

NOTES ON THE INDIRECT MEASUREMENT OF MATERNAL MORTALITY*

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1. The problem

There is a great deal of concern among health planners about the relatively high maternal mortality which affects women of reproductive age in the less developed countries, that is to say deaths which occur due to complications of pregnancy, childbirth and the period of confinement.

Maternal mortality is considered to be that which occurs among women during pregnancy or within 42 days of its termination, without regard to the duration or localization of the pregnancy, from any cause related to or aggravated by the pregnancy itself or attendance on it, but not from accidental or incidental causes. This is the operational definition of maternal mortality which permits its measurement from conventional registers of vital statistics, although it is questionable to take a time limit of only 6 weeks after the end of the pregnancy.

It is worth asking if available knowledge about maternal mortality in Latin America corresponds to reality, if the statistics reflect faithfully what is happening, particularly in the less developed countries which paradoxically would be the most affected. The answer appears to be clearly in the negative, when the maternal mortality rates per hundred thousand live births in recent periods are examined: Honduras and Nicaragua show low rates (approximately 50 per hundred thousand) similar to those of Cuba and Chile, which are countries with a recognized favourable evolution in relation to these indicators. Even the registers of El Salvador (70 per hundred thousand), Guatemala (79 per

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hundred thousand), Perú (89 per hundred thousand) and the Dominican Republic (74 per thousand) seem to be affected by an important under-estimation, or at least would not be coherent with data such as those of Colombia (126 per hundred thousand) and Ecuador (189 per hundred thousand), which themselves are not error-free.

These deficiencies of the vital statistics in various countries confirm observations made when other indicators are analysed, as for example those presented in Table 1: percentage under-registration of deaths (calculated by indirect methods) and percentage of ill-defined causes.

The figures speak for themselves. In the period 1975-1980 there are four countries with under-registration rates of more than 50 per cent, seven with more than 35 per cent and 12 with more than 19 per cent. Since the calculation of maternal mortality implies the use of information on mortality by causes, it is necessary to add to this lack of information, that which arises from ill-defined causes (column 4), which leads to an even more precarious situation in terms of the information available to measure its incidence (column 5). All those countries which, as mentioned previously, show maternal mortality rates which are apparently under-estimated, base their information on less than 60 percent of total deaths. To these must be added Bolivia and Haiti, for which there is no information available, and Brazil and Paraguay which base their data on a limited reporting area.

To the above could be added some difficulties related to errors introduced in the certification of the cause of death, in which pregnancy may not be mentioned. This type of error, in most cases deliberate, would affect mainly those cases in which the death is produced by abortion, especially in those countries where this practice is subject to legal sanctions.

2. Experiences with indirect measurement of demographic variables.

The problem of the measurement of maternal mortality is not essentially different from that which has had to be faced to obtain reliable estimates of

other indicators derived from registers of vital statistics: adult mortality, infant mortality and fertility.

One of the forms which has had most success in providing indirect estimates of demographic indicators has been the inclusion of retrospective questions in censuses and surveys. Experience has demonstrated that this type of information is very useful for obtaining data on mortality and fertility in those countries which do not have adequate vital statistics, and in fact it is beneficial in countries with good registers, both for evaluating them and as an independent source, such as for carrying out special studies which would permit obtaining estimates for sub-populations identifiable in the census or survey (areas of residence, socio-economic groups). The intention is to obtain approximate estimates of these variables, so it is important to take into account that they do not exactly reflect reality, but probably give a more complete vision than that which is available in the registers.

In particular, to measure fertility and childhood mortality, questions are asked of women 15 years of age and over:

- How many live-born children have you ever had?
- Of those, how many are still alive?
- Date of birth of the last live-born child.
- Is the last-born child still alive?

To study adult mortality it is habitual to ask about the survival of the mother (maternal orphanhood) and in some specific surveys a question has been asked about the survival of the father, first spouse or siblings.

This type of question does not conflict either with the vital statistics, or with the authorities in charge of collecting them, but rather is a complementary instrument and is useful for demonstrating the necessity of improving these statistics. In this way the same organizations which are responsible for publishing the results of the registers (in general the Statistical Offices) have applied these questions widely in the last round of censuses and, based on these results, have obtained estimates or have supported

those derived from the registers. In Table 2, which shows the retrospective questions included in the censuses of the 1980s, it may be seen that all the countries have included the questions on children ever born and children surviving of women aged 15 and over.

Since the beginning of the 1970s there has been an increasing number of studies of infant mortality and fertility, which, using census data, have permitted the identification of the geographical and socio-economic differences existing among sectors of the population, have broadened the analysis of the factors determining or associated with these variables and recently have led to the determination of the high-risk sectors and their characteristics with the intention of supporting the development of policies of primary attention.

In recent years other less conventional procedures have appeared, which take advantage of other instances, distinct from those of the censuses and traditional surveys, to carry out research on childhood mortality. These are a good example of flexibility in the search for appropriate ways to obtain this information. The necessity of obtaining up-to-date information which allows the evaluation of health programmes or plans which have an impact on childhood mortality, in certain areas, led to the design of a new, simple and low-cost procedure, which consists of the collection of information on the survival of the previous live-born child declared by the women who attend a hospital at the time of childbirth.

For the collection of the information using the above-mentioned procedure (called the previous-child method), it suffices to use a sheet on which in each row are registered the responses given by the informing woman (see sample questionnaire on attached sheet). The key questions for the calculation of the rate of childhood mortality are:

- Have you previously had a live-born child?
- Date of previous birth (may be omitted).
- Is that child still alive?
- If it died: date of death (may be omitted).

The dates may be omitted due to the fact that the simple proportion of dead children constitutes an estimate which may be interpreted as the probability of dying between birth and the age of two and a half years, a period which corresponds approximately to the mean birth interval in high-fertility populations. The rest of the information which is included may be useful as control variables or for studies of the factors which surrounded the child's death.

Since 1983, CELADE has collaborated in various research projects which used the previous-child method, with a positive balance in terms of the consistency of the results obtained. It may be noted that since a register is concerned, even though it is a simple one, it is necessary to maintain a permanent effort over a period of several months, with strict supervision, which has not always been possible.

An example of an interesting use of the method has been carried out recently by the Consejo Nacional de Población (CONAPO) of Bolivia in six maternity clinics in three cities of the country, with the objective of analysing the relationships between fertility and infant mortality. To this end the information on the mortality of the previous birth was taken into consideration, along with parity order, the birth interval and the age of the mother, using her educational level as a control variable for socio-economic group.

3. The proposals for indirect measurement of maternal mortality.

Taking these experiences as a base, the estimation of maternal mortality would be a particular case of the procedures for the estimation of female adult mortality. The estimation of female adult mortality from questions about the survival status of some near relative has been carried out principally via the survival of the mother, then of the first wife or partner and on some occasions from information on sisters. Now, it is a simply question of adding a question to investigate whether the death occurred from one of the causes related to the pregnancy, childbirth or period of confinement.

There are arguments for and against supporting each one of those procedures mentioned in the previous paragraph as the most appropriate for measuring maternal mortality. Below are presented the proposals which consider as most viable the information on survival of sisters on the one hand and maternal orphanhood on the other.

i) Survival of sisters.

In the Population Studies Centre (PSC) of the London School of Hygiene & Tropical Medicine work is being done in the direction of adapting the sibling survival procedure to obtain estimates of maternal mortality. The conclusion has been reached that this is the most appropriate, after analysing the problems which the other possibilities present:

- It is argued against the use of maternal orphanhood that the information must be obtained principally from persons who were children at the time of the death and who for that reason would not be capable of giving information on the cause of the death. Nor is information obtained from the women who die from maternal causes before having their first child, as there would be nobody to provide information on them. This limitation would be important due to the fact that these women would have a distinct incidence of maternal mortality.

- In relation to the use of a man as informant on the survival condition of his first wife or partner, the most important arguments against this are: a) The mortality of single mothers would not be taken into account, b) the husbands may not know the cause if they were separated or if the death occurred at an early stage of pregnancy and c) they may intentionally omit the information due to the sensitivity of the subject or through a feeling of guilt.

In spite of the fact that the information on survival of siblings has shown great difficulties at the moment of data collection in the field, and that the experience is much more restricted than that with the maternal orphanhood and male widowhood methods, based on the above arguments it is

considered by the researchers at the PSC that this is the most appropriate procedure. In addition, the argument is made in its favour that there would be information from a larger number of cases to study, due on the one hand to the fact that, on average, there would be more women in the reproductive ages, and on the other that for each informant there would be information on several women when this method is applied to populations with high fertility.

In this manner it is proposed to include in single-round censuses or surveys, adapting to the concrete necessities, a series of questions such as the following:

- "- How many sisters have you ever had (born to the same mother) who lived to be old enough to bear children?
- How many of these sisters are still alive?
- How many of these sisters are dead?
- How many of these dead sisters died whilst they were pregnant, during childbirth or during the period of confinement?

Field work was done in the Gambia in September of 1987 by the PSC in collaboration with the British Medical Research Council and the results will be known soon. Approximately 2000 households were interviewed, which should be sufficient since, according to the authors of the study, interviews may be done with some 5000 respondents.

ii) Survival of the mother.

The condition of maternal orphanhood is practically the unique form of investigating female adult mortality, using this type of questions, which has been shown to work successfully in varying conditions. For this reason the question "Is your mother alive?" has been included in the majority of the national demographic surveys of the region and in a large number of population censuses (see Table 2). This empirical argument seems to be sufficient for considering the possibility of using this route with the proposal of obtaining an approximate measure of maternal mortality.

The above-mentioned limitations on using this method may affect the results to a lesser degree than do the problems of collecting the information in the field. Accumulated experience has shown that people know much better what happened to their mother and have more difficulty informing about the destiny of other relatives.

Concern for knowing the potential of the maternal orphanhood method led CELADE to do some very simple exercises with the information available from surveys carried out in recent periods. Using only the information on survival of the mother it is not possible to obtain an indicator of maternal mortality, since the deaths may occur from multiple causes and in periods far from pregnancy. For this reason the National Demographic Surveys of Honduras (1983) and Guyana (1986) were selected, along with the experimental census of San Ramón (1983) in Costa Rica, in which in addition to including the question on orphanhood condition, a question was asked on the year of death of the mother in those cases in which she had died. As well, in all those cases the date of birth of the informant is available, since this is the natural way to determine the age of the population.

Making the assumption that the great majority of deaths of mothers occurring in the year of birth of the informant are due to maternal causes, it could be verified whether the incidence of this phenomenon has a reasonable order of magnitude, according to the available knowledge of rates of maternal mortality. There would be a number of deaths which are not maternal, and others which occur more than 42 days after the birth, which in part would be compensated for by the fact of including those deaths (due to other causes) which occur during or after childbirth, leading as well to a live-born child.

Below are presented the results of this exercise in summary form:

	Total respondents	<u>With mother dead</u> Total In the year of birth		Indicator of maternal mortality (per hundred thousand)	Registered maternal mortality rate (per hundred thousand)
<u>Honduras</u>					
Total	62496	10851	235	377	
1963-1983	36824	867	60	163	174 (1970)
<u>Guyana</u>					
Total	42682	8419	200	471	
1966-1986	21461	553	36	168	120 (1972)
<u>San Ramón</u>					
Total	23919	3941	85	358	
1963-1983	10926	135	7	64	98 (C. Rica 1972)

The order of magnitude of this indicator is reasonable, especially that corresponding to the last twenty years, as can be observed on comparing it with the rates from the vital statistics in the last column. In addition coherency is observed in the evolution over time, which shows a decline in mortality, and also consistency between the observed causes, with the lowest mortality logically being found in San Ramón, Costa Rica.

The encouragement provided by these preliminary findings justifies the necessity of real field work in which maternal orphanhood would be investigated, including the question on the year of death of the mother and also verifying if the death was related to pregnancy, childbirth or the period of confinement. This last information would permit the elimination of those cases which do not represent maternal mortality and also collect information on those deaths which were related to pregnancies after that leading to the birth of the respondent.

During the present year CELADE will participate in some experimental research (Bolivia, Chile (Mapuche Indians)) in which the various proposals will be included, with the aim of analysing the real possibilities of focussing measurement of mortality through these procedures. The questions on sisters, on maternal orphanhood and on other variables useful for characterizing the respondent population and for controlling the quality of the data will be used. The inclusion of these questions may be done on distinct occasions, for example in censuses or surveys, but also in other instances, in particular in the previous child procedure research may be done on the survival of the sisters of the respondents.

If these experiments are successful, a promising path for the study of determining factors and the elements which surrounded these deaths will be opened, via case studies in which these aspects may be studied in more detail.

Table 1
**LATIN AMERICA: MATERNAL MORTALITY (PER HUNDRED THOUSAND LIVE BIRTHS),
 PERCENTAGE OF UNDER-REGISTRATION OF TOTAL DEATHS AND OF
 ILL-DEFINED CAUSES (B45).**

Country	Maternal mortality Circa 1984	Under- registration 1975-80	Ill-defined cause 1978	Total without information 1978	(5)
(1)	(2)	(3)	(4)		
Argentina	68	1.4	4.3	5.6	
Bolivia	-	66.5	-	-	
Brazil	-	19.2	-	-	
Colombia	126	24.9	8.6	27.0	
Costa Rica	23	6.7	8.0	14.2	
Cuba	46	2.7	0.03	2.7	
Chile	45	2.5	10.8	13.0	
Ecuador	189	19.5	16.5	32.8	
El Salvador	70	24.3	28.5	45.9	
Guatemala	79	4.0	18.2	21.5	
Haiti	-	79.5	-	-	
Honduras	50	53.7	34.0	69.4	
Mexico	91	14.9	8.9	22.5	
Nicaragua	47	59.6	27.0	70.5	
Panama	60	24.5	10.8	32.7	
Paraguay	283	38.5	19.4	50.4	
Peru	89	35.7	8.4	41.1	
Dominican Rep.	74	45.2	31.9	62.7	
Uruguay	54	2.6	6.9	9.3	
Venezuela	38	9.8	14.2	22.6	

(3) under-registration was calculated from corrected deaths.

(4) percentage in the group B45 was calculated from registered deaths.

(5) percentage without information over corrected deaths:

$$(5) = (3) + (4) * (100 - (3)) / 100.$$

Table 2

QUESTIONS ON MORTALITY AND FERTILITY INCLUDED IN THE POPULATION CENSUSES
OF 1980 IN LATIN AMERICA.

Country	Adult mortality		Fertility and childhood mortality			
	Maternal orphanhood	Deaths in the previous year	Live-born children	Surviving children	Births in the previous year	Survival of those born the previous year
Argentina *	-	-	x	x	x(b)	-
Bolivia (1976)	-	-	x	x	x(a)	-
Brazil *	x	x	x	x	x(a)	-
Chile (1982)	-	-	x	x	x(b)	-
Colombia (1985)	-	-	x	x		
Costa Rica (1984)	-	-	x	x	-	-
Cuba (1982)	-	-	x	x	-	-
Ecuador (1982)	-	-	x	x	x(a)	x
Guatemala (1981)	x	-	x	x	x(a)	x
Haiti (1982)	-	x	x	x	x(a)	-
Mexico (1980)	-	-	x	x	x(a)	-
Panama (1980)	x	-	x	x	x(a)	x
Paraguay (1982)	x	-	x	x	x(a)	x
Peru (1981)	x *	-	x *	x *	x(a)	x *
Dominican Rep.	x	-	x	x	x(a)	x
Uruguay (1975)	-	-	x	x	x(b)	-
Venezuela (1981)	-	-	x	x	x(b)	-

* Sample study.

(a) Date of birth of the last child.

(b) Births during the year prior to the census.