Maternal Mortality in Michigan: An Epidemiologic Analysis, 1950–1971

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Abstract: An analysis was performed of direct maternal mortality over 22 years (1950 through 1971) in the state of Michigan. The overall direct maternal mortality rate fell from 5.0/10,000 live births in 1950 to 1.5 in 1971. The rate among nonwhites was more than four times greater than among whites and the difference in relative risk did not narrow over the 22 years. Mortality rates increased with increasing maternal age but not with increasing parity. Nulliparous women had a significantly higher mortality rate than did parous women, particularly those over 25 years of age. When the white gravida of urban Wayne County were compared with the white gravida of 33 rural counties, no difference in direct maternal mortality rates could be attributed to rurality *per se*. Hemorrhage, infection, and toxemia were the leading causes of direct maternal death. The data suggest that hospitals with less active obstetrical services were associated with a higher risk of direct maternal mortality than were hospitals whose obstetrical services were more active. An increasing proportion of the direct maternal deaths was designated as preventable over the study period. It is believed that analyses of maternal mortality have led to improved perinatal and obstetrical care and that further advances require their continued support. (Am. J. Public Health 67:821–829, 1977)

> "Where are the orphanages of yesterday? Undoubtedly the chief cause for their disappearance has been the phenomenal reduction in maternal mortality during the past 50 years."[1]

The prevention of maternal death remains one of the foremost goals of obstetrics and measures of its frequency are often considered an index of general health care. This subject received little rigorous attention until 1933 when the New York Academy of Medicine, Committee on Public Health Relations, published its landmark report, *Maternal Mortality in New York City. A Study of All Puerperal Deaths 1930—1932*.[2] Using methods unprecedented for the time, every maternal death in the city was promptly investigated by several means including interviews with medical personnel who had attended the patient and the study of autopsy findings. The circumstances surrounding each case were evaluated by a special committee and an assessment of preventability of the death made. The meticulously analyzed results were published within a year of the completion of the study and, despite the delicate circumstances, the data were presented forthrightly. The chairman of the study stated, "The facts . . . are presented honestly and frankly. No attempt has been made to hide facts."[2]

In 1932, the last year of the study, the maternal mortality rate* in New York City was 56.9/10,000 live births. The Academy concluded that two-thirds of the deaths could have been prevented. A series of factors were found to have contributed to this unacceptably high rate, including: ignorance of the general public, a deficiency in prenatal care, insufficient training of physicians in obstetrical care, substandard operative obstetrics, inadequate hospital facilities, and poorly trained midwives. The Academy asserted that the responsibility for reducing the hazards of childbirth rested with the medical profession and provided a detailed series of recommendations which were addressed to all of the implicated factors.

It is generally agreed that the report was enormously successful in introducing needed reforms which contributed to the dramatic decline in maternal deaths over the subsequent decades. The impact of the report stimulated the formation of similar committees in many states which addressed the problem of maternal mortality.[3, 4] We have had the opportunity to perform an epidemiologic analysis of data compiled over 22 years by the committee in the state of Michigan during a period (1950 through 1971) when the maternal hazards of childbirth were substantially lower than during the era of the Academy study.

Methods

The Michigan Maternal Mortality Study was organized in 1950 by the Committee on Maternal and Perinatal Health

*Although this statistic is properly defined as a *ratio*, we have chosen to use the traditional designation of rate.

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of the Michigan State Medical Society in cooperation with the Michigan Department of Public Health and the Chairmen of the Departments of Obstetrics and Gynecology of the medical schools of Michigan. The Committee has continued to function actively on this basis since its inception.

The state was geographically divided into 14 regions, and board-certified obstetricians were appointed as Regional Visiting Obstetricians in each area. Maternal deaths were identified by death certificates, reports from attending physicians or medical record librarians, and monthly hospital reports filed with the Michigan Department of Public Health. The Regional Visiting Obstetrician investigated every maternal death in his district and submitted a report on a standard form. Information was collected from the hospital record, the pathologist, or autopsy report, and the attending physician. All deaths were reviewed by the committee at its regular meetings. The findings of the committee are protected by law from subpoena or seizure and are used for medical education and health care planning.

The classification of obstetric deaths used in this study is that of the *Guide for Maternal Death Studies* published by the American Medical Association in 1964.[5] The categories therein described are:

- A *direct* death is defined as "death resulting from complications of the pregnancy itself, from intervention elected or required by the pregnancy, or resulting from the chain of events initiated by the complication or intervention."
- An *indirect* obstetric death is "death resulting from disease present before or developing during pregnancy (not a direct effect of the pregnancy) which was obviously aggravated by the physiologic effects of the pregnancy and caused the death."
- A *nonrelated* death is "death occurring during the pregnancy or within 90 days of its termination from causes not related to the pregnancy nor to its complications or management."
- The *undetermined* category consists of deaths which occurred during pregnancy of the 90-day puerperium where the cause could not be determined by the committee, usually due to a lack of information or specific data.

For this study, abstracts were made of each case report of maternal death including: date of death, age, race, marital status, residence, hospital of death, parity, gravida, length of pregnancy, cause of death from the death certificate, cause of death as determined by the committee, committee assessment of preventability of the death, determination of responsibility for avoidable factors, and classification of the death.

The committee made its own determination of the specific cause of death; this expert evaluation was often at variance with the cause of death recorded on the death certificate. As examples, the concurrence between the final determinations of the committee and the recorded diagnosis on death certificates for the three leading causes of death was only 59 per cent for hemorrhage, 62 per cent for infection, and 65 per cent for toxemia.

Denominator data were found in the annual volumes of *Vital Statistics in the United States* for the years 1950 through 1968. Denominator data for the years 1969 through 1971 were obtained from the National Center for Health Statistics, Rockville, Maryland, and the Michigan Center for Health Statistics, Lansing, Michigan.

One analysis done was of direct maternal mortality according to the size of hospitals' obstetrical services. Data were available on the number of live births for each hospital during the 11 years of 1960 through 1971 (excluding 1964, for which data were unavailable) for those hospitals which were extant in 1972. There were 164 hospitals for which complete data were available; the others had gone out of existence during the period. There were 338 different hospitals in which maternal deaths occurred during the 22 years of this study.

To compare maternal mortality in the rural and urban areas of Michigan we selected rural counties as a comparison group for urban Wayne County. With few exceptions, the rural counties of Michigan have very small nonwhite populations, therefore, the only appropriate rural vs. urban comparison would be to the white populations. The 33 selected counties consisted of those with at least 60 per cent of their populations classified as rural by the Census Bureau definition[6] (Figure 1). Two counties meeting these criteria, but with populations greater than 40,000 (Allegan and Livingston), were excluded. According to the 1970 census, less than 1 per cent of the populations of each of these rural counties was classified as nonwhite; indeed, no county contained more than a total of 78 nonwhite individuals of all ages and both sexes.

The rates in this study are presented in both crude and adjusted form. The method of Linder and Grove was used for the adjustments.[1] Statistical significance testing was conducted using chi-square analyses and the Wilcoxon signed rank test. For comparing adjusted rates the approach outlined by Mantel and Haenszel was used.[8] In appropriate instances, transformations and linear regression analysis were utilized to test for trends.

Results

There were a total of 2,215 maternal deaths reported in Michigan during the 22-year period from 1950 through 1971. Of these, 1,341 (61 per cent) were due to direct causes, 539 (24 per cent) to indirect causes, 273 (12 per cent) to nonrelated causes, and only 62 (3 per cent) whose classification could not be determined. Rates were computed using *direct* obstetric deaths as the numerator and live births as the denominator. There were 3,984,395 live births in Michigan during the 22 years. The overall direct maternal mortality rate in Michigan from 1950 through 1971 was 3.4 maternal deaths/10,000 live births. In 1950 the crude rate was 5.0 and by 1971 it had fallen to 1.5/10,000 live births.

Race: Although direct maternal mortality rates for both races declined over the 22-year period, the nonwhite rate was consistently higher than the white rate (Figure 2). Regression analysis of transformed rates revealed no significant difference in the rates of decline for nonwhites relative to whites. This conclusion was confirmed by analysis using relative risk statistics. The relative risk of direct maternal mor-

Figure 1. Michigan. Urban Wayne County is Indicated in Black; The 33 Rural Counties are Stippled.

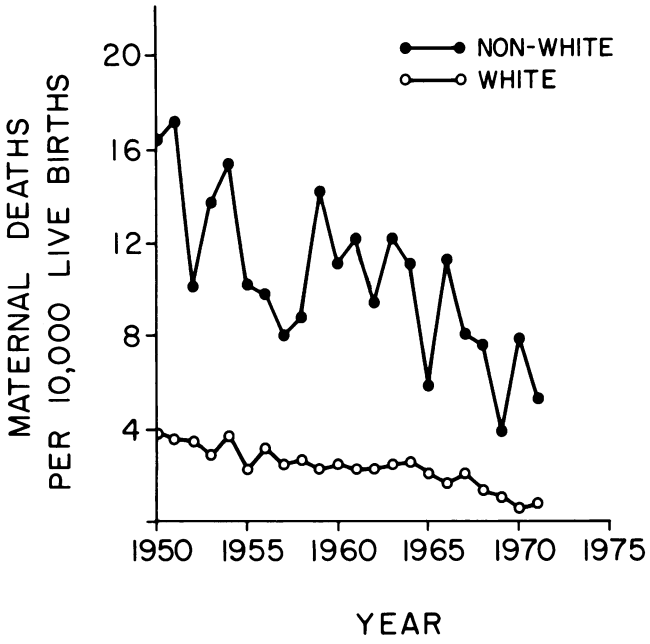

Figure 2. Annual Direct Maternal Mortality Rates by Race. Michigan 1950 through 1971.

tality has been and continues to be more than four times greater for nonwhites than for whites. Indeed, in the years 1970 and 1971 the relative risk was ten times greater.

Age: The median age of direct maternal death among whites was 30 and among nonwhites was 29. Table 1 provides direct maternal mortality rates by age groups for each race. For both races there were significant differences

TABLE 1—Direct Maternal Deaths and Direct Maternal Mortality Rates by Age and Race, Michigan, 1950 through 1971.

Age Groups (Years)	White		Nonwhite		Relative Risk Nonwhite/White
	No.	Rate*	No.	Rate*	
<15	1	5.1	3	8.3	1.6
15-19	50	1.2	51	4.9	4.1
20-24	156	1.3	82	5.4	4.2
25-29	176	1.8	107	10.0	5.6
30-39	338	4.0	178	18.0	4.5
≥40	92	12.5	32	37.9	3.0
TOTAL	813	2.3	453	9.6	4.2

* Direct maternal deaths/10,000 live births

($p < .02$) among the rates by age groups. The lowest rate occurred in the 15–19 year group and the highest rate was found among those 40 years or older. The rate sharply increased for nonwhites in the 25–29 year group, but the increase was delayed until the age group over 30 years for whites (Figure 3).

The white and nonwhite rates were adjusted for age in order to determine whether differences in the distributions of ages in the two populations could account to some extent for the large apparent racial differences. The overall adjusted rates were 4.2 for whites and 14.7/10,000 live births for nonwhites. The ratio of these rates was not substantially different from the ratio of the unadjusted rates.

Parity: The direct maternal mortality rates by parity are shown in Figure 4. The upper section of this figure depicts the unadjusted rates. It would appear that increasing parity results in an increasing risk of maternal death. However, age adjustment produced a striking change in the data. As shown in the lower section of Figure 4, it eliminated the effect of advancing parity. Nulliparous women had a significantly higher direct maternal mortality rate than did parous women ($p < .01$). Conversely, age-group rates when adjusted for parity did not differ from the unadjusted rates. Increasing parity, therefore, had no discernible independent effect on maternal risk.

In order to assess the influence of delaying first pregnancy on maternal mortality, a comparison of mortality by age among nulliparous and parous women was made (Table 2). Nulliparous women had higher mortality rates than did parous women in the 25 through 44 year age groups. Thus, delaying first pregnancy beyond the age of 25 incurred a higher risk than that experienced by parous women of comparable age.

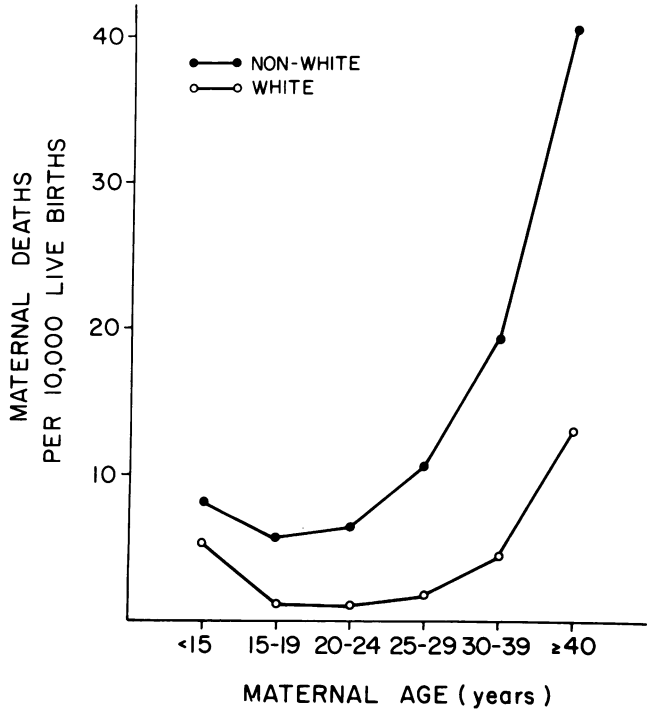

Figure 3. Direct Maternal Mortality Rates by Maternal Age Group, by Race. Michigan, 1950 through 1971.

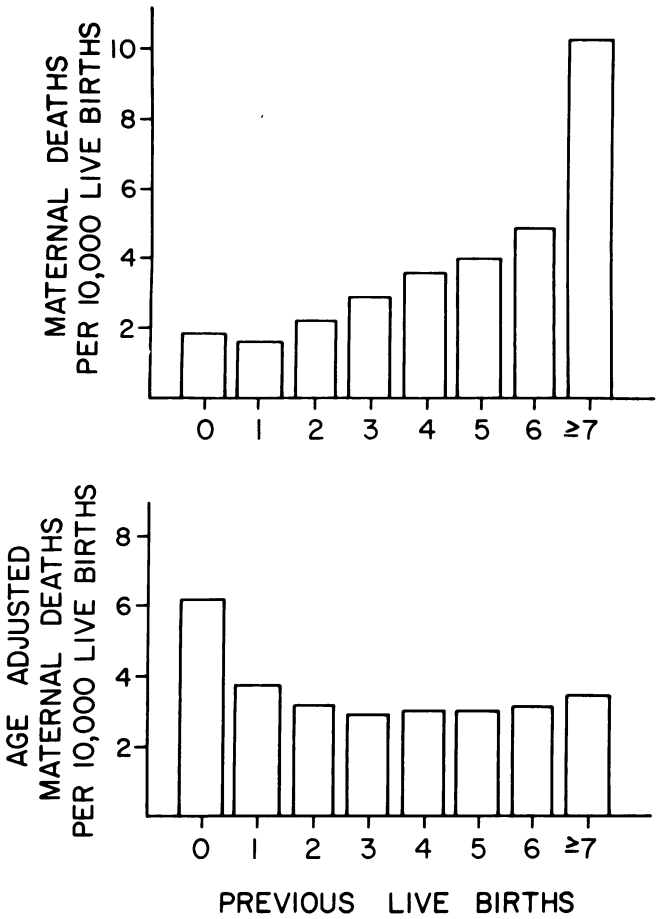

Figure 4. Direct Maternal Mortality Rates by Parity, Michigan, 1950 through 1971. The Upper Panel Illustrates Rates before Age Adjustment; the Lower Panel Illustrates Rates after Age Adjustment.

Rural-Urban Comparison: Direct maternal mortality rates in the white urban population of Wayne County were compared with the rates in 33 rural counties whose populations were virtually all white. Although the rate of 3.7 direct maternal deaths/10,000 live births in the rural counties was higher than the rate among whites in Wayne County (2.5/10,000 live births), this difference was not statistically significant.

Causes of Direct Maternal Deaths: The committee designated a cause of death in 1,277 (95.2 percent) of the total 1,341 direct obstetric deaths which occurred over the 22-year-study period. The 1,277 direct maternal deaths whose cause was determined form the data base for the subsequent analyses. The three most common causes of death were hemorrhage (33.3 percent), infection (23.5 percent) and toxemia (13.9 percent). Figure 5 illustrates the rates for each of these causes by race over the study period.

The direct maternal mortality from hemorrhage decreased from 1.8/10,000 live births in 1950 to 0.5 in 1971. Only 11 percent of the deaths from hemorrhage occurred during the last five years of the study. The maternal mor-

TABLE 2—Age-Specific Direct Maternal Mortality Rates among Nulliparous and Parous Women, Michigan, 1950 through 1971.

Age Groups (Years)	Direct Maternal Mortality Rates*		Relative Risks Nulliparous/Parous
	Nulliparous	Parous	
<15	9.9	0	—
15-19	2.1	2.1	1
20-24	1.8	1.5	1.2
25-29	3.8	2.2	1.7
30-34	4.3	3.6	1.2
35-39	10.5	7.3	1.4
40-44	17.7	12.6	1.4
≥45	0	27.8	—

* Direct maternal deaths/10,000 live births

tality rate from hemorrhage among whites (0.8/10,000 live births) was significantly lower ($p<.001$) than the rate among nonwhites (2.9/10,000 live births). There was no significant difference, however, in the mortality rate from hemorrhage between the white urban (0.80/10,000 live births) and the rural (0.79/10,000 live births) groups.

While death rates due to infection were comparable at the beginning and end of the study period (0.3/10,000 live births in 1950 and 0.4/10,000 in 1971), there was a large increase in infection death rates during the middle years of the study (Figure 5). Infection was the leading cause of maternal death among nonwhites. A large percentage of the deaths from infection among both whites and nonwhites occurred after abortion (45 per cent and 64 per cent respectively). There was no significant difference in maternal mortality due to infection between the white urban (0.5/10,000 live births) and rural (0.7/10,000 live births) groups.

The maternal death rate due to toxemia fell precipitously during the study interval (1.1/10,000 in 1950 to 0.1/10,000 live births in 1971). Almost three-fourths (73.5 per cent) of the deaths from toxemia occurred during the first ten years of study; only two deaths from toxemia occurred in 1971, the last year of the study.

Abortion: There were 234 women who died following an abortion (18.3 per cent of all the direct maternal deaths); 110 (47 per cent) were white and 124 (53 per cent) were nonwhite women. Infection was the leading cause of death following abortion, resulting in 60 per cent of the white and 78 per cent of the nonwhite deaths. Hemorrhage was the cause of 25 per cent of the deaths in whites and of 13 per cent of nonwhite abortion-related deaths.

The direct maternal mortality rates excluding abortion deaths, i.e., direct maternal deaths minus abortion-related deaths per 10,000 live births, were compared to the abortion mortality ratios (abortion-related deaths per 10,000 live births) over the 22-year study period (Figure 6). These maternal mortality rates declined steadily while the abortion mortality ratios rose to a peak in 1963 and declined sharply thereafter. Although we have no explanation for the latter phenomenon, it corresponds generally with the rise and fall in infection-related deaths noted previously. Analysis by race produced curves of similar configuration, although with higher values among nonwhites than whites.

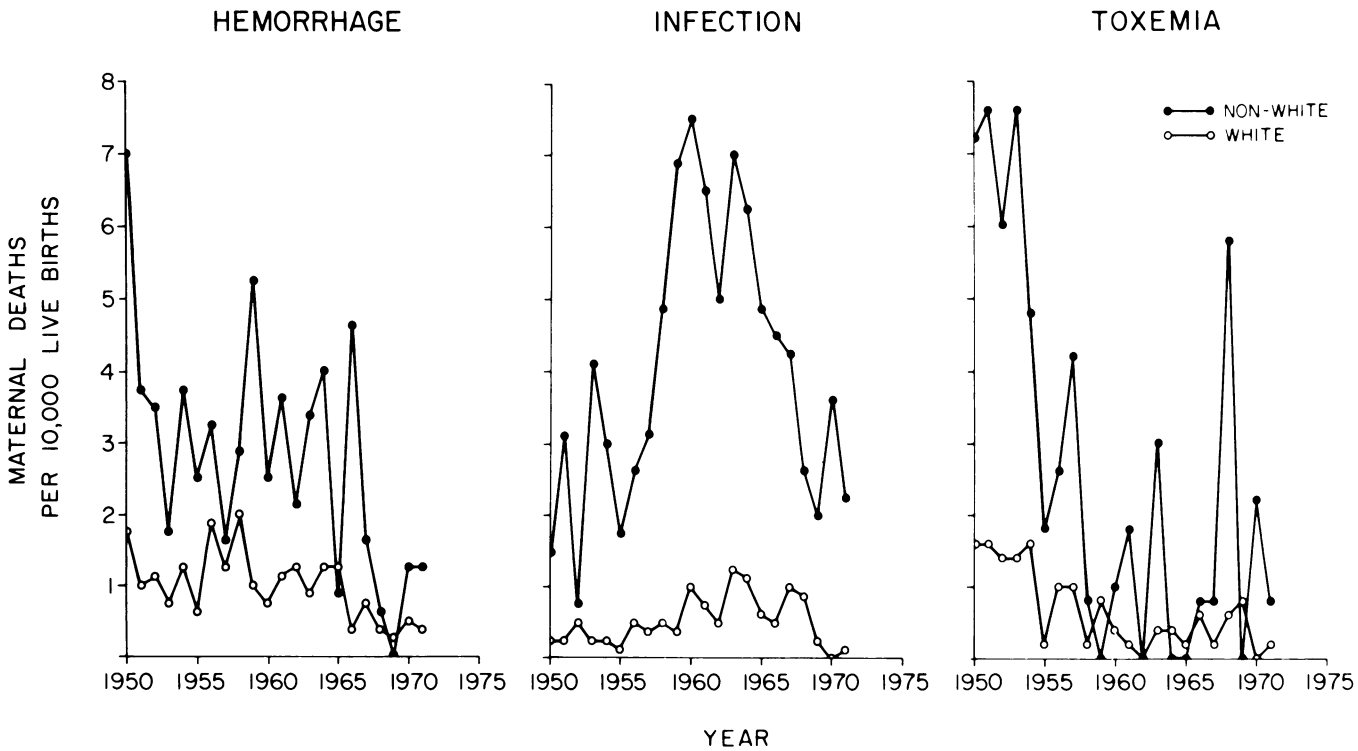

Figure 5. Annual Direct Maternal Mortality Rates by the Three Leading Causes (hemorrhage, infection, and toxemia), by Race. Michigan, 1950 through 1971.

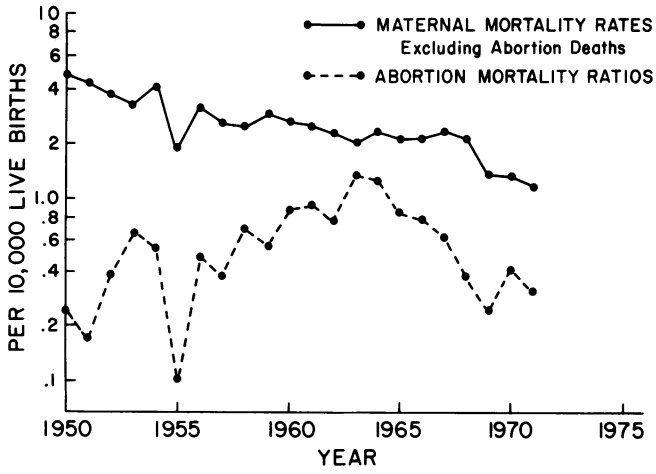

Figure 6. Annual Direct Maternal Mortality Rates (excluding Abortion Deaths) and Annual Abortion Mortality Ratios. Michigan, 1950 through 1971.

Size of Obstetrical Service: Data on the activity of hospitals' obstetrical services were available only for the 11-year period 1960 through 1971 (excluding 1964). The 164 hospitals were divided into five categories according to the average number of live births/week which occurred (Table 3). Unfortunately, race-specific live birth data were not available by hospital, so race-specific rates could not be computed. Since race has been shown to be a dominant risk factor, the following results must be interpreted with caution.

As demonstrated in Table 3, direct maternal mortality rates were found to be largest (8.5/10,000 live births) in hospitals with an average of less than four live births per week and smallest (1.3/10,000 live births) in hospitals with an average of 35 or more live births per week. In general, direct maternal mortality rates were found to be inversely proportional to the size of the hospital obstetric units. This relationship also obtained when deaths from infection and hemorrhage were each analyzed separately.

Of the 47 hospitals in the category with the highest rates (less than four deliveries per week), 15 were included in the urban (Wayne County) area and 11 were located in the 33 selected rural counties. The direct maternal mortality rate was significantly greater in these urban hospitals (16.6/10,000 live births) than among those in the rural counties (4.7/10,000 live births) ($p < .01$). This suggests that the excess mortality in the category with the smallest obstetrical service appears to reside in the urban rather than rural hospitals.

Preventability: Of the 1,341 direct obstetric deaths, 955 (71.2 per cent) were classified by the committee as preventable, 319 (23.8 per cent) as not preventable, and 67 (5.0 per cent) could not be classified. There has been a significant increase ($p < .01$) in the percentage of direct deaths which were classified as preventable over the 22 years studied (Figure 7). The leading cause of preventable direct maternal deaths among whites was hemorrhage while infection was the major cause among nonwhites.

Preventability rates for nonwhite women were higher than for white Wayne County women throughout the 22 years ($p < .01$). The preventability rates among white women in the selected rural counties also regularly exceeded the rates among the urban white women of Wayne County ($p < .05$). However, during the last four years of the study (1968 through 1971), the preventability rates among rural white (83 per cent), urban white (75 per cent), and urban nonwhite women (82 per cent) were not significantly different.

Discussion

In recent years analyses of neonatal and perinatal mortality rates have been the major indices employed to assess the adequacy of intra-partum, obstetric and post-partum medical care. Maternal mortality rates have not received equal emphasis for several reasons. The increased understanding of neonatal pathophysiology has focused attention on the infant with the resultant widespread acceptance of neonatal intensive care units. Conversely, the advances of

TABLE 3—Direct Maternal Deaths and Direct Maternal Mortality Rates by Hospitals Extant in 1972 and Cause of Death, Michigan, 1960 through 1971*

Total Number of Births During Study Period per Hospital	<2002	2003-4290	4291-8294	8295-20306	≥20307	Total
Average Number of Births per Week**	<4	4-7	8-14	15-35	>35	
Number of Hospitals	47	35	26	39	17	164
Maternal deaths (Rate per 10,000 live births)	37 (8.5)	39 (3.6)	38 (2.3)	129 (2.4)	69 (1.3)	312 (2.3)
Deaths from Hemorrhage (rate)	8 (1.8)	11 (1.0)	15 (0.9)	42 (0.8)	13 (0.2)	89 (0.6)
Deaths from Infection (rate)	13 (3.0)	4 (0.4)	11 (0.7)	35 (0.7)	27 (0.5)	90 (0.7)

* Excluding 1964 (data not available).

**Computed as $\frac{\text{Total number of births during study period per hospital}}{\text{Total number of weeks in study period (11 yrs} \times \text{52 wks} = \text{572 wks)}}$

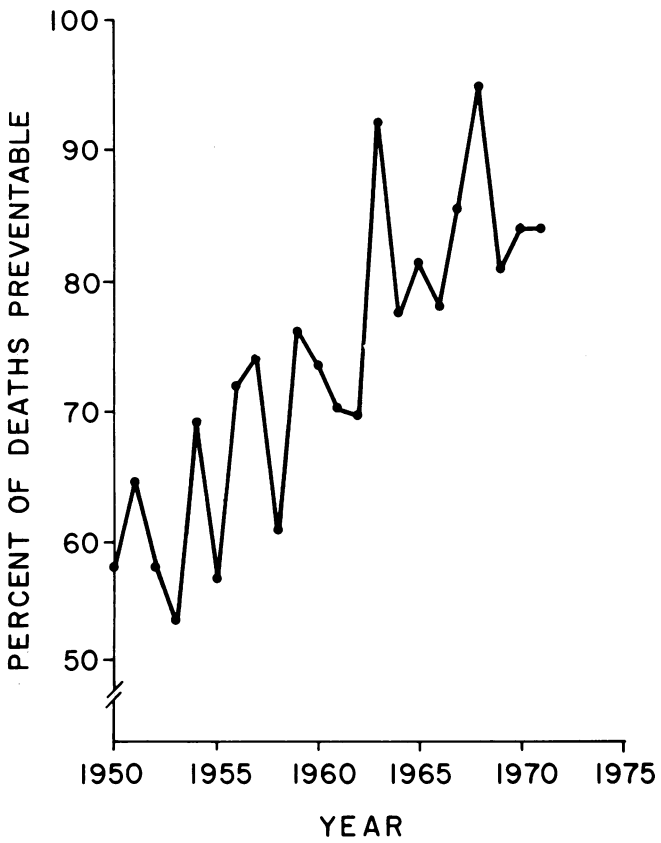

Figure 7. Percentage of Direct Maternal Deaths Which were Classified as Preventable, by Year. Michigan, 1950 through 1971.

antibiotic treatment of life-threatening maternal infection, large-volume blood transfusion treatment of massive obstetrical hemorrhage, and the treatment of toxemia had been implemented within the past three decades. The epochal studies defining preventable causes of maternal death were also of that era and contributed to the establishment of obstetrics as a medical specialty with resultant improvement in patient care. A gratifying fall in maternal mortality occurred. However, the recent decision of the U.S. Supreme Court legalizing abortion has highlighted the need to carefully reexamine the area of maternal mortality.

The information accumulated by the Michigan Maternal Mortality Study is of particular value for several reasons. The denominator population of gravida giving birth to live infants is large and well defined, extends over a long time span, and its composition encompasses a diversity of racial and urban-rural characteristics. Further, data gathering and interpretation of numerator events have been very precise and consistent over this long period due to over-lapping committee membership and the dedication of the physician participants. The importance of using several surveillance mechanisms to identify maternal deaths has been confirmed recently.[9] In contrast to many studies, death certificate diagnoses were not accepted at face value; an informed independent assessment of the cause of death was made by the committee after review of all available information.

During the 22-year interval (1950 through 1971) the direct maternal mortality rate in Michigan fell from 5 to 1.5/10,000 live births. However, race-specific analysis revealed a significant higher rate among nonwhites than among whites for each of the 22 years examined. Rates among both groups fell comparably. The important observation from the viewpoint of health care is that the difference between the races did *not* narrow. The relative risk of maternal mortality among nonwhites (largely concentrated in the highly urbanized areas of the state) remains more than four times greater than for whites. This is shown dramatically by the following: nonwhite Wayne County gravida had a direct maternal mortality rate of 10.5/10,000 live births while white gravida in Wayne County had a rate of 2.5/10,000 and their white rural counterparts had a rate of 3.7/10,000. The increased relative risk for nonwhite gravida also was evident within each age group. These data render specious the occasional opinions one encounters suggesting that the risk of maternal mortality has reached an "irreducible minimum". Therefore, programs designed to ameliorate this disparity in maternal mortality must be targeted at the nonwhite population which has remained at undiminished higher relative risk throughout the 22 years studied. Indeed, the direct maternal mortality rate among nonwhites in 1971, the last year of study, was 50 per cent higher than the rate among whites in 1950, the year the study began. It could be inferred that the prenatal and obstetrical care available to the nonwhite pregnant woman lags over 22 years behind that available to her white counterpart.

The risk of maternal death increased with maternal age, confirming long-accepted observations. However, no independent effect of increasing parity was found once appropriate age adjustments were made. Indeed, in contrast to current teaching,[10] significantly higher maternal mortality rates were experienced during the *first* pregnancy. Further, as the first pregnancy was delayed past the age of 25, nulliparous women were at higher risk than parous women of comparable age.

Another concern regarding the delivery of health care is whether rural gravida were at higher risk of a fatal outcome than were urban women. When the overriding confounding variable of race was removed by comparing only white urban and rural populations, no significant differences in direct maternal mortality rates were found.

Still another consideration regarding health care planning involves the size of the obstetric service in the hospitals in which the deliveries took place. Hospitals with less active obstetrical services are postulated to be less well staffed and equipped to respond effectively to life-threatening obstetrical situations. While the current analysis demonstrated a diminution of maternal risk with increasing size of hospitals' obstetrical services, it did not provide a definitive answer to the question. Since information regarding the racial distribution of live births by hospital was not available, the impact of this major confounding variable could not be assessed. As there currently is a plan to consolidate obstetrical services in Michigan, it would be advisable for the state to gather such data in order to more precisely evaluate the impact of such an extensive program. Specifically, the role of urban hospitals with very small obstetrical services deserves special scrutiny.

The leading causes of direct obstetrical death were the classic triad: hemorrhage, infection, and toxemia. The impact of clinical methods to prevent the latter were evident; by the end of the 22-year period deaths due to toxemia had been all but eliminated.

The maternal death rate caused by hemorrhage also decreased but remained very significantly higher among nonwhites than whites. As hemorrhage is often an intra-hospital event, the complex of factors relating to appropriate obstetrical care among nonwhites will need to be addressed if this excess mortality is to be ameliorated. In addition, the contribution of abortion to maternal deaths by hemorrhage was an important one (24.5 per cent of the deaths due to hemorrhage among whites and 13 per cent among nonwhites were associated with abortions). The finding of no significant difference between the death rate due to hemorrhage between white urban and rural populations suggests that rural transfusion services have become comparable to those in urban areas.

The role of infection as a cause of direct maternal death was more complex. The substantial increase in infection-related mortality during the mid-years of the study cannot be explained by our analysis. Again, abortions played an important role. Of deaths attributed to infection, abortions were associated with 54 per cent. Without a concomitant analysis of the clinical events surrounding these deaths, it is impossible to ascertain which aspects of the medical care extended to these individuals require improvement. Delayed presentation of the patient to the hospital, unsuspected or missed diagnoses, inappropriate selection and use of antimicrobial agents, inadequate supportive care, and nosocomial infections, among other problems, might be involved.

The committee's decisions regarding the preventability of each maternal death were, of necessity, subjective. Perhaps more importantly, standards changed over time. Technological advances alone over a 22-year period would alter expectations of the committee. The committee's deliberations also may have been influenced by the changing social milieu, *e.g.*, the improved network of highways may have enhanced their appraisal of ease of patient referral to more elaborate obstetrical facilities.

Also, with a doubling of the number of obstetricians during the 22-year period, committee judgments concerning complex patients cared for by generalists could have been altered. Because of the temporal instability of a definition for "preventability", emphasis was placed on the analysis of variables measured with greater objectivity. Nevertheless, the steady trend to increasing preventability underscores the conclusion that the safest possible maternity has not yet been attained.

Two general observations stemming from our experience in these investigations seem applicable. First, our analyses were based on data meticulously collected over many years by the members of the Michigan committee. Similar collections surely exist in the files of committees operating in other states. We commend them to epidemiologists whose analyses would confirm, extend, or differ with our findings. It is only when the results of several such studies are compared that the mortal risk of pregnancy in our society can be appreciated.

Secondly, state maternal mortality review committees appear to have reached a watershed period in their history. Their structure, support, and function are under current review and their future appears uncertain.[11] Our investigations clearly indicate the continuing need to examine maternal mortality because the risks fall unequally on different groups within our population. Although the magnitude of the problem has diminished strikingly since 1933, its essence remains the same: without carefully analyzed data, remedial measures in health care delivery cannot be designed and targeted with precision. Further, the impact of changes in our social philosophy (exemplified by the Supreme Court decision on abortion but also including changes in desired family size, age of first pregnancy, etc.) require objective assessment in large populations over time.

Because the orientation of the state committees has been primarily clinical, it is understandable that incisive current epidemiological analyses are lacking. Authorities in anesthesiology, infectious disease, transfusion services, and epidemiology among others should be added to those skilled in obstetrical care to address the problem.

We recommend that a national reevaluation of maternal mortality assessment be undertaken as a cooperative venture involving all interested clinical and public health groups. Problems of definition,[12] legal strictures, and financial support are among the many questions which must be addressed. Methods analogous to those employed in the evaluation of regionalized perinatal care programs in North Carolina might be used.[13]

Finally, the Michigan committee concluded that an ever-increasing percentage of maternal deaths in that state could have been prevented. It is hoped that this and future studies will aid in designing measures which will make the delivery of an infant, the renewal of life, even less hazardous for the mother. This must rank as one of the highest goals of medicine and society.

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Martha May Eliot Award 1977

R. Gerald Rice, MD, Chief of the Bureau of Maternal and Child Health, Michigan Department of Health, has been selected as the recipient of the 1977 Martha May Eliot Award. He will be presented with a $1,000 honorarium and handsome bronze bas-relief plaque, provided by Ross Laboratories, during APHA's 105th Annual Meeting in Washington, DC this fall.

This award is presented annually for unusual achievement in the field of maternal and child health. Dr. Rice's notable contribution has been his ability to sustain a level of leadership among his peers over more than three decades. His major accomplishments have been in the improvement of maternal and child health services at the state government level in Massachusetts, Pennsylvania, and Michigan, with particular recognition for innovations in the crippled children's program in the latter state where he combined the strengths of this well-established program with the need for qualitative input in the Medicaid effort. In his various endeavors he has carefully managed to work within the established medical care system and to influence that system toward attainment of a joint cooperative activity with good public health results.

Dr. Rice has consistently demonstrated his ability to develop an effective understanding among state legislators and foresight in embracing child health activities not necessarily required of him. While recognizing the special needs of mothers and young children, he has always visualized maternal and child health services as an integral part of the nation's pluralistic health care system.

The Awards Committee, chaired by Dr. Edward Lis, Director of Services for Crippled Children in Illinois, felt that Dr. Rice's qualities were the personification of the heritage of Dr. Martha May Eliot in the field of maternal and child health.