

# Pregnancy-related mortality in Guatemala, 1993–1996

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## ABSTRACT

To select the proper interventions that could prevent maternal mortality, adequate and appropriate maternal mortality data are needed. Nevertheless, the quality and quantity of information and the scope of maternal health- and death-related data are inadequate in many countries, particularly in the developing world. From January 1993 to December 1996 a surveillance program in maternal mortality was developed to conduct surveillance studies in the department of Guatemala, Guatemala. With an active surveillance system, our approach gave a more complete picture of maternal death and produced information on the specific causes of maternal mortality. Using multiple sources of information, we reviewed and analyzed all deaths of women of childbearing age (10 to 49 years). Each death was investigated to determine whether it was pregnancy-related or not. The maternal mortality ratio for the four-year study period was 156.2 deaths per 100 000 live births. Women 35 and older had a higher risk of maternal death than women under that age. Women who were 35–39 years old had a maternal death risk almost three times as high as women aged 20–24. For women who were 40 or older the risk was more than double that of women 20–24 years old. Overall, the two leading causes of maternal mortality were infection and hemorrhage. Vaginal deliveries where there was medical assistance had the highest rate of delivery-related maternal death from general infection. In deliveries attended by nonmedical personnel, delivery-related maternal deaths from hemorrhage were most frequently associated with retained placenta. Developing countries are called on to implement systems that can provide continuous and systematic data collection so that policymakers and health managers have adequate information to design proper interventions to save women's lives.

Launched in 1987 at a conference in Nairobi, Kenya, the Safe Motherhood Initiative has been supported by the World Health Organization and a number of other international organizations. By the end of 1990 most of the developed and developing nations of the world had recognized and accepted

the Initiative and its goal of reducing maternal mortality and morbidity by 50% by the year 2000 (1). By 1992 many countries had declared maternal mortality a national priority (2, 3).

As part of the Initiative, over the last 10 years most developing nations have made an effort to improve their data on maternal mortality and to publish new maternal mortality ratios (4). In spite of those efforts, in many cases, particularly in developing nations, the quality and quantity of information and the scope of health- and death-related data are still inadequate.

As they move into the new century, developing nations need to find new

strategies to improve the quality and quantity of their maternal health statistics. Public health surveillance is a concept that developing nations need to implement and strengthen at the national level. Surveillance is a cyclical process that requires several steps: 1) deciding whether the health event (e.g., maternal mortality) merits surveillance, 2) establishing the objectives of the system (why am I doing this?), 3) developing the methods (case definitions, sources of collection, and data collection instruments), and 4) analyzing, interpreting, and disseminating the information. A surveillance cycle is completed once a policy analysis pro-

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duces needed recommendations and the recommendations are disseminated to all health levels and to all participants involved in implementing them. Through this cyclical process the health event previously selected is reevaluated on a continuing basis.

In this paper, we present the results of a surveillance system developed and used for four years to study maternal mortality in a Guatemalan population and to provide information that was not available before for this particular target population. The aims of this study were to: 1) compare overall maternal mortality in the department of Guatemala as revealed by this surveillance method and by the national statistics registry and 2) use the new surveillance system to investigate specific features of maternal deaths (age and risk of death, direct and contributing causes of death, etc.) in the department.

## METHODS

From January 1993 through December 1996, a surveillance program in maternal mortality conducted studies in the department of Guatemala. The department has an area of 2 126 km<sup>2</sup> and includes 17 districts (similar to counties in the United States of America), one of which is Guatemala City. Seven hospitals and 92 primary health care centers serve the department's three million inhabitants (1 410 inhabitants per km<sup>2</sup>). Most deliveries (71%) are institutional (5). This region has an annual average of 69 000 live births, which represents 23% of the total births in the country. During 1995 the fertility rate was 3.9 children per woman, less than the national figure of 5.1 children per woman (6).

All death certificates of women of childbearing age (10–49 years old) issued from 1 January 1993 through 31 December 1996 were reviewed and analyzed. Each death was investigated to determine whether it was pregnancy-related or not. Two clerks who had had previous experience in data collection were trained by our team in the use of multiple sources of information. The

clerks reviewed medical charts and other information from public and private hospitals and from primary health care centers. Data for verbal autopsies were collected by interviewing traditional birth attendants (TBAs) and family members. Autopsy reports that had been prepared by hospitals and by the national coroner's offices were also reviewed. For each case, a data collection form with information on 56 variables was completed. The forms were reviewed monthly and entered into a computerized data system developed in the Epi Info software program (Centers for Disease Control and Prevention, Atlanta, Georgia, United States of America) and then adapted for the surveillance program. The software program allowed us to calculate rates and do other statistical analyses.

A woman's death was classified as maternal if it occurred while she was pregnant or within 42 days after the end of the pregnancy, independent of the duration of the pregnancy and of the delivery method. The maternal deaths encompassed both direct and indirect obstetric deaths. Direct obstetric deaths were ones that resulted from complications of the pregnancy itself, as a result of necessary interventions elected or required for the pregnancy, or from the chain of events initiated by the complications or the interventions. These direct deaths included ones resulting from hemorrhage, infection, and pregnancy-induced hypertension.

Indirect obstetric deaths were ones that resulted from preexisting disease or from disease that developed during pregnancy and was aggravated by the physiological effects of the pregnancy, such as cancer, cardiomyopathy, and HIV or AIDS.

## RESULTS

During the four-year study period, the surveillance program identified 276 432 live births in the department of Guatemala, 4 247 deaths of women ages 10–49, and 435 women dying during pregnancy or within 42 days after the end of pregnancy. The maternal mortality ratio for the study period was 156.2 deaths per 100 000 live births. During this study period the number of maternal deaths detected annually was as high as three times the number that the national vital statistics registry had indicated just a few years before. The total number of deaths among women aged 10–49 in 1996 (1 196) was more than double the number found in 1989 (549). However, during the 1993–1996 study period, there was little variation in the maternal mortality ratios or in the proportion of all deaths among women of childbearing age that was maternally related (Table 1).

Women 35 and older had a higher risk of maternal death than women younger than that (Table 2). Women

**TABLE 1. Maternal deaths and all deaths among women of childbearing age (10–49), by year and source of data, department of Guatemala, Guatemala, 1986, 1989, 1990, and 1993–1996**

Year	Number of maternal deaths	Maternal mortality ratio <sup>a</sup>	Number of all deaths among women 10–49	Maternal deaths as proportion of all deaths (%)
1986 <sup>b</sup>	47	84.9	Na <sup>c</sup>	Na
1989 <sup>d</sup>	85	Na	549	15.4
1990 <sup>b</sup>	41	68.0	Na	Na
1993 <sup>e</sup>	105	158.8	933	11.2
1994 <sup>e</sup>	106	160.3	986	10.7
1995 <sup>e</sup>	125	189.1	1 132	11.0
1996 <sup>e</sup>	99	149.7	1 196	8.2

<sup>a</sup> Maternal mortality ratio = maternal deaths per 100 000 live births.

<sup>b</sup> Source: National vital statistics.

<sup>c</sup> Na = Information not available.

<sup>d</sup> Source: Maternal and Child Department, Ministry of Public Health.

<sup>e</sup> Source: Surveillance program carried out by these researchers.

**TABLE 2. Maternal deaths by age group, department of Guatemala, Guatemala, 1993–1996**

Age group (years)	Maternal deaths	Maternal mortality ratio <sup>a</sup>	Risk ratio	95% confidence intervals
< 20	50	125.5	1.02	0.72–1.44
20–24	107	123.3	Reference group	—
25–29	99	135.9	1.10	0.83–1.46
30–34	77	167.1	1.35	1.00–1.83
35–39	78	359.7	2.92	2.15–3.94 <sup>b</sup>
≥ 40	21	260.9	2.12	1.29–3.45 <sup>b</sup>
Unknown	3	Na <sup>c</sup>	Na	Na

<sup>a</sup> Maternal mortality ratio = maternal deaths per 100 000 live births.

<sup>b</sup>  $P < 0.05$ .

<sup>c</sup> Na = not applicable.

who were 35–39 years of age had a maternal death risk almost three times as high as that of women aged 20–24, and the risk for women who were 40 years old or older was double that of women aged 20–24.

The pregnancy outcomes in maternal deaths during the study period are shown in Table 3. Of the 435 maternal deaths, 50% involved live births, 12% stillbirths, 12% abortions, 22% undelivered pregnancies, and 5% unknown.

The leading causes of death differed by pregnancy outcome. For women whose pregnancy ended in a live birth, the leading causes of death were hemorrhage (mostly uterine atony and retained placenta), pregnancy-induced hypertension, infection (sepsis after cesarean section and vaginal deliveries), pulmonary embolism, and anesthesia problems. For women whose

pregnancy ended in stillbirth, the leading causes of death were hemorrhage, infection, and pregnancy-induced hypertension. For the one case of ectopic pregnancy, the cause was hemorrhage from rupture of the ectopic site. For women whose pregnancy ended in a spontaneous or induced abortion, the leading causes of death were again infection (generalized infection) and hemorrhage.

For the 65 women who were still pregnant at the time of death, 40 (61%) of these deaths from “other” causes were from injury (Table 4). Of those 40 injury deaths, 18 of them were related to homicide or suicide and 10 were nonintentional injuries, mostly pedestrian accidents. For the 12 other deaths due to injury, it was impossible to determine a more precise cause of death. Of the women who died of injury, 57%

were in the second trimester of pregnancy, and 68% were less than 24 years old.

The two leading causes of maternal mortality overall were infection (26%) and hemorrhage (23%) (Table 3). In terms of the type of delivery and whether there was medical or non-medical assistance at delivery, the highest rate of delivery-related maternal death from general infection occurred with vaginal deliveries with medical assistance (Table 5). Delivery-related maternal deaths from hemorrhage were most likely to be associated with retained placenta in deliveries attended by nonmedical personnel, such as traditional birth attendants (Table 5).

## DISCUSSION

All developing countries have some way to systematically collect data related to maternal mortality. However, given the high rate of underreporting and the lack of data to guide interventions, it is evident that new strategies are needed to improve the identification of maternal deaths.

Two primary methods have been suggested for studying maternal mortality and monitoring the rate of change over time, even in the absence of complete and accurate vital statistics. However, both of these suggested methods have serious limitations. One approach, the “sisterhood method”

**TABLE 3. Cause of maternal death classified by pregnancy outcome, department of Guatemala, Guatemala, 1993–1996**

Cause of death	Live birth		Stillbirth		Abortion		Ectopic		Undelivered		Unknown		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Infection	50	23.3	14	26.9	34	61.8	Nc <sup>a</sup>	Nc	7	7.4	5	22	110	25.2
Hemorrhage	59	27.5	16	30.7	6	10.9	1	100.0	12	12.7	3	14	97	22.2
Pregnancy-induced hypertension	58	27.1	13	25.0	Nc	Nc	Nc	Nc	7	7.4	3	14	81	18.6
Anesthesia	5	2.3	Nc	Nc	Nc	Nc	Nc	Nc	Nc	Nc	Nc	Nc	5	1.1
Pulmonary embolism	7	3.2	1	1.9	Nc	Nc	Nc	Nc	Nc	Nc	Nc	Nc	8	1.8
Other <sup>b</sup>	25	11.6	8	15.3	12	21.8	Nc	Nc	65	69.1	3	14	113	25.9
Unknown	10	4.6	Nc	Nc	Nc	Nc	Nc	Nc	3	3.1	8	36	21	4.8
Total maternal deaths	214	100.0	52	100.0	52	100.0	1	100.0	94	100.0	22	100.0	435	100

<sup>a</sup> Nc = no cases reported.

<sup>b</sup> For further details on this “other” category of maternal death causes, see Table 4.

**TABLE 4. Specific causes of maternal death in the "other" category from Table 3, by pregnancy outcome, department of Guatemala, Guatemala, 1993–1996**

Cause of death	Live births and stillbirths	Abortion	Undelivered
Cancer	3	3	4
Cardiac arrest	2	Nc <sup>a</sup>	Nc
Cardiomyopathy	1	Nc	1
Cardiovascular problem	2	Nc	2
Collagen disease	Nc	1	1
HIV or AIDS	1	Nc	1
Kidney failure	Nc	Nc	1
Injury	5	6	40 <sup>b</sup>
Intracerebral hemorrhage	4	Nc	Nc
Metabolic problem	Nc	Nc	1
Neurologic problem	Nc	Nc	1
Neurovascular problem	4	Nc	Nc
Other (unspecified)	2	1	4
Pulmonary problem	9	1	6
Unknown	Nc	Nc	6

<sup>a</sup> Nc = no cases reported.

<sup>b</sup> Injury deaths among these 40 women were composed of ones from homicide (13), suicide (5), unintentional injury (10), and unknown type of injury (12).

(7), yields a retrospective maternal mortality estimate for the preceding 10–12 years rather than a current one. Another method predicts the maternal mortality rate based on the country's general fertility rate and the percentage of births delivered by trained attendants (7). This second method, however, will show change only as a result of changes in those two indicators, rather than by observed changes in the maternal mortality rate. There is clearly a need for a system that collects data continuously and systematically and provides policymakers and health

managers with adequate information to design proper interventions.

Our approach uses an active surveillance system to give a more complete picture of maternal death and to produce information on the specific causes of maternal mortality. Using multiple sources of information, the surveillance program we developed for the department of Guatemala detected as many as three times the number of maternal deaths as had the national vital statistics registry.

Our surveillance system also showed that women 35 and older have a higher

risk of dying than do women under that age. We also found a group of younger women in the second trimester of pregnancy whose maternal mortality was largely related to injury. As Koonan et al. (8) had reported for the United States of America, when we analyzed the cause of maternal death by pregnancy outcome, we found infection was the leading cause of maternal deaths associated with abortion, stillbirths, and live births. Moreover, after abortion, most infection cases are associated with the type of delivery. General infection was associated with vaginal delivery assisted by professionals. It is possible that the relative infrequency of maternal death in obstetrical practice, maternity wards, and in a healthy middle-class population may encourage the inaccurate and unrealistic belief that such patients no longer die in modern medical practice. These results suggest that obstetrical hospitals should make a confidential inquiry into all maternal deaths and ensure that obstetrical standards of practice are being correctly applied, as well as review and/or implement much better infection control practices, such as by establishing hospital infection control standards.

Even though our use of multiple sources of information improved the quality and quantity of information available to assess cause of death, the absence of detailed hospital information for all cases limited our ability to

**TABLE 5. Specific causes of maternal deaths by type of delivery and type of assistance (not including abortion), department of Guatemala, Guatemala, 1993–1996**

Type of assistance and type of delivery	Infection				Hemorrhage				Other <sup>a</sup>					
	Sepsis		Other		Uterine atony		Retained placenta		Placenta previa		Ruptured uterus		Other <sup>a</sup>	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Medical assistance														
Cesarean section	16	30	1	17	10	48	Nc <sup>b</sup>	Nc	7	100	5	83	7	32
Vaginal delivery	23	42	5	83	3	14	2	11	Nc	Nc	1	17	7	32
Nonmedical assistance														
Vaginal deliveries	15	28	Nc	Nc	8	38	16	89	Nc	Nc	Nc	Nc	8	36
Total	54	100	6	100	21	100	18	100	7	100	6	100	22	100

<sup>a</sup> "Other" hemorrhage includes coagulopathies (8), unspecified hemorrhage (7), other hemorrhage (4), unknown hemorrhage (2), and abruptio placenta (1).

<sup>b</sup> Nc = no cases reported.

assign specific causes to some of the deaths. Strengthening the surveillance system in developing countries by using multiple sources of information will help clarify the magnitude of maternal deaths, the risk factors involved, and the characteristics of the deaths. Enhancing a surveillance system for better assessment of causes of maternal death involves improving hospital medical records, and this can only be achieved by better educating all hospital personnel involved in this process, including physicians and registered nurses. Multiple sources of information have limited usefulness unless they are accompanied by data of inherently high quality.

All the maternal deaths in 1993 were reviewed by a maternal mortality committee whose members established the medical and nonmedical causes of death, determined whether the death was preventable, and proposed future interventions.<sup>2</sup> The committee found that more than 73% of the deaths were preventable. The committee also found that problems with the health system were at least par-

tially responsible in 70% of the maternal deaths reviewed, and that there had also been technical problems in 64% of the cases, such as an incorrect obstetrical diagnosis or poor obstetric treatment. Within the health care system, deaths were frequently related to poor access to family planning services and prenatal care. Substandard medical care was provided not just by TBAs but also by individual doctors.

With the help of our newly established program, we identified the need for three essential interventions to decrease maternal mortality in this population: 1) reducing the number of high-risk and unwanted pregnancies, 2) lowering the number of obstetric interventions by professional and non-professional attendants, and 3) cutting the number of deaths among women who develop complications. The first intervention needs to focus on older women, who have the highest maternal death rate. Adequate access to effective family planning methods is a need in this population (6). However, the youngest women have the highest rate of unwanted pregnancies and thus also need adequate counseling and access to family planning methods.

Data collected by our surveillance system—and not available in the death certificates—found that one-third of the maternal deaths from infection were related to a cesarean section. This

life-saving procedure needs to be evaluated in developing countries and its weight determined in the direct causes of maternal deaths (9–12).

Clearly, improvements in the quality of obstetrical care are needed in many less developed countries. While our new surveillance program provided new and better data for the population we studied, also needed are specific and effective interventions to decrease the high rates of maternal mortality. In the future, safe motherhood programs in developing nations must identify interventions beyond those indicated by mortality rates alone. Without permanent long-term surveillance programs, the Safe Motherhood Initiative's goal of reducing maternal mortality by 50% will remain an unrealistic goal for many countries for many more years to come.

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<sup>2</sup> Comité de Mortalidad Materna, Sub-Comité Técnico Nacional de Prevención de la Muerte Materna. Experiencia centroamericana. Guatemala: Sub-Comité Técnico Nacional; 1996.

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**RESUMEN**

**La mortalidad por causas relacionadas con el embarazo: Guatemala, 1993–1996**

Para poder elegir aquellas intervenciones que podrían prevenir la mortalidad materna, se necesitan datos apropiados y de calidad sobre ella. No obstante, la calidad y cantidad de la información y el alcance de los datos disponibles sobre salud y mortalidad maternas son pobres en muchos países, especialmente en el mundo en desarrollo. De enero de 1993 a diciembre de 1996 se puso en funcionamiento un programa de vigilancia sobre la mortalidad materna con la finalidad de llevar a cabo estudios de vigilancia en el departamento de Guatemala, Guatemala. Por medio de un sistema de vigilancia activa, nuestro método arrojó un cuadro más completo de la mortalidad materna e información sobre las causas específicas de dicha mortalidad. Partiendo de distintas fuentes de información, revisamos y analizamos todas las defunciones en mujeres de edad reproductiva (10 a 49 años) y cada defunción se investigó para determinar si guardaba relación con el embarazo. La razón de mortalidad materna para el período de 4 años que abarcó el estudio fue de 156,2 defunciones por 100 000 nacidos vivos. Las mujeres de 35 años de edad o mayores tuvieron un mayor riesgo de muerte por causas maternas que las mujeres de menor edad. Las mujeres de 35 a 39 años tuvieron un riesgo de muerte materna casi tres veces mayor que el de las mujeres de 20 a 24 años, y el riesgo para las mujeres de 40 años o más fue más del doble que el de este último grupo. En términos generales, las dos causas principales de muerte materna fueron la infección y la hemorragia. Los partos vaginales que fueron atendidos por personal médico mostraron la mayor tasa de mortalidad materna a raíz del parto por infección generalizada. En los partos atendidos por personal no médico, las muertes maternas por hemorragia durante el parto mostraron la mayor asociación con retención de la placenta. Los países en desarrollo deben implantar sistemas de recolección de datos continua y sistemática, a fin de que los que sientan políticas y administran el sector de la salud dispongan de información que les permita diseñar intervenciones adecuadas para salvar la vida de las mujeres.

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