

OMISSIONS IN THE REGISTRATION OF DEATHS IN MATERNITY HOSPITALS IN SANTIAGO, CHILE¹

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Recent study of neonatal deaths at six major maternity hospitals in Santiago revealed that over half these deaths were neither reported officially nor reflected in official statistics. The finding emerged from a survey carried out in connection with the Inter-American Investigation of Mortality in Childhood.

Introduction

Demographic and epidemiologic studies of mortality, especially infant mortality, make frequent use of rates of neonatal and fetal death. These rates are calculated according to available data on births, postnatal deaths, and fetal deaths, which in Chile are obtained by the Service of Civil Registry and Identification through legal registration of vital events. The data are then processed by the National Health Service and the National Statistics Service.

International studies have pointed out difficulties in comparing such data, owing to lack of uniformity in definition of the terms "live birth" and "fetal death" in different places. At the time of birth the professional birth attendant must determine whether or not the child was born alive. Since the child generally survives, this is usually no problem; but in some cases the attendant must have recourse to established international definitions.

The World Health Organization's definitions of live birth and fetal death (1) and the United Nations' definition of death (2) have been recommended for use in all countries. These definitions are as follows:

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Live birth is the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered live-born.⁴

Fetal death is death prior to the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy; the death is indicated by the fact that after such separation the fetus does not breathe or show any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles.⁵

Death is the permanent disappearance of all evidence of life at any time after live birth has taken place (post-natal cessation of vital functions without capacity of resuscitation). This definition therefore excludes fetal deaths.⁶

From 1 July 1968 through 30 June 1970 a study of child mortality carried out in the Chilean Province of Santiago investigated a sample of deaths among children under 5 years

⁴*Official Records of the World Health Organization*, No. 28, p. 17 (1). See also WHO Technical Report Series No. 25, 1950, p. 12.

⁵*Ibid.*

⁶United Nations. *Handbook on Vital Statistics Methods, Studies in Methods, Series 7, No. 7*, p. 53 (2).

of age in Greater Santiago (the capital city region) and in four of the province's northern rural subdivisions. This study was part of a collaborative research project, the Inter-American Investigation of Mortality in Childhood,⁷ sponsored by the Pan American Health Organization. The primary goals of this international investigation were, first, to obtain comparable death rates in the 10 participating countries, and then to study causes of death and associated factors such as socioeconomic conditions, medical attention, etc.

During development of the Investigation the hypothesis was advanced that some birth products that died in their first hours of life were not being registered in the Civil Registry or were being registered as fetal deaths. This would cause an omission in the registration of both live births and deaths in early life. To partially confirm this theory, records of fetal deaths were examined at a number of maternity hospitals, and corresponding clinical records were sought if there was evidence that the birth product had shown signs of life. Though this was only a preliminary study, it uncovered errors in classifying and registering many of these products and revealed that some maternity hospitals were considering all birth products weighing less than 1,000 grams as abortions.

Later, when the Pan American Health Organization calculated mortality during the first day of life, Santiago was found to have an unusually low rate of around 6 deaths per 1,000 live births. The United States of America, for example, had a rate of 10 deaths per 1,000 live births for this period. Since it did not seem logical to ascribe the low Santiago figure to better medical attention, this data supported the original hypothesis that there were omissions in the registration of those who died in the first hours or days of life.

Given this supporting evidence, and stimu-

lated by the interest of Dr. Ruth Puffer of PAHO, principal investigator for the Inter-American Investigation of Mortality in Childhood, the authors carried out a special study at maternity hospitals in the City of Santiago in collaboration with the Subdepartment of Promotion of the National Health Service. The objectives of this study were: (1) to determine the magnitude and characteristics of this under-registration, and (2) to correct the data given to the Inter-American Investigation of Mortality in Childhood, so as to obtain the most realistic possible rates of death.

Methodology

Our approach consisted of examining the clinical records of the city's principal maternity hospitals relating to the following types of birth products: (1) abortions and stillbirths; (2) newborns who died in the maternity hospital during the first 28 days of life; and (3) live births in the maternity hospitals that weighed 2,500 grams or less at birth. (Investigation of the latter was completed by following their subsequent histories at premature baby facilities of the maternity hospitals or children's hospitals.)

The maternity hospitals whose records were examined handled 56,544 deliveries in 1970, or approximately 85 per cent of all deliveries recorded for residents of Greater Santiago and the four provincial sub-divisions covered by the Inter-American Investigation.

The clinical records examined were selected from a sample with the same sampling fractions as that used in the Inter-American Investigation. Specific sampling procedures for each facility depended on the way each maintained its files of original documents; special procedures had to be formulated for each of the six large public maternity hospitals covered. In some the sample selection was based on the diagnostic index; in others it was based upon delivery and abortion books kept in the hospital, and in one case it was based upon discharge reports.

⁷This research project was made possible by a contract between the Agency for International Development of the United States of America and the Pan American Health Organization.

A card was then filled out for every case selected. Each card contained both the data needed to determine if a death record existed at the Civil Registry and the information needed to locate appropriate clinical records in the case of premature infants transferred to another hospital or other facility.

In all the cases where the birth product died a check was made to see if the death had been recorded at the Civil Registry. If not, a questionnaire of the type used by the Inter-American Investigation of Mortality in Childhood was filled out in order that the death be included in that study.

Results

The findings presented here indicate the principal features of these unregistered deaths. They also take into account a change that occurred in the sampling method in Santiago while the Inter-American Investigation of Mortality in Childhood was underway. During the first eight months, one in every five reported deaths among children under five years of age was investigated; thereafter this proportion changed to one death in every three. For this reason, to obtain the data that are presented here and that are an estimation of deaths occurring in the maternity hospitals, the numbers for the first eight months were multiplied by a factor of five and those for the remaining months were multiplied by a factor of three.

Table 1 shows the total number of known neonatal deaths, broken down by birth weight, and the number that were not recorded at the Civil Registry. As can be seen, 56.1 per cent of these deaths were not registered. There was also a clear relationship between birth weight and the likelihood that the death would be registered. As noted in the table, 80 per cent of the deaths among those weighing 1,000 grams or less were unregistered, and this percentage declined as birth weight increased. While the percentage of unregistered deaths among those weighing over 2,500 grams was still very high (45.3 per cent), the differences between the

TABLE 1—Unregistered deaths in six maternity hospitals, by birth weight.*

Weight in grams	Total deaths	Unregistered	
		No.	Per cent
500 or less	23	20	87.0
501-1,000	336	273	81.2
1,001-1,500	534	366	68.5
1,501-2,000	497	228	45.9
2,001-2,500	300	102	34.0
2,501 and over	311	141	45.3
Unknown	55	24	43.6
Total	2,056	1,154	56.1

* χ^2 obs. = 224; χ^2 1%, 5 = 15.1.

different weight groups were statistically significant.

A similar situation, this time with respect to length of pregnancy, is shown in Table 2. The shorter the pregnancy the greater the reporting deficit; nearly all of those born after a pregnancy of five months or less went unregistered. It should be emphasized that there was extensive underregistration, reaching 40 per cent, even when the pregnancy lasted a full nine months. The observed differences are hard to explain as being due to chance, however, since tests showed a clear statistical significance.

TABLE 2—Unregistered deaths in six maternity hospitals, by length of pregnancy.*

Length of pregnancy	Total deaths	Unregistered	
		No.	Per cent
4 months	17	17	100.0
5 "	99	87	87.9
6 "	411	291	70.8
7 "	642	386	60.1
8 "	401	170	42.4
9 "	410	164	40.0
Unknown	76	39	51.3
Total	2,056	1,154	56.1

* χ^2 obs. = 170; χ^2 1%, 5 = 15.1.

A particularly interesting (and statistically significant) correlation existed between the degree of nonregistration and the age of the child at death (see Table 3). There was 78 per cent underregistration for those who lived only

TABLE 3—Unregistered deaths in six maternity hospitals, by age at death.*

Age at death	Total deaths	Unregistered	
		No.	Per cent
Less than 1 hour	150	117	78.0
1-23 hours	723	419	58.0
1 day	297	165	55.6
2 days	163	80	49.1
3 days	119	42	35.3
4 days	47	21	44.7
5 days	71	34	47.9
6 days	54	20	37.0
7 days	30	15	50.0
8 days and over	248	90	36.3
Unknown	154	151	98.1
Total	2,056	1,154	56.1

* χ^2 obs. = 97; χ^2 1%, 5 = 21.7

minutes. This percentage shrank somewhat as the newborns' life-span increased, but in general it remained high. Even among those who survived eight days or more, over a third of the deaths were not legally registered. However, like the relationships shown in Tables 1 and 2, that between changes in survival time and changes in the degree of underregistration was statistically significant.

Table 4 shows the data on underregistration arranged according to the mother's age. It is not felt that the differences observed here were significant, since the rates were similar for the

TABLE 4—Unregistered deaths in six maternity hospitals, by mother's age.

Age of mother	Total deaths	Unregistered	
		No.	Per cent
Less than 15 years	17	9	52.9
15-19 years	399	224	56.1
20-24 years	691	391	56.6
25-29 years	474	218	46.0
30-34 years	249	176	70.7
35-39 years	144	90	62.5
40-44 years	65	38	58.5
45 years and over	6	3	(a)
Unknown	11	5	45.5
Total	2,056	1,154	56.1

(a) Percentage not calculated for base figure of 10 deaths or less.

products of young mothers and those near the end of their child-bearing years.

As already noted, the institutions involved in this study were six of the most important public maternity hospitals in the City of Santiago. Table 5 shows the results obtained at each facility (the individual hospitals have been assigned code letters). A very preliminary pilot study of data from Hospital A showed our initial theory (that deaths were underregistered) to be correct. Later, after the full study was completed, the level of nonregistration at Hospital A was found to be 71.5 per cent. Though this was exceptionally high, extensive underregistration was evident at all the institutions observed; even the institution with the best record (Hospital F) had a reporting deficit of 44.7 per cent.

TABLE 5—Unregistered deaths in six maternity hospitals, by ward.*

Maternity hospital	Total deaths	Unregistered	
		No.	Per cent
A	354	253	71.5
B	344	188	54.7
C	255	115	45.1
D	301	146	48.5
E	462	300	64.9
F	340	152	44.7
Total	2,056	1,154	56.1

* χ^2 obs. = 86; χ^2 1%, 5 = 15.1

Discussion and Conclusions

In the past Chile was generally thought to have virtually complete death registration, or at least a highly satisfactory level of registration; the hypothesis that large numbers of early childhood deaths might be unregistered had not been proven. The results presented here show that this hypothesis is valid, that such underregistration has indeed occurred, and that the reporting deficit has been great with respect to neonates who were born and died in the maternity hospitals studied. We consider this

finding to be very important because of its effect on the official figures published by agencies processing these statistics in Chile, i.e. the National Health Service and the National Statistics Institute.

These figures, based on information provided by the collecting agency (the Service of Civil Registry and Identification) evidently contain errors of omission with respect to both births and deaths; but these omissions have differing effects on the final figures arrived at because of the differing magnitude of the particular omissions involved. In any event, correcting for these omissions will raise the published death rates of newborns, which is precisely that age group experiencing maximum risk of death.

The Inter-American Investigation of Mortality in Childhood (4) provided a fine opportunity for both Santiago and all other participating areas to exert efforts to obtain information on all deaths of children less than 5 years of age. For many areas this constituted a much greater challenge than was originally anticipated. In various places where death registration was known from the beginning to be incomplete, special searches were conducted to help assure that complete data were obtained. In the case of Santiago, however, this search was delayed until the first results of the Investigation showed the death rate for the first day of life to be inexplicably low. In view of these initial results the research reported here was designed and carried out—an additional major effort made possible only through the collaboration of the National Health Service.

The problem of defining "live birth" and "fetal death" has caused widespread concern for many years. One study dealing with this matter was carried out during 1967 in New York City. It concentrated on direct observation of 2,622 births and verification of signs of life within two minutes of the birth. The authors concluded that it was not sufficient to base the decision entirely upon respiration, or upon pulsation of the umbilical cord, or upon movement of the voluntary muscles. The surest

single criterion of life was found to be a heartbeat detected by palpitation or auscultation—which was absent during the first 2 minutes of life in only one live birth out of 2,565. Thus it is important to emphasize the international definition, which takes account of all signs of life, not just the presence or absence of respiration.

Moreover, it is a well-known fact that statistics can only be as good as the original data on which they are based; and the quality of these data, in turn, depends on the accuracy of the observations and measurements from which they are derived. Demographic studies, public health studies, and other projects dealing with infant mortality are significantly affected by the circumstance discussed here, i.e. the underregistration of deaths occurring among newborns. Therefore it is important to stress the need for correct application of the foregoing definitions.

Solving this problem of underregistration will depend on the importance which professionals involved with deliveries and the newborn (obstetricians, pediatricians and midwives) give to having valid statistical information derived from the actual legal registration of these events.

On the other hand, it might be possible to introduce simple measures—such as having the office of statistics of each hospital or maternity hospital provide certain data on all birth products not reported to the Civil Registry—without having to take all the administrative steps involved in legal registration of the event. This is especially important because in many cases non-registration results from the parents' failure to claim the product in order to avoid burial expenses. It is understood that such action can pose an important legal problem and that this is one reason why the Services of Civil Registry strive for complete registration. However, as public health professionals we are especially concerned with the integrity of the statistics used to measure the extent of health problems of infancy, statistics which clearly need to be based upon accurate information.

SUMMARY

A special study was recently carried out in six large maternity hospitals in Santiago, Chile, to check the accuracy of data on neonatal deaths that had been obtained by the Chile project of the Inter-American Investigation of Mortality in Childhood. This thorough and important supplementary study revealed that over half of the deaths in these maternity hospitals were not reported to the Government's Civil Registry, and were thus not reflected in official statistics. Not only were most deaths among low-weight newborns going un-

reported, but so were nearly half the deaths of infants weighing over 2,500 grams at birth.

These previously unregistered deaths have already been included in the analyses of the Inter-American Investigation of Mortality in Childhood that led to the Investigation's report, *Patterns of Mortality in Childhood* (Scientific Publication PAHO 262, 1973), thereby assuring that the report's content reflects the most reliable possible statistics on infant mortality in Santiago.

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