

英文影印版

# 威廉姆斯产科学

# Williams Obstetrics

Twenty-first Edition

(第21版)

F. GARY CUNNINGHAM

NORMAN F. GANT

KENNETH J. LEVENO

LARRY C. GILSTRAP III

JOHN C. HAUTH

KATHARINE D. WENSTROM



科学出版社



McGraw-Hill

英文影印版

# 威廉姆斯产科学

## Williams Obstetrics

第 21 版 ● 21st Edition

F. Gary Cunningham, MD

Norman F. Gant, MD

Kenneth J. Leveno, MD

Larry C. Gilstrap III, MD

John C. Hauth, MD

Katharine D. Wenstrom, MD

科学出版社

McGraw-Hill

2002

F. Gary Cunningham, Norman F. Gant, Kenneth J. Leveno, et al: Williams Obstetrics, 21<sup>st</sup> Edition  
Copyright © 2001 by McGraw-Hill Companies, Inc.

Authorized Reprinting by **Science Press**, A division of *China Science Publishing Group*.

All rights reserved. For sale in the People's Republic of China only.

IE ISBN 0071204563

本书英文影印版由科学出版社——中国科学出版集团核心企业和美国麦格劳-希尔国际公司合作出版。未经出版者书面许可,不得以任何方式复制或抄袭本书的任何部分。

版权所有,翻印必究。未经允许,不得引用。

北京市版权局版权登记号:01-2001-3928

#### 图书在版编目(CIP)数据

威廉姆斯产科学;第21版/(美)坎宁安(Cunningham, F.G.)编著.-影印版.-北京:科学出版社,2002.2  
ISBN 7-03-009765-3

I. 威… II. 坎… III. 产科学-英文 IV. R71

中国版本图书馆CIP数据核字(2001)第069908号

#### 注 意

医学是一门不断发展的科学。由于新的研究及临床实践在不断丰富人们的知识,因此在药物使用及治疗方面也在谋求各种变化。本书编者及出版者核对了各种信息来源,并确信本书内容完全符合出版时的标准。然而,鉴于不可避免的人为错误和医学学科的发展,不管是编者、出版者还是其他参与本书出版的工作者均不能保证此书中的内容百分之百正确。因此,他们不能对由此类错误引起的后果负责。

我们提倡读者将本书内容与其他资料进行确证。例如,我们希望读者对他们将要使用的每一种药品的说明书仔细阅读,以确证本书的有关信息是正确的,且推荐的药品用量及禁忌证等没有变化。该建议对新药或非常用药尤为重要。

科学出版社 出版

北京东黄城根北街16号

邮政编码:100717

<http://www.sciencep.com>

新蕾印刷厂 印刷

科学出版社发行 各地新华书店经销

\*

2002年2月第一版 开本:890×1240 1/16

2002年2月第一次印刷 印张:105

印数:1—2 000 字数:2 966 000

定价:299.00元

(如有印装质量问题,我社负责调换(新欣))



It is with sadness and pride that we dedicate this 21st Edition of *Williams Obstetrics* to Dr. Paul C. MacDonald. The sadness is because of his death on November 25, 1997. The pride comes from our association with him and his career which culminated at the time of his death as Professor of Obstetrics & Gynecology at The University of Texas Southwestern Medical Center at Dallas as well as the Cecil H. and Ida Green Distinguished Chair in Reproductive Biology and Director of the Cecil H. and Ida Green Center for Reproductive Biology Sciences.

After his residency training at Parkland Hospital, Paul MacDonald was a member of an elite group of young obstetrician-gynecologists who studied steroid biochemistry with Dr. Seymour Lieberman at Columbia University. After his return to Dallas, Dr. MacDonald rapidly earned a reputation as an astute clinician, a gifted teacher, and a brilliant investigator. His distinguished career was spent wedding the basic sciences with obstetrics, gynecology, and human reproduction. His earliest scientific discoveries included elucidation of the origin and metabolism of gonadal and adrenal steroid hormones in children, women, and men. While he served as Chairman of Obstetrics & Gynecology at UT Southwestern from 1970 to 1977, he developed a close relationship with the well-known philanthropists, Mr. and Mrs. Cecil H. Green. Mr. Green, a co-founder of Texas Instruments, endowed the Cecil H. and Ida Green Center for Reproductive Sciences headed by Dr. MacDonald as the Green Distinguished Chair in Reproductive Biology. The accomplishments of Dr. MacDonald and his team of clinicians and scientists included biochemical and molecular foundations of the initiation

of human parturition; pathophysiology of pregnancy-induced hypertension; physiology and pathophysiology of endometrium; extraglandular estrogen formation in postmenopausal women and its relationship to obesity, age, and endometrial cancer; dehydroepiandrosterone sulfate as the precursor of placental estrogen in human pregnancy; and human fetal lung development and the respiratory distress syndrome of newborns.

For over 25 years, there were many clinician-scientists and postdoctoral fellows who trained with Dr. MacDonald and who subsequently served as division chiefs, departmental chairs, and deans of medical schools. He held numerous distinguished appointments including study sections, peer-review committees, and task forces for the National Institutes of Health and the March of Dimes. He was elected to the Institute of Medicine in 1987 and to the American Academy of Arts and Sciences in 1997. One particularly cherished honor was the Paul C. MacDonald Professorship in Obstetrics & Gynecology established by his trainees in conjunction with other national academics as well as community obstetricians-gynecologists. Shortly following his death, these same individuals tripled the endowment to that of the Paul C. MacDonald Distinguished Chair in Obstetrics & Gynecology.

A tireless worker, Dr. MacDonald always found time to offer help and to stimulate young clinicians and scientists. He demanded perfection of himself as well as those with whom he worked, but he always gave full credit to the entire team for their successes. He will be fondly remembered for his provocative insights into human reproduction and for his remarkable humanity.

# Preface

As *Williams Obstetrics* nears its 100th year of active service, we are again reminded of this excerpt from the preface in the First Edition:

*In the following pages I have attempted to set forth with thoroughness the scientific basis for the practical application of the obstetrical art.... At the same time I have endeavored to present the more practical aspects of obstetrics in such a manner as to be of direct service to the obstetrician at the bedside.*

JOHN WHITRIDGE WILLIAMS (1903)

This philosophy did not change in nineteen editions of this text that followed during the 20th century. The evolution of obstetrics as a clinical specialty was largely accomplished through the first half of the 1900s. Beginning then, academic leaders in our specialty demanded scientific verification of principles that underlie obstetrical practice. Thus, through the leadership of a relatively small number of "giants" in our field, scientific underpinnings of obstetrics began to assume a role of primary importance after the mid-20th century. Extensive research into maternal and fetal physiology, as well as endocrinology, infectious diseases, ultrasonography, and genetics paved the way for the birth of the subspecialty of Maternal-Fetal Medicine in the 1970s. Subsequently, genomic research and development of molecular techniques allowed opening of vistas in obstetrical research that likely will keep us busy much of the 21st century.

In addition to research to provide scientific proof of clinical practices, the demand for evidence-based medicine and documentation of clinical outcomes has been a major driving force in clinical medicine for the past two decades. Although there is no doubt that medicine remains an art, it is also a science, and many of these changes were long overdue.

For all of these reasons, our mandate to chronicle scientific and medical advances in this textbook, along with their clinical application to the care of mother and fetus, has assumed monumental proportions. With all of these caveats, is it possible for a single obstetrical textbook to be "everything to all"? Although the obvious answer may appear to be *no*, we have endeavored to provide to the practitioner of obstetrics and of maternal-fetal medicine scientific and clinical data that underlie recommendations for clinical practice. To help achieve this goal, we have sought new talent. Two new editors from the University of Alabama at Birmingham bring with them special expertise in the field of evidence-based clinical medicine and state-of-the-art application of clinical and molecular genetics as they pertain to obstetrics. Because of our participation in the Maternal-Fetal Medicine Units Network, we also draw heavily from the experiences of this multi-center collaborative to elucidate important problems that plague the mother and fetus. Careful consideration of the discoveries highlighted each year at the annual meetings of the Society for Maternal-Fetal Medicine and Society for Gynecologic Investigation also provides contemporaneous data. Finally,

and as before, we continue to emphasize clinical practice recommendations that are promulgated by national organizations to include the American College of Obstetricians and Gynecologists, the National Institutes of Health, and the Centers for Disease Control and Prevention.

The 21st edition of *Williams Obstetrics* has been extensively revised and an attempt made to include a synopsis of the burgeoning literature relevant to all aspects of our specialty. To accomplish this, more than 4000 new references have been cited along with an addition of over 250 new figures and tables. As we have done for the past seven editions, we cite frequently our clinical experiences from the Obstetrical Service at Parkland Hospital. To our sometimes vocal critics, we again emphasize that these clinical management schemata are not the only acceptable ones that may be employed to obtain excellent clinical outcomes. Certainly these management guidelines have served us well in caring for over 400,000 indigent pregnant women. We have also cited time-honored clinical practices used contemporaneously at the University of Texas at Houston as well as the University of Alabama at Birmingham, and we again emphasize that these may be only one of several acceptable methods of management.

We are fortunate to have a large number of vitally important people who have helped us complete this work. At The University of Texas Southwestern, we are especially indebted to Dr. Linette Casey for her expertise in basic physiology and endocrinology of human reproduction, placental development and function, fetal development, and the science of parturition. Drs. George Wendel and Jeanne Sheffield provided valuable insight into infections and sexually transmitted diseases, Dr. Barry Schwarz for contraceptive and sterilization techniques, and Dr. David Miller for trophoblastic disease. Drs. Diane Twickler, Rigoberto Santos, and Jodi Dashe generously supplied ultrasonographs as well as other types of maternal and fetal imaging. Drs. Shiv Sharma and Donald Wallace provided input into the subject of obstetrical anesthesia. Finally, Dr. Don McIntire was essential for provision of demographic and prevalence statistics cited throughout many chapters. Importantly, much of the stimulus to determine why, when, and how tenets evolve in obstetrics was provided by our Maternal-Fetal Medicine fellows who were unre-

lenting! These include Drs. Nicole Yost, Jeanne Sheffield, Gerda Zeeman, and Julie Lo. Finally, the massive amount of work done by our residents, nurses, and other personnel in obstetrics and gynecology should not be underappreciated. Their dedication to the care of women, and in most cases indigent women, continues to be inspiring.

It is easy to overlook administrative duties when so much time is devoted to the creation of a textbook. To this end, many of the administrative duties at the University of Texas Southwestern Medical Center and Parkland Hospital were carried out by Dr. Barry Schwarz as Vice-Chair of Obstetrics & Gynecology and Dr. Steve Bloom as Associate Director of Obstetrics at Parkland Hospital.

Meticulous coordination of this multi-institutional manuscript that comprised over 4500 pages was provided by Marsha Congleton and Connie Utterback. Much of the day-to-day production was provided by Beverly King, Minnie Tregaskis, Melinda Epstein, Cynthia Allen, Barbara Smith, Leticia Varela, Lynne McDonnell, Julie Thompson, Jeanette Cogburn, Dina Trujillano, and Ellen Watkins in Dallas; Carol Durham and Grace Lopez at the University of Texas at Houston; and Belinda Rials and Rhonda Scott at the University of Alabama at Birmingham. As she had in the previous two editions, Nancy Marshburn lent her considerable artistic experience to the development of new and revised figures.

After almost 100 years, *Williams Obstetrics* has a new publisher. In the very short time we have known and worked with them, Andrea Seils, Susan Noujaim, Karen Davis, and Marty Wonsiewicz of McGraw-Hill have proven to be excellent colleagues as well as good friends. Happily, joining the new McGraw-Hill team from Appleton & Lange is John Williams, who has ably served as production editor the last three volumes. To all of these people, as well as to many, many more not cited, we as always are grateful.

Finally, our families have made contributions to this text in a number of ways, perhaps the most apparent being less time that we could spend with them. Thus, to Deann Gant, Marjorie Leveno, JoEllen Gilstrap, and Dr. Dwight Rouse, we offer our thanks for their unwavering support.

# Contents

<i>Preface</i>	ix	16. The Newborn Infant	385
<b>SECTION I. HUMAN PREGNANCY</b>	<b>1</b>	17. The Puerperium	403
1. Obstetrics in Broad Perspective	3	<b>SECTION V. ABNORMAL LABOR</b>	<b>423</b>
2. Pregnancy: Overview, Organization, and Diagnosis	15	18. Dystocia: Abnormal Labor and Fetopelvic Disproportion	425
3. Anatomy of the Reproductive Tract	31	19. Dystocia: Abnormal Presentation, Position, and Development of the Fetus	451
<b>SECTION II. PHYSIOLOGY OF PREGNANCY</b>	<b>63</b>	20. Induction and Augmentation of Labor	469
4. The Endometrium and Decidua: Menstruation and Pregnancy	65	<b>SECTION VI. OPERATIVE OBSTETRICS</b>	<b>483</b>
5. The Placenta and Fetal Membranes	85	21. Forceps Delivery and Vacuum Extraction	485
6. The Placental Hormones	109	22. Breech Presentation and Delivery	509
7. Fetal Growth and Development	129	23. Cesarean Section and Postpartum Hysterectomy	537
8. Maternal Adaptations to Pregnancy	167	<b>SECTION VII. COMMON COMPLICATIONS OF PREGNANCY</b>	<b>565</b>
<b>SECTION III. PREGNANCY PLANNING AND ANTEPARTUM MANAGEMENT</b>	<b>201</b>	24. Hypertensive Disorders in Pregnancy	567
9. Preconceptional Counseling	203	25. Obstetrical Hemorrhage	619
10. Prenatal Care	221	26. Puerperal Infection	671
<b>SECTION IV. NORMAL LABOR AND DELIVERY</b>	<b>249</b>	27. Preterm Birth	689
11. Parturition	251	28. Postterm Pregnancy	729
12. Mechanisms of Normal Labor	291	29. Fetal Growth Disorders	743
13. Conduct of Normal Labor and Delivery	309	30. Multifetal Pregnancy	765
14. Intrapartum Assessment	331	<b>SECTION VIII. PLACENTAL DISORDERS</b>	<b>811</b>
15. Analgesia and Anesthesia	361	31. Abnormalities of the Fetal Membranes and Amnionic Fluid	813

32. Diseases and Abnormalities of the Placenta	827
--	-----

---

<b>SECTION IX. REPRODUCTIVE SUCCESS AND FAILURE</b>	<b>853</b>
---	------------

---

33. Abortion	855
34. Ectopic Pregnancy	883
35. Abnormalities of the Reproductive Tract	911

---

<b>SECTION X. FETAL ABNORMALITIES: INHERITED AND ACQUIRED DISORDERS</b>	<b>937</b>
---	------------

---

36. Genetics	939
37. Prenatal Diagnosis and Fetal Therapy	973
38. Teratology, Drugs, and Medications	1005
39. Diseases and Injuries of the Fetus and Newborn	1039

---

<b>SECTION XI. TECHNIQUES USED TO ASSESS FETAL HEALTH</b>	<b>1093</b>
---	-------------

---

40. Antepartum Assessment	1095
41. Ultrasound and Doppler	1111

---

<b>SECTION XII. MEDICAL AND SURGICAL COMPLICATIONS IN PREGNANCY</b>	<b>1141</b>
---	-------------

---

42. General Considerations and Maternal Evaluation	1143
43. Critical Care and Trauma	1159
44. Cardiovascular Diseases	1181
45. Chronic Hypertension	1209
46. Pulmonary Disorders	1223
47. Renal and Urinary Tract Disorders	1251
48. Gastrointestinal Disorders	1273
49. Hematological Disorders	1307
50. Endocrine Disorders	1339
51. Diabetes	1359
52. Connective-Tissue Disorders	1383
53. Neurological and Psychiatric Disorders	1405
54. Dermatological Disorders	1429
55. Neoplastic Diseases	1439
56. Infections	1461
57. Sexually Transmitted Diseases	1485

---

<b>SECTION XIII. FAMILY PLANNING</b>	<b>1515</b>
--------------------------------------	-------------

---

58. Contraception	1517
59. Sterilization	1555

<b>Index</b>	<b>1563</b>
--------------	-------------

# I

SECTION

## *Human Pregnancy*



# 1

## Obstetrics in Broad Perspective

### VITAL STATISTICS

#### Definitions

### PREGNANCY IN THE UNITED STATES

### HEALTHY PEOPLE 2010

### PERSPECTIVES ON OBSTETRICS

#### Best of Times

#### Worst of Times

### SUMMARY OF THE STATE OF OBSTETRICS

The first standard certificates for the registered live births and deaths were developed in 1900. An an-

TABLE 1-1. Ten Great Public Health Achievements in the United States—1900–1999

Recognition of tobacco use as a health hazard
Family planning
Healthier mothers and babies
safer and healthier foods
Decline in deaths from coronary heart disease and stroke
Control of infectious diseases
safer workplaces
Motor-vehicle safety
Vaccination

From the Centers for Disease Control (1999).

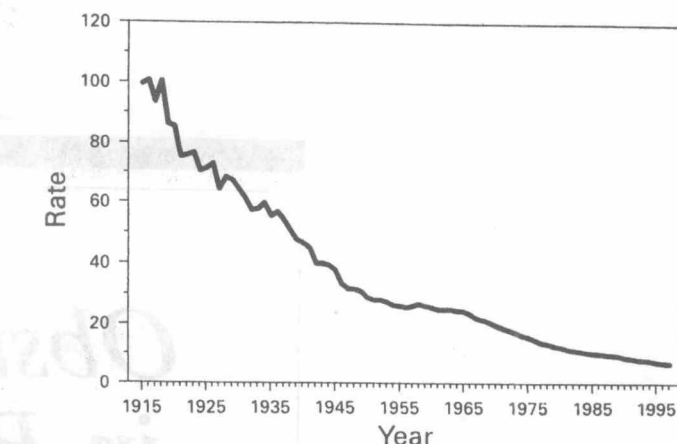
Publication of this 21st edition of *Williams Obstetrics* is conspicuously coincidental with the beginning of the 21st century. Indeed, the first 20 editions of this textbook have encompassed the 20th century and chronicled dramatic advances in obstetrics. As shown in Table 1-1, healthier mothers and babies ranks as one of the 10 great public health achievements in the United States between 1900 and 1999. At the beginning of the century, almost 1 in every 100 women giving birth in this country died of pregnancy-related complications, and nearly 1 of 10 infants died before age 1 year (Centers for Disease Control, 1999b). As shown in Figures 1-1 and 1-2, by the end of the 20th century, infant mortality had declined more than 90 percent to 7.2 per 1000 live births in 1997, and the maternal mortality rate declined almost 99 percent to 7.7 deaths per 100,000 live births in 1997.

This chapter provides a synopsis of the current state of maternal and newborn health in the United States. Following this is a perspective on the forces affecting obstetrics as we begin what we hope will become another successful century of *Williams Obstetrics*.

## VITAL STATISTICS

The vital statistics of the United States are collected and published through a decentralized, cooperative system (Tolson and colleagues, 1991). Responsibility for the registration of births, deaths, fetal deaths, marriages, divorces, annulments, and induced terminations of pregnancy is vested in the individual states and certain separate governmental entities. The system comprises 57 registration areas: each state, the District of Columbia, New York City, American Samoa, Guam, the Northern Mariana Islands, Puerto Rico, and the Virgin Islands.

The first standard certificates for the registration of live births and deaths were developed in 1900. An act



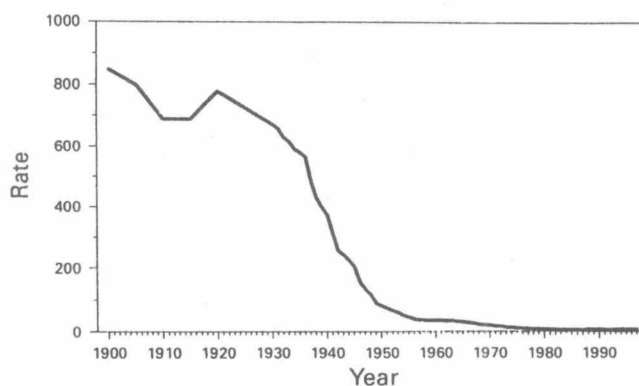
**FIGURE 1-1.** Infant mortality rate per 1000 live births, United States 1915–1997. (From the Centers for Disease Control, 1999a.)

of Congress in 1902 established the Bureau of the Census to develop a system for the annual collection of vital statistics. The overall objective was to develop and maintain a system for registration that is uniform in such matters as forms, procedures, and statistical methodology. The Bureau retained the authority for producing national vital statistics until 1946, when the function was transferred to the United States Public Health Service. It is presently assigned to the Division of Vital Statistics of the National Center for Health Statistics. The standard certificate of live birth was substantially revised in 1989 to include much more information on medical and lifestyle risk factors and also obstetrical care practices. Currently, more than 99 percent of births in the United States are registered (Ventura and colleagues, 2000). According to Dr. Stephanie Ventura of the National Center for Health Statistics, another revision of the birth certificate is planned for 2003. Changes

**TABLE 1-1. Ten Great Public Health Achievements in the United States—1900–1999**

Vaccination
Motor-vehicle safety
Safer workplaces
Control of infectious diseases
Decline in deaths from coronary heart disease and stroke
Safer and healthier foods
Healthier mothers and babies
Family planning
Fluoridation of drinking water
Recognition of tobacco use as a health hazard

From the Centers for Disease Control (1999b).



**FIGURE 1-2.** Maternal mortality rate per 100,000 live births by year—United States, 1900–1997. (From the Centers for Disease Control, 1999a.)

will include a format conducive to electronic processing, more explicit demographic data on the parents, and an improved selection of information regarding antepartum and intrapartum complications. Some examples of new data to be collected include labor progress, uterine rupture, blood transfusions, and pregnancy resulting from infertility treatment.

**DEFINITIONS.** To allow comparison of data from not only one state or region of the country to another, but from one country to another, uniform use of standard definitions is encouraged by the World Health Organization as well as the American Academy of Pediatrics and the American College of Obstetricians and Gynecologists (1997). It is recommended that United States statistics include all fetuses and infants born weighing at least 500 g, whether alive or dead. It should be clarified, however, that the states are not uniform in their reporting requirements for fetal deaths. For example, 28 states stipulate that fetal deaths beginning at 20 weeks' gestation should be recorded, eight states report all products of conception as fetal deaths, and still others use birthweights of 350 g, 400 g, or 500 g or greater to identify fetal deaths.

Definitions recommended by the National Center for Health Statistics and the Centers for Disease Control and Prevention are as follows:

- **Perinatal period.** This includes all births weighing 500 g or more and ends at 28 completed days after birth. When perinatal rates are based on gestational age, rather than birthweight, it is recommended that the perinatal period be defined to commence at 20 weeks.
- **Birth.** The complete expulsion or extraction from the mother of a fetus, irrespective of whether the umbilical cord has been cut or the placenta is attached. Fetuses weighing less than 500 g are usually not considered as births, but rather are termed abortuses for purposes of vital statistics.
- **Birthweight.** The weight of a neonate determined immediately after delivery or as soon thereafter as feasible. It should be expressed to the nearest gram.
- **Birthrate.** This is the number of live births per 1000 population.
- **Fertility rate.** This is the number of live births per 1000 females 15 through 44 years of age.
- **Live birth.** Whenever the infant at or sometime after birth breathes spontaneously, or shows any other sign of life such as a heartbeat or definite spontaneous movement of voluntary muscles, it is recorded as a live birth. Heartbeats are to be distinguished from transient cardiac contractions, and respirations are to be distinguished from fleeting respiratory efforts or gasps.
- **Stillbirth (fetal death).** No signs of life are present at or after birth.
- **Neonatal death.** Early neonatal death refers to death of a live-born infant during the first 7 days after birth. Late neonatal death refers to death after 7 days, but before 29 days.
- **Stillbirth rate (fetal death rate).** The number of still-born infants per 1000 infants born, including live births and stillbirths.
- **Neonatal mortality rate.** The number of neonatal deaths per 1000 live births.
- **Perinatal mortality rate.** The number of stillbirths plus neonatal deaths per 1000 total births.
- **Infant death.** Includes all deaths of live-born infants from birth through 12 months of age.
- **Infant mortality rate.** The number of infant deaths per 1000 live births.
- **Low birthweight.** The first newborn weight obtained after birth is less than 2500 g.
- **Very low birthweight.** The first newborn weight obtained after birth is less than 1500 g.
- **Extremely low birthweight.** The first newborn weight obtained after birth is less than 1000 g.
- **Term infant.** An infant born anytime after 37 completed weeks of gestation and up until 42 completed weeks of gestation (260 to 294 days) is considered to be a term infant.
- **Preterm infant.** An infant born before 37 completed weeks (259th day).
- **Postterm infant.** An infant born anytime after completion of the 42nd week beginning with day 295.
- **Abortus.** A fetus or embryo removed or expelled from the uterus during the first half of gestation (20 weeks or less), weighing less than 500 g.
- **Induced termination of pregnancy.** The purposeful interruption of an intrauterine pregnancy with the intention other than to produce a live-born infant, and which does not result in a live birth. This definition excludes retention of products of conception following fetal death.
- **Direct maternal death.** This includes death of the mother resulting from obstetrical complications of pregnancy, labor, or the puerperium, and from interventions, omissions, incorrect treatment, or a chain of events resulting from any of these factors. An example is maternal death from exsanguination from rupture of the uterus.
- **Indirect maternal death.** This includes a maternal death not directly due to an obstetrical cause, but resulting from previously existing disease, or a disease that developed during pregnancy, labor, or the puerperium, but which was aggravated by maternal physiological adaptation to pregnancy. An example is maternal death from complications of mitral stenosis.
- **Nonmaternal death.** Death of the mother resulting from accidental or incidental causes not related to pregnancy are classified as nonmaternal deaths. An

example is death from an automobile accident or concurrent malignancy.

- **Maternal mortality ratio.** The number of maternal deaths that result from the reproductive process per 100,000 live births. Used more commonly, but less accurately, are the terms *maternal mortality rate* or *maternal death rate*. The term ratio is more accurate because it includes in the numerator the number of deaths regardless of pregnancy outcome—for example, live births, stillbirths, ectopic pregnancies—while the denominator includes the number of live births.

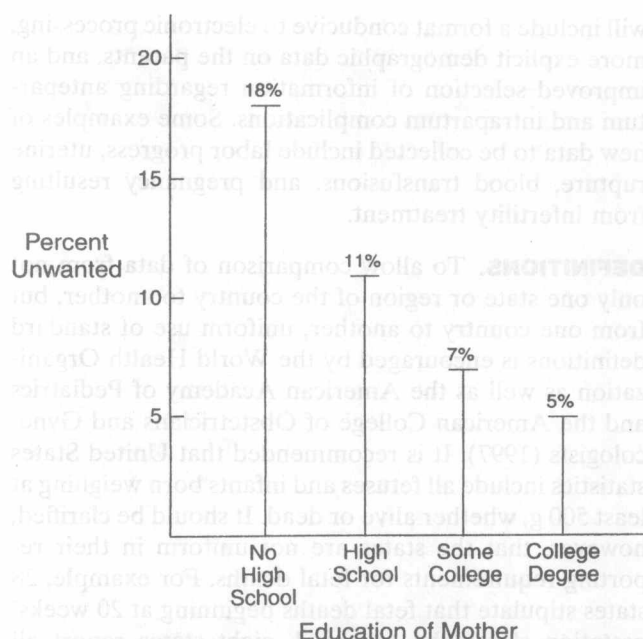
## PREGNANCY IN THE UNITED STATES

Pregnancy, and by extension obstetrics, has a major impact on the health of the nation. Data from diverse sources have been used to provide the following snapshot of pregnancy during the last years of the 20th century in the United States.

In 1998, the population of the United States was 269 million people and the fertility rate for women 15 to 44 years of age was 67 live births per 1000 women (National Center for Health Statistics, 2000). There were 3.94 million live births in 1998 which, when offset by 2.34 million deaths, resulted in a net increase in the population of 1.6 million people. Life expectancy for those born in 1998 was 76.5 years (Anderson, 1999).

The number of births in 1998 increased by 2 percent, and this was the first annual increase in the United States after a 7-year decline between 1990 and 1997 (U.S. News and World Report, 2000). American women average 3.2 pregnancies over their lifetimes, and 1.8 of these were considered wanted pregnancies (Ventura and colleagues, 1999). As shown in Figure 1-3, unwanted pregnancies are related to lesser amounts of education in the mother. About 1 percent of infants born to never-married women were relinquished for adoption in 1995, which is down from 9 percent of births before 1979 (Chandra and associates, 1999). After exclusion of fetal losses and induced terminations, American women on average deliver 2.0 live births in a lifetime.

Using 1996 as an example, there were 6.24 million pregnancies in the United States (Table 1-2 and Fig. 1-4); 62 percent ended with live births, 22 percent ended by induced terminations, and 16 percent were spontaneous miscarriages. Notable changes with regard to the setting and timing of births as well as in the birth attendant have taken place in the United States (Curtin and Park, 1999). Osteopaths and midwives are delivering an increasing share of births, but nearly all of these increases have been for in-hospital births. The use of electronic fetal monitoring, ultrasound, and labor induction and stimulation all increased, with the most dramatic change being the doubling in the number of births that



**FIGURE 1-3.** Proportion of births unwanted by the mother as compared with education status—United States, 1995. (Data from Ventura and colleagues, 1999.)

were induced. Partly as a result of the rise in inductions, there are more births on weekdays. The highest number of births occur in the summer months, with births most likely to occur on Tuesday throughout the year.

Pregnancy care is a major component of the American health care scene. In 1998, delivery was the second leading cause for hospitalization behind heart disease (Hall and Popovic, 2000). The average length of hospital stay for all deliveries was 2.5 days. Prenatal care was the fourth leading reason for office visits to physicians and accounted for nearly 23 million visits in 1997 (Woodwell, 1999). In 1991 and 1993 there were approximately 720,000 non-delivery-related hospitalizations for pregnancy complications, amounting to hospitalization for one in five pregnancies (Bennett and co-authors, 1998). Nondelivery hospitalizations have decreased substantially since the late 1980s, presumably due to managed care efforts to minimize expenditures. The leading indication for hospitalization unrelated to delivery was preterm labor. Nicholson and co-workers (2000) have estimated that the total national cost, in 1996 dollars, for hospitalization for preterm labor that did not eventuate in delivery was \$360 million. This number increased to \$820 million when those women with preterm labor and who actually delivered early, were added.

The magazine *OBG Management* (1999) surveyed approximately 1 percent of obstetricians-gynecologists in the United States in an effort to assess the state of obstetrics at the turn of the 20th century. The average

**TABLE 1-2. Fetal and Neonatal Mortality in the United States—1950–1998**

Year	Fetal Mortality Rate <sup>a</sup>	Neonatal Mortality Rate <sup>b</sup>
1950	18.4	20.5
1960	15.8	18.7
1970	14.0	15.1
1980	9.1	8.5
1985	7.8	7.0
1990	7.5	5.8
1991	7.3	5.6
1992	7.4	5.4
1993	7.1	5.3
1994	7.0	5.1
1995	7.0	4.9
1996	6.9	4.8
1997	6.8	4.8
1998	6.7	4.8

<sup>a</sup>Fetal deaths of 20 weeks or more.

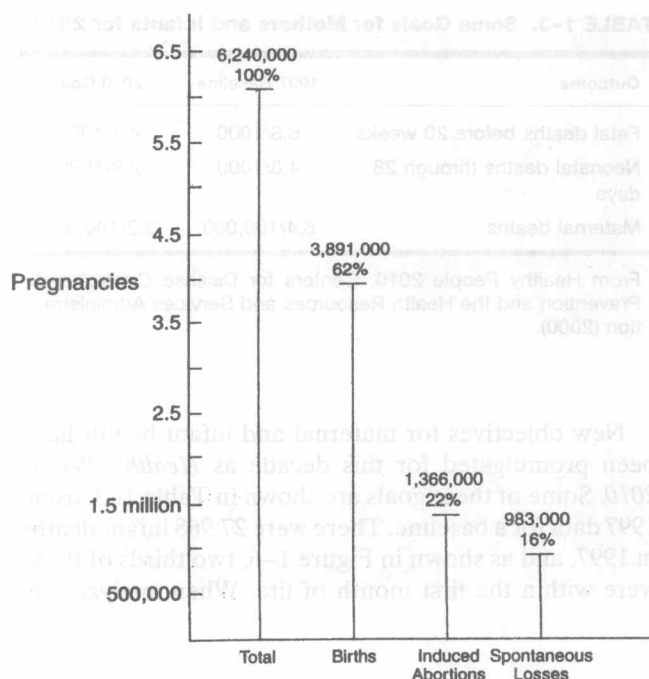
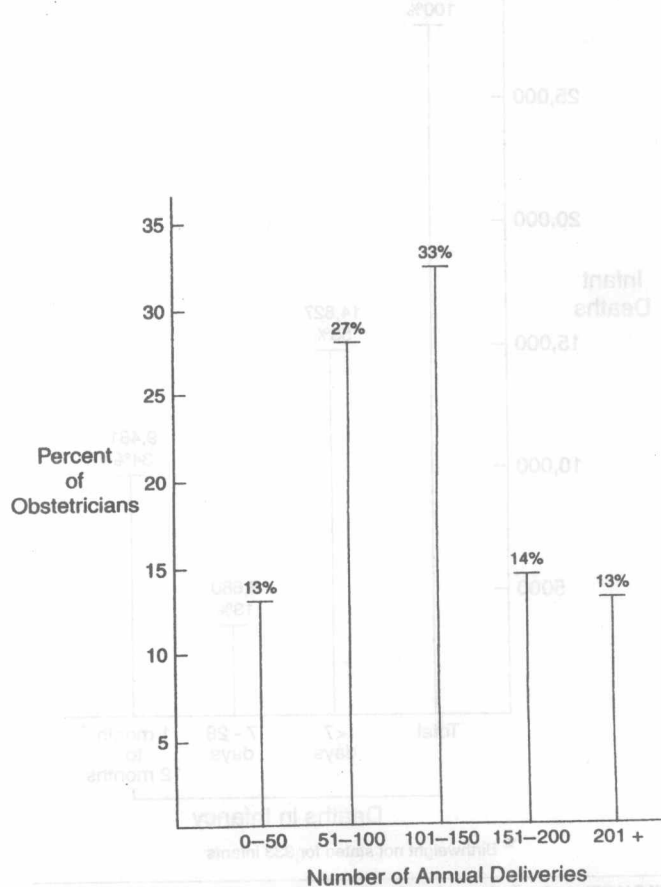
<sup>b</sup>Infant deaths of less than 29 days per 1000 live births.

(Data from Murphy, 2000.)

number of deliveries in 1998 was 140 per obstetrician (Fig. 1-5). More than 80 percent of those who responded to the survey reported that they continued to practice obstetrics as well as gynecology. Those who gave a reason for discontinuing their obstetrics practice cited medicolegal concerns, professional-liability premiums, and declining reimbursement as the reasons they stopped. Among those who still practice obstetrics, about 40 percent anticipated that their obstetrical case-load would increase in 1999.

### HEALTHY PEOPLE 2010

In 1991, the United States Public Health Service issued a report titled *Healthy People 2000*, which proposed goals for improving the health of mothers and infants by the year 2000. Of the 17 maternal and infant health objectives included in *Healthy People 2000*, progress was made in eight objectives. In five objectives, however, movement was away from the target. Notable gains were made in the areas of infant death, fetal death, cesarean delivery (particularly repeat cesareans), breast feeding, early use of prenatal care, hospitalization for pregnancy complications, abstinence from tobacco use during pregnancy, and screening for fetal abnormalities and genetic disorders. For the remaining objectives, changes were neither positive or negative. These included maternal death, fetal alcohol syndrome, and low birthweight.

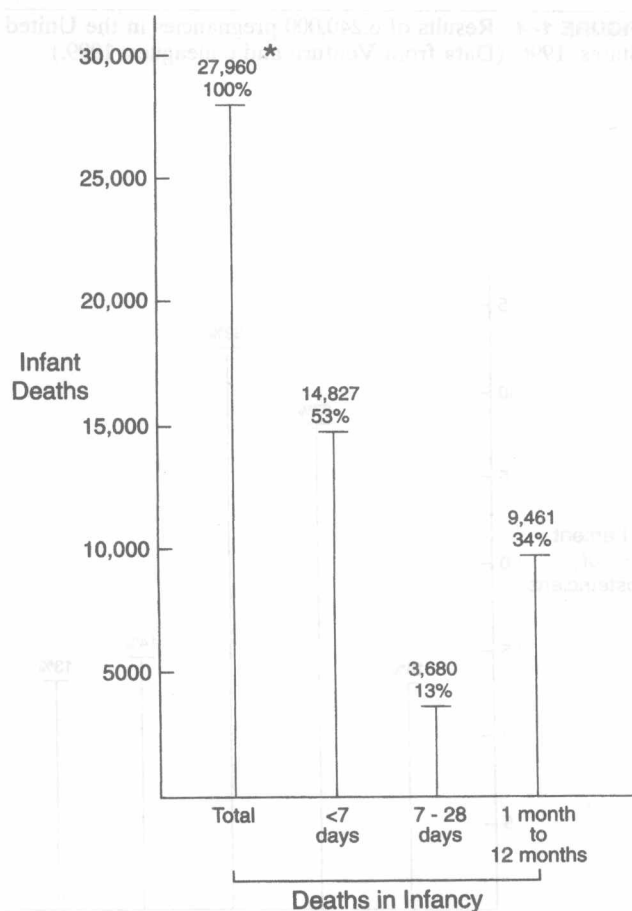
**FIGURE 1-4.** Results of 6,240,000 pregnancies in the United States, 1996. (Data from Ventura and colleagues, 1999.)**FIGURE 1-5.** Number of annual deliveries by obstetricians-gynecologists in 1998. (From OBG Management, 1999.)

**TABLE 1-3. Some Goals for Mothers and Infants for 2010**

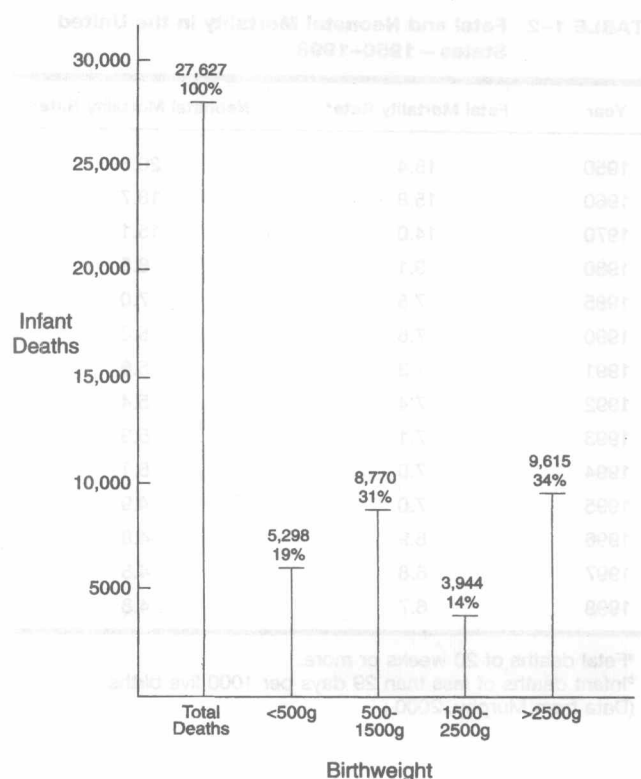
Outcome	1997 Baseline	2010 Goal
Fetal deaths before 20 weeks	6.8/1000	4.1/1000
Neonatal deaths through 28 days	4.8/1000	2.9/1000
Maternal deaths	8.4/100,000	3.3/100,000

From Healthy People 2010, Centers for Disease Control and Prevention and the Health Resources and Services Administration (2000).

New objectives for maternal and infant health have been promulgated for this decade as *Healthy People 2010*. Some of these goals are shown in Table 1-3, using 1997 data for a baseline. There were 27,968 infant deaths in 1997, and as shown in Figure 1-6, two thirds of these were within the first month of life. When analyzed by



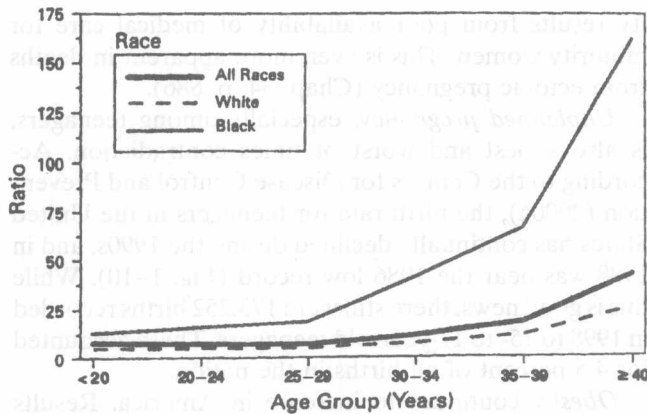
**FIGURE 1-6.** Infant deaths from birth through 12 months—United States, 1997. (Data from MacDorman and Atkinson, 1999.)



**FIGURE 1-7.** Infant deaths from birth through 12 months according to birthweight—United States, 1997. (Data from MacDorman and Atkinson, 1999.)

birthweight, two thirds of infant deaths were in low-birthweight infants (Fig. 1-7). Of particular interest are those births less than 500 g where neonatal intensive care is now often offered. In 1997 there were 5994 live births weighing less than 500 g and 87 percent of these died during the first 28 days of life. Of the 784 who survived the first 28 days of life, 696—12 percent of all births less than 500 g—survived infancy. St. John and associates (2000) have estimated the total cost of initial care in this country for all newborn infants was \$10.2 billion annually. Almost 60 percent of this expenditure is attributed to preterm births before 37 weeks, and 12 percent is spent on infants born between 24 and 26 weeks.

In addition to deaths during infancy, the effect of pregnancy and childbirth on women's health is an important indicator of national health. In 1997, a total of 327 maternal deaths were identified by vital statistics (Hoyert and colleagues, 1999). It should be emphasized, however, that it is estimated that more than half of maternal deaths are not ascertained (Koonin and colleagues, 1997). As shown in Figure 1-8, there is considerable disparity in maternal mortality when analyzed according to race. Pregnancy-related mortality for black



**FIGURE 1-8.** Pregnancy-related mortality ratio (deaths per 100,000 live births) by age group and race—United States, 1987–1990. (From Koonin and colleagues, 1997.)

women is three to four times higher than for white women. The maternal death differential between African-Americans and whites is highest for those pregnancies that did not end in birth of an infant. These include ectopic pregnancy, spontaneous and induced abortions, and gestational trophoblastic disease (Centers for Disease Control and Prevention, 1995). Shown in Table 1–4 are the causes of maternal death according to the outcome of pregnancy. Hemorrhage and infection are prominent causes of death in ectopic pregnancies and abortions, whereas hypertension, embolism, hemorrhage, and infection are the leading causes of maternal death in women delivered after midpregnancy.

## PERSPECTIVES ON OBSTETRICS

Medical writers have recently turned to the opening line of Charles Dickens's *A Tale of Two Cities* to describe

**TABLE 1-4.** Percentage of Pregnancy-Related Maternal Deaths by Cause and Outcome of Pregnancy—United States, 1987–1990

Cause of Death	Pregnancy Outcome				
	Live Birth	Still-Birth	Ectopic	Abortion	Molar
Hemorrhage	21	27	95	19	17
Embolism	23	11	1	11	—
Pregnancy hypertension	24	26	—	1	—
Infection	12	19	1	49	—
Cardiomyopathy	6	3	—	—	—
Anesthesia	3	0	2	9	—
Other	11	14	—	11	83

From Koonin and colleagues (1997).

these prevailing times in medicine and obstetrics as “the best of times. . . the worst of times. . .” (Grumbach, 1999; Morrison, 2000). Why are these times at once the best and worst of times for obstetrics? There are many reasons for this, and some are now considered.

**BEST OF TIMES.** The chronicle of maternal and infant mortality during the 20th century described earlier should suggest that much is good in the health care of women and their infants—indeed, better than it has ever been. “Better than ever” should be read here as previously unparalleled rather than unsurpassable because continual improvement must inevitably remain the goal in obstetrics.

These times could be the best of times for many other reasons. Just to mention a few would include the ascendance of evidence-based medicine. There have been striking developments in the study of the molecular basis for many diseases. In fact, gene therapy was recently first reported successful to “cure” severe combined immunodeficiency disease (Cavazzana-Calvo and colleagues, 2000). There has been completion of the mapping of the human genome. Importantly, the swelling ranks of women in obstetrics and gynecology is expected to reach parity with men by 2014 (American College of Obstetricians and Gynecologists, 1999b).

The National Institutes of Health is leading the current emphasis on outcomes-based research. In obstetrics, the National Institute of Child Health and Human Development has formed two clinical networks that are crucial to the study of obstetrical outcomes. The Maternal–Fetal Medicine Units Network and the Neonatal Units Network are multicenter groups that conduct investigations to study some of the more vexing and important problems in obstetrics and neonatal medicine. Not surprisingly, preterm labor and delivery as well as preeclampsia are in the foreground of these efforts.

The year 2000 marks the 50th anniversary of the American College of Obstetricians and Gynecologists (Pearse, 2000). Originally formed to promote continuing education, in 1975 the college became involved in legislative initiatives in a number of important arenas to include regionalization of perinatal care, maternal and child health, patient education, and most recently, to provide uninterrupted access of women to the obstetrician-gynecologist as their primary care physician.

In the 20th edition of *Williams Obstetrics* we offered the cartoon shown in Figure 1–9 to highlight the effects of for-profit managed care on obstetrics. We could use this same cartoon to highlight in this 21st edition the tempering of the effects of HMOs that has transpired in the last 5 years. Notably, mandatory early discharge was curtailed by federal legislation through the Newborns’ and Mothers’ Health Protection Act that went