivery treatment (urban/rural):***

Infrastructure/access to emergency obstetric care line item

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## VII. References

Bulatao, R. 2001. "Effects of Maternal Health Services on Maternal Mortality: A Simulation Model." Available at: [www.futuresgroup.com](http://www.futuresgroup.com).

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Stover, J. 2005. *DemProj: A Demographic Projection Model for Development Planning*. Glastonbury, CT: The Futures Group. Available at <http://www.FuturesGroup.com>.

Stover, J., L. Heaton, and J. Ross. 2005. *FamPlan: A Computer Program for Projecting Family Planning Requirements*. Glastonbury, CT: The Futures Group. Available at <http://www.FuturesGroup.com>.

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## VIII. Glossary of Terms

Some of the following terms were obtained from the Population Reference Bureau's *Population Handbook* (1989); others were adapted from the International Union for Scientific Study of Population's (IUSSP's) *Multilingual Demographic Dictionary* (Van de Walle and Henry, 1982); while still others are definitions employed by the Demographic and Health Surveys program executed by Macro International. These terms are defined in the context of their use within Spectrum.

**Abortions.** The number of induced abortions occurring during the year.

**Acceptors.** The number of new users of a particular method in a particular year. A woman is classified as an acceptor if she starts using a method during the year and was not using that method at the start of the year. Previously she may have been using nothing or she may have been using a different method.

**Age-specific fertility rate (ASFR).** The number of births in a year for a population of a given age and sex to the mid-year population of that same sex and age group.

**Aggregation.** A group of elements to be considered as a whole, such as women of reproductive age.

**Annual growth rate (GR).** The rate at which the population is increasing or decreasing in a given year due to natural increase and net migration, expressed as a percentage of the base population.

**Appropriate method mix.** The distribution of contraceptive methods that correspond to the individual fertility intentions and personal characteristics of a population of women.

**Births.** The number of live births occurring during a year.

**Cohort.** A group of persons who experience certain events within a specified period of time, such as those who are born or who are married in the same year.

**Commodities.** The amount of supplies required for different methods to provide a specified level of family planning services. Commodities are expressed in terms of numbers of condoms, sterilization kits, injectable vials, IUDs, Norplant implants, pill cycles and vaginal tablets.

**Contraceptive prevalence rate.** The percentage of women<sup>6</sup> of reproductive age using some form of contraception. Most commonly, prevalence is given for women in unions.

**Cost per user.** The public sector cost of providing family planning, per family planning user.

**Couple-year of protection.** The number of units of a contraceptive needed to provide protection from pregnancy for one couple for an entire year. For example, 13 units of oral contraceptives are needed to provide one couple with a full year of protection.

**Desired fertility rate.**<sup>7</sup> The desired fertility rate is an indicator similar to the total fertility rate. It indicates the average number of children that a woman would have *if her expressed fertility desires were achieved*.

**Dialogue box.** A box (shown on the computer screen) permitting users to choose among a limited number of options. The box is accompanied by text elaborating on those options.

**Disaggregation.** A group of elements broken down into subsets, such as a population broken down into single-age categories (ages 1, 2, 3, etc.).

**Effectiveness.** Effectiveness is the extent by which a contraceptive method lowers the chances to become pregnant in a given month. This measure depends both on the ability of women to conceive and on the method's failure rate.

**Fecundity.** The calculated total fecundity rate. Total fecundity is the average number of children that would be born to women if none of the proximate determinants was acting to reduce fertility from its biological maximum. In the model, fecundity is calculated for the base year only. It remains constant in all other years.

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<sup>6</sup> Although some methods are male-specific (i.e., condoms and vasectomy), it is conventional to refer to contraceptive users as women or couples because fertility is generally female-specific rather than male-specific.

<sup>7</sup> The terms "wanted fertility" and "desired fertility" are used interchangeably in this manual. The model uses the term "desired fertility," but users may be more familiar with the "wanted" terminology.

**Gross cost.** The total public sector cost of providing family planning services.

**Growth rates.** The increment in total number of contraceptive users from year to year. These are net figures, consisting of new users and the continuing users who remain after previous users either have discontinued or have “aged out.”

**Infant mortality rate (IMR).** The number of deaths to infants under one year of age per 1,000 live births.

**Interpolation.** Given two numbers that serve as boundary points, the estimation of values that lie at intervals between the two points. For example, if the total fertility rate for a country or region was actually measured only in 1980 and in 1995, by assigning a relationship between the values from year to year, it is possible to estimate a TFR for each intervening year. (Spectrum uses a linear form of interpolation so that the difference between each annual value is the same. Other nonlinear forms of interpolation also are possible, but are not used in Spectrum.)

**Life expectancy (e(0)).** The average number of years a newborn can expect to live based on the mortality conditions at the time.

**Maternal deaths.** The number of women who die from any cause related to or aggravated by pregnancy or its management during pregnancy and childbirth, or who die within 42 days of termination of pregnancy.

**Maternal Mortality Rate (MMR).** The number of maternal deaths per 100,000 live births.

**MWRA.** The number of women of reproductive age who are married or in union.

**Method mix.** The distribution of contraceptive users by contraceptive method.

**Mistimed pregnancy.** Pregnancies that were wanted to occur, but at a time other than the time of their conception.

**Model.** Computer system designed to demonstrate the probable effect of two or more variables that might be brought to bear on an outcome. Such models can reduce the effort required to manipulate these factors and present the results in an accessible format.

**Module.** Synonym for “model.”

**Net cost.** The net public sector cost of family planning services. This figure is equal to gross cost minus revenue collected.

**Normalization.** The transformation of a series of data points into a percent distribution summing to 100 percent.

**Pop-up menu.** A menu (shown on the computer screen) from which users can select items or actions. Pop-up menus can appear anywhere on the screen.

**Postpartum insusceptibility.** The period after a birth during which a woman is not exposed to the risk of pregnancy either because of postpartum amenorrhea or because of postpartum abstinence.

**Pregnancies.** The number of pregnancies occurring during a year. Pregnancies can be wanted, wanted later, or not wanted.

**Proximate determinants.** Variables that directly impinge on fertility outcomes; these variables include the proportion of women in sexual union, the duration of the period of inability to conceive following a birth, the level and quality of contraceptive practice and, to a lesser degree, the underlying capability to conceive, the level of induced abortion, and the prevalence of pathological sterility.

**Pull-down menu.** A menu (shown on the computer screen) opened by clicking on key words at the top edge of the screen. Pull-down menus allow users to select operations.

**Radio button.** These buttons (shown on the computer screen) emulate raised buttons on early radios, which were punched to select radio stations. The graphically portrayed raised “radio buttons” on interfaces permit users to select among at least three alternatives.

**Revenue.** The total amount of revenue collected from fees for family planning services.

**Total abortion rate.** The average number of induced abortions a woman would have if she survived to age 49 and had abortions at the prevailing age-specific rates. Thus, in concept, it is similar to the total fertility rate.

**Total fertility rate.** The average number of children that would be born alive to a woman (or a group of women) during her lifetime if she were to pass through all her childbearing years conforming to the age-specific fertility rates of a given year.

**Under five mortality rate (U5MR).** The number of deaths to children under the age of five per 1,000 live births.

**Unmet need.** Refers to couples who presumably should be using contraception based on their fertility desires and susceptibility to a pregnancy, but are not using contraception.

**Unwanted pregnancy.** Either a pregnancy that occurs due to method failure, or simply one that occurs to a woman who did not want to become pregnant at the time she conceived.

**Users.** The number of women who are using some form of contraception.

**Wanted pregnancies.** Calculated as the total pregnancies that were wanted at the time of conception or were wanted to occur at a later time.

**Wanted total fertility rate.** An indicator similar to the total fertility rate. The wanted total fertility rate is calculated as the level of fertility that would have prevailed during the past few years if all unwanted births had been prevented. (See also desired fertility rate.)

**WRA.** The number of women of reproductive age, 15-49.

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# IX.

## Abbreviations

AIM	AIDS Impact Model
ASFR	age-specific fertility rates
CPR	contraceptive prevalence rate
CR	Condom Requirements (model)
C-section	Cesarean section
GNI	gross national income
U5MR	under-five mortality rate
IUD	intrauterine device
IMR	infant mortality rate
MBP	Mother-Baby Package
MMR	maternal mortality ration
MNPI	Maternal and Neonatal Program Effort Index
MVA	manual vacuum aspiration
PAC	postabortion care
PMTCT	prevention of mother-to-child transmission
RAPID	Resources for the Awareness of Population Impacts on Development
SMM	Safe Motherhood Model
USAID	U.S. Agency for International Development
WHO	World Health Organization
WRA	women of reproductive age

# X.

## Appendix A

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### QUESTIONNAIRE

#### Maternal and Neonatal Program Effort Index (MNPI)

COUNTRY: \_\_\_\_\_

RESPONDENT NAME: \_\_\_\_\_

POSITION: \_\_\_\_\_

ORGANIZATION: \_\_\_MOH \_\_\_NGO \_\_\_UN Agency \_\_\_Other Donor \_\_\_Other ( )

DATE:

NUMBER OF YEARS RESPONDENT WORKED:

	In Maternal Health	In Neonatal Health
At national level.....	_____(years)	_____(years)
At provincial level.....	_____	_____
At district level.....	_____	_____
At community level.....	_____	_____

THANK YOU FOR YOUR ASSISTANCE WITH THIS RESEARCH

## Questionnaire

### Maternal and Neonatal Program Effort Index (MNPI)

This questionnaire measures maternal and neonatal program effort, which is the effort that programs have put into the reduction of maternal mortality/morbidity and related neonatal conditions. It concerns strength of effort for program inputs, not measures of outputs like maternal mortality rates or cases served. To keep the questionnaire short, only selected, representative functions are listed here.

There are three parts to the questionnaire:

- I. Facility Capacities and Access by the Whole Population
- II. Maternal and Neonatal Health Services
- III. General Supporting Functions: Policies, Resources, IEC, Training, and Monitoring and Research.

### Explanation of Terms for the MNPI

Several types of facilities are mentioned repeatedly in this questionnaire. Country situations differ, but here is generally what is meant by each facility type.

Central Hospital	Provides all levels of obstetric care.
District Hospital	Provides all levels of obstetric care, with skilled staff including some doctors who can perform Cesarean sections. Beds, anesthesia, sterile equipment, and supplies of drugs should be available.
Health Center	Provides all essential and most emergency obstetric care. Midwives and nurses provide most of the care. Beds, anesthesia, sterile equipment and supplies of drugs should be available.
Health Post	Provides some essential obstetric care and limited emergency care. Staffed by midwives or other birth attendants. Sterile equipment and some drug supplies should be available.
Home	Births may be attended by a traditional birth attendant or a skilled health worker who carries some drug supplies for limited management of emergency cases. Referrals may be made to a higher level within the health system.

## INSTRUCTIONS:

**Rate most items below between 0 and 5.** Zero means the item is absent or extremely weak, and five means it is optimal.

You can also think of each item as true or false – if it is fully true it receives a score of 5; if it is entirely false it receives a score of zero. Intermediate situations receive scores between zero and five. A few items ask for a percentage estimate.

The numbers between 0 and 5 indicate partial effort. (For example, a score of 2 on the first item below would mean that some progress has been made for health center treatment of hemorrhage cases but that the situation is still far from satisfactory.)

**Just circle the number you choose for each item.**

### **I. FACILITY CAPACITIES AND ACCESS BY THE WHOLE POPULATION**

**NOTE: “Health Center” refers to the first level of care (sometimes a satellite clinic)  
“District Hospital” refers to a higher level, with greater clinical capacity.**

#### **All health centers have skilled staff, in place, who can provide obstetric care:**

1. Manage postpartum hemorrhage cases <i>Present effort</i>	0	1	2	3	4	5
2. Administer antibiotics intravenously <i>Present effort</i>	0	1	2	3	4	5
3. Perform manual removal of retained placenta <i>Present effort</i>	0	1	2	3	4	5
4. Perform vacuum aspiration of the uterus, using MVA (manual vacuum aspiration) or an electric suction device <i>Present effort</i>	0	1	2	3	4	5
5. Use a partograph to determine when to refer <i>Present effort</i>	0	1	2	3	4	5
6. Have transportation arrangements to quickly move a woman with obstructed labor to a district hospital <i>Present effort</i>	0	1	2	3	4	5
7. Have adequate antibiotic supplies on hand (sufficient supplies of the correct types) <i>Present effort</i>	0	1	2	3	4	5

**All First Referral Facilities- District Hospitals- have skilled staff, in place, who can:**

1. Provide all functions listed above for Health Centers <i>Present effort</i>	0	1	2	3	4	5
2. Perform blood transfusions (and have adequate supplies of safe blood on hand) <i>Present effort</i>	0	1	2	3	4	5
3. Perform Cesarean section or other operative delivery (e.g. forceps delivery or craniotomy) <i>Present effort</i>	0	1	2	3	4	5

**Access to Services by Pregnant Women**

**Many women do not have access to a skilled professional attendant, a health center with beds, or a district health center—and even if they do, the nearest attendant or facility may not have staff or equipment, or the service may be too expensive. So this section pertains to the percentage of pregnant women with adequate access to each service. (Enter percentage in each cell.)**

**What percentage of pregnant women have**

**adequate access to:**

**RURAL    URBAN**

1. Treatment for postpartum hemorrhage during or soon after delivery?		
2. Management of obstructed labor?		
3. Treatment of abortion complications?		
4. Provision of safe abortion services, or menstrual regulation?		
5. Antenatal care during pregnancy?		
6. Delivery care by a skilled professional attendant?		
7. Postpartum family planning services?		
8. District hospitals that are open 24 hours/day?		

## II. MATERNAL AND NEONATAL HEALTH SERVICES

Please indicate the degree to which each statement is true or false, using “0” to indicate “completely false,” and 5 to indicate “completely true,” and the numbers between to indicate partially true or false. (For example, a score of 2 on the first item below would mean that some progress has been made systematically checking for anemia but that the situation is still far from satisfactory.)

### At antenatal visits, all pregnant women:

1. Receive iron folate tablets for anemia <i>Present effort</i>	0	1	2	3	4	5
2. Are both examined for hypertension, and treated as needed <i>Present effort</i>	0	1	2	3	4	5
3. Are both examined for syphilis, and treated as needed <i>Present effort</i>	0	1	2	3	4	5
4. Receive needed tetanus injection(s) <i>Present effort</i>	0	1	2	3	4	5
5. Are informed about danger signs of obstetric and newborn complications and are assisted in planning for any emergency <i>Present effort</i>	0	1	2	3	4	5
6. Are offered voluntary counseling and testing for HIV <i>Present effort</i>	0	1	2	3	4	5
7. Receive a urine test for asymptomatic bacteriuria and are treated as needed. <i>Present effort</i>	0	1	2	3	4	5
8. Receive full IPT (Intermittent Preventive Treatment) for malaria <i>Present effort</i>	0	1	2	3	4	5
9. Are protected by ITN (Insecticide-Treated Nets) <i>Present effort</i>	0	1	2	3	4	5
10. Are examined for malaria and treated as needed. <i>Present effort</i>	0	1	2	3	4	5

## DELIVERY AND NEONATAL CARE

Please indicate the degree to which each statement is true or false, using “0” to indicate “completely false,” and 5 to indicate “completely true,” and the numbers between to indicate partially true or false. (For example, a score of 2 on the first item below would mean that some progress has been made for all deliveries but that the situation is still far from satisfactory.)

Note: These items refer to all deliveries throughout the country, not just those seen in facilities.

### At delivery, all women:

1. Are attended by a professionally skilled attendant (either at home or in a facility) <i>Present effort</i>	0	1	2	3	4	5
2. Have their labor monitored <i>Present effort</i>	0	1	2	3	4	5
3. Are checked for signs of hypertension, anemia, or infection <i>Present effort</i>	0	1	2	3	4	5
4. Are able to receive emergency obstetric care as needed <i>Present effort</i>	0	1	2	3	4	5
5. Are provided an appointment for a check-up within 48 hours of delivery <i>Present effort</i>	0	1	2	3	4	5
6. Are encouraged to immediately start breastfeeding the newborn (within one hour of birth) <i>Present effort</i>	0	1	2	3	4	5
7. Are counseled on umbilical cord care <i>Present effort</i>	0	1	2	3	4	5

### For newborn care, all infants whether delivered at home or in a facility:

1. Have their mouth and nasal passageways cleared <i>Present effort</i>	0	1	2	3	4	5
2. Are dried and kept warm immediately after birth <i>Present effort</i>	0	1	2	3	4	5
3. Are placed in skin-to-skin contact with their mother <i>Present effort</i>	0	1	2	3	4	5
4. Receive prophylactic treatment for their eyes. <i>Present effort</i>	0	1	2	3	4	5
5. Have their umbilical cord cut with a clean blade <i>Present effort</i>	0	1	2	3	4	5
6. Receive BCG immunization <i>Present effort</i>	0	1	2	3	4	5

7. Receive a DPT injection at 3 months <i>Present effort</i>	0	1	2	3	4	5
8. Are scheduled for subsequent immunizations <i>Present effort</i>	0	1	2	3	4	5
9. Also, there is community-based pneumonia case management for infants. <i>Present effort</i>	0	1	2	3	4	5

### **For Provision of Family Planning**

All health centers:

1. Routinely offer family planning after abortion cases <i>Present effort</i>	0	1	2	3	4	5
2. Routinely offer family planning at postpartum visits <i>Present effort</i>	0	1	2	3	4	5
3. Have contraceptive pill supplies regularly in stock <i>Present effort</i>	0	1	2	3	4	5
4. Have progestin-only pill supplies for breast-feeding women <i>Present effort</i>	0	1	2	3	4	5
5. Have skilled staff, in place, who can insert intra-uterine devices <i>Present effort</i>	0	1	2	3	4	5

### **For Provision of Family Planning**

**All first referral facilities- district hospitals:**

1. Routinely offer family planning after abortion cases <i>Present effort</i>	0	1	2	3	4	5
2. Routinely offer family planning at postpartum visits <i>Present effort</i>	0	1	2	3	4	5
3. Have contraceptive pill supplies regularly in stock <i>Present effort</i>	0	1	2	3	4	5
4. Have skilled staff, in place, who can insert intra-uterine devices <i>Present effort</i>	0	1	2	3	4	5
5. Can offer sterilization to female clients <i>Present effort</i>	0	1	2	3	4	5
6. Can offer sterilization to male clients <i>Present effort</i>	0	1	2	3	4	5





## MONITORING, EVALUATION, RESEARCH

<p>1. A routine statistical system (using facility-based information) provides good periodic information on supplies, personnel, deliveries, Cesarean sections, and cases of complications</p> <p style="padding-left: 20px;"><i>Present effort</i></p>	0	1	2	3	4	5
<p>2. Staff at the national level regularly monitor and analyze results from the routine statistics (above)</p> <p style="padding-left: 20px;"><i>Present effort</i></p>	0	1	2	3	4	5
<p>3. Recent surveys provide data on maternal events (pregnancies, deliveries, attendants and sites for deliveries, estimates of maternal deaths, etc.)</p> <p style="padding-left: 20px;"><i>Present effort</i></p>	0	1	2	3	4	5
<p>4. An updated listing exists of facilities that can treat obstetric emergencies</p> <p style="padding-left: 20px;"><i>Present effort</i></p>	0	1	2	3	4	5
<p>5. Ministry administrators systematically use statistical information for decisions and reconsideration of strategies for reducing maternal mortality</p> <p style="padding-left: 20px;"><i>Present effort</i></p>	0	1	2	3	4	5
<p>6. Each hospital follows a regular procedure to review and learn from every case of a maternal death in the facility</p> <p style="padding-left: 20px;"><i>Present effort</i></p>	0	1	2	3	4	5

# XI.

## Appendix B

**Table 1: Average of MNPI  
Components for 52 Countries**

	<b>1999 Average</b>
Policy	62.7
Budget	48.2
Monitoring	56.7
Training	53.5
Health promotion	49.3
Private effort	53.4
FP - prevention	65.6
FP - avoidance	55.0
Health center - risk identification	48.6
Health center - treatment	44.8
Hospital - risk identification	67.5
Hospital - treatment	58.7
Antenatal - prevention	72.5
Antenatal - risk identification	65.7
Delivery - risk identification	53.4
Delivery - treatment	56.6
Urban access - avoidance	54.0
Rural access - avoidance	30.3
Urban access - prevention	79.9
Rural access - prevention	57.2
Urban access - risk identification	75.9
Rural access - risk identification	45.2
Urban access - treatment	68.8
Rural access - treatment	34.5
Access - avoidance	40.0
Access - prevention	66.0
Access - risk identification	57.3
Access - treatment	48.0

Table 2. Regressions for support function and service indices (equation sets 1 and 3)

	Equation set 1			Equation set 3 <sup>a</sup>		
	B	t	p<	B	t	p<
<i>Budget</i>						
Policy	0.0258	5.51	0.000			
Constant	-1.6767	-5.70	0.000			
R <sup>2</sup> (n)	0.39	49				
<i>Monitoring</i>						
Policy	0.0223	3.52	0.001			
Budget	0.0136	2.11	0.040			
Constant	-1.7955	-5.71	0.000			
R <sup>2</sup> (n)	0.49	48				
<i>Training</i>						
Budget	0.0046	0.86	0.395			
Monitoring	0.0308	6.46	0.000	0.0333	8.75	0.000
Constant	-1.8141	-7.65	0.000	-1.7314	-8.02	0.000
R <sup>2</sup> (n)	0.63	48		0.62	48	
<i>Health promotion</i>						
Policy	0.0115	1.85	0.071			
Budget	0.0188	3.15	0.003			
Monitoring	0.0105	1.90	0.065			
Constant	-2.2857	-8.17	0.000			
R <sup>2</sup> (n)	0.61	48				
<i>Fertility regulation, prevention</i>						
Policy	0.0183	1.64	0.109	0.0277	3.77	0.001
Budget	0.0078	0.74	0.465			
Monitoring	0.0037	0.27	0.788			
Training	0.0040	0.35	0.729			
Constant	-1.2492	-2.48	0.017	-1.0346	-2.24	0.030
R <sup>2</sup> (n)	0.27	48		0.24	48	
<i>Fertility regulation, avoidance</i>						
Policy	0.0006	0.06	0.953			
Budget	0.0152	1.72	0.094	0.0162	2.07	0.045
Monitoring	0.0100	0.87	0.389	0.0152	2.16	0.036
Training	0.0068	0.69	0.492			
Constant	-1.4879	-3.50	0.001	-1.4278	-4.08	0.000
R <sup>2</sup> (n)	0.34	48		0.33	48	
<i>Health center risk identification</i>						
Budget	0.0082	1.15	0.258			
Training	0.0130	2.02	0.050	0.0170	3.10	0.003
Constant	-1.2086	-3.57	0.001	-1.0217	-3.44	0.001
R <sup>2</sup> (n)	0.20	48		0.17	48	

**Table 2. Regressions for support function and service indices (equation sets 1 and 3)**

	Equation set 1			Equation set 3 <sup>a</sup>		
	B	t	p<	B	t	p<
<i>Health center treatment</i>						
Budget	0.0180	2.07	0.044			
Training	0.0275	3.54	0.001			
Constant	-2.5982	-6.38	0.000			
R <sup>2</sup> (n)	0.43	48				
<i>Hospital risk identification</i>						
Budget	0.0091	1.35	0.185			
Training	0.0166	2.74	0.009	0.0209	4.07	0.000
Constant	-0.5855	-1.85	0.071	-0.3799	-1.36	0.180
R <sup>2</sup> (n)	0.29	48		0.26	48	
<i>Hospital treatment</i>						
Budget	0.0095	1.14	0.259			
Training	0.0168	2.24	0.030	0.0213	3.37	0.002
Constant	-1.0003	-2.56	0.014	-0.7844	-2.28	0.027
R <sup>2</sup> (n)	0.22	48		0.20	48	
<i>Antenatal prevention</i>						
Training	0.0026	0.34	0.735			
PRJ	0.0242	2.97	0.005	0.0252	3.36	0.002
Fertility regulation, prevention	0.0143	2.18	0.035	0.0151	2.51	0.016
Constant	-1.3280	-2.33	0.025	-1.2982	-2.33	0.025
R <sup>2</sup> (n)	0.29	48		0.29	48	
<i>Antenatal risk identification</i>						
Training	0.0122	2.69	0.010	0.0126	2.84	0.007
Private effort	0.0020	0.41	0.687			
Health center risk identification	0.0021	0.35	0.726	0.0018	0.30	0.763
Hospital risk identification	0.0159	2.41	0.021	0.0163	2.52	0.016
Antenatal prevention	0.0095	1.91	0.064	0.0102	2.20	0.033
Constant	-1.9506	-5.53	0.000	-1.9211	-5.62	0.000
R <sup>2</sup> (n)	0.61	48		0.61	48	
<i>Delivery risk identification</i>						
Training	0.0165	3.99	0.000			
Private effort	0.0069	1.71	0.094			
Antenatal risk identification	0.0236	4.83	0.000			
Constant	-2.6731	-10.04	0.000			
R <sup>2</sup> (n)	0.75	48				

Table 2. Regressions for support function and service indices (equation sets 1 and 3)

	Equation set 1			Equation set 3 <sup>a</sup>		
	B	t	p<	B	t	p<
<i>Delivery treatment</i>						
Training	0.0032	0.79	0.433			
Health promotion	0.0023	0.68	0.500	0.0033	1.06	0.294
Private effort	0.0104	3.15	0.003	0.0101	3.08	0.004
Health center treatment	0.0050	1.84	0.072	0.0054	2.04	0.048
Hospital treatment	0.0031	1.06	0.294	0.0030	1.01	0.316
Delivery risk identification	0.0251	6.06	0.000	0.0269	7.78	0.000
Constant	-2.3208	-12.58	0.000	-2.2848	-12.84	0.000
R <sup>2</sup> (n)	0.88	48		0.88	48	
<i>Urban access, avoidance</i>						
Budget	0.0031	0.25	0.807			
Training	0.0206	1.85	0.072			
Fertility regulation, avoidance	0.0331	3.24	0.002	0.0441	5.15	0.000
Constant	-2.8564	-4.85	0.000	-2.2212	-4.66	0.000
R <sup>2</sup> (n)	0.42	48		0.36	48	
<i>Rural access, avoidance</i>						
Budget	0.0176	1.65	0.106			
Training	0.0175	1.85	0.070			
Fertility regulation, avoidance	0.0387	4.51	0.000	0.0540	7.11	0.000
Constant	-4.9434	-9.96	0.000	-3.9966	-9.45	0.000
R <sup>2</sup> (n)	0.61	48		0.52	48	
<i>Urban access, prevention</i>						
Budget	0.0066	0.65	0.521			
Training	0.0329	3.61	0.001			
Antenatal prevention				0.0057	0.59	0.556
Constant	-0.5422	-1.14	0.262	1.1196	1.61	0.114
R <sup>2</sup> (n)	0.33	48		0.01	48	
<i>Rural access, prevention</i>						
Budget	0.0116	1.06	0.294			
Training	0.0249	2.54	0.015			
Antenatal prevention	0.0175	1.92	0.061	0.0289	3.07	0.004
Constant	-2.8785	-4.25	0.000	-1.8073	-2.63	0.012
R <sup>2</sup> (n)	0.37	48		0.17	48	
<i>Urban access, risk identification</i>						
Delivery risk identification	0.0333	3.31	0.002			
Urban access, prevention	0.0384	3.54	0.001			
Constant	-3.4987	-5.58	0.000			
R <sup>2</sup> (n)	0.63	49				

**Table 2. Regressions for support function and service indices (equation sets 1 and 3)**

	Equation set 1			Equation set 3 <sup>a</sup>		
	B	t	p<	B	t	p<
<i>Rural access, risk identification</i>						
Delivery risk identification	0.0315	5.50	0.000			
Rural access, prevention	0.0285	7.45	0.000			
Constant	-3.5466	-14.29	0.000			
R <sup>2</sup> (n)	0.82	49				
<i>Urban access, treatment</i>						
Budget	0.0053	0.60	0.550			
Training						
Delivery treatment	0.0100	1.00	0.324	0.0125	1.35	0.184
Urban access, risk identification	0.0447	5.86	0.000	0.0448	5.86	0.000
Constant	-3.2604	-6.95	0.000	-3.1626	-7.34	0.000
R <sup>2</sup> (n)	0.68	48		0.68	48	
<i>Rural access, treatment</i>						
Budget	0.0096	1.60	0.118			
Training	0.0079	1.15	0.257			
Delivery treatment	0.0051	0.69	0.491	0.0129	2.17	0.035
Rural access, risk identification	0.0344	8.85	0.000	0.0365	9.43	0.000
Constant	-3.4824	-11.84	0.000	-3.1238	-12.29	0.000
R <sup>2</sup> (n)	0.85	48		0.83	48	

<sup>a</sup> Equations not shown are identical to those in equation set 1. Equation set 2 is identical to equation set 3 except for some equations for access.

Table 3. Regressions for change in indices, from change in other indices (equation set 4)

	B	t	p<		B	t	p<
<i>Budget adequacy</i>							
Policy	0.0379	19.66	0.000				
R <sup>2</sup>	0.89						
<i>Monitoring</i>							
Policy	0.0278	5.94	0.000				
Budget	0.0117	2.33	0.025				
R <sup>2</sup>	0.92						
<i>Health promotion</i>							
Budget	0.0114	2.40	0.021				
Training	0.0344	6.54	0.000				
R <sup>2</sup>	0.94						
<i>Fertility regulation, prevention</i>							
Budget	0.0175	2.95	0.005				
Health promotion	0.0237	3.93	0.000				
R <sup>2</sup>	0.89						
<i>Health center risk identification</i>							
Budget	0.0207	3.68	0.001				
Private effort	0.0231	4.19	0.000				
R <sup>2</sup>	0.89						
<i>Hospital risk identification</i>							
Private effort	0.0202	3.64	0.001				
Health center risk id	0.0300	5.42	0.000				
R <sup>2</sup>	0.91						
<i>Antenatal prevention</i>							
Training	0.0407	5.16	0.000				
Fertility regulation, prevention	0.0162	2.14	0.038				
R <sup>2</sup>	0.88						
<i>Delivery risk identification</i>							
Private effort	0.0153	3.85	0.000				
Antenatal risk id	0.0245	7.05	0.000				
R <sup>2</sup>	0.96						
<i>Urban access, avoidance</i>							
Fertility regulation, avoidance	0.0293	12.79	0.000				
R <sup>2</sup>	0.77						
<i>Urban access, prevention</i>							
Antenatal prevention	0.0336	12.24	0.000				
R <sup>2</sup>	0.76						
<i>Training</i>							
Policy	0.0190	4.97	0.000				
Monitoring	0.0185	4.54	0.000				
R <sup>2</sup>	0.96						
<i>Private effort</i>							
Policy	0.0232	4.29	0.000				
Training	0.0198	3.07	0.004				
R <sup>2</sup>	0.94						
<i>Fertility regulation, avoidance</i>							
Budget	0.0123	2.90	0.006				
Private effort	0.0282	6.80	0.000				
R <sup>2</sup>	0.93						
<i>Health center treatment</i>							
Budget	0.0210	2.41	0.020				
Private effort	0.0328	3.83	0.000				
R <sup>2</sup>	0.84						
<i>Hospital treatment</i>							
Private effort	0.0237	4.91	0.000				
Health center treatment	0.0175	4.22	0.000				
R <sup>2</sup>	0.87						
<i>Antenatal risk identification</i>							
Training	0.0241	5.33	0.000				
Hospital risk id	0.0236	6.91	0.000				
R <sup>2</sup>	0.95						
<i>Delivery treatment</i>							
Private effort	0.0322	7.69	0.000				
Hospital treatment	0.0164	4.15	0.000				
R <sup>2</sup>	0.92						
<i>Rural access, avoidance</i>							
Fertility regulation, avoidance	0.0317	12.77	0.000				
R <sup>2</sup>	0.77						
<i>Rural access, prevention</i>							
Antenatal prevention	0.0304	13.67	0.000				
R <sup>2</sup>	0.80						

**Table 3. Regressions for change in indices, from change in other indices (equation set 4)**

	<i>B</i>	<i>t</i>	<i>p</i> <		<i>B</i>	<i>t</i>	<i>p</i> <
<i>Urban access, risk identification</i>				<i>Rural access, risk identification</i>			
Delivery risk id	0.0161	4.07	0.000	Delivery risk id	0.0077	2.47	0.017
Urban access, prevention	0.0248	4.68	0.000	Rural access, prevention	0.0292	7.84	0.000
R <sup>2</sup>	0.89			R <sup>2</sup>	0.94		
<i>Urban access, treatment</i>				<i>Rural access, treatment</i>			
Delivery treatment	0.0174	4.88	0.000	Delivery treatment	0.0172	4.99	0.000
Urban access, risk id	0.0250	4.15	0.000	Rural access, risk id	0.0203	3.34	0.002
R <sup>2</sup>	0.89			R <sup>2</sup>	0.87		

Note: For the dependent variables, changes in logits are used. Variables are chosen stepwise. Intercepts are forced to zero.

**Table 4. Regressions for change in index for fertility regulation-avoidance, from change in other indices (equation sets 5 and 6)**

	<i>Equation set 5</i>			<i>Equation set 6</i>		
	<i>B</i>	<i>t</i>	<i>p</i> <	<i>B</i>	<i>t</i>	<i>p</i> <
Training	0.0193	5.57	0.000	0.0123	2.40	0.021
Private effort				0.0090	1.83	0.074
Fertility regulation, prevention	0.0261	7.82	0.000	0.0232	6.41	0.000
R <sup>2</sup>	0.96			0.96		

Note: Equation sets 5 and 6 also include the other equations in set 4, except that for private effort.

**Table 5. Regressions for maternal mortality ratio**

	<i>Short run</i>			<i>Long run<sup>a</sup></i>		
	<i>B</i>	<i>t</i>	<i>p</i> <	<i>B</i>	<i>t</i>	<i>p</i> <
<i>1990 maternal mortality ratio (n = 38)</i>						
GNP per capita (log)	-0.3114	-2.22	0.033	-0.7203	-4.82	0.000
Net female primary enrolment ratio (log)	-0.5775	-2.20	0.034			
Access to services	-0.0243	-4.03	0.000	-0.0357	-5.55	0.000
Constant	0.4483			1.4567		
R <sup>2</sup>	0.66					
<i>1995 maternal mortality ratio (n = 39)</i>						
GNP per capita (log)	-0.3604	-2.47	0.019	-0.7752	-4.86	0.000
Net female primary enrolment ratio (log)	-0.4857	-1.78	0.084			
Access to services	-0.0237	-3.77	0.001	-0.0323	-4.70	0.000
Constant	0.3327			1.6603		
R <sup>2</sup>	0.75					
<i>1990-98 maternal mortality ratio (n = 27)</i>						
GNP per capita (log)	-0.5889	-3.46	0.002	-0.7349	-4.41	0.000
Net female primary enrolment ratio (log)	0.1658	0.41	0.689			
Access to services	-0.0196	-2.85	0.009	-0.0274	-3.77	0.001
Constant	-1.2757			0.7760		
R <sup>2</sup>	0.40					

<sup>a</sup> For the long-run equations, maternal mortality is forced to reach a developed-country level (a ratio of 10) when per capita GNP and MTRI ratings also reach developed-country levels (assumed to be \$20,000 and ratings of 99 for each item). Female enrolment is left out because its effect is consistently positive, though nonsignificant.



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