Estimates of Maternal Mortality in Guatemala 1996 - 1998

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ACRONYMS

SIGSA	Sistema Gerencial de Información en Salud (Health Management Information System)
IGSS	Instituto Guatemalteco de Seguridad Social (Guatemalan Social Security Institute)
INCAP	Institute of Nutrition of Central America and Panama
INE	Instituto Nacional de Estadística (National Institute of Statistics)
ENSMI	Encuesta Nacional de Salud Materno Infantil (National Survey of Maternal and Child Health)
MM	Maternal mortality
MMR	Maternal mortality ratio
MSPAS	Ministerio de Salud Pública y Asistencia Social (Ministry of Public Health and Social Welfare)
PAHO	Pan American Health Organization
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development

EXECUTIVE SUMMARY

The estimate of maternal mortality for the period 1996-1998, derived from the procedures described in this report, is 184 maternal deaths per 100,000 live births (186 for 1998). The procedure yields results that are consistent with estimates available for earlier periods, both at the national and departmental level from other special studies. These studies have found ratios that range from 160 to 230 maternal deaths per 100,000 live births. Unadjusted official figures, from INE and SIGSA for the period 1988–1998, range from 87 to 111. These official statistics reflect the high level of underreporting of maternal deaths at the departmental and national level, that has been documented in several studies.

All the data sources analyzed for the preparation of this report confirm that maternal mortality levels have remained stable during the last decade[1]. This may be due to the fact that the implementation of interventions aimed at reducing maternal mortality began during the last 5–7 years. The implementation of interventions has been slow and does not cover the entire country yet.

The methodology described in this report was designed to produce an estimate of Guatemala's maternal mortality ratio at the national level. The estimation procedure was developed by the Measure *Evaluation* project at Macro International and implemented by GSD Consultores Asociados. The methodology is based on the application of a national level adjustment factor to SIGSA and MSPAS's recent official figures. This adjustment factor was taken from a detailed study of underreporting of maternal deaths at the departmental level carried out by Dr. Medina of the MSPAS in 1989. Dr. Medina extensively studied data collected from the civil registers at the departmental level on all deaths of women of reproductive age, with the goal of identifying maternal deaths that had not been previously reported. This methodology is based on the assumption that the quality of the civil register and the MSPAS in Guatemala has not changed during recent years.

The methodology was discussed with key officials involved in maternal health and maternal mortality reduction programs in Guatemala, as listed in Section VII. They all agree that this is a useful and cost-effective methodology to assess the maternal mortality situation in Guatemala. It will be possible to continue using this methodology providing:

- The quality and timely availability of INE's maternal mortality data does not undergo major changes.

- MSPAS's Maternal Mortality Epidemiological Surveillance System and SIGSA does not register all maternal deaths nor provide these data in a timely manner. This system is currently providing data more quickly than before, but is not yet collecting 100% of the expected cases.

However, significant changes in INE's functional structure are planned, including an upgrade of computer equipment and regionalization of information management. These

changes, which began in 1999, could improve the registration of vital statistics, but in the short-term INE is projected to face continued underreporting of data.

SIGSA and the MSPAS's Maternal Mortality Epidemiological Surveillance System are providing more timely and reliable information than 2-3 years ago: a higher percentage of Health Areas are submitting monthly reports of maternal deaths. There has been an improvement in the information flow rate and more cases are being identified, but reporting has not yet reached 100% of the expected cases. If SIGSA's registration system and the MSPAS's Maternal Mortality Epidemiological Surveillance System continue to improve, there could be a reliable and valid maternal mortality registration system in the next 5-10 years.

I. INTRODUCTION

The availability of a reliable maternal mortality indicator is of paramount importance to evaluate the progress of women's health programs supported by the Government and for monitoring compliance with agreements aimed at reducing maternal mortality subscribed to by the Government of Guatemala. In this study, a methodology proposed by the Measure *Evaluation* project at Macro International[2] was used to estimate maternal mortality in Guatemala. The methodology consists of applying an adjustment factor to MSPAS's official registers to compensate for current underreporting.

The need to use an estimate as an alternative to official figures results from the high levels of underreporting found in official registers in several studies. In-depth studies in selected areas of Guatemala have demonstrated that vital registers only identify one third to one half of all maternal deaths occurring in Guatemala[3].

For the period 1986-1995, INE estimates of maternal mortality range from 87 to 111 deaths per 100,000 live births. SIGSA's projections for the period 1996-1998 range from 98 to 108 deaths per 100,000 live births[4]. However, several studies have calculated maternal mortality ratios between 190 and 230 per 100,000 live births for the period 1989-1995[5].

II. PURPOSE OF THE STUDY

The main purpose of this study is to estimate maternal mortality levels for the most recent period based on the introduction of adjustments to compensate for the underreporting of maternal deaths at the departmental level.

III. BACKGROUND

It is estimated that 50 to 90% of all maternal deaths in Guatemala are preventable. According to the place of delivery (hospital, household) these cases are associated with late identification of obstetric emergencies, inadequate or delayed management of complications, problems in the referral system, lack of access to health care facilities due to economic or cultural reasons, and poor delivery of health care. The main causes of maternal death are hemorrhage, complications from abortions, sepsis and eclampsia[6].

Since 1988 efforts have been made to identify the limitations in the registration system for maternal deaths. The first studies carried out by Medina *et al*[7] and INCAP[8] in 1989 showed maternal mortality levels of 220 and 230 per 100,000 live births, respectively. These studies showed a significant underreporting of maternal deaths both at the hospital and household level. Hospital under-reporting ranged from 60 to 90% of deaths. Under-reporting of deaths at the community level was usually lower, approximately 40%. Data from a national study developed by Medina in 1989 agree with the findings of a

study from INCAP in the Quetzaltenango Health Area covering a two-year period. Similar results have been reported by a study developed by PAHO and the MSPAS in 1996 in the Huehuetenango Health Area[9].

Medina reported a 50% undercount of maternal deaths for the department of Guatemala. On the other hand, Kestler et al[10], who have been investigating maternal mortality in the metropolitan region for more than 6 years, found three times more maternal deaths than those registered in death certificates in the civil registry. However, it is important to note that there is a significant percentage of *imported* deaths from other departments that reach the reference hospitals located in the metropolitan region: Roosevelt, San Juan de Dios and IGSS.

IV. SOURCES OF INFORMATION ON MATERNAL MORTALITY IN GUATEMALA

Currently Guatemala has four sources of information on maternal mortality:

1. The National Institute of Statistics
2. The MSPAS's Health Management Information System -SIGSA-[11]
3. The 1995 national maternal and child health survey.[12]
4. Other special studies (already mentioned) financed by international cooperating agencies that are not regular source of information.

Each source has its own characteristics and limitations:

1. **National Institute of Statistics:** There is evidence of underreporting of certain vital events, and for several indicators tabulations are not updated frequently. For example, there is a delay of two or more years in the registration of live births used as the denominator to calculate the maternal mortality ratio. Another significant problem is the diagnosis entered as the cause of death in the death certificate. Ideally, the cause of death should be determined by an MSPAS physician in all health districts and national hospitals, or by a private physician. However, when a death occurs during non-working hours or in places where there is no physician, the cause of death is established by the civil registrar based on the information provided by the family members of the deceased.

   UNICEF supported training of civil registrars in Guatemala. A training project on the registration of vital events was developed from 1996 to 1998. It began in Quiché and Huehuetenango in 1996, was extended to 11 departments in 1997, and in 1998 it covered the rest of the country. Training covered the registration of births, stillbirths, mortality and marital status. The project's evaluation report is still pending internal review by INE. However, considering that maternal mortality was not covered specifically, and that the main problem in the civil registers, and even hospitals, is the misdiagnosis of maternal deaths, a significant improvement regarding underreporting of maternal mortality cannot be expected.

REGISTRY OF VITAL STATISTICS AT INE

The Department of Vital Statistics of the National Institute of Statistics is the official source of data for calculating maternal mortality indicators in Guatemala. Data are collected by the civil registrars, who are municipal officials in each department of the country.

Published data on births and deaths, broken-down by cause, are available up to 1995. Data for 1996 is already entered in the computer system and is available for on-site consultation by private users upon request. Data entry of vital statistics for 1997 was scheduled to be concluded in May 1999.

Official births and deaths registries are prepared in triplicate. One copy is sent to INE. Civil registrars in each department collect these copies every month, and send them to INE's departmental office. At this level there is no processing or analysis of the information, they simply send the information every month to INE's headquarters in Guatemala City.

Once data reaches INE's headquarters, data-entry clerks record births and deaths in separate batches. The monthly salary of each clerk is US$ 250.00. More data-entry clerks would improve the pace of registering information, but this is not a key factor for having more up to date registries.

INE has eight coding clerks, all located in Guatemala City. They verify the causes of death entered and assign the corresponding code according to the International Classification of Diseases.

A regulation established by the National Institute of Statistics states that forms will be entered if they are received up to six months after the registration of the death or birth. That is, if a birth or death occurs in January, it will not be entered in the database if the form is received in or after July of the same year. However, the number of vital registrations not entered into the system due to this regulation is not significant from a statistical perspective.

All vital registration forms received in Guatemala City are reviewed and entered into the database. In order to avoid inter-institutional conflicts (INE – Municipalities) no system has been developed to verify if all forms filled at the department levels are, in fact, sent to Guatemala City.

2. **MSPAS's Health Information Management System (SIGSA):** During the last two years, SIGSA has established an information system with a faster flow of information compared to past MSPAS information systems[13]. In 1998, SIGSA and the Maternal Mortality Epidemiological Surveillance Committees have been able to collect updated monthly reports of maternal deaths in nearly 70% of the health areas. This represents a striking improvement in terms of reporting timeliness and coverage, despite the fact that not all expected maternal deaths are being identified.

   Maternal Mortality Epidemiological Surveillance Committees (a methodology designed by PAHO and MSPAS) are organized at the health area and district level and in national hospitals which attend deliveries. In the health area or district the committees are organized by representatives from the health sector, civil registry, municipal officials and NGO's. In the national hospitals the members of the committee are physicians, nurses, residents and medical students, as well as staff from the department of statistics and registration. This basic configuration may vary at the different health-care facilities. The committees hold monthly meetings in the hospitals and health areas. In the districts, due to the relatively small number of maternal deaths, they usually meet when a maternal death occurs.

   It is the responsibility of the committee to investigate all deaths of women of reproductive age in their area and determine if in fact it was a maternal death. If a maternal death is confirmed, the committee will attempt to establish the cause of

death and determine the factors associated with the death. Based on the diagnosis and the associated factors, the committee issues operational recommendations required to be implemented in the health-care facilities in order to improve their quality of care. The area committee consolidates data from their corresponding hospitals and districts and sends a monthly report to SIGSA. Seventy percent the of the health areas comply with the monthly reporting requirement, but it is not possible to establish if they are investigating all the deaths of women of reproductive age, as well as maternal deaths in all the areas. Based on the level of underreporting found in previous studies, the committees are reporting a lower number of deaths than expected.

3. **1995 National Maternal and Child Health Survey (ENSMI):** Using the Demographic and Health Survey (DHS) program's sisterhood method for direct estimation, the 1995 ENSMI calculated a maternal mortality ratio of 190 maternal deaths per 100,000 live births for the period 1990-1995[14]. Due to the low number of deaths identified, the margin of error of this survey estimate could be considerable and the data cannot be used to make estimates by department or to analyze maternal mortality trends.

4. **Specific studies:** With the exception of Medina's study in 1989, there are no assessments of underreporting of maternal deaths at the national level during the last 10 years. There are some studies that cover one or two health areas[15], while the metropolitan region has been extensively studied by Kestler[16].

   Medina found a maternal mortality ratio of 219 deaths per 100,000 live births and an undercount of 46%. PAHO/MSPAS's study in 1985[17] found a maternal mortality ratio of 205 and an undercount of 42%. A study developed by INCAP[18] in 1989-1990 found a maternal mortality ratio of 230 and undercount of 66%. Kestler found a ratio of 156 in the metropolitan region for the period 1993-1996 and an undercount of 66%.

Table 1
Source of maternal mortality estimates and underreporting levels in Guatemala

Study	Year	Geographic coverage	Maternal mortality per 100,000 live births	Underreporting
Medina *et al*.	1989	National	219	45.7%
INCAP	1989-1990	Quetzaltenango	230	66.0%
MSPAS-PAHO	1985	Huehuetenango	205	41.7%
ENSMI 1995	1990-1995	National sample	190	—
Kestler *et al*.	1993-1996	Guatemala	156	66.0%

Note: The figure of 219 for 1989 is revised from the original figure of 248 calculated by Medina. A correction in the numerator was introduced (there was an excess of 18 maternal deaths among the maternal deaths from the civil registries and the additional deaths found by Medina); and INE's estimate of the number of live births is used as the denominator in this calculation, instead of the number of births reported by Medina.

Sources:

1999. Kestler E, Ramírez L. Pregnancy Related Mortality in Guatemala, 1993-1996.
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V. METHODOLOGY USED TO ESTIMATE MATERNAL MORTALITY IN GUATEMALA

To date, no methodology or model has been proposed to estimate maternal mortality in Guatemala. The use of an adjustment factor based on Medina's study is reasonable because the level of underreporting in that study is similar to the underreporting levels reported in other studies and the Medina study is the only one that estimates underreporting for the entire country. With this method, it is possible to adjust INE and SIGSA statistics and calculate an estimate of maternal mortality for Guatemala.

The methodology proposed by Measure *Evaluation*[19] consists of adjusting (inflating) the available data on maternal deaths at the national level based on the percentage undercount of maternal deaths found in Guatemala in 1989 by Medina to inflate the numerator of the maternal mortality ratio. (For basic information used by Medina, see Table 2):

Table 2
Number of live births and maternal deaths registered and estimated for 1989 by department

Department	Live births INE	Maternal deaths from civil registers	Total maternal deaths found by Medina	Percentage undercount	Adjusted maternal mortality (per 100,000 live births)
1. Chiquimula	9,516	8	16	50.0	168
2. Izabal	9,879	6	15	60.0	152
3. Santa Rosa	9,671	10	18	44.4	186
4. Retalhuleu	8,191	5	14	64.3	171
5. Suchitepequez	13,417	16	28	42.9	209
6. Jutiapa	14,166	9	16	43.8	113
7. Jalapa	8,123	8	19	57.9	234
8. El Progreso	3,747	7	9	22.2	240
9. Zacapa	5,645	11	15	26.7	266
10. Escuintla	15,552	14	34	58.8	219
11. Totonicapán	12,927	14	35	60.0	271
12. Sacatepéquez	6,317	11	14	21.4	222
13. Quetzaltenango	23,083	26	44	40.9	191
14. Alta Verapaz	23,405	46	83	44.6	355
15. Huehuetenango	28,019	51	71	28.2	253
16. Chimaltenango	12,560	15	23	34.8	183
17. San Marcos	27,834	19	51	62.7	183
18. Petén	10,646	19	30	36.7	282
19. Baja Verapaz	6,857	8	13	38.5	190
20. Sololá	9,579	18	38	52.6	397
21. El Quiché	20,806	31	55	43.6	264
22. Guatemala	60,867	54	107	49.5	176
Total	**340,807**	**406**	**748**	**45.7**	**219**

Note: Medina used the figures for “births” for 1989 instead of “live births” as the denominator for the MMR in his original calculations since official figures from INE were unavailable at the time of the publication of the study. In order to have more accurate estimates, this study uses INE’s estimates of the number of live births for 1989 in the denominator instead of the figures used by Medina.

In addition, in his review of the civil registers to estimate the total number of deaths, Medina mistakenly used 764 maternal deaths instead of 748. When summing deaths from the civil register he omitted two deaths, using a total of 404 instead of 406 (there were 54 deaths in the Civil Register of the Department of Guatemala and not 52 as originally published).

Estimates at the departmental level show substantial variation~~s due to variation~~ in the number of maternal deaths and live births. Therefore, it is not possible to make an effective interpretation of the rates at the department level and rank their maternal mortality ratios.

INDICATORS OF MATERNAL MORTALITY

Maternal Mortality Rate = (No. of maternal deaths / Number of women)
Maternal Mortality Ratio = (No. of maternal deaths / Live births)

In this study the indicator calculated is the maternal mortality ratio and not the maternal mortality rate.

CALCULATION OF MM AJUSTED FOR 1996 – 1998:
[(Number of maternal deaths reported by SIGSA's) * (inflation factor)**]** **/** (Number of live births).

The result is multiplied by the 100,000 because maternal mortality is an event of relatively low prevalence when compared to, for example, infant mortality, which is multiplied by the 1000. Thus, an infant mortality rate of 50 per 1000 is equivalent to 5000 deaths of children under 1 year of age per 100,000 live births. Therefore, maternal mortality levels or trends should be evaluated with caution. For example, if the maternal mortality ratio were presented per 1000 live births, there would not be much difference between a ratio of 220 maternal deaths per 100,000 live births and 160 per 100,000, since both ratios could be expressed as ***2*** **maternal deaths per 1000 live births**.

In the case of maternal mortality the absolute number of deaths and its evolution over time is very important.

INFLATION FACTOR = $1 + (x - |Y|)/x$
Where:
x = number of maternal deaths from the civil registries in 1989,
y = number of maternal deaths in 1989 from Medina's study.

According to Table 2, x = 406; y =748.
Resulting inflation factor =1.84.

VI. RESULTS AND ANALYSIS

Table 3 summarizes adjusted and unadjusted maternal mortality ratios based on official SIGSA data for the period 1996-1998. Although there is slight variation when comparing annual estimates, maternal mortality at the national level calculated by SIGSA figures was relatively constant during the 1996-1998 period at approximately 102 deaths per 100,000 live births. However, when the underreporting adjustment factor was introduced, the estimate of maternal mortality rate for the 1996-1998 period was, on average, 184 deaths per 100,000 live births (186 for 1998). These adjusted estimates are consistent with other available estimates for earlier periods, both at the national and departmental level, as shown in Table 1.

Table 3
Maternal mortality for the period 1996-1998 with and without using the adjustment factor for underreporting of maternal deaths reported by SIGSA

Year	Live births SIGSA	Number of maternal deaths SIGSA	Unadjusted MMR (per 100,000 live births)	Adjusted number of maternal deaths	Adjusted MMR (per 100,000 live births)
1996	362,756	362	108	666	184
1997	357,987	352	98	648	181
1998	380,780	384	100	707	186

Note: Data from 1996 to 1998 correspond to those published by SIGSA/MSPAS. The adjustment factor used at the national level was 1.84, as described in box on page 7.
Data from 1986 to 1995 (excluding 1989) published by INE show that the number of maternal deaths per year ranged from 327 to 416 (not shown in the table). For example, according to INE, in 1986 there were 347 maternal deaths and 341 in 1995. For detailed information see: 1998. MSPAS. Departamento Materno Infantil. SIAS. Andrade C, Velázquez E. Nuestro compromiso: la reducción de la mortalidad materna en Guatemala.

As previously discussed, Medina's study was designed to assess underreporting of maternal deaths in the civil registration system. Maternal mortality estimates require both data on maternal deaths and data on live births, generally derived from vital statistics. However, underreporting of live births was not assessed. Table 4 compares the number of the live births reported by INE with the number of live births estimated from the crude birth rate for the period 1993-1995 from the 1995 ENSMI and population data from the 1994 census, in an attempt to verify the birth data from the civil registry. Results from this verification suggest that the source of information on the number of live births has little effect on the estimates of maternal mortality ratios.

Table 4
Number of live births and estimates of maternal mortality (MM) using two sources of information on live births

Population & year	Population	Crude birth rate (CBR) 1993-1995 (95 MCHNS)	Estimated number of live births CBR*Pob.	Live births according to INE	MMR with 95 ENSMI births	MMR with INE births
Population; 1990	8,748,812	37/1,000	323,706	347,207	197	183
Population; 1995	9,975,927	37/1,000	369,109	371,091	171	170
1996				362,756		
1997				357,987		
1998			395,183**	380,780	180	187
Population; 2000	11,385,337	37/1,000	421,257			

** Extrapolated number of live births for the mid-point between 1995 and 2000.

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