Maternal Mortality in Taiwan: Rates and Trends

By Senyeong Kao, Li-Mei Chen, Leiyu Shi, Martin C. Weinrich and C. Arden Miller

The development of a strategy for collection of accurate data on maternal deaths featured an interview census of families of women of reproductive age who died in Taiwan during 1984–1988. The census found 101 maternal deaths in addition to the 173 deaths identified as such in vital statistics records. The maternal mortality rate for the five-year period was 16.4 deaths per 100,000 live births, which is 58% higher than the official rate of 10.3 per 100,000. Taiwan’s maternal mortality rate, which was 20.3 deaths per 100,000 in 1984, declined by 20% over the period studied.

The maternal mortality rate is an important indicator of standards of obstetric care and has been used as an index of the status of maternal health. It has recently been used as yet another illustration of the disparity between developing and developed countries. Of the world’s estimated 500,000 annual maternal deaths, 99% occur in developing countries; however, only 86% of live births take place in those countries. The maternal mortality rate in developing countries is 200–1,000 per 100,000 live births, compared with 4–20 per 100,000 live births in developed countries.

In Taiwan, as in most countries, official statistics pertaining to maternal mortality are based on information taken from death certificates. However, previous studies have indicated that the use of such data leads to underestimates of maternal deaths. The research reported on in this article was conducted to test a different method of obtaining data on maternal deaths, to provide more accurate estimates of the level of maternal mortality in Taiwan and to describe recent trends in the maternal mortality rate.

Data and Methods

Between 1984 and 1988, we examined the death certificates of all deceased women aged 10–49 in Taiwan. Data on each year’s deaths were collected beginning in July of the following year. Family members of the deceased women were interviewed by public health nurses and midwives from local health stations to gather detailed information on the circumstances of death. The interviewers were trained to ensure that a uniform method was used in data collection and to ensure reliability and consistency.

Completed questionnaires from the interviews, with accompanying death certificates, were examined by the head public health nurses of local health stations before being sent to the county or city health bureau, where they were evaluated by nursing supervisors. The head nurses or supervisors returned any questionnaire they judged incomplete or questionable to the interviewer for correction of information.

All questionnaires collected from county and city health bureaus were screened by the researchers. Finally, obstetrician-gynecologists analyzed each death certificate and any available ancillary information obtained from interviews and assigned a cause of death according to codes in the International Classification of Diseases, 9th Revision, Clinical Modification. If no information was available from interviews or other sources, the cause of death was taken from the death certificate. Deaths that occurred during pregnancy or within 42 days after the end of pregnancy were included in the study; those resulting from pregnancy were categorized as maternal deaths, while those resulting from causes incidental to pregnancy were classified as nonmaternal. Deaths that occurred after the 42-day limit were excluded from the study.

Results

Maternal Mortality

As Table 1 shows, 27,171 women aged 10–49 years died in Taiwan between 1984 and 1988. Interviews were conducted with family members of 22,121 of the deceased women (81%), of whom 479 had been pregnant or had recently been pregnant at the time they died. These deaths included 233 from maternal causes. In addition, the study identified 41 maternal deaths based on examination of death certificates for the 5,050 women whose relatives were not interviewed.

During the five-year period studied, the official reporting system recorded 173 maternal deaths and 1,673,608 live births, resulting in an official maternal mortality rate of 10.3 deaths per 100,000 live births. This study identified an additional 101 maternal deaths, for a total of 274; the revised maternal mortality rate for 1984–1988 would therefore be 16.4 deaths per 100,000 live births.

Mortality Trends

Between 1984 and 1988, the mortality rate among women who were pregnant or had recently been pregnant decreased by al-
most 19%, from 35.5 deaths per 100,000 live births to 28.9 per 100,000. The maternal mortality rate declined by 20% during that period, from 20.3 per 100,000 live births to 16.4 per 100,000 (Table 2), while nonmaternal mortality decreased by 17%, from 15.2 per 100,000 live births to 12.6 per 100,000. The number of deaths and the mortality rates were evenly distributed during the study period; thus, no significant trends were detected across the years of the study.

Estimated Mortality Rates
By supplementing death certificate data with information from interviews, we were able to improve identification of maternal deaths by 58%. However, even the revised estimate is likely to be too low, because the families of 19% of the women who died during the study period were not interviewed. Therefore, we estimated the number of maternal deaths among those women by applying the percentage of maternal deaths found among the women whose families were interviewed.

Using this method, we found that 13 additional maternal deaths might have been detected if all of the 5,050 deaths of women whose relatives were not interviewed had been included in the study. Thus, we estimate that a total of 287 maternal deaths occurred between 1984 and 1988. When the additional deaths are included in our calculations, the maternal mortality rate is 172 per 100,000 live births.

Discussion
The maternal mortality rate is an important index of a country’s socioeconomic and cultural status and the availability and quality of obstetric care and maternal and child health care, as well as a source of information for policy decisions about health services. Reliable measures of maternal mortality and its causes and correlates are essential for planning successful maternal and child health programs and family planning programs.

Vital registration systems are perhaps the most widely used source of mortality statistics. However, they are known to be a relatively poor source of data on maternal deaths, even in countries with very well developed systems with high levels of coverage and completeness. Intermediate between countries with good vital registration and those with no coverage or incomplete registration are many countries, including Taiwan, where the registration of deaths is relatively complete but determination of the cause of death is comparatively poor.

As studies from both developed and developing countries have demonstrated, only about half of the actual maternal deaths can be identified as such in vital reporting systems and hospital records. In one hospital-based study, more than one-third of the maternal deaths that followed delivery of a live birth were not identified as maternal deaths on the death certificate. Even when both hospital and vital registration sources are used, some maternal deaths will still be missed: A physician who fills out a death certificate may not note a recent pregnancy, and the hospital in which a woman gives birth will probably not be notified if she dies during the postpartum period.

This study demonstrates the limitations of official vital registration data in estimating maternal mortality and provides the first nationally representative estimates of pregnancy-related deaths in Taiwan. In a retrospective study, the number of deaths occurring during or soon after pregnancy can be underestimated. Such underestimation was minimal in this study because of the high interview rate and the multiple sources used to identify maternal deaths. The methods used in this study may suggest ways to improve the accuracy of estimates of maternal mortality in countries whose mortality rates are based solely on death certificate information recorded in a national vital registration system; the results show that a combination of death certificates, interviews and clinical review successfully identifies a much greater proportion of maternal deaths than do death certificates alone.

Table 1. Numerical distribution of deaths among women aged 10–49, by basis for classification, according to year, Taiwan, 1984–1988

<table>
<thead>
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<tbody>
<tr>
<td>Not pregnant or postpartum</td>
<td>21,642</td>
<td>4,022</td>
<td>4,180</td>
<td>4,620</td>
<td>4,350</td>
<td>4,470</td>
</tr>
<tr>
<td>Pregnant or postpartum</td>
<td>479</td>
<td>112</td>
<td>97</td>
<td>96</td>
<td>80</td>
<td>94</td>
</tr>
<tr>
<td>Maternal</td>
<td>233</td>
<td>56</td>
<td>54</td>
<td>41</td>
<td>31</td>
<td>51</td>
</tr>
<tr>
<td>Nonmaternal</td>
<td>246</td>
<td>56</td>
<td>55</td>
<td>49</td>
<td>43</td>
<td>43</td>
</tr>
<tr>
<td>Family interviewed*</td>
<td>5,050</td>
<td>1,236</td>
<td>1,102</td>
<td>732</td>
<td>1,001</td>
<td>979</td>
</tr>
<tr>
<td>Family not interviewed</td>
<td>5,009</td>
<td>1,217</td>
<td>1,098</td>
<td>727</td>
<td>993</td>
<td>974</td>
</tr>
</tbody>
</table>

*Classification based on death certificates.

Table 2. Number of maternal deaths and maternal mortality rate, by year, Taiwan, 1984–1988

<table>
<thead>
<tr>
<th>Year</th>
<th>Deaths</th>
<th>Rate*</th>
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<tbody>
<tr>
<td>1984</td>
<td>274</td>
<td>16.4</td>
</tr>
<tr>
<td>1985</td>
<td>58</td>
<td>16.9</td>
</tr>
<tr>
<td>1986</td>
<td>58</td>
<td>16.9</td>
</tr>
<tr>
<td>1987</td>
<td>50</td>
<td>15.0</td>
</tr>
<tr>
<td>1988</td>
<td>39</td>
<td>12.5</td>
</tr>
</tbody>
</table>

*Maternal deaths per 100,000 live births.

References
8. S. J. Duthie, A. Ghosh and H. K. Ma, 1989, op. cit. (see reference 1); A. W. Walters, 1989, op. cit. (see reference 1); and R. Kumar et al., 1989, op. cit. (see reference 2).
11. R. W. Rochat et al., “Changing the Definition of Maternal Mortality: A New Look at the Postpartum Inter-
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Resumen
El desarrollo de una estrategia para recopilar datos precisos sobre la muerte materna incluyó un censo realizado mediante entrevistas a familias de mujeres en edad reproductiva que murieron en Taiwan entre 1984 y 1988. El censo reveló 101 muertes maternas además de las 173 identificadas en los registros de estadísticas vitales. La tasa de mortalidad materna durante el quinquenio fue de 16,4 muertes por cada 100.000 nacimientos vivos, la cual es el 58% más elevada que la tasa oficial de 10,3 por 100.000. La tasa de mortalidad materna en Taiwan, que ascendió a 20,3 muertes por 100.000 en 1984, declinó en un 20% durante el periodo en que se realizó el estudio.

Résumé
Le développement d’une stratégie de collecte de données précises sur les décès maternels a reposé sur un recensement avec entrevue des familles de femmes en âge de procréer décédées à Taiwan entre 1984 et 1988. L’étude a révélé 101 décès maternels excédentaires aux 173 identifiés en tant que tels dans les statistiques de l’état civil. Le taux de mortalité maternelle calculé pour la période de cinq ans observée était de 16,4 décès par 100.000 naissances vivantes, soit 58% de plus que le taux officiel de 10,3 par 100.000. Calculé à 20,3 par 100.000 en 1984, le taux de mortalité maternelle a diminué, à Taiwan, de 20% au cours de la période soumise à l’étude.