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Underreporting of Maternal Mortality in The Netherlands

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Objective: To establish the actual number of maternal deaths in The Netherlands by determining the degree of underreporting.

Methods: We conducted a nationwide, retrospective cross-check of the three available maternal mortality registration systems and issued a questionnaire to senior obstetricians in all hospitals during the years 1983–1992.

Results: The officially reported maternal mortality rate during the study period was 7.1 per 100,000 live births (133 maternal deaths per 1,862,985 live births). After completion of the study, our data indicate that the rate should be at least 9.7 per 100,000 live births (180 maternal deaths). Early pregnancy and indirect deaths were more likely to be underreported than direct deaths during labor and the puerperium. Failure to register the recent pregnancy on the death certificate was a frequent problem. Misclassification was particularly evident for cerebrovascular disorders, cardiovascular disorders, and eclampsia.

Conclusion: The level of underreporting of maternal mortality in The Netherlands was estimated at 26%. The pregnancy status of women should be registered on death certificates. Officially reported maternal mortality rates are unreliable and international comparisons using these data thus are less meaningful. (Obstet Gynecol 1997;90:78–82. © 1997 by The American College of Obstetricians and Gynecologists.)

Underreporting and misclassification of maternal deaths is a common problem, especially in developing countries.¹ However, it has been recognized even in countries with sophisticated registration systems such as France and the United States.^{1,2}

At present, it is unknown to what extent the officially reported maternal mortality rate in The Netherlands

reflects the true incidence. A recent survey in Europe showed that only in Denmark, Germany, the Irish Republic, and Scotland did the death certificate contain a pertinent question concerning whether the deceased was pregnant.⁴ Even if pregnancy is mentioned on the death certificate, the death still can be classified wrongly as not being related to pregnancy. Furthermore, some European countries exclude early pregnancy and indirect deaths, both of which are included in the International Classification of Diseases (ICD-9).⁴ This study addresses the issue of underreporting of maternal mortality in The Netherlands during the years 1983–1992.

Materials and Methods

Maternal mortality is registered primarily by the Central Bureau of Statistics. During the study period (1983–1992) the cause of death was classified according to the ICD-9. Data on the numbers and underlying causes of death are published periodically and these data are used by the World Health Organization (WHO) for international comparisons.

A direct maternal death was defined as the death of a woman due to complications of pregnancy, labor, and puerperium (42 days) or its management. An indirect maternal death was defined as the death of a woman whose pregnancy contributed to her death by exacerbating a preexisting health problem or by a general health problem that developed during pregnancy and the puerperium. All other maternal deaths were considered accidental or incidental (nonmaternal).⁵

The Dutch Society of Obstetrics and Gynaecology initiated and supported the registration of maternal death by its Maternal Mortality Committee. Members are asked to report every maternal death to the Committee. The Maternal Mortality Committee classifies the

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cases according to WHO definitions and assesses whether substandard care factors are present. Furthermore, some cases of maternal death also are registered in the Dutch Perinatal Database. A computerized questionnaire is completed shortly after birth for all pregnancies of more than 16 weeks.

All reports from members of the Dutch Society of Obstetrics and Gynaecology concerning a maternal death were examined, and, if necessary, a request for additional information was issued by the Maternal Mortality Committee. Members also were asked to report any other maternal death that had come to their knowledge. Further, they were asked to report deaths during pregnancy and puerperium that they had considered nonmaternal. A similar questionnaire was sent to senior obstetricians in those hospitals that had not reported a maternal death during the study period.

Comparison of Central Bureau of Statistics, Dutch Perinatal Database, and Maternal Mortality Committee data has been undertaken for each year of the study period. The Central Bureau of Statistics was provided with Maternal Mortality Committee data, in which both the date of birth and the date of death of the deceased woman were included. The Central Bureau of Statistics thus was able to identify women who had not yet been reported to the Committee. The certifying doctors of these women were sent a letter from the Central Bureau of Statistics with the request to report the case to the Maternal Mortality Committee.

At the end of the study period, Maternal Mortality Committee and Central Bureau of Statistics data were compared once more to identify those women who still had not been reported to the Maternal Mortality Committee. Any differences in the ICD-9 coding between the Central Bureau of Statistics and the Maternal Mortality Committee subsequently could be investigated. Also, anonymous Dutch Perinatal Database data were used to identify deaths that had not yet been reported to the Maternal Mortality Committee. Dutch Perinatal Database deaths were verified through a letter to the respective obstetricians. Anonymity was assured through the help of a lawyer.

Results

During the study period, the Central Bureau of Statistics classified 133 deaths as being maternal (Table 1). Of these, 56 had not been reported to the Maternal Mortality Committee. Twenty-nine were reported subsequently, after a request was issued to do so. The deaths of 25 of the remaining cases were not reported to the Maternal Mortality Committee, and for that reason only

Table 1. Maternal Deaths* in The Netherlands (1983-1992) as Registered by Central Bureau of Statistics, Maternal Mortality Committee, and Dutch Perinatal Database

Year	CBS registration	Reported to MMC		DPD registration	Total found in study period
		Before study	After study		
1983	9	6	8	3	10
1984	17	9	16	8	19
1985	8	5	11	4	11
1986	15	11	16	6	18
1987	14	17	20	10	23
1988	18	12	16	12	24
1989	10	6	9	5	12
1990	15	9	16	5	19
1991	12	9	13	5	15
1992	15	17	23	7	29
Total	133	101	148	65	180

CBS = Central Bureau of Statistics; MMC = Maternal Mortality Committee; DPD = Dutch Perinatal Database.

* International Classification of Diseases (ICD-9) definition (nonmaternal and late deaths excluded).

Central Bureau of Statistics data were available for further analysis. The remaining two cases were classified by the Committee as nonmaternal.

Data on 74% of all births are registered in the Dutch Perinatal Database.⁶ In the study period, 78 hospitals reported 147 maternal deaths to the Dutch Perinatal Database. However, 89 of these cases had not been reported to the Maternal Mortality Committee. Forty-eight of the 55 involved hospitals replied to the request for further information. As a result, 80 of the 89 cases were verified: 62 appeared to be wrongly registered, and in fact those women had not died. Fifty-three of these 62 administrative failures occurred in the first 3 years of the study period. In all, 18 confirmed deaths had not been reported to the Maternal Mortality Committee. Fourteen of these were classified as maternal deaths (ten direct and four indirect) and four as nonmaternal.

In the study period, 194 maternal deaths were reported to the Maternal Mortality Committee (Table 2). Of these, 139 deaths were directly reported by members of the Dutch Society of Obstetrics and Gynaecology, a further 29 deaths after a request from the Central Bureau of Statistics, five more after a request from the Dutch Perinatal Database, and two in a miscellaneous way; one death was reported twice. The remaining 20 deaths were discovered as a result of the questionnaire.

Of the 194 maternal deaths, 40 were classified as nonmaternal and six occurred more than 42 days after birth. Therefore, 148 maternal deaths (WHO) were

Table 2. Sources of Maternal Mortality Committee Data 1983–1992

	All deaths	ICD-9 and >42 days*	ICD-9 [†]
Direct by DSOG members	139	106	101
After call by CBS	29	29	29
After call in study	20	14	13
After call by DPD	5	4	4
Other	2	2	2
Total [‡]	194	154	148

ICD-9 = International Classification of Diseases; DSOG = Dutch Society of Obstetrics and Gynaecology; CBS = Central Bureau of Statistics; DPD = Dutch Perinatal Database.

* Nonmaternal deaths excluded.

[†] Nonmaternal and late deaths excluded.

[‡] One case was reported twice (CBS and study).

reported to the Maternal Mortality Committee in the study period (Tables 1 and 2).

When Central Bureau of Statistics, Dutch Perinatal Database, and Maternal Mortality Committee data were combined, 237 maternal deaths were identified (Table 3). After excluding nonmaternal and late deaths (between 43 and 365 days after birth), 180 maternal deaths were identified in The Netherlands during the study period (Table 3). They were classified further as 135 direct and 45 indirect deaths.

However, the Central Bureau of Statistics classified only 133 cases according to ICD-9. Two of the Central Bureau of Statistics cases were classified as being nonmaternal by the Maternal Mortality Committee, and one case occurred more than 42 days postpartum. Conversely, the Maternal Mortality Committee classified 50 deaths as maternal deaths, which were classified as being nonmaternal by the Central Bureau of Statistics (Table 4).

Of the 50 nonreported deaths, 25 (50%) were direct and 25 (50%) were indirect deaths, compared with 75% direct and 25% indirect deaths for the whole group of

Table 3. Information Available on All Deaths Related to Pregnancy in The Netherlands, 1983–1992

	All cases	ICD-9*
Reported to MMC	194	148
Only CBS data [†]	30	26
Only DPD data	8	5
Only DWTT data	5	1
Total	237	180

ICD-9 = International Classification of Diseases; MMC = Maternal Mortality Committee; CBS = Central Bureau of Statistics; DPD = Dutch Perinatal Database; DWTT = Dutch Working Party on Trophoblastic Tumors.

* Nonmaternal and late deaths excluded.

[†] One death was not classified as maternal death by CBS.

Table 4. Underlying Cause in and International Classification of Diseases Code for Women Who Died From Maternal Causes* but Were Classified as Nonmaternal in the National Statistics (The Netherlands, 1983–1992)

Underlying causes	CBS code	No.
Suicide	E958/3	2
Drowning	E984	1
Sepsis unspecified	038.9	1
Hereditary hemolytic anemias	282	1
Coagulation defect unspecified	286.9	1
Thrombocytopenia	287.3	1
Other blood diseases	289	1
Epilepsy	345	1
Hypertension	401	2
Other forms of chronic ischemic heart disease	414	1
Pulmonary embolism	415.1	1
Subarachnoid hemorrhage	430	6
Intracerebral hemorrhage	431	7
Other intracerebral hemorrhage	432	1
Other disorders of circulatory system	459	1
Chronic obstructive respiratory disease	496	2
Other diseases of lung	518	1
Peritonitis	567.2	1
Other specified diseases of intestines	569.8	1
Nonspecified diseases of intestines	569.9	1
Liver cirrhosis	571.5	1
Nonspecified renal insufficiency	586	1
Other congenital heart disease	746	1
Sudden death of unknown cause	798	1
Other ill-defined and unknown causes of morbidity and mortality	799	1
No nonmaternal CBS classification known		11
Total		50

CBS = Central Bureau of Statistics.

* Nonmaternal and late deaths excluded.

180 maternal deaths (Table 5). Misclassification was particularly evident for cerebrovascular disorders (12), cardiovascular disorders (6), and eclampsia (5).

Discussion

This study showed that in The Netherlands maternal deaths are underreported in the official vital statistics. In the study period (1983–1992), the Central Bureau of Statistics reported a maternal mortality rate of 7.1 per 100,000 live births (133/1,862,988). Our data indicate that the ratio should be at least 9.7 (180/1,862,988). Therefore, the level of underreporting was estimated as 26%.

The most important reason for underreporting was failure of the doctor to register the recent pregnancy on the death certificate. This explains why 56% of all

Table 5. Underlying Cause of Death in 50 Maternal Deaths (International Classification of Diseases), Not Classified as Maternal Death by the Central Bureau of Statistics and Percentage of Underreporting in Some Major Underlying Causes

Underlying cause of death	Unregistered cases	Total found in study (n)	% Underreporting
Direct maternal death			
(Pre-)eclampsia	6	51	12
Thromboembolism	3	20	15
Obstetric hemorrhage	1	11	9
Genital tract sepsis	3	10	30
Other direct causes	12	43	28
Total	25	135	19
Indirect maternal death			
Cerebral bleeding	12	18	67
Other indirect causes	13	27	48
Total	25	45	56
Total direct and indirect	50	180	28

indirect deaths remained unrecognized as maternal deaths (Table 5). The most important misclassified underlying cause of death was cerebrovascular bleeding in the puerperium. In 19% of direct deaths the underlying cause also was misclassified and hence the deaths were not reported as maternal deaths (Table 5). Doctors should be trained to improve their skills in diagnosing the underlying causes of death in pregnancy and the puerperium.

In the Confidential Enquiries in the United Kingdom between 1985 and 1990, 332 maternal deaths were known to the Registrars General versus 461 found in the Enquiry.⁴ A 28% underreporting rate is in agreement with our study (Table 6). Much higher percentages were found in the United States and France. One possible explanation may be the lesser impact of legal action in The Netherlands.

Table 6. Underreporting of Maternal Mortality in Some Western Countries

Country (period)	Official (n)	MMR official	Found in study (n)	% Underreporting	MMR after study
The Netherlands* (1983-1992)	133	7.1	180	26	9.7
UK (1985-1990) [†]	332	7.2	461	28	10
US (1977-1981) [‡]	17	NA	36	53	?
France (1988-1989) [§]	24	9.7	54	56	21.9

MMR = maternal mortality rate; NA = data not available.

* Source: This study.

[†] Source: Confidential inquiry⁴ 1994.

[‡] Source: Benedetti et al² 1985.

[§] Source: Bouvier-Colle et al³ 1991.

In Washington State, a 53% underreporting rate was found for the period from 1977 to 1981 (Table 6).² All ten indirect deaths in that study went unrecognized, compared with only nine of the 26 direct deaths. Extrapolating these data would implicate that in the United States 150 to 300 maternal deaths are unrecognized each year.

In France, a 56% underreporting rate was found in a retrospective survey of 3045 deaths of women of reproductive age between December 1988 and March 1989 (Table 6).³ In this survey, 68 deaths during pregnancy or the puerperium were detected. Only 24 were recognized as maternal deaths. Although in 17 cases a complication of pregnancy or the puerperium had been recorded on the death certificate, these cases were coded wrongly as nonmaternal. Early pregnancy and indirect deaths were more likely to be underreported.

Studies in different developing countries also have shown that less than half of all maternal deaths actually are reported.¹ One may conclude that in most countries underreporting is the rule rather than the exception. However, the degree of underreporting differs from country to country. Although we consider our data fairly complete, we cannot guarantee that we identified all maternal deaths in The Netherlands during the study period. However, we believe we explored all possible ways of detecting maternal deaths.

Comparison of maternal mortality rates between countries is meaningful only when every effort is made to provide complete data and the same definitions have been used. Then maternal mortality can be implemented as an important indicator of reproductive health. Registration of the pregnancy status of women on death certificates, as suggested in the tenth revision of the International Classification of Diseases,⁷ could be a first step in achieving this goal.

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