



---

— WILLIAMS —

---

# OBSTETRICS

---

12th EDITION

NICHOLSON J. EASTMAN

Professor Emeritus of Obstetrics, Johns Hopkins University; Obstetrician-in-Chief Emeritus to the Johns Hopkins Hospital

LOUIS M. HELLMAN

Professor and Chairman, Department of Obstetrics and Gynecology, State University of New York, Downstate Medical Center; Director of Obstetrics and Gynecology, Kings County Hospital, Brooklyn



APPLETON-CENTURY-CROFTS, INC.  
NEW YORK

Copyright, © 1961, by

APPLETON-CENTURY-CROFTS, INC.

*All rights reserved. This book, or parts thereof, must not be reproduced in any form without permission of the publisher.*

Library of Congress Card Number: 61-9340

652-64

Copyright, 1950, 1956, by Appleton-Century-Crofts, Inc.  
Copyrighted in part in 1945, by D. Appleton-Century Company, Inc., as Textbook  
of Obstetrics by Henricus J. Stander  
Copyright, 1936, 1941, by D. Appleton-Century Company, Inc.  
Copyright, 1902, 1903, 1904, 1907, 1909, 1912, 1917, 1923, 1930,  
by D. Appleton and Company  
Copyright, 1930, 1931, 1932, by J. Whitridge Williams  
Copyright, 1935, 1940, by Caroline de W. Williams  
Copyright, 1951, by Anne W. Niles

PRINTED IN THE UNITED STATES OF AMERICA

## PREFACE

During the five years that have elapsed since the publication of the last edition of this work, many important advances have been made in both the science and practice of obstetrics. Noteworthy among these has been the acquisition of much new knowledge concerning fetal physiology and its aberrations—indeed, concerning all that pertains to the welfare of the fetus and newborn. Many advances in this area have yielded information of the utmost pertinence in the everyday practice of obstetrics. These developments are given full consideration in this edition, which includes an entirely new chapter on fetal malformations, an extensive revision of the section on hemolytic disease of the newborn with greater emphasis on clinical management, and new material on the nature, prognosis, and treatment of hyperbilirubinemia. In addition, new information on placental transfer, fetal homeostasis, and asphyxia neonatorum has been added.

Since coincidental diseases in pregnancy often pose perplexing problems, portions of this chapter have been expanded and a number of conditions added which have not heretofore received consideration. Other subject matter that has been either added or revised extensively includes: the incompetent cervix, the cesarean section scar and its management, bacterial shock, hydramnios, uterine inertia, the vacuum extractor, sterilization, contraception, x-ray pelvimetry, and the antimicrobial management of puerperal infection and abortion. In addition to these major changes, countless alterations of a more minor nature have been necessary in order to keep the book abreast with present-day obstetric thought.

The chapters on the endocrines, anesthesia, and the toxemias have been extensively revised. Every attempt has been made to validate the material with modern biostatistical data derived not only from the authors' two large institutions but from a wide variety of other sources.

Despite these additions and many new illustrations, the elimination of superfluous and outmoded material has made it possible to keep the book at approximately the same number of pages as in the previous edition.

It is the belief of the authors that the bibliographies, some of which are extensive, will serve as useful working tools to practicing physician and medical student alike. To the former they afford a means of amplifying his knowledge whenever faced with a troublesome problem, while to the latter they should not only stimulate further study but remind him that obstetrics is not a static subject but a progressive, dynamic branch of medical science. While the bibliographies make no attempt to be all-inclusive the authors have tried in each instance to include those new pertinent references from which complete bibliographical information can be derived.

In sum, it is the hope of the authors that this Twelfth Edition of *Williams Obstetrics*, in keeping with the tradition of past editions, will continue to be a modern and practical, as well as comprehensive, textbook for medical students and practitioners.

Any medical text of magnitude cannot result from the efforts of its authors alone but requires extensive advisory help from a host of scientific and clinical colleagues. The Twelfth Edition of *Williams Obstetrics* is no exception. While

almost all of the writing has been done by the authors themselves, except for Chapter 13, we owe a heartfelt expression of appreciation to all in this country and those abroad who have aided our work and helped to increase its merit.

In particular, we are indebted to Dr. Leon Chesley for his extensive editorial help and aid with the chapters on maternal physiology and toxemia. We are particularly appreciative of the advice of Drs. Joseph Velardo, Hilton Salhanick, Georgeanna Seegar Jones, and J. Edward Hall on the endocrine chapters. Dr. Donald Barron and Dr. André Hellegers, as well as Dr. Nicholas Assali, gave valuable aid and counsel in the field of fetal and maternal physiology and placental transfer; while Dr. Roy Holly helped with information on maternal iron metabolism and anemia. As in the last two editions, the chapter on multiple pregnancy has been revised by Dr. Alan F. Guttmacher.

The material on sex chromatin and chromosomes as well as that on the vacuum extractor was furnished by Dr. Vincent Tricomi.

Dr. Schuyler Kohl has contributed immensely with biostatistical advice and the addition of new and pertinent material. Dr. Robert Barter aided Mr. Leon Schlossberg in the preparation of the illustrations on treatment of the incompetent cervical os; while Dr. Christopher Tietze has advised and furnished statistical data for the section on contraception.

To Miss Juliana Duffy and Miss Josephine Peary we are immeasurably indebted for many hours of typing and revision of the manuscript. Mrs. Mary Jane Cashman prepared the index and gave extensive and invaluable editorial assistance. Without her devoted help this edition would have been impossible.

Dr. Joseph Cresci has read through the entire page proof; while Drs. John Dettling and Carl Pauerstein have checked the bibliographies. For this onerous work we owe them a debt of gratitude.

Finally, it is our pleasant duty to thank Appleton-Century-Crofts, Inc. for the meticulous attention which they have given in the preparation of this volume.

NICHOLSON J. EASTMAN  
LOUIS M. HELLMAN

# CONTENTS

PREFACE . . . . .	vii
-------------------	-----

## *Section One: ORIENTATION*

1. OBSTETRICS IN BROAD PERSPECTIVE . . . . .	1
--	---

## *Section Two: ANATOMY AND PHYSIOLOGY OF REPRODUCTION*

2. THE ANATOMY OF THE FEMALE REPRODUCTIVE ORGANS . . . . .	16
3. THE OVARIAN CYCLE AND ITS HORMONES . . . . .	58
4. THE ENDOMETRIAL CYCLE AND MENSTRUATION . . . . .	97
5. THE PHYSIOLOGY AND DEVELOPMENT OF THE OVUM . . . . .	115
6. THE PLACENTA AND ITS HORMONES . . . . .	140
7. THE DEVELOPMENT AND PHYSIOLOGY OF THE FETUS . . . . .	184
8. MATERNAL PHYSIOLOGY IN PREGNANCY . . . . .	221

## *Section Three: MANAGEMENT OF NORMAL PREGNANCY*

9. DIAGNOSIS OF PREGNANCY . . . . .	267
10. THE NORMAL PELVIS . . . . .	281
11. LIE, PRESENTATION, AND POSITION OF THE FETUS: METHODS OF DIAGNOSIS . . . . .	324
12. ANTEPARTUM CARE . . . . .	337
13. PSYCHIATRIC ASPECTS OF PREGNANCY AND CHILDBIRTH LEO KANNER . . . . .	354

## *Section Four: PHYSIOLOGY AND CONDUCT OF LABOR*

14. THE FORCES CONCERNED IN LABOR . . . . .	373
15. THE MECHANISM OF LABOR IN VERTEX PRESENTATIONS . . . . .	404
16. THE CLINICAL COURSE OF LABOR . . . . .	419
17. THE CONDUCT OF NORMAL LABOR . . . . .	434
18. ANALGESIA AND ANESTHESIA . . . . .	466

## *Section Five: THE PUERPERIUM AND THE NEWBORN*

19. THE PUERPERIUM . . . . .	494
20. THE NEWBORN . . . . .	511

## *Section Six: ABNORMALITIES OF PREGNANCY*

21. ABORTION AND PREMATURE LABOR . . . . .	525
22. ECTOPIC PREGNANCY . . . . .	563
23. DISEASES AND ABNORMALITIES OF THE FETAL MEMBRANES AND PLACENTA . . . . .	591
24. PLACENTA PREVIA; ABRUPTIO PLACENTAE; OBSTETRIC SHOCK . . . . .	628

25. COMPLICATIONS DUE TO DISEASES AND ABNORMALITIES OF THE GENERATIVE TRACT . . . . .	657
26. MULTIPLE PREGNANCY . . . . .	677
27. NAUSEA AND VOMITING OF PREGNANCY . . . . .	706
28. THE TOXEMIAS OF PREGNANCY . . . . .	715
29. COINCIDENTAL COMPLICATIONS OF PREGNANCY . . . . .	784

*Section Seven: ABNORMALITIES OF LABOR*

30. DYSTOCIA DUE TO ANOMALIES OF THE EXPULSIVE FORCES . . . . .	857
31. DYSTOCIA DUE TO ABNORMALITIES IN POSITION, PRESENTATION, OR DEVELOPMENT OF THE FETUS . . . . .	876
32. DYSTOCIA DUE TO PELVIC CONTRACTION . . . . .	925
33. DYSTOCIA DUE TO ABNORMALITIES OF THE GENERATIVE TRACT . . . . .	964
34. INJURIES TO THE BIRTH CANAL . . . . .	976
35. ABNORMALITIES OF THE THIRD STAGE OF LABOR . . . . .	995

*Section Eight: ABNORMALITIES OF THE PUERPERIUM*

36. PUERPERAL INFECTION . . . . .	1011
37. DISORDERS OF THE PUERPERIUM OTHER THAN PUERPERAL INFECTION . . . . .	1039

*Section Nine: ABNORMALITIES OF THE NEWBORN*

38. INJURIES SUSTAINED BY THE INFANT IN PREGNANCY AND LABOR . . . . .	1052
39. DISEASES AND MALFORMATIONS OF THE NEWBORN . . . . .	1066
40. MALFORMATIONS OF THE FETUS . . . . .	1105

*Section Ten: OPERATIVE OBSTETRICS*

41. ARTIFICIAL TERMINATION OF PREGNANCY, STERILIZATION, AND CONTRACEPTION . . . . .	1116
42. FORCEPS . . . . .	1130
43. BREECH EXTRACTION AND VERSION . . . . .	1162
44. CESAREAN SECTION . . . . .	1179

INDEX . . . . .	1207
-----------------	------

## Section One: ORIENTATION

# 1

## OBSTETRICS IN BROAD PERSPECTIVE

**Definition.** *Obstetrics* is that branch of medicine which deals with parturition, its antecedents, and its sequels. It is concerned principally, therefore, with the phenomena and management of pregnancy, labor, and the puerperium, under both normal and abnormal circumstances. In England the older term *midwifery* carries the same connotation as obstetrics, and the two words are used synonymously. In the United States, however, owing to inadequate supervision and regulation of midwives, the practice of these attendants has long been conducted rather surreptitiously and, in the main, is held in disrepute. Here, accordingly, "midwifery" carries with it a certain stigma which does not obtain in England and elsewhere. The German word for obstetrics is *Geburtshilfe*; and the French, *obstétrique*.

The word *obstetrics* is derived from the Latin term *obstetrix*, meaning *midwife*. The etymology of *obstetrix*, however, is obscure. Most dictionaries connect it with the verb *obstare*, which mean *to stand by or in front of*. The rationale of this derivation would be that the midwife stood by or in front of the parturient. This etymology has long been attacked by Seligmann who believed that the word was originally *adstetrix* and that the *ad* had been changed to *ob*. If this etymology is correct, then *obstetrix* would mean *the woman assisting the parturient*. The fact that on certain inscriptions *obstetrix* is also spelled *opstetrix* has led to the conjecture that it was derived from *ops*, that is, *aid*, and *stare*, and had the meaning of *the woman rendering aid*. According to Temkin, the most likely interpretation is that *obstetrix* meant *the woman who stood by the parturient*. Whether this alluded merely to the midwife's standing in front of, or near, the parturient or whether it carried the additional connotation of rendering aid is not clear.

The term *obstetrics* is of relatively recent usage. Thus the Oxford English Dictionary gives the earliest example from a book published in 1819, and the same source observes that in 1828 it was necessary to apologize for the use of the word *obstetrician*. Kindred terms are, however, much older. Thus, *obstetricate* occurs in English works published as early as 1623; *obstetricatory*, in 1640; *obstetricious*, in 1645; and *obstetrical*, in 1775. These terms were often used figuratively. As an example of such usage the adjective *obstetric* appears in Pope's *Dunciad* (1742) in the famous couplet:

There all the Learn'd shall at the labour stand,  
And Douglas lend his soft, obstetric hand.

The much older term *midwifery* was used instead of *obstetrics* until the latter part of the nineteenth century both in the United States and Great Britain. It is derived from the Middle English *mid*, meaning *with*, plus *wif*, meaning wife in the sense of a *woman*; that is, the "with-woman." The term *midwife* was used as early as 1303, and *midwifery*, in 1483.

**Aims of Obstetrics.** The transcendent objective of obstetrics is that every pregnancy culminate in a healthy mother and healthy baby. It strives to reduce to a very minimum the number of women and infants who die as a result of the reproductive process or who are left injured therefrom. It aims further to minimize the discomforts of pregnancy, labor, and the puerperium and at the same



time so to safeguard and ease the whole course that both mother and child will conclude the experience in a healthy state, both physically and mentally.

**Vital Statistics: Definitions.** If it is hoped to reduce the number of mothers and infants who die as the result of pregnancy and labor, it becomes desirable to know how many of these deaths take place in this country each year and under what circumstances. But to evaluate such data intelligently it is essential first to be familiar with certain standard definitions, as follows:

*Birth rate.* The number of births per 1,000 population.

*Marriage rate.* The number of marriages per 1,000 population.

*Neonatal death.* Death of a newborn infant within the first four weeks of life.

*Neonatal death rate.* The number of neonatal deaths per 1,000 live births.

*Fetal death.* Death in utero of an infant (fetus) weighing 500 grams or more. This corresponds roughly with a fetus of 20 weeks or more gestational age, that is, with a "viable" fetus. (Note: this term is often used loosely and *incorrectly* to designate the sum of fetal and neonatal loss. This can only lead to confusion in the evaluation of statistics.)

*Fetal death rate.* The number of fetal deaths per 1,000 live births.

*Perinatal death rate.* The sum of fetal and neonatal death rates.

*Maternal death rate or mortality.* The number of maternal deaths per 10,000 live births which occur as the direct result of the reproductive process. (Note that this is calculated per *ten* thousand live births and not per *one* thousand.)

**The Birth Rate.** The magnitude of obstetrics as a branch of medical practice is shown by the number of births each year. During the 1930's there was an average of 19 births per 1,000 population. There was a sharp rise during and immediately after World War II to a birth rate of 25.8 in 1947, but after this peak the birth rate for the total population declined slightly and has maintained itself at about 25.0. The birth rate for the nonwhite population has shown no such decrease but has continued to rise. According to the vital statistics of the U. S. for 1957, the number of live births registered was 4,254,784. As shown in Table 1, the population of the United States increased about 13 per cent between 1950 and 1957.

Table 1. Live Births and Population, United States, 1940-1957\*

YEAR	LIVE BIRTHS, ADJUSTED FOR UNDER REGISTRATION			POPULATION OF CONTINENTAL U. S.
	TOTAL	WHITE	NONWHITE	
1957	4,254,784	3,621,456	633,328	171,196,000
1954	4,078,055	3,474,811	603,244	162,409,000
1950	3,631,485	3,107,638	523,847	151,132,000
1945	2,858,449	2,470,502	387,947	139,928,000
1940	2,558,647	2,198,911	359,736	131,820,000

\* Birth Statistics: Department of Health, Education and Welfare. Social Security Administration. Children's Bureau. Based on data from the National Office of Vital Statistics.

Total Population: Department of Commerce. Bureau of the Census. Current Population Survey P-25, No. 195, Feb. 18, 1959.

One factor which influences the birth rate is the marriage rate. Thus, the record high marriage rate of 16.3 set in 1946 was followed by the high birth rate of 25.8 in 1947. This all-time peak in marriage rates, comparing with only 7.9 in 1932, has since fallen considerably, the figure for 1954 being 9.2 and the estimated figure for 1957 being approximately 8.9.

**Maternal Mortality.** The number of women who died in 1958 as the direct result of childbearing was 1,581 in the course of 4,203,812 live births, giving a

mortality rate of 3.8. As may be seen in Figure 1, there has been a dramatic reduction in the maternal mortality during the past three decades from a plateau above 60 in white women before 1930 to a level of approximately one-twentieth that rate in 1958, the rate in white women for the latter year being 2.6. The

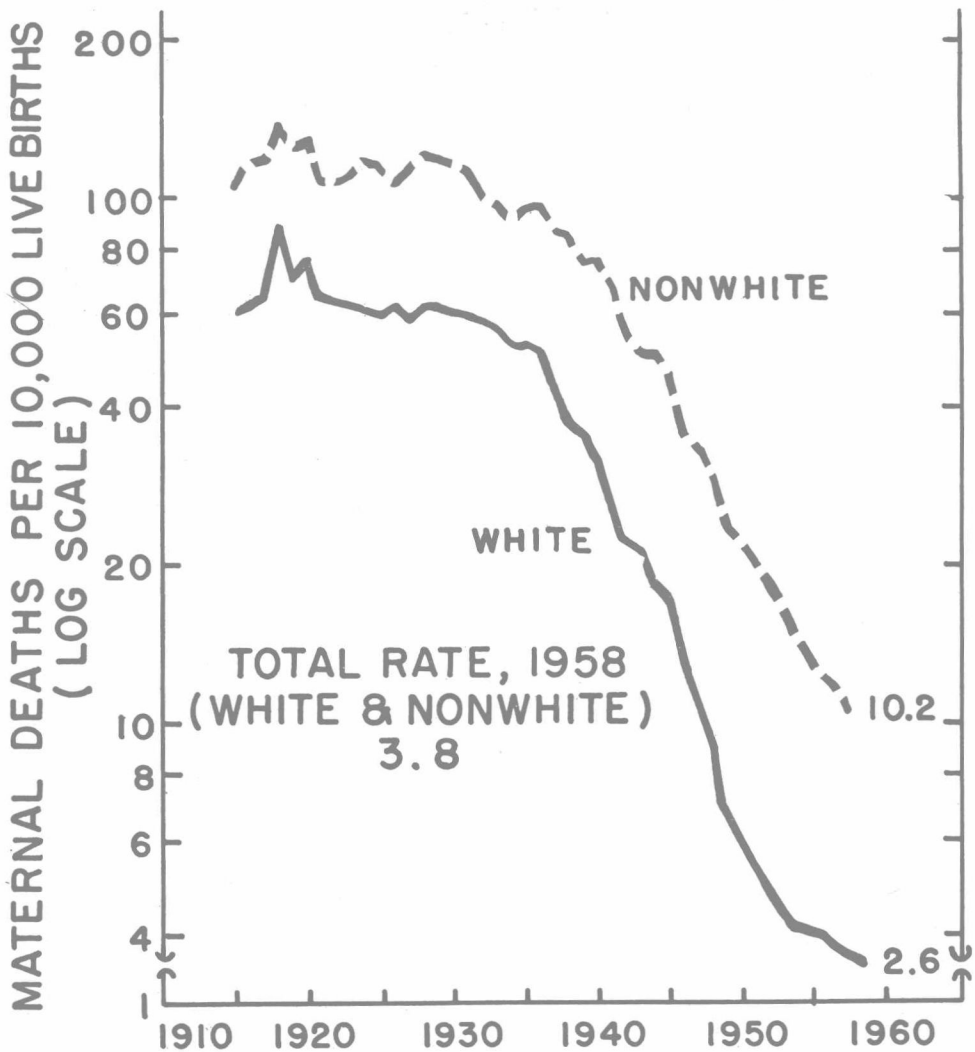


Fig. 1. Maternal mortality, 1915-1958, United States Birth Registration Area. (Department of Health, Education and Welfare. Social Security Administration. Children's Bureau. Based on data from the National Office of Vital Statistics.)

corresponding figures for the nonwhite were 117.0 in 1930 and 10.2 in 1958. Since the latter figure is about one-tenth of the former it is clear that the fall in maternal mortality in the nonwhite has been less pronounced than in the white, indeed, just one-half as great. Nevertheless, the over-all reduction is a superb achievement, and the reasons for it will be discussed in subsequent paragraphs.

Although maternal mortality rates for the United States as a whole are much higher for nonwhite mothers than for white, this difference tends to disappear

in areas where mothers of both races receive equally good maternity care, such as, let us say, in the District of Columbia. This fact shows that there is no inherent difference between white and nonwhite mothers in respect to successful childbearing, the difference in the national statistics being the result of different environmental factors. Chief among the environmental factors which result in a higher maternal mortality in nonwhite mothers are: lack of a medical attendant at delivery, lack of antepartum care, dietary deficiencies, poor hygiene, and faulty health education. As these unfavorable environmental circumstances for nonwhite mothers become corrected, the racial difference in the maternal death rates will doubtless disappear.

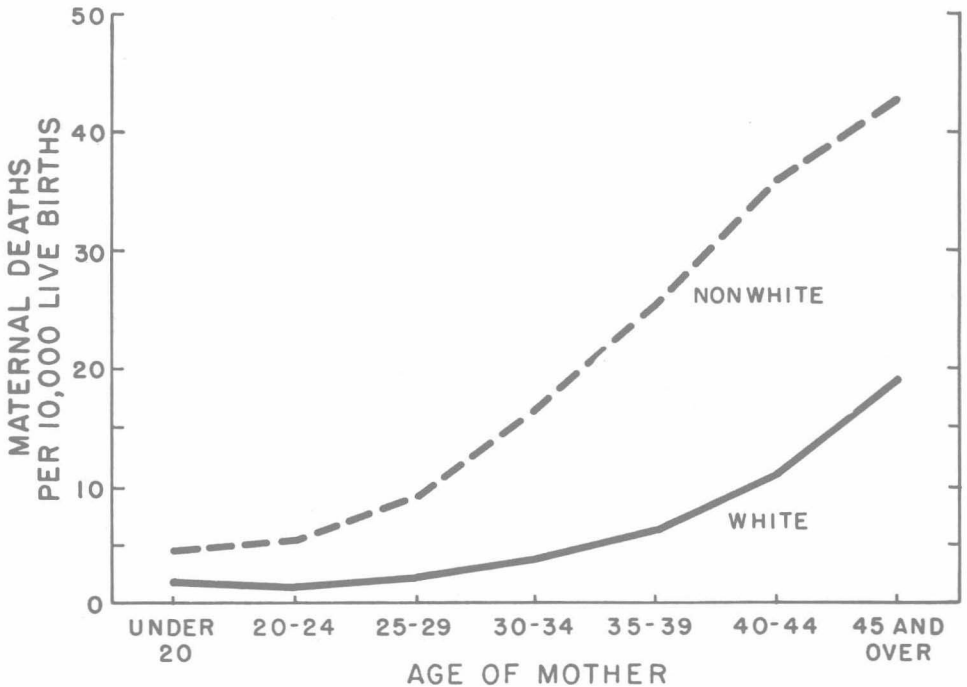


Fig. 2. Maternal mortality rate by age of mother, 1958. (Department of Health, Education and Welfare. Social Security Administration. Children's Bureau. Based on data from the National Office of Vital Statistics.)

The maternal mortality rate varies also with quite a different type of factor, namely, the age of the mother, as clearly shown in Figure 2. While the racial difference in maternal death rates is clearly the result of environmental circumstances, it is equally clear that the tremendous increase in mortality with advancing age, both in whites and nonwhites, can only be explained on the basis of some factor intrinsic in the mother. The increasing frequency of hypertension with advancing years, the higher incidence of uterine neoplasms, and the greater tendency of older uteri to manifest various hemorrhagic complications, all contribute to this effect. The maternal mortality rises also in women who have eight or more infants. These two factors, advanced age and advanced parity (number of previous births), may occasionally act independently of each other to increase

the risk of childbearing, but usually their effects are additive. For example, most women with eight or more children are in the upper-age brackets, while, conversely, the majority of women who bear children during the later reproductive years already have had a number of previous births. In the actual analysis of cases, it is difficult to dissociate these two factors, and hence Figure 2 must be interpreted as showing, for the most part, the additive effects of both age and parity.

Finally, in connection with Figure 2, let it be emphasized that the lowest maternal mortality rates are encountered in mothers between 20 and 30 years of age. This is also the reproductive period when the outlook for the baby is best. Beyond question, this is the optimum time for childbearing.

**Common Causes of Maternal Mortality.** The common causes of death in childbearing are hemorrhage, toxemias of pregnancy, and puerperal infection. These three complications account for about 75 per cent of all maternal deaths. The causes of obstetric hemorrhage are multiple: uterine bleeding immediately after birth (postpartum hemorrhage); shock and bleeding in association with abortion; bleeding from rupture of the fallopian tube in cases in which the ovum has become implanted there rather than in the uterus (extra-uterine, or ectopic, pregnancy); bleeding as the result of abnormal placental location or behavior (placenta previa, abruptio placentae); and bleeding from rupture of the uterus. The toxemias of pregnancy are certain disturbances suffered by about 6 or 7 per cent of gravid women, which are characterized by hypertension, edema and proteinuria, and in some severe cases by convulsions and coma. Puerperal infection is a wound infection of the birth canal, which sometimes undergoes extension to cause peritonitis, thrombophlebitis, bacteremia, and other distant foci of infection. The detailed consideration of the nature, prevention, and treatment of these conditions constitutes a large portion of the subject matter of obstetrics.

As the result of various improvements in obstetric care, together with the availability of antibiotics, the death rate from puerperal infection and the toxemias has fallen more precipitously than has that from hemorrhage. As a consequence, hemorrhage has become the predominant cause of death in childbirth, as shown in Figure 3.

Hemorrhage is first among these three causes of maternal mortality for another important reason. In official classifications of causes of death, it is customary to consider only the *direct* cause, and predisposing causes are necessarily ignored. Thus, if the final and direct cause of death is puerperal infection, it is so classified without further ado. However, a common sequence of events in fatalities from puerperal infection is as follows: the patient suffers a massive but sublethal hemorrhage; her resistance to infection is thereby weakened; then operative procedures are instituted to correct whatever is causing the hemorrhage; these procedures traumatize and devitalize tissues and also introduce infection; death occurs some days or weeks later from puerperal infection; and the fatality is so classified. Although infection is unquestionably the agent which is directly responsible for death in cases of this type, it must be equally clear that the determining cause of such fatalities is hemorrhage abetted by the manipulations made necessary by the bleeding. In varying degrees hemorrhage acts in this manner as a most important predisposing cause of death. But this does not appear in the official statistics. Only if a woman actually bleeds to death, that is, succumbs to exsanguination and

shock, is a death so classified. In view of these circumstances, the total toll which hemorrhage exacts in maternal mortality probably exceeds that of all other causes combined.

The fourth most common cause of death of the mother in pregnancy, labor, and the puerperium is heart disease; indeed, among obstetric patients at the New York Lying-In Hospital in the 10-year period between 1948 and 1957, this was the most common cause of death (Mendelson). But death of a gravid or puerperal woman as the result of cardiac disease is not classified by the National Office of Vital Statistics as a "maternal death" because in these cases the pregnant state is

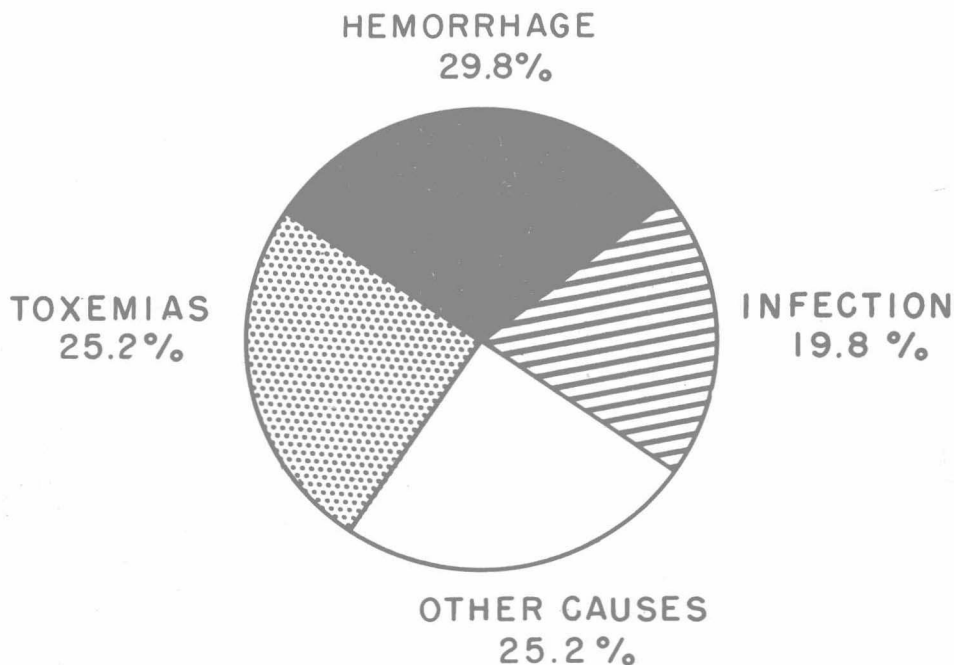


Fig. 3. The relative frequency of the three most common causes of maternal death, based on 1,581 maternal deaths in the United States in 1958, as tabulated by the National Office of Vital Statistics. (Vital Statistics, Special Reports, National Summaries, Vol. 52, No. 6, Aug. 18, 1960, Table 2.) The hemorrhage sector includes deaths from ectopic pregnancy and abortion without sepsis or toxemia as well as deaths from other types of obstetric hemorrhage. As explained in the text, deaths associated with maternal heart disease and other coincidental conditions are not included.

not the *direct* cause of death but acts through the intermediary of pre-existing heart disease. Hence, fatalities from this cause are not included in the 1,581 maternal deaths reported by the National Office of Vital Statistics for 1958 but are classified as "heart disease." Other coincidental diseases, including many cases of chronic hypertension, are likewise excluded from "maternal mortality," despite the fact that the load of pregnancy may have been the determining factor in the fatal issue. This circumstance must be kept in mind in evaluating the over-all toll taken by the pregnant state.

**Reasons for Recent Decline in Maternal Mortality.** Many factors and many agencies are responsible for the dramatic fall in the maternal death rate which this country has experienced over the past 20 years (Fig. 1). Most important

perhaps are the widespread training and educational programs in obstetrics which have been developed and which have provided more and better qualified specialists and, at the same time, more competent general practitioners. The American Board of Obstetrics and Gynecology has been especially instrumental in this advance. Although without legal authority, this is the generally endorsed body which certifies specialists in this field. The 5,000-odd specialists whom the Board has certified have not only established high levels of obstetric care in their own practices, but by example and precept have provided tutelage of high caliber for thousands of medical students, internes, and residents.

A unique type of postgraduate instruction for specialists and general practitioners alike was developed by Philip F. Williams in the early 30's—the maternal mortality conference. Begun in Philadelphia, these conferences have now been held for almost three decades in many of our large cities at regular intervals, usually under the sponsorship of the local medical society. They comprise searching analyses of all maternal deaths occurring in a given city, especially from the viewpoint of preventability; that is, was the death due to faulty obstetrics? These meetings are open to the medical profession (including medical students), and the discussions are usually highly informative in respect to the more common and more costly errors in obstetric practice. Such conferences also serve a certain disciplinary function, in that practitioners are somewhat more careful in their maternity work and somewhat more likely to call for consultation in difficult cases if they know that every death will be examined critically at these open meetings.

Postgraduate courses in obstetrics designed especially for general practitioners have been held in such profusion throughout the country that there is scarcely a practitioner who has not had the opportunity of receiving instruction in his own vicinity if he so desired—and the attendance records show that tens of thousands of them have so desired. In this connection, the American College of Obstetricians and Gynecologists is entitled to great credit for its annual and district meetings which have afforded instruction and stimulation to its huge roster of 6,000 obstetricians and gynecologists.

The sine qua non of good work in any field is well-trained personnel. In the ways just mentioned, the personnel available for obstetric work in the United States has been immeasurably improved both in quality and quantity. But this personnel would not have been able to achieve the fine results shown in Figure 1 if it had not been for a great expansion in facilities for good obstetric care. Most noteworthy, perhaps, is the extension of facilities for antepartum care.

The past two decades have seen widespread expansion in facilities for antepartum care, particularly in rural areas. As an example may be cited the work of the Maryland State Department of Health as shown in Figure 4. No less than 55 antepartum clinics are in operation at key points throughout the state; instructions are given to expectant mothers in regard to hygiene, diet, danger signals, and so on, and arrangements are made for competent assistance at deliveries. Patients presenting any abnormalities are carefully screened for referral to well-staffed and completely equipped obstetric clinics for expert care; and, furthermore, a full-time obstetrician is available 24 hours a day for consultation in the event of emergencies. Largely as the result of this program, the maternal mortality rate in the counties of Maryland (excluding Baltimore City) has fallen from 60 in 1933 to 3.4 in 1959.

Similar programs are in operation in other states, with comparable results.

They are a great credit to the respective state health departments and to the U. S. Children's Bureau which has sponsored them. The latter organization, through its emphasis on high standards of maternity care, its support of educational programs, its development of obstetric facilities in rural areas, and its grants-in-aid for federal and state cooperation in maternal welfare, has played a most important role in providing both better facilities and better personnel.

From the viewpoint of safer care during labor, the outstanding advance of the past 20 years has been the great increase in the proportion of hospital deliveries. In 1935, 37 per cent of the live births occurred in hospitals; in 1945, 80 per cent; while in 1957 the percentage had risen to 95.6. The multiple safeguards which hospital delivery affords, especially in emergencies, cannot be denied, and this trend alone has accounted for the saving of many maternal lives.

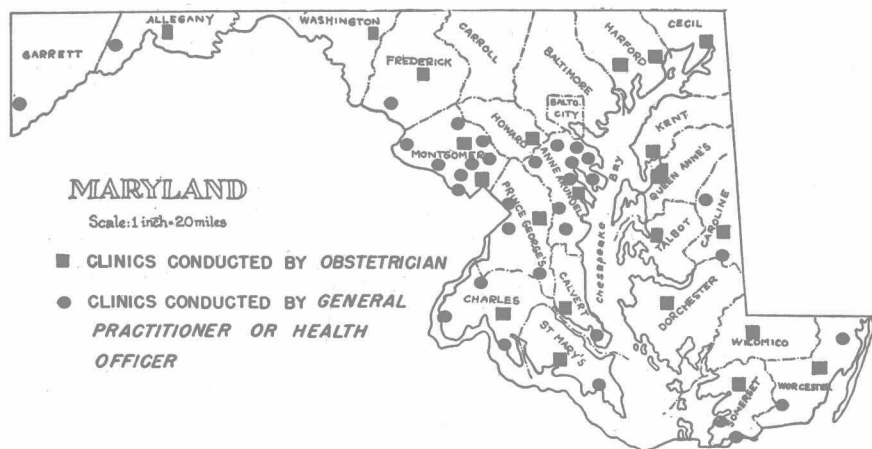


Fig. 4. Antepartum clinics conducted by the Maryland State Department of Health. (From Whitridge.)

Along with these improvements in personnel and facilities, several major advances in therapy have been introduced. Noteworthy among these is the increased availability and use of blood transfusions, and the chemotherapeutic and antibiotic agents. Prior to the present decade, many an exsanguinated mother lost her life while the bloods of relatives were being laboriously typed and matched. Now, most maternity services possess blood banks which eliminate these costly delays. They make feasible, moreover, the administration of blood in large quantities which is sometimes essential in massive hemorrhages. The beneficent achievements of the sulfonamides and antibiotics in combating hitherto uncontrollable infections are well known, and in puerperal infection, as in other types, they have saved thousands of lives.

**Fetal Deaths (Stillbirths) and Neonatal Mortality.** The infant mortality which chiefly concerns the obstetrician comprises two groups of cases: fetal deaths or stillbirths and neonatal deaths.

The total number of stillbirths in the United States during 1958 was approximately 93,000, while the number of neonatal deaths was approximately 82,000. Of these, the vast majority were the direct result of antepartum and intrapartum causes. By adding the stillbirths and neonatal deaths, it will be seen that the total

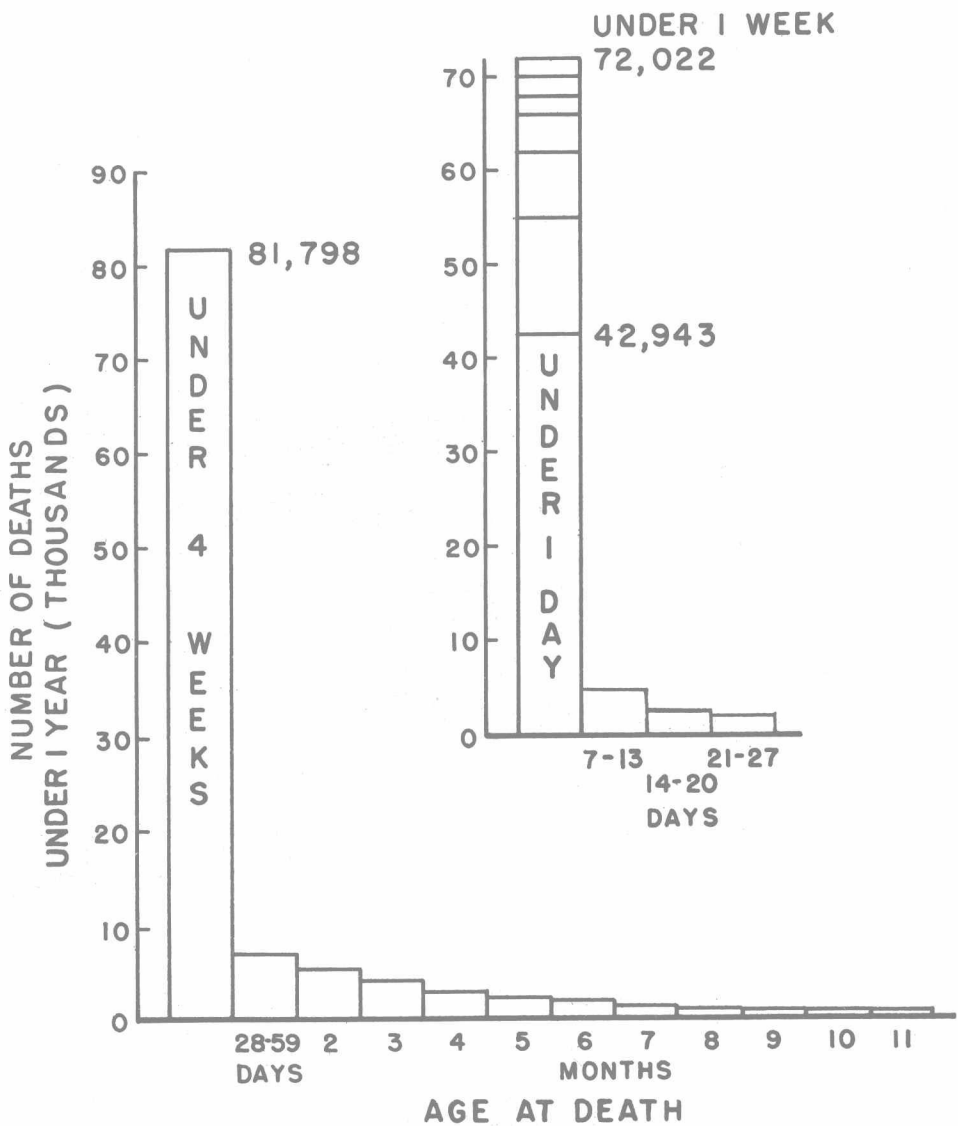


Fig. 5. Infant mortality, by age, United States, 1958. (Department of Health, Education and Welfare. Social Security Administration. Children's Bureau. Based on data from the National Office of Vital Statistics.)

infant loss which occurred in close proximity to the birth process was about 175,000. Expressed in a different way, the number of infants lost in close association with the reproductive mechanism constitutes more than 10 per cent of deaths in the United States at all ages and from all causes. The same circumstance is observed year after year and indicates the relative magnitude of the infant loss which is associated with pregnancy, labor, and the early weeks of life.

About half of the neonatal deaths occur in the first day of life (Fig. 5). Indeed, the deaths occurring during that 24 hours exceed in number those occurring during the second, third, fourth, fifth, and sixth months of life combined. The causes responsible for this huge fetal wastage during the neonatal period



are many. However, the most important by far is premature birth (Fig. 6). Thus, of the 82,000 neonatal deaths occurring in 1958, over one-half took place in premature infants, that is, in infants who weighed less than 2,500 gm. (5½ pounds) at birth and who, for the most part, were born a month or more early. The factors which are responsible for these premature births, although evident in some cases (toxemia of pregnancy, twin pregnancy, and so forth), are completely unknown in 60 per cent of the total. Just why so many gravidas go into labor prematurely and hence give birth to infants who often are unable to cope with extra-uterine conditions is one of the great unsolved problems of obstetrics. The second most common cause of neonatal death is brain injury. Here the word

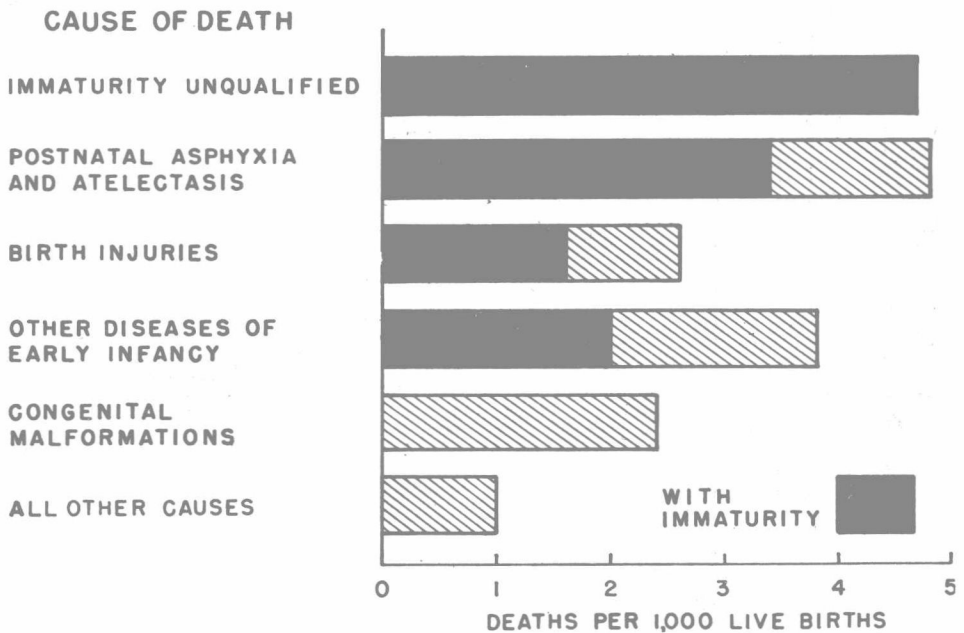


Fig. 6. Main causes of neonatal mortality by age, United States, 1958. (Department of Health, Education and Welfare. Social Security Administration. Children's Bureau. Based on data from the National Office of Vital Statistics.)

"injury" is used in its broad sense to indicate both cerebral injury sustained from hypoxia in utero and traumatic injury to the brain suffered in passing through the birth canal. Many of these deaths could be prevented by more judicious management of labor. Still another but less frequent cause of neonatal death is congenital malformations. Stillbirths may be due to various accidents which may befall the placental circulation in the course of pregnancy, to certain diseases which may affect the fetus, and also to brain injury sustained during labor. In a large proportion of cases, however, death in utero occurs without demonstrable explanation.

Neonatal mortality rates have gradually fallen from 32.4 in 1935 and 24.0 in 1946 to approximately 20 in 1958. Gratifying as this decrease is, it will be noted that it is not comparable to the fall in maternal mortality.

**Abortion.** Far exceeding stillbirths and neonatal mortality as a cause of fetal wastage is abortion. In medical parlance, abortion connotes both spontaneous and