MATERNAL AND FETAL MORTALITY IN THE UNITED STATES*

H. J. STANDER, M.D., F.A.C.S.

Professor of Obstetrics and Gynecology, Cornell University Medical College

NEW YORK CITY

THE birth registration area in continental United States was established in 1915, at which time it included only ten states and the District of Columbia, representing 31.1 per cent of the population of our country. The area has been gradually extended since then by the addition of other states. In 1933, with the admission of Texas, it included for the first time the entire area for the continental United States. This was an important event as all comparative information regarding maternal and fetal deaths in this country is based on the statistics from the birth registration area. It seems appropriate then for us to consider the subject of maternal and fetal deaths in the United States at a meeting of the Obstetricians and Gynecologists of the last state to join the birth registration area.

During the past five years there has awakened in the minds of the laity in this country an unusual interest in maternal and fetal mortality. Such a public interest in this subject has also been witnessed in certain European countries and particularly in the British Isles. The reasons for this public awakening are fairly apparent. Obstetrics has steadily, although slowly, developed to be one of the major branches of medicine. However, it has become more and more evident to a small group of courageous ones in our profession that this development of the science and art of midwifery has not been attended by any marked improvement in maternal and fetal risks. In 1930, Comyns Berkeley of London stated that public opinion in England had at last been roused because of the fact that the maternal mortality and morbidity in the British Isles had not been lowered for the last twenty years, a statement which cannot be made about any other branch of medicine. In 1928, the Minister of Health of England appointed a Committee to study maternal mortality and morbidity in the British Isles. In 1932 this Committee made its final report, from which a great deal of important information may be obtained. Later I shall quote from this document.

In our country similar studies have been conducted by various societies during the past several years. The New York Academy of Medicine studied the problem in Greater New York City for the three years, 1930, 1931 and 1932, and published their findings and conclusions last year. Such investigations have been carried out in Philadelphia and other cities.

Concomitant with this deepened interest in this subject by our profession there have appeared, in the lay press and magazines, articles on almost every phase of maternal mortality. A great deal of this material has been erroneous and misleading, due undoubtedly to misinformation on the part of the writer. However, even if lay articles are often misleading the aroused interest of the lay public in the maternal mortality problem is focussing our attention on matters with which we should have concerned ourselves more diligently ere now. It is a commentary on our specialty that outside interest is needed to spur us on.

* From the Department of Obstetrics and Gynecology, Cornell University Medical College and New York Hospital. Read before the Texas Association of Obstetricians and Gynecologists, Galveston, Texas.

TABLE 1

DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS
DIVISION OF VITAL STATISTICS

DEATHS FROM PUERPERAL CAUSES WITH RATES PER 1,000 LIVE BIRTHS IN THE BIRTH REGISTRATION AREA IN CONTINENTAL UNITED STATES: 1915 TO 1932

Cause of Death	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932
The puerperal state:																		
Number	4,719	5,091	8,958	12,496	10,127	12,058	11,688	11,792	11,922	12,672	12,158	12,168	13,837	15,461	15,084	14,836	13,964	13,120
Rate	6.07	6.21	6.61	9.16	7.37	7.99	6.81	6.64	6.65	6.56	6.47	6.55	6.47	6.92	6.95	6.73	6.66	6.32
Per cent of population of continental United States included in birth registration area	31.1	32.5	53.6	53.6	58.6	59.8	69.3	72.2	72.2	76.2	76.0	76.8	87.3	94.4	94.7			

Now why this interest, both professional and lay, in the matter of maternal mortality? Table 1 will best answer this question.

It is clear from this table that no real improvement in the mortality figures has taken place during the past twenty years. It is also well to remember that deaths due to "the Puerperal State" as classified by the United States Bureau of the Census exclude such deaths as those due to one of the more serious acute infectious diseases. In a study of maternal deaths in 15 states by the Children's Bureau under the Department of Labor, in which the deaths were classified by the United States Bureau of the Census, we find the definition of "the Puerperal State" as follows:

1. Accidents of pregnancy. This includes (a) abortion, (b) ectopic gestation, and (c) others under this title. ("Abortion" will be referred to throughout this report as "abortion or premature labor." The word "abortion" does not have the same meaning as it does in the international classification, but is defined as the termination of a uterine pregnancy before the period of viability, i.e., in the first two trimesters.)
2. Puerperal hemorrhage, which includes (a) placenta previa, (b) others under this title: postpartum hemorrhage, accidental hemorrhage, etc.
3. Other accidents of labor.
   (a) Caesarean section.
   (b) Other surgical operations and instrumental delivery.
   (c) Others under this title.
4. Puerperal septicemia.
5. Puerperal phlegmasia alba dolens, embolus, sudden death.
6. Puerperal albuminuria and convulsions. This title also includes pyelitis, nephritis, tetanus and uremia.
7. Following childbirth (not otherwise defined).
8. Puerperal diseases of the breast.

In further elaboration of the definition we read:

When more than one puerperal cause appears on a death certificate, the death is assigned to one of them in accordance with definite rules

published in the Manual of Joint Causes of Death, which the Children's Bureau has followed literally in all cases. It is well to realize what the general rules of the classification are. If one of the more serious acute infectious diseases, such as typhoid fever, smallpox, diphtheria, or if cancer or syphilis, or if an external cause such as an accident or homicide, appears on a woman's death certificate with a puerperal cause, her death is assigned to that cause and not to the puerperal cause. (Influenza, however, takes precedence over no puerperal cause except "other accidents of pregnancy," "following childbirth (not otherwise defined)," and "puerperal diseases of the breast.") Puerperal septicemia takes precedence over all puerperal and non-puerperal causes except the ones mentioned. Tuberculosis in most forms takes precedence over all puerperal causes except puerperal septicemia. Other serious chronic diseases, such as cardiac valvular disease and chronic nephritis, take precedence over all puerperal causes except the most severe complications of childbirth. The term "pregnancy" on a death certificate causes a death to be classified as puerperal only when it appears alone, or with a term denoting a mild disorder or with a cause implying a complication of pregnancy.

It would appear then that the maternal mortality is even worse than is indicated in the foregoing table. I should like to see all countries and clinics adopt a uniform method of reporting maternal mortality or deaths due to "the puerperal state." This death rate should express the percentage of women, with both nonviable and viable babies, dying during pregnancy, labor and the puerperium, *without* correction for such complications as heart disease, cerebral accident, anemia, thrombosis, embolism, pulmonary edema, pneumonia, influenza, tuberculosis, diabetes, chorea, epilepsy, appendicitis, criminal abortion or any other complication of pregnancy. Until all maternal deaths are reported in this manner, statistical comparisons are futile, for the reason that all other methods permit of correction, and unfortunately all writers, investigators and countries do not correct in the same manner. Therein lies the trouble.

TABLE II

DEATHS FROM PUERPERAL CAUSES WITH RATES PER 1000 LIVE BIRTHS IN THE BIRTH REGISTRATION AREA IN CONTINENTAL UNITED STATES: 1930

Causes	1930	1931	1932
Abortion with septic conditions:			
Number	1961	2049	2026
Rate	.88	.96	.97
Abortion without mention of septic condition (to include hemorrhage):			
Number	671	653	706
Rate	.30	.30	.34
Ectopic gestation:			
Number	595	588	562
Rate	.26	.27	.27
Other accidents of pregnancy (not to include hemorrhage):			
Number	169	88	84
Rate	.07	.04	.04
Puerperal hemorrhage:			
Number	1523	1442	1377
Rate	.69	.68	.66
Puerperal septicemia (not specified as due to abortion):			
Number	3321	3149	2734
Rate	1.50	1.49	1.31
Puerperal septicemia and pyemia:			
Number	3303	3137	2721
Rate	1.49	1.48	1.31
Puerperal phlegmasia alba dolens, embolus, sudden death (not spec. as septic):			
Number	702	630	626
Rate	.31	.29	.30
Puerperal tetanus:			
Number	18	12	13
Rate	*	*	*
Puerperal albuminuria and eclampsia:			
Number	3589	3027	2659
Rate	1.62	1.43	1.28
Other toxemias of pregnancy:			
Number	493	529	489
Rate	.22	.25	.23
Other accidents of childbirth:			
Number	1767	1755	1807
Rate	.80	.83	.87
Other and unspecified conditions of the puerperal state:			
Number	45	54	50
Rate	.02	.02	.02

* Less than one-tenth of 1 per 1000 live births.

Furthermore, you will notice that in my definition of maternal mortality as already stated, I said "the percentage of women . . . dying," and not "deaths per 1000 live births." I am aware of the reason usually given for computing maternal mortality on a basis of live births, namely that it expresses the sacrifice in mothers to produce so many live births. This method leads to numerous errors and affords many ways of correcting the death rate. The higher the fetal mortality, the lower the number of live births, a state of affairs affecting the maternal death rate. In other words, the maternal death rate depends not only on the actual number of women who died as a result of childbirth but also on the number of babies born alive. This, to my mind, is a most illogical method of recording our results as they relate to the mother. I believe we should be able to state quite clearly that out of a given number of women who became pregnant the death rate was thus and so; in other words, so many puerperal women died per 100, or 1000, women who became pregnant. I advocate very strongly that all maternal mortality reports, either by individuals, societies, cities, states or countries, be based on the total uncorrected maternal deaths, irrespective of the duration of pregnancy or the result to the offspring.

Let us consider the main causes of maternal mortality as shown by the figures of the United States Bureau of the Census, bearing in mind the foregoing comments on "the puerperal state" and on "deaths per 1000 live births." In Table II will be seen the statistics for the last three years ending 1932. These show very clearly that puerperal infection is the main cause of death with a rate of almost 3 per 1000, or nearly 50 per cent of all deaths. The toxemias appear next with a rate of 1.5 to 2 per 1000. Puerperal hemorrhage is the third largest contributing factor, accounting for 0.7 per 1000. These three: infection, toxemias and hemorrhage, constitute then the cause of death in almost 85 per cent of all fatal cases.

I should like to present to you now the figures on maternal mortality in the Woman's Clinic, or Lying-In Hospital of the New York Hospital. These are shown in Table III.

I do not present these figures in order to impress you with our results, but rather to bring out the reasons, as I see them, for such figures. Our morbidity incidence is low because of rigid aseptic technique and an isolation floor for all infected or potentially infected patients. This isolation floor is completely equipped with nurseries, kitchens, sterilizing room, operating and delivery room, and is subdivided into sections, one for observation and the milder forms of infection such as pyelitis, gonorrhea and breast infections and one for puerperal infection.

It should be noted that the morbidity rates as shown in Table III are uncorrected and give the results in a maternity hospital where both registered and unregistered, as well as emergency patients are admitted and treated. These figures, therefore, permit of comparison with any other series of cases reported on an uncorrected statistical basis.

Regarding morbidity, I recently stated:

> It is evident that a bidaily temperature reading often gives very false and misleading information, especially if such temperatures are taken early in the morning and at two o'clock in the afternoon. The four and eight o'clock temperatures are more significant than that at two o'clock. On such a bidaily basis of recording temperatures, many patients with an uterine infection, and even with a hectic temperature course may appear to be afebrile. The important factor in detecting a puerperal infection is that throughout the patient's stay in the hospital her temperature be faithfully recorded at 6 and 10 A.M., 2, 6, and 10 P.M. and 4 A.M. The last temperature, 4 A.M., may be omitted if the patient is asleep. Our standard of morbidity in the Woman's Clinic of the New York Hospital is as follows: "The Puerperium is considered febrile if there is a rise in temperature to 38°C. (100.4°F.) occurring once during each of two twenty-four hour periods

following delivery, or remaining elevated longer than twenty-four hours, excluding the first twenty-four hours after delivery, temperatures on all patients being recorded every four hours throughout the patient's stay in the hospital."

Other factors besides a rigid admission system and adequate isolation, which lower the incidence of infection, are the use of a face mask by all attending a patient in labor and at delivery, surgical asepsis on the part of the obstetrician, the proper performance of rectal examinations and elimination, as far as possible, of vaginal examinations during labor, a low incidence of operative interference, a house staff adequately trained in obstetrics, adequate supervision by the attending staff and careful nursing care during labor and the puerperium, especially in so far as perineal care is concerned. I may say that our house staff is on a five year resident system.

The prevention, control and treatment of the toxemias is too large a subject for me to discuss at this time. Suffice it to say that antenatal care, properly instituted and conducted, the conservative treatment of pre-eclampsia and eclampsia, the early recognition and treatment, radical if necessary, of nephritis as well as a careful follow-up system for a period of six months to one year of all cases are the important factors in any attempt to lower the deaths from the toxemias.

As to the third important cause of maternal deaths, hemorrhage, I may say that our treatment has changed most radically during the past ten years. Today a patient bleeding, however little, during the last trimester of pregnancy, is brought into the hospital and the *first* step in the treatment is blood grouping and matching. This is done before any other step in the procedure, unless some type of obstetrical

Table III

MATERNAL MORBIDITY AND MORTALITY IN THE WOMAN'S CLINIC, NEW YORK HOSPITAL FOR THE PERIOD SEPT. 1, 1932 TO JUNE 30, 1934

A. *Morbidity (Indoor Service)*

	Premature		Full Term		Total	Per Cent Total	Per Cent Morbidity
	Spont.	Oper.	Spont.	Oper.			
Puerperium: Normal	75	36	2718	630	3459	74.244	
One day fever	11	4	406	153	574	12.320	
Febrile, Puerperal infection	12	9	228	176	425	9.122	13.436
Mastitis	0	0	37	10	47	1.009	
Pyelitis	2	2	22	5	31	0.665	
Intercurrent disease	1	1	14	3	19	0.408	
Other causes	2	6	57	39	104	2.232	
	103	58	3482	1016	4659	100.000	
	161		4498				

B. *Mortality*

Total indoor full term + premature deliveries	4659
Total deaths in indoor service	7
Incidence = 0.15 per cent or 1.5 per 1000	
Total obstetrical patients treated in indoor & outdoor service	7869
Total maternal deaths	14
Incidence = 0.177 per cent or an uncorrected maternal mortality of 1.77 per 1000	

interference is imperative. Many of these patients stop bleeding and it is our practice in such instances to refrain from vaginal examinations for four or five days, and these are carried out only when definitely indicated. The prime importance of adequate preparedness at all moments in the matter of blood transfusion for the case of puerperal hemorrhage has become more clear to us and it has displaced immediate obstetric interference from first place in the routine procedure of treatment.

Time will not allow me to enter into a detailed discussion of the other various causes of maternal mortality, but later I shall summarize my views as to the factors in general which do and will lower our appalling maternal mortality.

The confusion we have seen in the reporting of maternal mortality is surpassed only by that observed in the statistics on fetal mortality. There is no single definition of fetal mortality in general use and the application of the terms stillborn and deadborn vary widely in the law and practices of the different states. I have recently advocated that fetal deaths be reported in the form of total uncorrected infantile mortality rate, including all stillbirths in babies of 1500 gm. or over, as well as neonatal deaths occurring during the first fourteen days of life. This is the only basis on which intelligent comparisons can be made. A corrected fetal mortality rate is as misleading as a corrected maternal mortality rate.

It will be seen from this definition that no corrections are made for premature babies nor for neonatal deaths, occurring during the first two weeks of life. This definition obviates any argument as to what constitutes viability and brings to the light of day the bad results, occurring one or more days after delivery, and following birth injuries incident to such obstetrics as unskillful forceps application, unnecessary haste in breech extraction unwarranted and untimely version and extraction, as well as all the other methods of meddlesome and unskilled midwifery.

The figures of the Bureau of the Census of the United States on fetal mortality give merely the number of stillbirths, and so do not tell us the whole story. But from those figures alone it would seem that our results may stand great improvement. In 1933 there were 2,064,944 births in the continental United States with 76,837 stillbirths, a rate of 3.7 per 100 live births. We do not know the number of premature and neonatal deaths. I would estimate that the total uncorrected infantile mortality in the United States is in the neighborhood of 6 per cent. I base this estimate on the fact that in a large maternity service we have found that the neonatal deaths constitute approximately one-third of the total infantile mortality. For example, in our clinic for the year 1933 the gross infantile mortality was 145 deaths, in 3752 infants, or 3.86 per cent, and of these 145 deaths, 47 occurred during the first two weeks following delivery.

It is often stated that the maternal and fetal mortality in other countries, especially the Scandinavian, are far lower than in the United States. Such comparisons are dangerous and misleading. I quote for you from the Final Report of the British Committee on Maternal Mortality which made an exhaustive study of the Scandinavian countries. Their report states:

> In Denmark and Sweden the official maternal death rates for the five years 1925–29 average 2.74 and 3.12 respectively, as compared with 4.21 for England and Wales. Enquiry showed, however, that certain causes of death, which in the English returns are classed to childbirth, were habitually excluded from this category in Denmark and also that in both these countries the method of classification where more than one cause of death appears on the certification diminishes the number of cases which would in England have been ascribed to maternal deaths. The investigators arrived at the opinion that in consequence of these discrepancies the official figures as they stand do not give a true idea of the relative maternal mortality, and that if the rates in these countries were computed upon the English basis they would more closely approach that of England and Wales. In all the countries there has been a definite rise in the recorded

maternal mortality rate in recent years. Different reasons for this were given in each country, but it would seem that in all the greater care now exercised in death certification has been an important factor in bringing about this result.

Furthermore, if we consider that for the year 1929 the total maternal mortality for England, according to this report was 5.82 deaths per 1000 live births, while in the United States for the same year the figure was 6.9 for colored and white, and 6.3 for its white population, it would appear that the standard of obstetric practice is about the same in each of these countries, and leaves much to be desired.

To my mind maternal mortality in the United States can be materially reduced by allowing more time for the teaching of obstetrics in our medical schools, by postgraduate teaching in obstetrics, by better hospital training in obstetrics for those who deliver women in their practice and by providing adequate welfare clinics and hospital facilities for maternity patients. These facilities should include, as so well set forth by the American College of Surgeons, the following:

a. Segregation of obstetric patients from all others in the institution.

b. Special facilities available for immediate segregation and isolation of all cases of infection, temperature or other conditions inimical to the safety and welfare of patients within the department.

c. Adequately trained personel, the entire nursing staff to be chosen specially for work in this department and not permitted to attend other cases during time on obstetric service.

d. Readily available, adequate laboratory and special-treatment facilities under competent supervision.

e. Accurate and complete clinical records on all obstetric patients.

f. Frequent consultations encouraged on obstetric service, a consultation made obligatory in all cases where major operative procedure may be indicated.

g. Thorough analysis and review of the clinical work of the department each month by the medical staff with particular considerations to deaths, infections, complications, or such conditions as are not conducive to the best end results.

h. Adequate theoretical instruction and practical experience for student nurses in prenatal, parturient, and postpartum care of the patient, as well as the care of the newborn.

Finally I feel very strongly that the general public should be taught that it is imperative for *every* woman to have adequate medical supervision and care during pregnancy, labor and the puerperium. This supervision and care must begin early in pregnancy, must be continuous throughout the postpartum period and must be in the hands of a physician, not a midwife, properly taught as an undergraduate and adequately trained in a first class hospital in the art and science of obstetrics.

Regarding certain other specific factors relating to maternal mortality, such as anesthesia and analgesia, midwives and home deliveries, I can do no better than to quote from the Report of a Committee of the New York Obstetrical Society appointed this year to review the Maternal Mortality Report of the New York Academy of Medicine. As I was a member of this committee, my views are in complete accord with the following quotations from its report. These are:

Midwives:

Your Committee believes that while there is need for better training and supervision of the present licensed midwives, that there is no need for training or licensing of additional midwives. The record shows that during the past twenty years in the city of New York there has been a steady decline in the practice of midwives—from 50 per cent to 8.5 per cent at the present time. In order to accomplish the better training and supervision of the existing midwives, we recommend that the New York Obstetrical Society offer its services to the Commissioner of Health of the City of New York.

Your Committee believes that the practice of Obstetrics will never be elevated to the position it rightly deserves as long as the midwife is permitted to practice. The profession, as well as the majority of the laity, is perfectly cognizant of the limitations of the midwife and the teachers and leaders of obstetrics should, by now, appreciate the inadequacy of

any system which introduces incompetency in competition with scientific knowledge.

Hospital and Home Deliveries:

Your Committee recommends that the New York Obstetrical Society should countenance home deliveries only when under ideal conditions as to competent medical attendance or supervision, equipment and assistance.

Operations:

We all know that operative deliveries, with good indications in skilled hands, are necessary. They are merciful and life-saving and they constitute one of the great advances of modern obstetrics.

Anesthesia and Analgesia:

Your committee believes that the use of anesthetics and analgesics when properly selected and properly administered are valuable and indispensable and should be encouraged. They are not only humane but tend to prevent unnecessary and too early interference with the natural progress of labor and *per se* do not add to the maternal or fetal death rate, nor to operative interference.

Education:

Your Committee is unanimously of the opinion that the New York Obstetrical Society should go on record in the medical and lay press as to its attitude regarding education and training in obstetrics and gynecology. This seems necessary in order that the Society may use its full influence in an endeavor to accomplish the following: Hospital training in obstetrics for those who plan to practice obstetrics must be adequate. An obstetrical interneship should not be less than one year and a general rotating interneship in which obstetrics is included, should be at least two years in order to allow a minimum of six months for obstetrics.

All university and other qualified hospitals should utilize their facilities, wherever possible, to offer postgraduate courses in obstetrics and gynecology.

Only through these three factors, adequate undergraduate teaching, thorough hospital training and postgraduate courses, will the obstetrical standards of the work in all our hospitals be elevated to the required level of efficiency and safety.

Furthermore the lay public, through the various public health agencies, including the Department of Health, should be informed of the requirements of a physician doing obstetrics; the standards of hospitals taking obstetric cases; and finally what the patient herself should know about pregnancy, labor and the puerperium.

Cooperation with Medical Organizations and Publicity to the Medical Profession:

Your Committee recommends that the New York Obstetrical Society appoint a Committee to cooperate with the Department of Health, the Department of Hospitals, and other agencies, in order to accomplish the above recommendations regarding midwife practice, undergraduate and postgraduate education, regulation or registration of physicians practicing obstetrics, supervision of all hospitals doing obstetrics which do not conform to the minimum standards of the American College of Surgeons and to evolve a plan for a Board of Regional Consultants in obstetrics and gynecology. We further recommend that, with respect to our report, such a Committee be empowered to consider and act in the matter of publicity to the medical profession, as well as to the lay public.

Fetal Mortality:

Your Committee recommends that in any further study of Maternal Mortality, fetal mortality should be included as giving more complete and accurate analysis of our results in childbirth.

I have endeavored to bring before you the appalling figures, seen in every state in the Union, on maternal and fetal mortality and have further attempted to indicate lines along which we may hope to elevate the standard of obstetrics and gynecology in our country, which will automatically carry with it marked improvement in these frightful mortality figures. It rests with you and me, as obstetricians and gynecologists, to vindicate ourselves in the eyes of the general public, as well as our own profession. We must accomplish in our specialty what is being done in other branches of medicine, we must prolong the span of woman's life, we must make childbirth safe and without undue risk to mother and child and we must see that womankind suffers not from the end results of inadequate obstetrics. This is our task and the responsibility may not be shifted.