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Basic Elements for the Study and Prevention of Maternal Mortality

Deaths from complications of pregnancy, childbirth, and the puerperium are among the principal causes of death in women of reproductive age in the countries of the Region *(1)*. Maternal mortality is understood to mean "death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of pregnancy, from any cause related to or aggravated by the pregnancy itself or its management, but not from accidental or incidental causes" *(2)*.

By international agreement the maternal death rate has been defined as follows:

$$\frac{\text{No. of maternal deaths in one year} \times 10{,}000 \text{ or } 100{,}000}{\text{No. of live births in the same year}}$$

In a strict sense this measure is a ratio and not a rate because the number of live births does not coincide with the number of pregnant women at risk of death from these causes. However, the use of this denominator has been preferred because it is very difficult to obtain reliable information of similar quality in the countries on the number of pregnancies that end in abortions or stillbirths.

The strategies of WHO at the world level and those of PAHO in the area of the Americas both assign high priority to reduction of these deaths as part of the social objective of Health for All by the Year 2000. The importance of such death extends beyond what official statistics show, inasmuch as in the geographical areas where they are most common, underreporting tends to be greater. Hence, frequently the severity of the situation is underestimated.

At the present time, however, there is growing evidence of the magnitude of the problem and greater concern is being shown by the governments of the Region, regarding its study and quantification and the reduction of deaths through health and intersectoral coordination measures. There is a growing awareness that most maternal deaths derive from preventable causes.

Despite the underreporting in Latin America and the Caribbean, there are countries in which the rates based on the available official data truly reflect the seriousness of the problem, since they point to maternal death rates in excess of 30 per 10,000 live births. Even the lowest figures in Latin America are several times higher than those observed in North America *(3)*.

During their reproductive period, women are exposed to risks in the absence of proper social conditions, sufficient nutrition, and coverage and quality of services. In geographical areas with high fertility, as

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in the majority of the developing countries, these risks are increased, since women begin their reproductive life at an earlier age, have a greater number of pregnancies, and have them into more advanced ages.

Demographic Importance

Women of reproductive age, from 15 to 49 years, represent approximately 25% of the population, both in the underdeveloped and developed countries, while the population from 0 to 14 years amounts to 39% in the countries of the Third World and less than 22% for the most advanced countries. Inversely, the elderly population, 65 and over, is greater in the developed countries, twice that of the developing countries (28% and 11% respectively).

In absolute numbers, it is estimated that the female population from 15 to 49 years (which currently approximates 86 million) will increase by 58 million in Latin America and the Caribbean between 1980 and 2000. For North America that increase would be only 11 million in the same period (Table 1).

If the population growth and the combined effect of current death and fertility rates in the Region are maintained, more than one million maternal deaths can be expected between 1980 and 2000 in Latin America and the Caribbean, whereas if overall levels of maternal mortality similar to those of Costa Rica and Cuba at the present time are attained, the number of deaths will be barely 60,000.

Relation between Fertility and Infant and Maternal Mortality

In the mortality structure in the Americas, complications of pregnancy, childbirth, and the puerperium figure among the first five causes of death; in some regions they occupy second place as the cause of death, both in women between 15 and 25 years of age and between 25 and 49 years of age *(1)*.

As in infant mortality, the maternal death rate reflects differences in the health and living conditions of populations, but it also constitutes a good indicator of the state of development of prenatal, delivery, and puerperium services.

In Latin America and the Caribbean, wide variation is observed in maternal death rates by country, ranging from 20 to 50/10,000 live births in Bolivia, Haiti, and Paraguay, and from 3 to 6/10,000 live births in Chile, Costa Rica, Cuba, Panama, and Uruguay in recent years (1980-1984) *(4)*.

A decline has been observed in maternal mortality in the last two decades and it has been reduced to half or less in countries such as Chile, Costa Rica, and Cuba. In Canada and the United States the current level of maternal mortality is from 0.5 to 0.8/10,000 live births respectively *(4)*. Despite these achievements, figures are still high. The maternal death rate is almost 100 times greater in the country with the highest figure as compared with the lowest recorded in the Region (Table 2). Despite its importance for the family and society, it would appear that maternal mortality has not been confronted with sufficient determination and has not been assigned the priority it deserves.

It has been observed that the maternal death rate is usually closely related to variations in infant mortality and in fertility. Thus, in countries where fertility is high, maternal death rates and infant mortality rates are also high. Inversely, in countries where fertility is low, infant and maternal mortality rates are also low (Figure 1). In part this is because the three indicators

Table 1. Total population of women of reproductive age (15 to 49 years) and percentage of women of reproductive age of the total population by subregion, 1980 and 2000.

	Population (millions)		Women 15 to 49 years			
			Number (millions)		Percentage	
Subregion	1980	2000	1980	2000	1980	2000
Latin America and the Caribbean	362	560	86.9	143.3	24.0	26.1
North America	252	298	65.2	75.6	25.9	25.4

Source: United Nations. *World Population Prospects. Estimates and Projections as Assessed in 1982*. New York, 1985.

Table 2. Fertility rate, infant mortality rate, and maternal mortality rate in selected countries in the Region of the Americas.

Country	General fertility rate (live births per 1,000 women 15-49 years)		Infant mortality (per 1,000 live births)		Maternal mortality (per 10,000 live births)	
	Year	Rate	Year	Rate	Year	Rate
Argentina	1983	98.7	1983	28.4	1981	6.9
Bolivia	1980-85	189.0[a]	1980-85	124.0[a]	1980-85	48.0
Brazil	1982	179.5	1980	87.3[b]	1980	7.0[b]
Canada	1983	56.1	1983	8.5	1983	0.5
Chile	1984	80.2	1984	20.6	1984	3.7
Colombia	1982	125.1	1983	55.4	1982	11.7
Costa Rica	1983	114.9	1983	18.6	1983	2.6
Cuba	1984	62.2	1983	16.8	1983	4.5
Dominican Republic	1982	145.4	1982	32.1	1982	6.6
Ecuador	1982	127.3	1980	63.9	1982	18.0
El Salvador	1983	125.0	1982	42.2	1982	8.5
Guatemala	1984	167.6	1983	81.1	1984	7.9
French Guiana	1983	121.9	1983	20.0	1983	23.8
Guyana	1979	113.1	1984	45.0	1979	3.5
Haiti	1983	227.6	1982	124.0	1984	23.0
Honduras	1983	179.4	1983	17.4	1983	5.0
Jamaica	1984	102.9	1978	16.2	1977	5.3
Mexico	1982	144.6	1982	33.0	1982	9.1
Nicaragua	1983	195.6	1983	75.2	1984	4.7
Panama	1983	110.0	1983	20.4	1983	6.0
Paraguay[b]	1984	107.0	1984	49.8	1984	27.5
Peru	1983	156.1	1982	31.8	1982	8.5
Puerto Rico	1983	77.9	1983	17.3	1983	0.6
Suriname	1983	157.0	1983	24.7	1982	8.9
Trinidad and Tobago	1980	104.0	1979	18.7	1979	7.1
United States of America	1984	59.7	1983	11.2	1983	0.8
Uruguay	1984	75.7	1984	30.4	1984	3.8
Venezuela	1983	127.6	1983	27.8	1981	5.2

Source: Official reports sent by countries to the PAHO's Health Situation and Trend Assessment Program, with the exception of data noted, whose source is indicated below.

[a]United Nations. *World Population Prospects. Estimates and Projections as Assessed in 1982*, New York, 1985.

[b]Information area.

Figure 1. Relation between the fertility, infant mortality and maternal mortality rates, in selected countries of the Region of the Americas.

FERTILITY	INFANT MORTALITY	MATERNAL MORTALITY	
		High (>5,0)	Low (≤ 5,0)
High fertility rate (>100)	High infant mortality (>35)	Bolivia Brazil Colombia Ecuador El Salvador Guatemala Haiti Paraguay[a]	Guyana Nicaragua
	Low infant mortality (≤35)	Dominican Republic French Guiana Jamaica Mexico Panama Peru Suriname Trinidad and Tobago Venezuela	Costa Rica Honduras
Low fertility rate (≤100)	High infant mortality (>35)		
	Low infant mortality (≤35)	Argentina	Canada Cuba Chile United States of America Puerto Rico Uruguay

Source: Official reports sent by countries to the PAHO Program of Health Situation and Trend Assessment.

[a]Information area.

are related to a country's development level; however, independently of this consideration, high fertility has a direct effect on the other two rates, since in the extreme ages of women, high parity and short intergenesic intervals, characteristic of high fertility, are associated with greater risks of maternal and infant mortality *(5)*.

Up to now mother and child care, as well as studies of maternal and infant mortality, have been carried out separately in most cases. However, from the point of view of services, they should be coordinated in order to promote a beneficial exchange of experiences. Such coordination of studies does not imply disregarding the fact that, owing to their different nature and frequency, different methodologies should be applied to these phenomena.

Avoidability of Maternal Mortality

If the level of maternal death rates in the more developed countries is taken as a point of reference and it is compared with the values in other countries, it may be concluded that most of the maternal deaths that occur in the Third World are avoidable. Still, in developed countries such as the United States, 50% of the deaths are considered preventable *(5)*. The situation in some Latin American countries (Chile, Costa Rica, Cuba) demonstrates such avoidability even in developing countries *(3)*. A study carried out in the Region showed that 94% of maternal deaths were avoidable *(6)*.

Maternal deaths are closely linked to the characteristics of the health services, such as coverage, quality of care provided, and accessibility to institutional care, which increases the responsibility of the health sector when such deaths occur. In this sense, maternal mortality constitutes an indicator of the quality of the services. It is, in addition, an indicator of extreme damage done to women with respect to the reproductive process, since it conceals morbidity and cases of psychic and biological disability in women who survive. It is also of great social significance for the family and society.

Evolution of Maternal Mortality in the Americas

Problems stemming from deficiencies in the quality of vital statistics records, certification, and determination of the causes of death constitute formidable obstacles to achieving progress in the study of maternal mortality.

In general, the overall underdevelopment of the countries also places limitations on their statistical registration systems; consequently the less advanced countries frequently obtain incomplete and often unreliable information. For these reasons, available information should be analyzed with caution and the conclusions derived from it should be formulated prudently while awaiting better data. This also increases the need to carry out more detailed studies on the topic.

Trends in maternal mortality. In accordance with the information provided by the countries to the Health Situation and Trend Assessment Program of PAHO, the levels and trends of maternal mortality in the Americas show great differences from one country to another (Table 3). In most of them a downward trend is observed in the rates per 10,000 live births, with marked reduction in some countries: in Chile, from 29.9 in 1960 to 7.3 in 1980; in Costa Rica, from 12.6 in 1960 to 2.3 in 1980; in Uruguay, from 11.7 in 1960 to 5.0 in 1980; in Canada, from 4.5 in 1960 to 0.8 in 1980; and in the United States, from 3.7 in 1960 to 0.9 in 1980 *(3)*.

It should be pointed out that in 1960 a great number of countries showed high rates of more than 20 per 10,000 live births (Chile, Colombia, Ecuador, Guatemala, Honduras, Jamaica, Paraguay). In 1970, 10 years later, only Ecuador, Paraguay, and Peru remained in this category. In 1980, only Paraguay persisted with figures higher than 20 per 10,000 live births *(3)* (Table 3). However, these figures refer to countries that report on their vital statistics. Other countries that do not present annual reports are not included. Among the countries with low maternal mortality and a tradition of reliable statistical data in 1983 were Canada with 0.5 per 10,000 live births, Chile with 4 per 10,000 live births, Costa Rica with 2.6 per 10,000 live births, Cuba with 4.5 per 10,000 live births, the United States with 0.8 per 10,000 live births, and Uruguay with 3.9 per 10,000 live births *(3)*.

Criteria for the Analysis of the Causes of Maternal Death

For a better comprehension of the problem different classifications of the causes of maternal death may be employed:

From the obstetrical standpoint, the direct obstetric deaths are "those resulting from obstetrical complications of the pregnant state (pregnancy, labour, and puerperium), from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above" *(2)*; indirect obstetric deaths, which

Table 3. Maternal mortality per 10,000 live births in selected countries of the Americas for 1960, 1970 and 1980.

Country	1960	1970	1980	Percent reduction[a] 1960-1980	Percent reduction[a] 1970-1980
Argentina	10.8	13.9	7.0	2.1	6.6
Canada	4.5	2.0	0.8	8.3	8.6
Chile	29.9	16.8	7.3	6.8	8.0
Colombia	25.9	15.9	12.6[b]	3.4[b]	2.1[b]
Costa Rica	12.6	9.5	2.3	8.2	13.2
Cuba	11.6	7.0	6.0	3.2	1.5
Dominican Republic	10.1	10.2	7.2	1.7	3.4
Ecuador	27.0	23.0	19.1	1.7	1.8
El Salvador	17.4	10.1	6.9	4.5	3.7
Guatemala	23.2	15.7	9.1	4.6	5.3
Honduras	31.0	17.4	9.4	5.8	6.0
Jamaica	20.0	10.6	3.6[c]	7.5[c]	8.6[c]
Mexico	19.3	14.3	8.7[b]	3.7[b]	4.4[b]
Nicaragua	18.6	...	4.7[d]	5.8[d]	...
Paraguay (Information area)	32.7	55.9	36.5	(0.6)	4.2
Peru	...	21.5	10.8	...	6.7
Trinidad and Tobago	13.1	13.5	6.4	3.5	7.2
United States of America	3.7	2.2	0.9	6.8	8.6
Uruguay	11.7	7.7	5.0	4.2	4.2
Venezuela	10.4	9.2	6.5	2.3	3.4

Source: Official mortality reports sent by the countries to PAHO's Health Situation and Trend Assessment Program.

... Data not available.

[a]Geometric reduction rate expressed as percent. Data in parenthesis indicate an increase.

[b]Data from 1981.

[c]Data from 1982.

[d]Data from 1983.

re "those resulting from previous existing disease or lisease that developed during pregnancy and which vas not due to direct obstetric causes, but which was aggravated by physiologic effects of pregnancy" *(2)*, and nonobstetric deaths, which occur from an accidental or incidental cause related to pregnancy or its management. Although in accordance with the rules of the International Classification of Diseases, Ninth Revision, (ICD) these are not included among the causes of maternal mortality for international comparisons, certain countries with low rates may be interested in this information.

From the clinical standpoint, the principal causes of maternal death are classified in the ICD (630-676) *(2)*.

From the standpoint of avoidability through the actions of the health services, maternal deaths may be classified as:

Avoidable: Deaths preventable by actions carried out by the health services (prenatal care, adequate care at delivery, and family planning).

Probably unavoidable: Deaths occurring even though correct and timely actions have been carried out.

Unknown: Deaths of unknown cause not included in the previous categories, but related to pregnancy, childbirth, and the puerperium.

The concept of avoidability is oriented toward the administration of services, improvement of care, and decision-making in order to guarantee an adequate supply of services to the population, particularly in the areas of perinatal care and family planning.

Factors Associated with Maternal Mortality

In the different classifications of the causes of maternal death the influence of certain factors cannot be disregarded. Some of them are directly related to the organization of services, while others are indirectly related. Among the former the following may be cited: accessibility to services (sociocultural, economic, and geographical) in relation to pregnancy, childbirth, and puerperium care; the availability and quality of resources and services (human, physical, and financial), and the regionalization of services with a risk approach that allows for an appropriate referral system.

In addition, consideration should be given to the socioeconomic determinants that act with varying impact upon maternal mortality. The association, although very close, is considered to be indirect. Included among these factors are poverty, malnutrition, suburban or rural residence, composition of the family and its edu-

Table 4. Percent distribution of maternal mortality by cause of death[a] in selected countries of the Americas, for the most recent year with available data.

Country (year)	Total maternal deaths	Percent distribution of deaths					
		Direct obstetric causes					Indirect obstetric causes
		Abortion	Haemorrhage	Toxemia	Complications puerperium	Others	
Argentina (1981)	472	35.8	14.4	13.1	14.4	20.6	1.7
Brazil[b] (1983)	2,116	13.5	19.6	31.6[c]	14.7	17.7	3.0
Chile (1984)	94	40.4	6.4	20.2[c]	13.8	11.7	7.4
Colombia (1981)	969	17.2	18.6	23.5[c]	6.5	31.3	2.9
Cuba (1984)	77	15.6	3.9	–	13.0	35.1	32.5
Dominican Republic (1984)	120	21.7	18.3	31.7	–	17.5	10.8[d]
Ecuador (1984)	384	8.9	21.4	27.9	8.6	32.0	1.3
El Salvador (1984)	99	7.1	7.1	5.1	8.1	71.7	1.0
Guatemala (1981)	326	8.6	4.6	3.4	9.2	74.2	–
Honduras (1982)	149	6.0	3.4	0.7	1.3	88.6	–
Mexico (1982)	2,166	8.2	21.2	5.9	8.6	53.0	3.0[d]
Paraguay[b] (1984)	155	12.3	27.7	18.7	16.1	21.3	3.9
Peru (1982)	576	12.5	29.3	7.5	12.3	38.0	0.3
United States of America (1983)	290	17.2	10.3	13.8	29.0	26.9	2.8
Venezuela (1983)	303	19.8	15.8	20.5	18.8	18.2	6.9

Source: Official mortality reports sent by countries to the Program of Health Situation and Trend Assessment, PAHO.
– Data not available.
[a]Causes of maternal death include the following ICD codes: Abortion, 630-639; Haemorrhage, 640, 641, 666; Toxemia, 642.4-642.9, 643; Other direct obstetric causes, 642.0-642.3, 644-646, 651-665, 667-676; Indirect obstetric causes, 647-648.
[b]Information area.
[c]Also includes codes 642.0-642.3, that for other countries are included under "Other direct obstetric causes."
[d]Includes one death due to normal childbirth (ICD code 650).

cational level, marital status, and the disadvantageous cultural and social situation of women in accordance with each type of society.

Both direct and indirect factors affect maternal mortality but their effects vary according to how they combine with biological variables such as age, parity, and intergenesic interval.

Characteristics and Determinants of the Principal Groups of Causes of Maternal Death

The complications of pregnancy, childbirth, and the puerperium persist as a major cause of death in the developing countries for women between 15 and 49 years of age *(1)*.

Most maternal deaths are due to direct obstetric causes and among them the most significant are those associated with hemorrhage, complications of the puerperium, and toxemia. Induced illegal abortion must be added to these, particularly in Latin America. These four groups of causes represent 75% or more of maternal deaths in some countries of Latin America and the Caribbean. Such is the case in Argentina, Chile, and Venezuela, among others (Table 4).

Although in many cases available information does not lend itself to detailed analysis of levels and trends, on the other hand it does provide a general overview that is useful in guiding subsequent studies and proposals for health interventions. A profile of maternal mortality is thus obtained which makes it possible to establish priorities for action in maternal health programs.

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