Assessment of the Quality of Maternity Registers in Guatemala

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PRESENTACION

El Ministerio de Salud Publica y Asistencia Social inició un proceso de Mejoría de la Calidad y El Desempeño en Atención Materno Neonatal Esencial, como una estrategia para alcanzar tanto el compromiso establecido en los acuerdos de paz, como los objetivos del Plan de Salud 2,00 – 2004 que es la reducción de la morbilidad y mortalidad materna y neonatal.

Para abordar este problema, el Ministerio de Salud Publica, con el apoyo de varias organizaciones de cooperación técnica, actualmente promueve el acceso a la atención del parto por personal calificado, con estrategias de referencia oportuna y movilización comunitaria al momento de una emergencia obstétrica. Estos esfuerzos deben de ser complementados con información que permita establecer el impacto de estas iniciativas y el estado de la salud materna, en términos generales.

Ante esta situación es necesario contar con datos epidemiológicos departamentales que ofrezcan información oportuna y precisa, que permitan detectar cambios inmediatos en las instituciones proveedoras de servicios de atención a la madre. Para estos fines son necesarios indicadores de proceso que den cuenta de los logros de las nuevas intervenciones y permitan corregir los cursos de acción.

En este contexto se realizó el estudio de "Registro de Nacimientos como Fuente de Información para el Monitoreo de la Salud Materna y Neonatal en Guatemala" mismo que reveló que el Libro de Registro de Partos es una fuente valida y confiable de información , disponible en la mayor parte de instituciones publicas y ha resistido el paso del tiempo y varias reorganizaciones del sistema nacional de información. Por lo que se presenta el Informe Final, y como producto de dicha investigación "La Guía del Usuario del Libro de Partos"

Esperando que este material sea de apoyo para el personal de salud, tanto del nivel operativo como del tomar de decisiones, les exhorto a seguir trabajando a favor de la salud de las mujeres.

Dr. Mario Rene Bolaños Duarte
Ministro de Salud Publica y
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1 INTRODUCTION

Better tools and methods are required for monitoring progress in maternal health. Population-based indicators, on which most countries have relied, are inappropriate for monitoring purposes. Deriving key process indicators from birth register data has been a method proposed for a number of years, but experience to date is limited and there is ongoing debate as to whether this approach is feasible or sustainable. Although maternity register data are collected in most facilities, there is little evidence that they are used effectively for monitoring, even in many developed countries.

This report presents the findings of an in-depth case study carried out in facilities in three *departamentos* of Guatemala (Quiché, San Marcos and Totonicapán) to determine whether routine data in maternity registers can be used to monitor and evaluate maternal and neonatal health at the facility and *departamento* level, and if so, in what ways the register might best be used.

1.1 Background

In Guatemala, measurement of changes in maternal and neonatal health status has mostly been done through five-year surveys that provide data to estimate the maternal mortality ratio. At the national level, there are 186 maternal deaths per 100,000 live births,[1] and the infant mortality ratio is 45 per 1000 live births.[2] There are higher ratios in *departamentos* located in the western plateau, where there is a large indigenous Mayan population and many women give birth at home, attended by a relative or a traditional midwife (71.6% of births in south-western region and 89.9% in north-western region[3]).

In the 1990s, the United States Agency for International Development (USAID) supported the Ministry of Health's (MOH) efforts to increase access of women in the Mayan highlands to health services through the Mother Care Project, now known as the Maternal and Neonatal Health Project.

However, the limitations of a measurement restricted to impact indicators, such as the maternal mortality ratio, have been recognized in the Guatemalan MOH. In the context of the Peace Accord of 1996, the Guatemalan government made a commitment to decrease maternal mortality by 50% within five years. At the end of the term, and despite the efforts, data suggest that the maternal mortality ratio had not declined.

One potential solution to improving monitoring and evaluation consists of better utilizing the information system currently operating. Even in developing countries, almost every obstetric facility routinely collects data on the delivery, the mother and the newborn. Although the collected data vary from one register to another, most registers include similar key variables: case number, name of the mother, age of the mother, clinical record

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[1] MEASURE *Evaluation / GSD Consultores Asociados. Estimates of Maternal Mortality in Guatemala: Period 1996-1998. Guatemala, March 2000.*

[2] *INE. National Maternal and Infant Health Survey (Encuesta Nacional de Salud Materno) Infantil 1998-1999. INE-MSPAS-USAID-UNICEF-FNUAP-MEASURE DHS+. Table 7.1 pag. 86.*

[3] *Idem, table 8.5, page 101.*

number, person who attended the delivery, procedure followed, as well as the condition, sex and weight of the newborn.[4]

The MOH is interested in using alternative indicators for monitoring health programs. The Unified Information System (SUI in Spanish), the section of the MOH responsible for the information system, is directing its efforts towards increasing the quality and use of routine data.

1.2 Rationale for the Use of Maternity Registers

Maternity registers have the potential of being an affordable and sustainable instrument for monitoring maternal health, but this has not yet been demonstrated in practice.

Little is known about what maternity register data are being collected or how maternity register data are being utilized in developing countries. Some reports suggest that the information is transferred from *departamentos* and consolidated at the national level for administrative and managerial purposes. However, there is little evidence that this information is fed back for decision-making at the local level. Technical experts and representatives of developing countries who attended the workshop "Towards Improving Monitoring and Evaluation in Maternal and Perinatal Health" organized by MEASURE *Evaluation* in March 1999 could not identify a national or district system that relied on indicators derived from maternity registers data.

Workshop discussions highlighted the need to investigate three topics: a) an analysis of intervention rates and deaths documented in the registers; b) a study of the data registers and their users; c) the quality of indicators derived from register data. In order to meet these needs, a pilot study on those topics was included in the research methodology.[5]

This study, carried out with USAID support, was designed to assist the improvement of maternal and neonatal health monitoring at the *departamento* level. Throughout the study, the study coordinators at GSD Consultores Asociados and MEASURE *Evaluation* worked in coordination with the MOH and the Maternal Neonatal Health Project, to establish whether maternity register data could be utilized in the monitoring of maternal and neonatal health at facility and *departamento* levels, and if the *departamento* information systems can contribute to the national level monitoring. The project examined the possibility of using the data in the estimation of national figures, and proposed to review the contribution of the new birth registers introduced by the Mother Care Project.[6]

1.3 Purpose of the Study

To determine the feasibility of using maternity registers for monitoring maternal and neonatal health status at the facility, *departamento* and national levels.

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[4] MEASURE *Evaluation*. *Towards Improving Monitoring and Evaluation in Maternal and Perinatal Health. Proceedings from a Workshop on the Use of Birth Registers as a Data Source for Maternal and Perinatal Health Care. March 2-4, 1999. Arlington, Virginia. page 8.*

[5] *Ibid., page 23 and 25.*

[6] *MotherCare implemented new maternity registers at the main public hospitals of Sololá and Quetzaltenango.*

1.4 Specific Objectives

- To describe the extent, quality and use of information that can be derived from the maternity registers for monitoring maternal and neonatal health status.
- To calculate estimates of the most important key indicators from the existing registers.
- To identify mechanisms for a more effective use of maternity register data for monitoring at all levels.

1.5 Methodology

The first step in the study was a review of existing literature on the use of maternity registers. Next, both the protocol and the data collection forms prepared by MEASURE *Evaluation* were translated. In order to choose the *departamentos* for inclusion in the study, several officers of the Reproductive Health Program of the MOH and the USAID office in Guatemala were consulted, as well as team members of the Maternal Neonatal Health Project. The following three *departamentos* were chosen: Quiché, San Marcos and Totonicapán. The above mentioned entities helped to complete a list of obstetric care providers in these *departamentos*. This initial information was the basis for a facility and register census, which laid the groundwork for the second stage of the study.

The second stage of the study included three components: a) assessing of the validity of the maternity register data; b) identifying deliveries missed by maternity registers; and c) calculating of facility and *departamento* rates. The data collection was carried out with strict monitoring of quality. Supervisors verified the completed data collection forms in each facility, correcting problems with data collection along the way; every week the supervisors sent progress reports to the study coordinators. The field team issues that could not be resolved by supervisors were brought to the attention of the national coordination team. The coordination team visited the facilities during the data collection process. Three meetings between supervisors and the coordination team were conducted, one each month.

Data were entered into an MSAccess® 2000 database using a double entry process in order to guarantee the quality of the data processing. Consistency in data was verified by comparison between the first and second entries, and identified conflicts were resolved by consulting the data collection forms.

The queries of the database were exported to MSExcel® 2000 in order to analyze the data and prepare the tables for this report.

1.6 Key Findings

- *Because they are widely used*, evidence shows that maternity registers are a valid source of information for monitoring maternal health; the majority of births in the period under study were recorded in this register (86.6% of institutional deliveries).

- *Because of consistency with medical records*, evidence suggests that maternity registers are a reliable data source. The date of delivery coincides in 96.2% of cases where there it is recorded in both registers; the person who attended the delivery coincides in 97.8% of cases; and cesarean sections, maternal complications and neonatal deaths coincide in 100% of cases. Congruency between the maternity register and the medical records was less for the variable "mother's age", but the data still coincided in 83.5% of cases.

- *Because of its low under-registration level,* evidence supports that the maternity register is a useful data source. At facilities with a maternity register, the missing cases (cases with a birth recorded in the medical record but not in the maternity register) are just 0.7%, and fewer than 20% of cesarean sections recorded in the surgery register are not recorded in the maternity registry. The greatest proportion of missing cases were found in San Marcos (33.3%) and the least in Totonicapán (where there are no missing cases).

- *Because of its use for monitoring at facilities,* evidence suggests that maternity registers are a source that is both available and useful. In every facility percentages of cesarean sections, perinatal deaths, maternal complications and maternal deaths can be calculated. Thus, the facilities themselves can track changes through time and monitor performance and quality of essential obstetric care.

- *Because of the applicability to local level monitoring efforts,* evidence suggests that maternity registers are a reliable source for *departamento* level calculation of estimates for indicators such as: a) percentage of cesarean sections, and b) percentage of deliveries attended by trained personnel. Both indicators refer to activities that are only performed in health facilities.

- *There are good opportunities for improvement.* Nine out of ten providers of obstetric care with maternity registers are public facilities. The current conditions of the registers (including state of conservation, location, and personnel training for data collection) are precarious. Yet, they are available and a reasonable source of information. Precise, low-cost, local actions are required to improve the quality and extend the coverage of maternity registers as sources of information for monitoring maternal and neonatal health.

2 DESCRIPTION OF THE METHODOLOGY

Maternity registers are a stable and continuous source of information to document the progress of maternal and neonatal health. Registers in facilities are used as written records of the name, address, delivery procedure, and condition of the woman and the newborn. The staff at the facilities learn to complete maternity registers as students. For this reason the data in the registers are useful for estimating indicators used at different levels.

In order to recommend the use of maternity registers it is necessary to determine to what extent data are recorded incorrectly or deliveries are missing from the register altogether. In the absence of the use of standardized registers, it is also unknown which variables are recorded and which are useful for monitoring purposes.

2.1 Study Components

The study had three components (Figure 1). The first assessed the validity of maternity register data. The second identified the proportion of cases attended but not registered. The third component dealt with estimating rates in order to prepare process indicators of maternal and neonatal health. All of the components are based on the pilot study, carried out to identify the eligible facilities, the registers in use in such facilities, and the variables included in the registers.

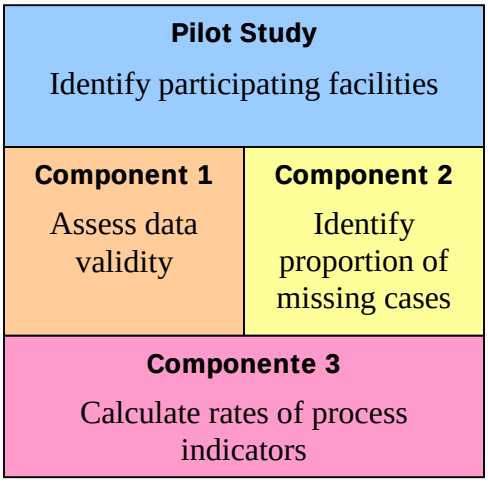

Figure 1 Study Components

2.1.1 Register Validity

This component focused on the recording of the most important variables of the obstetric care process in registers (Table 1) and covered the births occurring during the two months prior to the data collection, August and September 2000.

The original purpose was to compare the maternity register with medical records. However, not all of the facilities have a register exclusively dedicated to recording information on births. For this reason, it was necessary to include auxiliary registers, such as the surgery register – in which cesarean sections are registered – and the discharge register.

In this component, not only the data themselves were recorded, but also whether the data for each variable had been entered in a specific space, if the annotation was legible, and, for auxiliary registries, if the data coincided with those in the maternity register.

Additional information was also collected, such as the *departamento*, municipality, name of the facility, level and sector of care, and data about the residence of the mother

(*departamento*, and urban or rural area). Finally, the date of the data collection and code of the field worker were also recorded.

TABLE 1. MATRIX OF RELATIONSHIPS BETWEEN VARIABLES OF THE DELIVERY AND THEIR ATTRIBUTES IN REGISTERS

Variables	There is space to record it	The data is readable	The data coincides with the maternity register	Data
Order Number				
Medical Record Number				
Date of Delivery				
Mother's Age				
Vaginal Delivery				
Cesarean Section				
Live Birth				
Stillbirth				
Neonatal Death				
Maternal Complications				
Maternal Death				
Person who Attended the Delivery				

2.1.2 Missing Cases

Maternity registers were compared with medical records, discharge registers and surgery registers in order to identify the deliveries attended but not registered. The data for this comparison was the same as for the validity component, so the review also included all the cases attended in participating facilities during August and September 2000.

2.1.3 Rate Calculation

For the calculation of rates, a one year period was analyzed. The data collection included all births recorded between November 1, 1999 and October 30, 2000. Additionally, official data about births and related events were sought (cesarean sections, perinatal and maternal deaths, and services provided during the delivery) in registers at the Office of the *Departamento* Health Director.

2.2 *Departamento* Selection

The original research design planned to include every health facility with maternity registers and obstetric care in three *departamentos* of the country. The selection of *departamentos* was made using criteria provided by the Reproductive Health Unit of the MOH and the Maternal Neonatal Health Project. The criteria for selection included: a) *departamentos* with the worst problems in maternal and neonatal health; b) *departamentos* whose population suffered lack of access to essential obstetric care; and c) *departamentos* within the target area of the Maternal Neonatal Project, in order to apply the results for the improvement in the use of maternal and neonatal health monitoring information. The *departamentos* chosen were Quiché, San Marcos, and Totonicapán (Figure 2).

Figure 2 Selected *Departamentos*

2.3 Pilot Study: Selection of Facilities

A pilot study conducted in the selected *departamentos* allowed the gathering of information about the characteristics of the facilities that attend deliveries and keep records of the services provided. It was also possible to obtain data related to the form and content of the registers, as well as the current use of the information.

The MOH and the Maternal Neonatal Health Project provided an initial inventory of 22 facilities. The Reproductive Health Program of the MOH facilitated communications with the directors of public facilities.

All of the public and private facilities that provide obstetric services in Quiché, San Marcos, and Totonicapán were visited. The initial inventory grew after the interviews with health officers and local authorities of every municipality were visited. Another 22 facilities were added to the inventory. Other facilities were discarded for reasons such as closure of the facility, the facility did not attend deliveries, or the facility was not able to participate in the study.

Three professionals, the supervisors in the second stage, carried out the pilot study. In the pilot stage they performed the following activities:

- Visited *Departamento* Health Director office: the field professionals explained the purpose and extent of the study to health directors. The directors offered to add to the original list of facilities.
- Visited public and private facilities: Interviews were carried out with both the facility director and the chief of the Department of Gynecology and Obstetrics. The maternity registers and auxiliary registers were also reviewed during this visit.
- A total of 44 facilities were visited (11 in Quiché, in 24 San Marcos and 9 in Totonicapán). Maternity registers were found in 27 facilities (7 in Quiché, 13 in San Marcos and 7 in Totonicapán). Some of those facilities did not have a maternity register, but delivery registration was made in discharge or surgery registers.

2.4 Second Stage Implementation

Six field workers and three supervisors were recruited for data collection. Supervisors were selected for their knowledge of the health services system of the country and the MOH's information system. The field workers were all physicians and residents of the western highland region were the study was conducted. They also had experience working in previous studies with GSD.

MEASURE *Evaluation* provided support to the training of supervisors and field workers, carried out in the capital city. The training included information about objectives, the field work program, content and use of the data collection forms. To test both the forms and the training, two hospitals in Guatemala City were visited and a field test was conducted. The discussion that arose after the field test complemented the training and helped in writing the final version of the guidelines for completing the data collection forms.

2.5 Field Work

Three teams were organized for data collection, each one with a supervisor and two field workers. Each team was assigned to a *departamento*. The number of births was very different from one *departamento* to another, so the teams that finished the collection first gave support to those with a larger workload. The activities performed followed the sequence described below.

2.5.1 Study presentation and interview with the directors

The field teams interviewed the directors and explained the details of the second stage of the study. Agreements were reached regarding the administrative arrangements needed to access the medical records and registers. In some facilities, help from the statistician was requested for the information gathering process. After the results of the pilot study, it was anticipated that 27 facilities would participate; however three of them, all from the private sector, refused in the end. Thus, 24 facilities were included in the second stage of the study.

2.5.2 Interviews with professionals in charge of maternity services

Field workers conducted interviews with professionals in charge of maternity services, or any other person designated as the best source of information about the use of maternity registers. An informed consent document was signed by respondents before answering any questions.

2.5.3 Group interviews

Group interviews were conducted with personnel of public hospitals in order to establish when the data were registered, how they were processed and the dynamics of analysis and utilization of the data. The date, hour and participants in those interviews were established with the director during an interview. Every staff member present in group interviews signed an informed consent document prior to participation.

2.5.4 Data collection from registers

The data gathering process depended upon the facilities' administrative routines: access to files, working hours, permissions and restrictions for handling documents. The following registers were utilized as sources of information:

- Maternity register, usually located at the delivery room;
- Surgery Register, usually located in the nurses station of the operating room;
- Discharge Register, located in the maternity nurses station, in the admissions or secretary's office.
- Medical Records. The monthly report of statistics from public hospitals helped to identify medical records of patients admitted for labor and delivery. At the private facilities, every medical record between August and September 2000 was reviewed.

2.5.5 Supervisory visits

Each supervisor made about 20 visits (Totonicapán, 19; San Marcos, 22; Quiché, 20), for a mean of 2.5 visits per facility. In each visit the supervisor cross-checked the forms with the registers, choosing randomly the forms to be reviewed. The supervision reports were sent weekly to GSD. Additionally, a monitoring visit to the field teams was carried out in December 2000. The national coordinator, the principal investigator and the MEASURE *Evaluation* researcher verified the field work procedures and precision of the data. These visits also provided an opportunity to contact the directors of the facilities and the staff that fills and consolidates the register data.

2.5.6 Supervisor meetings

The data collection was completed in three months. Each month a meeting of the national coordinating team and supervisors was conducted in Guatemala City. Supervisors brought the completed forms, and discussed technical and administrative problems that arose during field work.

2.6 Data Processing

The database was designed with MSAccess®2000. A preliminary version was reviewed by MEASURE *Evaluation* researchers who gave suggestions for its improvement. During data entry, some mistakes in the template were identified and were subsequently corrected.

Double data entry was carried out to assure the quality of the information. Both first and second data entry and the pilot stage data were included in the same database.

The data input was standardized through a handbook including graphics depicting the data entry template. During the first round of data entry, some opportunities to improve the handbook emerged, leading to improvements in the second round of data entry.

The first round of data entry occurred simultaneously with the data collection process, when some changes in forms were introduced, forcing consequent adjustments to the database and the data entry handbook. However, those adjustments were always consistent with the forms, so no information blanks appear due to unforeseen data requirements.

Field workers, still working during the first round of data entry, provided explanations to assist with data processing. In some cases, field workers had to go back to the registers to complete information. The second round was initiated after the first had been finished.

The comparison between datasets allowed the identification of divergences. Most of the errors occurred in the numerical data entries: order number, medical record number, and date of delivery. In every case, discrepancies led to a direct check against the original data collection forms.

A copy of the database was made, and both data entries were corrected. Then, comparison queries were run again to detect unidentified differences. With this iterative process, one dataset with no errors was achieved.

2.7 Analysis Plan

During the MEASURE *Evaluation* researcher's visit to Guatemala, guidelines for analysis were agreed upon; a scheme for the analysis plan was prepared, including the output tables. A first version was tested with data coming from the first data entry. The queries were updated with the adjusted data to obtain the final figures.

The output tables were exported from MSAccess®2000 to MSExcel®2000 to analyze data consistency (outliers, coincidence in the simple frequencies, categorization of open answers) and the statistical treatment of the data. The tables exported to Excel were also used to prepare summary tables, estimate parameters and prepare graphics.

Outlines were prepared for each component of the study report. In addition, a set of spreadsheets with the datasets was prepared in MS Access2000®, and exported to MS Excel2000®, for statistical analysis in Guatemala and at the MEASURE *Evaluation* headquarters.

2.8 Report Validation

A preliminary version of the report and the database was reviewed by MEASURE *Evaluation*. Personnel from USAID, the Maternal Neonatal Health Project and the MOH Reproductive Health Program reviewed the report and provided comments and suggestions. The first draft of the report was sent to the *departamentos* where the data were collected. A few days later workshops were conducted in those *departamentos* to share the results with the primary informants. In the workshop, the directors of the facilities announced actions directed to improve the registers, addressing the results discussed in the reviewed draft report.

2.9 Limitations of the Study

The consistency of maternity registers in public and private facilities was reviewed in three *departamentos* of Guatemala. A major limitation faced by the study is the high proportion of deliveries without obstetric care in the south-western (79.6%) and north-western (90.2%) regions where the study was carried out.[7] This is an important limitation because most of population with an elevated risk is not documented by the assessed maternity registers.

[7] *INE. National Maternal and Infant Health Survey (Encuesta Nacional de Salud Materno Infantil) 1998-1999. Table 8.5, page 101.*

3 RESULTS

This chapter contains the main findings, ordered according to the components related to each study objective. As an introduction, this report presents the current situation of the registers in the facilities visited.

The pilot study included 44 facilities (11 in Quiché, 24 in San Marcos and 9 in Totonicapán). In the second stage 24 facilities were visited (7 in Quiché, 11 in San Marcos y 6 in Totonicapán).

Most participating facilities were hospitals or medical centers within the private sector (fourteen facilities). The MOH participated with eight facilities. This government entity, besides playing a leadership role in Guatemalan health, has the most widespread health care facility network . The Guatemalan Social Security Institute (IGSS in Spanish), which covers employees of the formal sector, participated with two facilities.

3.1 The Status of Maternity Registers

The pilot study obtained information about the status of registers that was later confirmed by data collected in the second stage. Most of the facilities keep medical records to follow up the health care of patients (the most frequent declared purpose to keep registers). The maternity register is the second most frequently used register, and is used to record deliveries and births. The surgery register and discharge register were used less frequently.

In MOH facilities, administrative staff is in charge of statistics. The Momostenango maternity center is an exception, since the registers are kept by physicians and nurses. In the IGSS facilities, the nurses' supervisor and the administrative staff are responsible for the registers. In private facilities, the registers are kept by the secretary (in all three *departamentos*), the manager (San Marcos), physicians, nurses or the director of facility (San Marcos and Totonicapán). An extreme case is in Quiché where one facility reported that no records are kept.

Registers are generally in precarious physical condition. There is risk of error and data omission because entries are made on notebooks with lines marked with a pen. Sometimes, only the columns on the first page have titles indicating variable names, while on the next pages annotations are not consistent with the previous order. In other cases, some columns in previous pages may be skipped in the following ones, with loss of data for those cases.

The registers are located where they are most used. Admission and discharge registers are located in the Admissions, Secretary or Medical Records Offices. The surgery registers are located in the operating room. The maternity registers can be found in the nurses stations of the obstetrics departments.

Physicians, nurses and auxiliary nurses are the personnel who most often complete records (in that order). It is assumed that these personnel are qualified in health care, but it was not known whether they have training to complete the registers. Usually colleagues at the facility teach new personnel, there are written instructions, or they learn with

experience. Only five facilities reported training activities specifically oriented toward the completion of registers.

Statistical analysis is carried out in every facility of the MOH on a weekly, bi-weekly or monthly basis; only one facility reported meeting for the analysis of information every two months. Half of private facilities and one of the IGSS facilities have no meetings or meet very infrequently.

In the IGSS and private facilities, analysis is centered on the frequency of vaginal deliveries and mother and newborn complications; in MOH facilities, the focus is mainly on maternal and neonatal mortality and the rate of cesarean sections.

There is no use of data for setting goals in ten of the fourteen private facilities. Just one out of the four remaining facilities mentioned improving the quality of care as a goal. The IGSS facilities use the information for setting budgetary goals for the following year.

Information from registers is an asset for setting goals in the MOH, especially those referring to reducing maternal and neonatal mortality, increasing quality of care and decreasing the rate of cesarean sections. Among the facilities included in this study, it is the MOH that holds the responsibility for public health in the country.

3.2 Validity of Maternity Registers

The deliveries recorded between August and September 2000 in 24 facilities of Quiché, San Marcos and Totonicapán were reviewed to assess the extent and consistency of maternity register data. The evidence (presented in the pages that follow) shows that maternity registers are a valid source of information for monitoring maternal and neonatal health. These registers have the greatest coverage of births in the period and their data are highly coincident with medical records.

3.2.1 Registers and their coverage of deliveries

Even though only 10 out of 24 facilities had a maternity register, most deliveries that took place during the time period under study (1,084 out of 1,252, or 86.6%) were attended in those ten facilities (Table 2). Nine of the ten facilities with maternity registers were public.

The surgery register has a restricted coverage (352 cases) because it is almost exclusively used to record cesarean sections. On the other hand, the discharge register, having the supposed purpose of recording every in-patient discharge, did not include more than 741 (59.2%) of the 1,252 recorded deliveries.

TABLE 2. NUMBER OF FACILITIES WITH MATERNITY REGISTER, SURGERY REGISTER AND DISCHARGE REGISTER, AND NUMBER OF CASES RECORDED IN EACH REGISTER BETWEEN AUGUST AND SEPTEMBER 2000, BY *DEPARTAMENTO* AND SECTOR

	Maternity Register		Surgery Register		Discharge Register		Total	
	Facilities	Cases	Facilities	Cases	Facilities	Cases	Facilities	Cases
TOTAL	10	1,084	10	361	13	732	24	1,252
% Facilities	41.7%		41.7%		54.2%		100.0%	
% Cases		86.6%		28.8%		58.5%		100.0%
Departamento								
Quiché	5	497	3	156	2	114	7	520
San Marcos	3	436	4	152	8	475	11	549
Totonicapán	2	151	3	53	3	143	6	183
Sector								
Public	9	1,081	5	289	5	669	10	1,092
Private	1	3	5	76	8	63	14	160

In all facilities, medical records are the source of information with the most annotations. For this reason they can be considered the "gold standard" when comparing different registers. After the medical record, the maternity register is the most complete type of record (Table 3).

Records of maternal complications and maternal and perinatal deaths are infrequent in surgery registers, as well as on the maternity register. Perinatal deaths are more frequently found in the discharge register.

A plausible explanation is that those events generally occur when both mother and newborn are recovering and have left the delivery room or surgery room. In other words, such events occur when the delivery has already been recorded in the maternity or surgery register.

TABLE 3. NUMBER OF ANNOTATIONS OF SELECTED VARIABLES BETWEEN AUGUST AND SEPTEMBER 2000, AND ANNOTATIONS AS PROPORTION OF TOTAL CASES PER REGISTER

	Maternity Register		Surgery Register		Discharge Register		Medical Record	
	Recorded Cases		Recorded Cases		Recorded Cases		Recorded Cases	
	n	%	n	%	n	%	n	%
Total Cases in Register	1,084	100.0%	361	100.0%	732	100.0%	1,211	100.0%
Delivery Procedure (a)	934	86.2%	256	70.9%	357	48.8%	1,170	96.6%
Delivery Outcome (b)	474	43.7%	6	1.7%	222	30.3%	675	55.7%
Maternal Complication (c)	8	0.7%	10	2.8%	26	3.6%	61	5.0%
Maternal Death (c)	0	0.0%	0	0.0%	223	30.5%	314	25.9%

(a) Including vaginal and cesarean section
(b) Including live births, stillbirths and neonatal deaths
(c) May include annotations of complication or maternal death and also annotations of discharge without maternal complication or death.

3.2.2 Coincidence of data between registers

Maternity registers cover most of the births in facilities, but it was not known whether the data coincide with those recorded in the medical records. Evidence gathered (Table 4) suggests that the maternity register data are very congruent. When there are annotations in both registers, the delivery date coincides in 96.2% of the cases; the person who attended the delivery coincides in 97.8% of the cases; cesarean sections, maternal complications and deaths, as well as neonatal deaths coincide in 100% of cases. The mother's age is less congruent but it still coincides in 83.5% of the cases, with lower and upper limits in San Marcos (76.7%) and Totonicapán (90.1%).

Both surgery and discharge registers coincide to a high level with medical records (Table 5); they have a lower registration of mother's age, which is an important indicator of risk in pregnancy, but they still coincide at a level above 80%. However, both registers share a limited coverage of deliveries in comparison with the maternity register.

TABLE 4. NUMBER OF DELIVERIES BETWEEN AUGUST AND SEPTEMBER 2000 WHERE REFERENCE DATA WERE RECORDED IN BOTH MATERNITY REGISTER AND MEDICAL RECORD, AND NUMBER AND PERCENTAGE OF COINCIDENT CASES BY *DEPARTAMENTO* AND SECTOR

	Total			Quiché			San Marcos			Totonicapán			Public			Private		
	Rec	Coincident		Rec	Coincident		Rec	Coincident		Rec	Coincident		Rec	Coincident		Rec	Coincident	
Variable	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%	N	n	%
Date of Delivery	631	607	96.2%	115	107	93.0%	371	357	96.2%	145	143	98.6%	628	604	96.2%	3	3	100.0%
Delivery Attendant	812	794	97.8%	323	306	94.7%	359	358	99.7%	130	130	100.0%	812	794	97.8%	0	--	--
Mother's Age	857	716	83.5%	346	305	88.2%	369	283	76.7%	142	128	90.1%	857	716	83.5%	0	--	--
Cesarean Section	188	188	100.0%	86	86	100.0%	63	63	100.0%	39	39	100.0%	188	188	100.0%	0	--	--
Maternal Complications	7	7	100.0%	4	4	100.0%	0	--	--	3	3	100.0%	7	7	100.0%	0	--	--
Perinatal Deaths*	23	23	100.0%	6	6	100.0%	10	10	100.0%	7	7	100.0%	23	23	100.0%	0	--	--

* Perinatal deaths refers to stillbirths and neonatal deaths that occurred in the facility where the delivery was attended.

TABLE 5. NUMBER OF DELIVERIES BETWEEN AUGUST AND SEPTEMBER 2000 WHERE REFERENCE DATA WERE RECORDED IN SURGERY REGISTER, DISCHARGE REGISTER AND MEDICAL RECORD, AND COINCIDENCE BETWEEN REGISTERS AND MEDICAL RECORDS.

	Surgery Register and Medical Record			Discharge Register and Medical Record		
	Recorded	Coincident		Recorded	Coincident	
Variable	N	n	%	N	n	%
Date of Delivery	210	200	95.2%	214	196	91.6%
Delivery Attendant	225	223	99.1%	237	232	97.9%
Mother's Age	237	200	81.4%	486	413	85.0%
Cesarean Section	226	226	100.0%	84	84	100.0%
Maternal Complications	10	10	100.0%	3	3	100.0%
Perinatal Deaths*	6	6	100.0%	8	8	100.0%

* Perinatal deaths refers to stillbirths and neonatal deaths that occurred in the facility where the delivery was attended.

3.3 Missing Deliveries

Under-registration of births in the maternity register is an important cause for concern if its use is to be recommended to monitor maternal and neonatal health. However, findings in this study indicate that, overall, fewer than 1% of deliveries recorded in medical records were missing from maternity registers. In Totonicapán (Table 6) under-registration is about 2.7%; in Quiché there were no missing cases.

TABLE 6. NUMBER OF CASES RECORDED BETWEEN AUGUST AND SEPTEMBER 2000, IN MEDICAL RECORDS OR IN THE SURGERY REGISTER, AND NUMBER AND PROPORTION OF SUCH CASES NOT RECORDED IN THE BIRTH REGISTER, BY DEPARTMENT AND SECTOR

Missing Cases in Maternity Register	Medical Record			Surgery Register		
	Total Cases	Missing Cases		Total Cesarean S.	Missing Cases	
	N	n	%	N	n	%
Total	1065	7	0.7%	182	36	19.8%
Departamento						
Quiché	491	0	0%	58	8	13.8%
San Marcos	423	3	0.7%	84	28	33.3%
Totonicapán	151	4	2.7%	40	0	0%
Sector						
Public	1062	0	0.7%	182	36	19.8%
Private	3	0	0%	0	--	--

Cesarean sections are first recorded in the surgery register. The information is not always copied to the maternity register, hence the importance of establishing the proportion of cesarean sections which are registered in the surgery register but not in the maternity register.

About 20% of cesarean sections are not annotated in the maternity register. Upper and lower limits are San Marcos (33.3%) and Totonicapán (no missing cases). These results indicate that the level of under-registration is low and manageable, since it occurs in facilities of the public health services network.

3.4 Estimated Rates

The estimation or rates related to the obstetric process is among the monitoring activities based on institutional registers. A total of 8,624 deliveries were investigated between October 1999 and September 2000 in the departments under study. This information was used to calculate percentages (Table 7) of cesarean sections, maternal complications and maternal deaths in facilities of the three *departamentos*.

Indicators can be prepared routinely in each facility to verify changes over time in order to monitor both the performance of the facility and the progress in quality of essential obstetric care and maternal health in various *departamentos* of Guatemala.

TABLE 7. NUMBER AND PROPORTION OF CESAREAN SECTIONS, MATERNAL COMPLICATIONS AND MATERNAL DEATHS RECORDED IN MATERNITY REGISTERS BETWEEN OCTOBER 1999 AND SEPTEMBER 2000

	Cesarean Sections			Maternal Complications			Maternal Deaths		
	N*	n	% of births	N	n	% of births	N	n	% of births
Departamento									
Quiché	2112	689	32.6%	2175	16	0.7%	2175	1	0.05%
San Marcos	4764	905	19.0%	4916	3	0.1%	4916	0	0.00%
Totonicapán	1477	534	36.2%	1533	26	1.7%	1533	0	0.00%
Sector									
Public	7996	1900	23.8%	8136	42	0.5%	8136	1	0.01%
Private	357	228	63.9%	488	3	0.6%	488	0	0.00%

* The denominator includes only cases where the delivery procedure is known.

The data are not useful to calculate *departamento* level estimates of maternal mortality, maternal complications and perinatal deaths, due in part to a low coverage of institutional obstetric care. The National Survey on Maternal and Infant Health 1998 – 1999 states that only 40.5% of deliveries take place in health care facilities. Among indigenous populations, deliveries are not attended by trained personnel in 83.9% of cases and, among non-indigenous people, in 45.0% of cases. In the southwestern region (which includes Totonicapán and San Marcos), delivery takes place outside facilities in 71.6% of cases; the proportion in northwestern region (which includes Quiché) reaches 90.2%.

However, estimates can be calculated for clinical procedures that occur exclusively in facilities: cesarean sections and deliveries attended by trained health personnel. Table 8 shows live births, and more specifically, live births delivered by cesarean section, between October 1999 and September 2000 in the *departamentos* studied. Percentages are calculated for these indicators in relation to the total of live births reported by the Office of the Departmental Health Director.

TABLE 8. NUMBER OF LIVE BIRTHS ATTENDED BY TRAINED HEALTH PERSONNEL AND CESAREAN SECTIONS RECORDED IN MATERNITY REGISTERS BETWEEN OCTOBER 1999 AND SEPTEMBER 2000 AND THEIR PROPORTIONS OF TOTAL LIVE BIRTHS OFFICIALLY REPORTED IN THE SAME PERIOD, IN QUICHÉ, SAN MARCOS AND TOTONICAPÁN

Departmento	Total Live Births	Attended by Trained Health Personnel		Cesarean Sections	
		n	%	n	%
Quiché	27,791	2,160	7.8%	676	2.4%
San Marcos	31,594	4,817	15.2%	889	2.8%
Totonicapán	13,423	1,465	10.9%	499	3.7%

Note: These figures include only live births.

As shown in Table 8, maternity registers seem to be a useful source of routine statistical information. Every facility can calculate the percentages of cesarean sections, maternal

complications and maternal deaths. By estimating these rates, every facility can monitor both performance and quality of essential obstetric care.

Departamento Health Directors may also use the consolidated information to monitor the cesarean section index and identify advances in the coverage of obstetric care by trained health personnel as an input to planning, decision making and assessment of health services.

4 CONCLUDING REMARKS

- *Because they are widely used*, evidence shows that maternity registers are a valid source of information for monitoring maternal health; the majority of births in the period under study were recorded in this register (86.6% of institutional deliveries).
- *Because of consistency with medical records*, evidence suggests that maternity registers are a reliable data source. The date of delivery coincides in 96.2% of cases where there it is recorded in both registers; the person who attended the delivery coincides in 97.8% of cases; and cesarean sections, maternal complications and neonatal deaths coincide in 100% of cases. Congruency between the maternity register and the medical records was less for the variable "mother's age", but the data still coincided in 83.5% of cases.
- *Because of its low under-registration level*, evidence supports that the maternity register is a useful data source. At facilities with a maternity register, the missing cases (cases with a birth recorded in the medical record but not in the maternity register) are just 0.7%, and fewer than 20% of cesarean sections recorded in the surgery register are not recorded in the maternity registry. The greatest proportion of missing cases were found in San Marcos (33.3%) and the least in Totonicapán (where there are no missing cases).
- *Because of its use for monitoring at facilities*, evidence suggests that maternity registers are a source that is both available and useful. In every facility percentages of cesarean sections, perinatal deaths, maternal complications and maternal deaths can be calculated. Thus, the facilities themselves can track changes through time and monitor performance and quality of essential obstetric care.
- *Because of the applicability to local level monitoring efforts*, evidence suggests that maternity registers are a reliable source for *departamento*-level calculation of estimates for indicators such as: a) percentage of cesarean sections, and b) percentage of deliveries attended by trained personnel. Both indicators refer to activities that are only performed in health facilities.
- *There are good opportunities for improvement.* Nine out of ten providers of obstetric care with maternity registers are public facilities. The current conditions of the registers (including state of conservation, location, and personnel training for data collection) are precarious. Yet, they are available and a reasonable source of information. Precise, low-cost, local actions are required to improve the quality and extend the coverage of maternity registers as sources of information for monitoring maternal and neonatal health.

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USER'S GUIDE: MONITORING MATERNAL AND NEONATAL HEALTH WITH MATERNITY REGISTERS IN INSTITUTIONS

1. INTRODUCTION

The high maternal mortality rate in Guatemala is a reflection of the poor living conditions of a great portion of the population, and of inadequate access to high quality health services. Even though reduction in maternal mortality is a commitment included in the 1996 Peace Accords, this indicator has remained virtually unchanged during the last 10 years.[1] The high proportion of home births[2] makes it difficult to offer timely and efficient care at the time of an obstetric emergency.

In order to address this problem, the Ministry of Health (MOH), with support from various technical organizations, is currently promoting increased access to delivery assisted by trained personnel, as well as strategies for timely referral and community mobilization at the occurrence of an obstetric emergency. Eight hospitals in Region IV and El Quiché have already started the process of improving the administration and quality of maternal services by acquiring basic skills in maternal and neonatal care. These efforts should be supplemented by the availability of information useful to demonstrate the impact of these initiatives on the maternal health situation.

The epidemiological data consolidated from district-level reporting do not offer timely and accurate information and cannot detect immediate changes within institutions providing maternal health services. Process indicators are needed in order to know the accomplishments that have been achieved by new interventions and so that continual improvements can be made.

The maternity register is a document available in must public institutions; it is completed by personnel responsible for the deliveries and has resisted changes

[1] MEASURE *Evaluation*/GSD Consultores Asociados. Estimates of Maternal Mortality in Guatemala: Period 1996 – 1998. Guatemala, March 2000.
[2] About 90% in the north-western region of Guatemala.

throughout the years, including many reorganizations of the national information system. However, there is no solid evidence about its value for monitoring maternal health.

Basic Definitions

- **Obstetric Complication**: A case with an obstetric complication is defined as a woman with any of the following diagnostics: pre or post delivery bleeding, delayed or obstructed delivery, post-delivery infection (sepsis), abortion complication, preeclampsia / eclampsia, ectopic pregnancy, or uterine tear.
- **Clinical History** or Clinical Record: In this document information produced during the patient stay in the health facility is recorded. It includes, among others, the medical and nursery records and laboratory results.
- **Maternal Death**: A maternal death is that which occurs during pregnancy, delivery or within 42 days after delivery, regardless of the duration and type of pregnancy, whatever the related cause or whether aggravated by the pregnancy or its treatment. Accidents or incidental causes are excluded.
- **Vaginal Delivery**: Birth of a baby through the vagina, as opposed to a cesarean section delivery.
- **Maternity Register**: Document in which the person responsible for the delivery records personal information, clinical procedure, and health status of the mother and the newborn.
- **User**: Every person or institution that requires and uses the data generated by the information system for decision making.
- **Variable**: Basic unit of information that orders the systematic recording of information. For instance: mother's name, age, complications, person who assisted the delivery.

A study conducted by MEASURE *Evaluation* in 2001[3] conclusively reveled that the maternity register is a valid[4] and reliable[5] source of information for maternal health monitoring.

Since health facilities already have a valuable instrument for recording deliveries and births, this User's Guide was formulated to offer administrators, health service providers and users of information practical recommendations for the use of the maternity register as a source of information to monitor maternal health. The suggestions and recommendations included in this document were originated in personal interviews and workshops held according to the methodology proposed for the mentioned study.

This guide describes the physical characteristics that a maternity register should have, proposes the basic variables that should be included in this register, makes suggestions for training and supervision of the staff completing the register and adequate recording practices that will lead to improved accuracy of the data. Finally, this guide presents recommendations to increase the use of information by facilities themselves in order to generate a cycle that will lead to further improvements in accurate data collection.

[3] MEASURE *Evaluation*/GSD Consultores Asociados. An assessment of the quality of maternity registers for monitoring maternal and neonatal health in institutions in Guatemala, October 2001. Research implemented in the public and private services of Totonicapán, Quiché y San Marcos with the participation of the Ministry of Health and the Maternal and Neonatal Health Project, and financed by USAID.
[4] Maternity registers contain information on 85% of deliveries in facilities.
[5] Variables recorded in maternity registers coincide with data in other registers in at least 83% of cases.

2. PHYSICAL CHARACTERISTICS OF THE MATERNITY REGISTER

For precise and efficient use of information, the maternity register should have the following characteristics:

- **Hard Cover**: The register is a reference document frequently used even after it is completed, filed and stored; therefore, it is necessary to assure its physical integrity.

- **Predefined Variables:** Variables should be predefined, ideally as a product of institutional and national consensus, and printed in the document (some suggestions are offered in the next section). A less expensive alternative[6] is the use of a rubber stamp to make an imprint on the document. The use of a notebook (or unattached sheets of paper) with hand made columns creates a potential source of mistakes and inaccuracy.

- **Attached Sheets:** The pages must be firmly joined within a hard covered book. The frequent handling of this document may be the origin of missing, unattached pages. The consecutive numbering of the pages may be useful to identify missing information. It is also advisable to number the births consecutively[7] so that missing information can be easily detected and corrected.

- **Institutional Support:** The inclusion of an introductory note in the register by the Ministry of Health stressing the importance of the maternity register for the calculation of indicators subject to international verification will lead to a more precise and careful inscription.

- **Permanent Location:** Ideally, the document should be located in the nurses' station of the delivery room. In must public hospitals, this room is next to the operating room where cesarean sections are performed. This facilitates the data recording procedure. Consultations of the maternity register should be done in the place where it is permanently located, to avoid losing records.

The printing of a document with the features mentioned above (or the alternative use of a rubber stamp) and the continuous supply of replacements for completed books is the responsibility of the service administration.

[6] This suggestion arose frequently in the *departamento* workshops.
[7] For example, 001-2001, 001-2002.

3. MINIMAL VARIABLES REQUIRED IN THE BIRTH REGISTER

In the short term, the variables to be included should be the result of a consensus among administrators and the providers of gyneco-obstetric services at the facility. In the long term, however, a national consensus is recommended for the inclusion of standardized[8] variables according to the Ministry of Health's needs that allows aggregation and comparative analysis.

The following variables were frequently found in the facilities included in the study, which may be a starting point to reach national consensus:

- **Name of the mother** (for identification and follow up)
- **Age of the mother**
- **Clinical history number**
- **Date of the delivery/cesarean section** (to analyze cesarean indicators and deliveries attended by trained personnel)
- **Vaginal delivery** (eustosic or distosic, for analysis of maternal complications)
- **Cesarean delivery** (to monitor the number of cesareans performed)
- **Indication for cesarean section**
- **Live birth** (to establish neonatal deaths)
- **Sex of the newborn**
- **Weight at birth** (to monitor low birth weigh)
- **Parity, number of children previously born alive:** (one birth yes/no; useful to analyze the rate of episiotomies)
- **Gestational age:** (to identify premature delivery)
- **Episiotomy** (to calculate the rate of episiotomies)
- **Apgar score** (to analyze the rate of neonatal complications)
- **Maternal complications**
- **Maternal deaths** (to calculate the rate of maternal mortality)
- **Newborn complications** (to calculate the rate or newborn complications)
- **Stillbirth** (to calculate the rate of stillbirths)
- **Person attending the delivery** (to calculate the percentage of deliveries attended by trained personnel)
- **Active management of the 3rd stage of labor:** (to calculate the introduction of active management)
- **Need of blood transfusion:** (to analyze with the indicator maternal complications)

4. TRAINING IN RECORDING DATA IN THE MATERNITY REGISTER

Training for new health personnel delivering births should include instruction in completing the maternity register. In-service training should include: the importance of accurate recording of information, the established protocols for completing the register, and the meaning and codes for each variable. Whenever appropriate, personnel should be trained to calculate and analyze process indicators that can be obtained from the maternity register.

[8] Standardized variables will measure the provision and quality of services.

5. PROCEDURE FOR REFCORDING DATA IN THE MATERNITY REGISTER

5.1 Person Responsible

The person who attended the delivery should enter the data in the maternity register. He/she has firsthand information about the procedures and any complications. The recording of information by a person who did not directly attend the delivery may generate inaccuracies.

5.2 Timeliness

The information should be entered immediately after the delivery. The recording of several deliveries at the end of a workday, for example, is a potential source of mistakes.

5.3 Supervision

Systematic supervision of the maternity register should be carried out by assigning one person to be in charge of monitoring the completion of the register and quality of the information entered. The accuracy of the data should be supervised by someone delegated for this task at the facility, so that systematic errors in the recording of information may be identified and corrected, and to ensure that all deliveries are registered. The data recorded in the maternity register should be verified against information found in the clinical history files. The data in both documents should coincide.

6. USE OF THE INFORMATION

6.1 Maternity Register as a Source of Official Data

The accuracy of the data in the maternity register may be improved if:

a. It becomes the official source of consolidated data that health institutions must provide to the Unified System of Information (SUI). Example: Deliveries attended by trained personnel.
b. Process and quality of care indicators are regularly used and analyzed to monitor performance.
c. The maternity register is systematically used as a source of basic information in clinical meetings periodically conducted in the health institutions.

6.2 Use of the Maternity Register in Facilities

The information generated by the maternity register may have the following uses:

- **Service outcomes:** Maternal and neonatal health services may gather monthly information about:

Indicator[9]	Definition	Construction	Interpretation and Comments
Number of deliveries	Percentage of deliveries attended by trained personnel	Deliveries attended by trained personnel/ # estimated of live births	This is a process indicator and should be monitored monthly and through surveys.
Number of cesarean sections	Rate of deliveries resolved through cesarean section, out of all deliveries.	(# of cesarean sections in the reference period / # estimated of live births in the reference period) x 100	This is a process indicator that should be monitored monthly.
Number and type of maternal complications	Total of needs properly met for emergency obstetric care (EOC): Estimated rate of women who will have complications and will be assisted in services with essential maternal and neonatal care (AMNE, in Spanish)	(Total # of complicated cases attended in all AMNE services/ total # of births in the area) x 100 Note: Estimated births are multiplied by 0.15 to calculate the total number of complications in the population.	This is a process indicator and should be monitored monthly. What is expected is that 100% of women who have a complication receive care in a facility with AMNE.
Number and type of neonatal complications	Total of properly met needs for neonatal care.	(Total of complicated neonatal cases by asphyxia in all services with AMNE/ total number of newborns with complications) x 100	This is a process indicator that should be monitored monthly.
Death rate for obstetric complications	Maternal deaths among all women seeking care at a health facility for obstetric complications	(# of maternal deaths of obstetric origin/ # of direct obstetric complications) x 100	This is a process indicator that should be monitored with monthly data from the facility. It should not be aggregated at the national level. It reflects the performance and the quality of health care. For this indicator 1% is the maximum acceptable figure.
Percentage of deliveries attended by trained personnel.	Total live births attended by trained personnel, including: physicians, professional nurses, auxiliary nurses, and health providers trained in primary health care and maternal and neonatal care.	(# of deliveries attended by trained health personnel/ estimated # of live births) x 100	This is a process indicator that should be monitored monthly.

[9] Definitions taken from:

a) Mother/Baby Package: Implementing Safe Motherhood. WHO/FHE/MSM/94.11
b) Guidelines for Monitoring the Availability and Use of Obstetric Services. WHO, UNFPA. October, 1997.
c) Design and Evaluation of Maternal Mortality Programs. Center for Population and Family Health. School of Public Health. Columbia University, 1997.
d) Mother Care Matters. Indicators for Low-risk Pregnancy: Lessons learned to Measure Progress. Vol. 8, No. 1, May 1999.

Indicator[9]	Definition	Construction	Interpretation and Comments
Rate of low birth weight	Total live births with a weight lower than the minimum acceptable	(# of live births with a weight under 2,500 grms. / # of live births) x 100	This is an impact indicator that can be calculated with health facility data, either routinely or through surveys. It identifies the results of health interventions related to neonatal care.
Annual consolidation of each of variable.			
Comparison of each variable with the same month in previous years.			

This information should be presented in posters, so that personnel can have immediate feedback on the information collected.

- **Clinical specialist meetings:** Public institutions periodically conduct meetings for the discussion of clinical cases. During these meetings a summary of service provision can be presented using the indicators listed above.

- **Analysis of epidemiological and health services provision at the district level:** The epidemiological and health services provision information from local facilities should be consolidated at the office of the District Health Director. Information from private hospitals and Social Security institutions should also be included, so that the consolidated data comprehensively reflect the situation of health services in the district. The coherence of the health system will benefit if a copy of the information aggregated at the district level is sent as feedback to all facilities that report primary data.