SECTION I

Introduction to Epidemiology of Women's Health

CHAPTER 1

An Overview of Women's Health: From the Past to the Future

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Introduction

Women's health encompasses a continuum of biologic, psychologic, and social challenges that differ considerably from those of similarly aged men. These challenges significantly influence gender-specific longevity and quality of life. From conception, during in utero development, and continuing throughout the life course, women experience diverse health challenges influenced by genetic susceptibility interacting with changing endogenous hormone levels, environmental exposures, therapeutic interventions, and gender-specific cultural and psychosocial pressures.

Although most physical and mental conditions women experience do not specifically involve reproduction, endogenous hormones essential for childbearing significantly influence women's susceptibility to infectious diseases, autoimmune and rheumatologic disorders, and cancer. Compared with men and the clinical challenges they face, women experience disparities in health outcomes frequently affected by social, economic, and political inequities, especially among some American racial and ethnic groups.

The organization of this textbook reflects the concepts of life-course epidemiology in which health behaviors established at young ages have a significant impact on health status and quality of life in senior years. The topics selected represent some of the major infectious and chronic conditions women face across the life span from exposures in utero, activities during youth, development during puberty, reproductive decisions, and health patterns following menopause.

Each chapter presents findings from epidemiologic and psychosocial research primarily conducted among Americans; the focus is on studies that consider patterns of health and disease among groups rather than individual patients. The material should alert students and professionals, regardless of gender, to the unique health challenges women experience. Some of the conditions and diseases affect only women, others are more prevalent or serious among women, and some have risk factors or require interventions that differ for women compared with men with similar clinical problems.

Although women comprise more than 50% of the U.S. population, their healthcare needs had received limited research attention until recent years; women were often excluded from studies of diseases that affect both genders simply because changing levels of endogenous hormones complicated studies or because exposures might endanger a developing fetus. This discriminatory pattern changed as more women were successfully elected to leadership positions, forcing expansion of federally supported research to require the inclusion of women in every appropriate study.

This opening chapter provides a brief description of the changing political climate in the United States during the past 4 decades that significantly improved the lives of women, reviews three historical health transitions of the 20th century, and provides an overview of the diseases and conditions discussed in each section.

Politics Associated with Women's Health

A landmark event affecting women's health occurred in 1971 with the publication of *Our Bodies, Ourselves* by the Boston Women's Health Book Collective. Initially the text was prepared for a course "by and for women" to provide accurate and accessible information about female anatomy and physiology in addition to encouraging gender-relevant health policy changes. Since the publication of the first book, multiple additional texts with more detailed information have been published. The women's movement provided the impetus for women to demand inclusion in policymaking locally, resulting in more women being elected to state and federal government positions, including both houses of Congress.

The Congressional Caucus for Women's Issues, initially formed in 1977 by 15 representatives, significantly influenced the legal, economic, and health status of American women.[1] These representatives were aware that major clinical research had excluded women; therefore, one of their early campaigns led to legislation encouraging all federally funded clinical studies to include women unless the health conditions exclusively affected men. Caucus members ultimately recognized that stronger oversight was required for the policy to change.[1,2]

The nonprofit Women's Research and Education Institute (WREI), also established in 1977, contributed to the changing view of the health needs of women. The WREI staff provided synthesized data collected from many sources, which they formatted for presentation by federal and state policymakers, scholars, and advocates.[3] WREI's current mission includes identifying issues and contributing to policy decisions affecting women at home, in the workplace, and in the broader community through policy-establishing meetings, online publications, and internship positions for college students.[3]

Twenty years ago, the visibility of women's health received increased attention when Dr. Bernadine Healy was nominated as the first female director of the National Institutes of Health (NIH). That same day in 1990, NIH announced the establishment of the Office of Research on Women's Health (ORWH). The purpose of the new agency was to monitor and guide the *required* inclusion of women in NIH-funded studies that addressed medical conditions common to both women and men.[4]

The Women's Health Initiative (WHI), one of the primary health research programs developed by Dr. Healy, was the largest study ever conducted by NIH. More than 150,000 middle- and older-aged women were enrolled in one or more components of the initiative, including the randomized clinical trials and observational studies designed to identify risk and protective factors associated with heart disease, breast cancer, osteoporosis, and other clinical conditions. The first of many publications in 2002 reported increased risk of both heart disease and breast cancer among women randomized to received estrogen combined with progestin in contrast to placebo, necessitating early termination of one component of the WHI clinical trial.[5] After publication of these unanticipated results, hormone use by many postmenopausal women declined rapidly and incidence rates of breast cancer declined.[6] Follow-up of WHI study participants has provided important data on health effects of various exposures as referenced in this textbook.

By Executive Order in March 2009, President Obama created the White House Council on Women and Girls with a mandate that each federal agency account for the needs of women and girls when formulating policies in the programs they created and the legislation they support.[7] Although many women have been selected to chair and direct the activities of several federal agencies, the president was expressing concern for the needs of all American women when the Council on Women and Girls was created.[7]

In anticipation of its 20th anniversary, ORWH held public workshops in 2009–2010 in several regions of the country to review past accomplishments and set goals for the next decade. Members of scientific, medical, public health, and advocacy organizations, as well as the public, presented their action items for consideration. In addition to defining gender-specific health needs, disparities in health outcomes among subgroups were discussed and interventions proposed. At the ORWH anniversary meeting in the fall of 2010, the report, *A Vision for 2020,* was unveiled. Six broad goals were included in the strategic plan (Table 1-1); these goals provide a comprehensive framework aimed at stimulating research planning by multidisciplinary researchers and students interested in women's health.[4]

One goal of ORWH is to increase the number of women recruited to senior-level decision-making positions in order to leverage an expansion of federal funding for gender-specific health research. Career choices for women have expanded in the last several decades, requiring women to balance career options with childbearing demands; these personal goals often coincide in terms of timing. Reproductive decisions may create emotional turmoil, generating long-term physical and psychologic health challenges. Such life decisions were clearly described in Elsa Walsh's *Divided Lives*, a biographical account of three accomplished women, one of whom chose to become a breast surgeon but not a parent as she feared the conflicting time demands of each role.[8] Although a more supportive environment for women has been evolving, childbearing decisions continue to require compromises. Leadership by women is essential to appropriately guide research addressing gender-specific career choices, related health issues, and employment policies to enable childbearing by career-oriented women.

In July 2011 the Institute of Medicine (IOM) released the report *Clinical Preventive Services for Women, Closing the Gap* in response to a charge by the U.S. Department of Health and Human Services to review current preventive practices for women and to identify necessary additions.[9] The IOM report has guided policy decisions included in

Table 1-1

Goals defined in the Office of Research on Women's Health strategic plan for 2020

- Increase the study of sex and gender differences in basic biomedical and behavioral research
- Incorporate findings of sex and gender differences into the design and application of new technologies, medical devices, and therapeutic drugs
- Actualize personalized prevention, diagnostics, and therapeutics for women and girls
- Create strategic alliances and partnerships to maximize the domestic and global impact of women's health research
- Develop and implement new communication and social networking technologies to increase understanding and appreciation of women's health and wellness research
- Employ innovative strategies to build a well-trained, diverse, and vigorous women's health research workforce

Source; Data from Pinn VW, Clayton JA, Begg L, Sass SE. Public partnership for a vision for women's health research in 2020. *J Women's Health*. 2010;19:1603–1607.

the controversial Patient Protection and Affordable Care Act (ACA), which focuses on preventive services oriented to increasing optimum health status among Americans while reducing the burdens of long-term, debilitating illnesses.[10] Women are expected to benefit more than men from the focus on prevention given their longer life expectancy, reproductive health needs, gender-specific health problems, and higher incidence of chronic and disabling conditions. Contraception, a preventive service identified by the IOM, has enabled reduced family size with longer intervals between births, significantly improving the health and longevity of all women although disparities remain when rates are compared by racial/ethnic and economic subgroups as noted in Chapter 3.[12] The IOM report is briefly reviewed in Chapter 4.

Historical Perspective

The lives of American women were significantly influenced by three historical public health challenges of the 20th century, challenges that continue to have an impact on the goals established by ORWH for the next decade.

Epidemics of Infectious Diseases

Uncontrolled infectious diseases, especially in crowded urban areas, were major recurring threats early in the 20th century until public health interventions reduced exposures and prevented transmission of infectious agents (Figure 1-1). Longer life expectancy resulted from the dramatic reductions in death from infectious diseases, a major cause of maternal and infant mortality. Among the greatest public health achievements in the last century was the significant impact on women's lives of the decline in deaths during childbirth from a frighteningly high 1 per 100 in 1900 to 1 per 10,000 in 2000.[12] Similarly, the greatly reduced neonatal mortality rate increased life expectancy an average of 30 years for babies born in 2000 compared with newborns in 1900, only 40% of whom reached age 65.[11] In 1916, just 2 years before the influenza pandemic noted on Figure 1-1, maternal mortality was the second most common cause of death among women, after tuberculosis.[12] Infection control and improved clinical management of pregnancy, childbirth, and infant care enabled women to achieve their desired family size with fewer pregnancies.

Recalling the high mortality in 1918 when 500,000 Americans died, a rate of 1,000 per 100,000 population, has kept scientists focused on the potential emergence of virulent bacterial or viral infectious agents that might suddenly trigger another pandemic.[12] Life expectancy has significantly increased since World War II, driven primarily by medical innovations, especially drug discoveries. Antibiotics, vaccines, enhanced clinical devices, and procedures have greatly lowered mortality. However, infectious outbreaks continue to occur, challenging the need for rapid development and distribution of vaccines to address newly identified infectious agents, as occurred most recently with H1N1 influenza.[13] The diversity of facilities offering the vaccine greatly increased during the 2010–2011 season, enabling more than 37 million to be vaccinated.[14] Many public health workers and researchers urge continued vigilance as the potential for emerging infections are an ever-present concern given globalization of commerce and tourism and the ability of diseases to be transmitted from animals to humans.[15]

The Tobacco Epidemic

As high rates of mortality from infectious diseases were declining during the first 50 years of the 20th century, another lethal "epidemic" was growing. Figure 1-2 notes

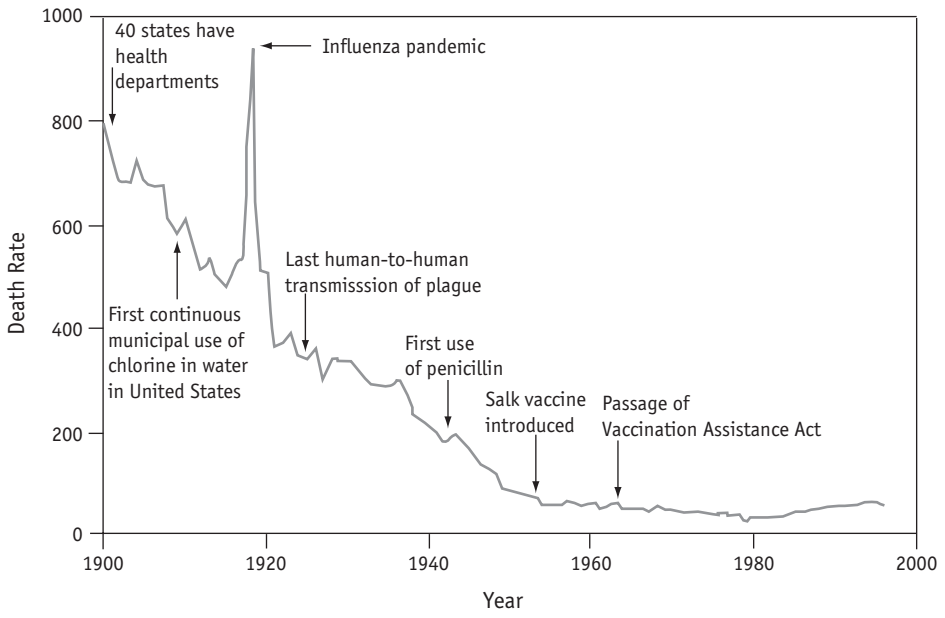


Figure 1-1 Trends in infectious disease mortality. Crude death rate per 100,000 population per year—United States 1900–1996.

Source: Reproduced from Centers for Disease Control and Prevention. Achievements in Public Health, 1900–1999. *MMWR* 1999;48(29):621.
The figure also appears in Levitt AM, Drotman DP, Ostroff S. Control of infectious diseases: a twentieth-century public health achievement. In: Ward JW, Warren C, eds. *Silent Victories. The History and Practice of Public Health in Twentieth-Century America*. New York, NY: Oxford University Press;2007: 3–17.

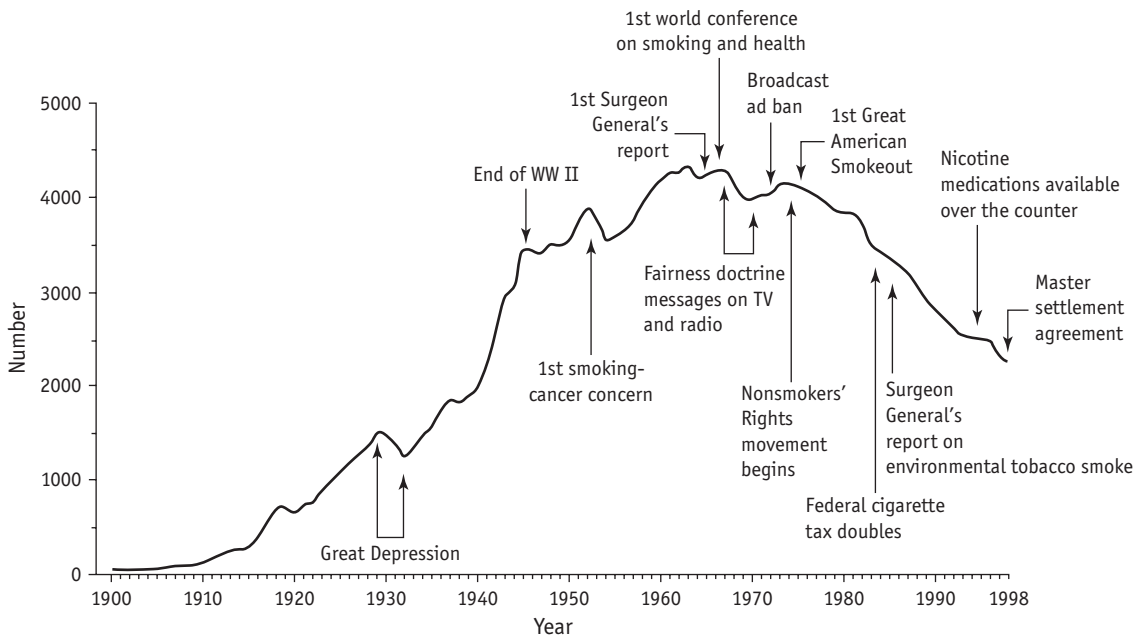


Figure 1-2 Annual adult per capita cigarette consumption and major smoking and health events—United States, 1900–1998.

Reproduced from Centers for Disease Control and Prevention. Achievements in Public Health, 1900–1999. *MMWR* 1999;48:986–993. Data from United States Department of Agriculture and 1986 Surgeon General's Report.

the rapid increase in cigarette sales, which reached a peak in the 1960s and has slowly declined in response to repeated warnings of major health risks by the Surgeon General and many researchers who linked smoking to most major chronic conditions.[16] Brandt stated in his historical review, *The Cigarette Century*, that one of the most important public health accomplishments of the 20th century was "to demonstrate scientifically that cigarette smoking causes *serious* disease and death."[17]

As maternal and infant mortality declined and improved contraceptive options became available, women's lives expanded to encompass higher education, employment, and community involvement, including election to influential positions in education, government, and other fields. Involvement in broader social networks influenced reproductive decisions and other health behaviors such as cigarette smoking, which gradually became acceptable as tobacco companies targeted women with carefully crafted advertisements.[17,18]

A multitude of public health measures have succeeded in reducing the sale of cigarettes and diminishing interest in smoking, including controls on cigarette advertising, increased taxes making cigarettes less affordable, and laws prohibiting smoking in most public indoor and outdoor settings, including parks and beaches.[19] An advertisement from the Centers for Disease Control and Prevention (CDC) program Tips from Former Smokers (Figure 1-3) suggests children have encouraged their mothers to quit. Smoking, a self-induced exposure, has caused high rates of mortality from many respiratory conditions, heart disease, and cancers among men and women; smokers also adversely affect the health of nonsmokers including children who passively inhale secondhand smoke. Both active and passive smoking have now been strongly associated with premature mortality, as well as adverse birth outcomes. Lung cancer mortality during the past several decades has declined as men quit smoking, but reduced mortality from lung cancer among women has only recently been detected after years of increasing smoking-related deaths (Figure 25-1). In 2011, smoking remained the primary preventable cause of morbidity and premature mortality among women and

Figure 1-3 An advertisement from the CDC program Tips from Former Smokers.

Source: Courtesy of the CDC.

men, although men reduced their rate of smoking earlier than women (discussed in Chapter 4).[20]

Public health efforts to reduce cigarette sales have shown success (Figure 1-2) with data indicating that fewer Americans are smoking and that mortality due to cardiovascular disease, stroke, and respiratory conditions has been declining during the past 50 years. Unfortunately, the long latency between initiation of smoking and smoking-related diseases does not readily deter young people from developing the habit as they remain the target of tobacco advertisements.

Epidemic of Obesity

Public health improvements in sanitation reduced infection rates, advances in medical treatments increased longevity, and technologically enhanced agricultural production increased availability of low-cost, high-calorie foods. All these factors and many others encouraged the third epidemic, obesity, to emerge in the last decades of the 20th century (Figure 1-4). The availability of an overabundance of fresh and processed foods, some of which were fortified to enhance their nutritional value, encouraged overconsumption by a growing percentage of Americans. Their dietary intake exceeded the nutrients essential for growth during childhood, for successful reproduction, and for health maintenance during adult years. As U.S. markets offered increasing varieties of processed foods containing excessive fats and sugars with limited nutritional value, the obesity epidemic evolved. Overconsumption coupled with limited physical activity has resulted in obesity and increased susceptibility to many conditions and diseases affecting women. Olshansky et al. predicted a reversal of the recently achieved longer life expectancy if this expanding epidemic continues among America's youth.[21] Chapter 5 discusses essential nutrients required for optimum health of women across the life span.

Less than 16% of female participants in the National Health Examination Study of 1960–62 had a body mass index of 30 or more; by 2005-2008, 36% of women were obese and 58% were overweight.[22] Prevalence rates of obesity, initially higher in southern and western states, have now increased across the United States and distinguish Americans when they travel abroad. National survey data document the changing prevalence of obesity (Figure 1-5). Since the rapid rise in obesity began in 1988, a corresponding increasing pattern of chronic diseases, cancer, and rheumatologic conditions has occurred as noted in subsequent chapters.

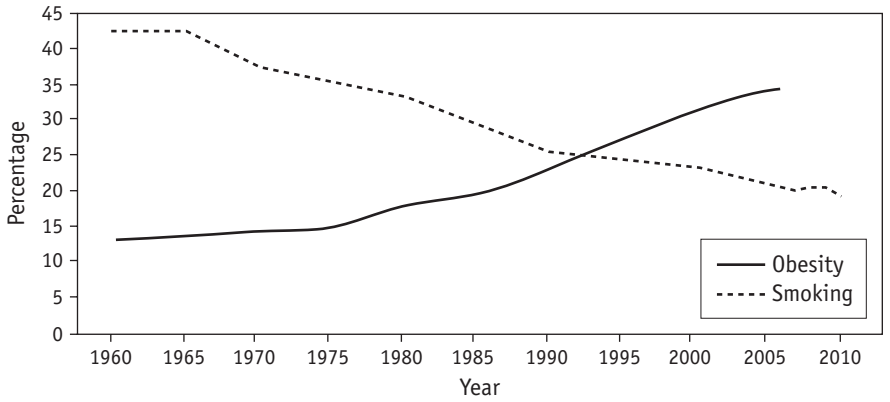
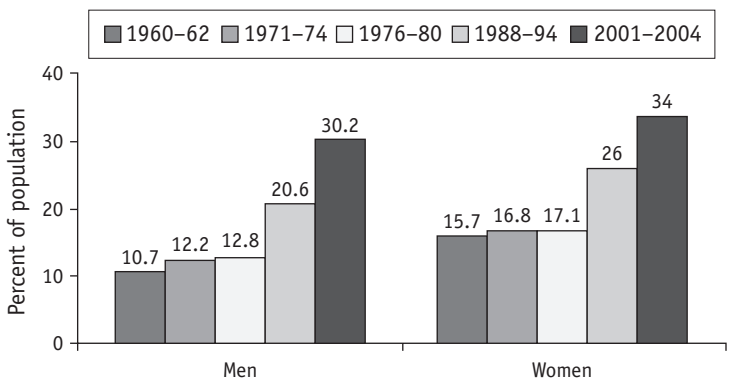


Figure 1-4 Trends in the prevalence of smoking and obesity—United States, 1960–2010.

Source: Reproduced from Fifty Years of Progress in Chronic Disease Epidemiology and Control. Morbidity Mortality Weekly Report 2011;60:70–77.



Note: Obesity is defined as a BMI (body mass index) of 30.0 and higher.

Figure 1-5 Age-adjusted prevalence of obesity among adults ages 20–74 NHES 1960–62, NHANES 1971–74, 1976–80, 1988–94, and 1999–2002.

Source: Reproduced from National Center for Health Statistics. Health, United States, 2010: With Special Feature on Death and Dying. Hyattsville, MD. 2010. Available at www.cdc.gov/nchs/data/hus/hus10.pdf.

Cohort studies of nurses and other health professionals have identified multiple lifestyle changes that led to gradual weight gain, with the strongest influences pertaining to dietary components, duration and types of physical activity, and hours spent sleeping.[23] Research among more diverse populations has suggested the prevalence of obesity is due to a complexity of personal health behaviors, genetics, and community and governmental policies.[24] Across a woman's life course, age at onset of obesity may be an important predictor of adverse health outcomes affecting childbearing, onset of chronic diseases, autoimmune conditions, and cancer. Recent estimates indicate that 1 in 10 deaths among women are due to obesity.[25]

About This Text

This section gives an overview of the contents of the book and the overall approach of the chapters.

Life-Course Epidemiology

Most chapters reveal a life-course approach to epidemiology research indicating many health conditions that develop among adults were initiated by physical and social exposures that occurred years earlier.[26] Life-course approaches provide an important perspective for studying health patterns over a woman's life span that recognizes the long latency between some exposures and disease onset.[27] Researchers identified disease-specific critical windows of exposure during youth initiating cellular changes that ultimately lead to adult diseases.

This book provides important information for students, professionals, and public health workers in meeting 21st century goals for health promotion to guide avoidance of disease and increase the probability of longevity free of activity limitations. Health education is needed to establish healthful behaviors during childhood in order to enhance the quality of life at older ages. Although genetic factors may influence risk, a more informed healthcare workforce has the potential to affect health behaviors in addition to encouraging access to appropriate medical interventions, to reduce risk associated with inherited susceptibility, and delay disease onset.

Each individual woman carries a person-specific trajectory across her life span including health outcomes related to biologic, behavioral, social, and psychologic events.[27] Recognized disparities influence disease development and survival among subsets of women whose exposures have differed significantly by socioeconomic status, education, personal lifestyle, and access to high-quality health care from early life through senior years. The federal ACA[10] and state-specific legislation mandate availability of health care for all Americans; measurements of successful changes in access to health care will be monitored by consistent data collection including race/ethnicity and other variables that may identify some causes of health disparities and opportunities for improving health outcomes.[28] The ACA identifies prevention as a national priority with financial support for many state and community-based health promotion and educational programs.[29] The following sections describe the chapter contents that provide baseline information to further these national priorities.

I. Introduction to Epidemiology of Women's Health: Chapters 1 to 3

In Chapter 1, the historical perspective and changing political influences of women provide background information that describes the great progress achieved in the 20th century and the many public health challenges that remain.

Chapter 2 addresses the primary goal of epidemiologic research: to identify risk factors associated with diseases, providing opportunities for prevention. Specialized research methods are required to accomplish these goals and to produce reliable results. Multiple investigations conducted in diverse populations often using different study designs are desirable to confirm new findings or identify different outcomes. Statistical procedures have been evolving to handle the extensive data now accumulating from gene-environment interaction studies. To overcome the hazards of conflicting findings, meta-analyses are conducted combining data from prior epidemiologic studies or randomized clinical trials, considered the "gold standard." Each study methodology has positive and negative influences on the accumulated results and all require careful assessment before firm conclusions are drawn and policy changes are considered.

Changing demographics of the U.S. population by age and race/ethnicity are provided in Chapter 3, enabling some predictions of the population distributions in coming decades. The diverse cultural and sociologic aspects associated with these changes have major implications for educational, research, and community-based services that will promote health and prevent injury throughout the life span. These data provide the foundation for subsequent chapters. Three of the five leading causes of death in young adult to middle-aged women are unintentional injury, suicide, and homicide; among women, an estimated 22% of premature deaths before age 65 are due to fatal injuries rather than health conditions such as heart disease or cancer that generally occur at later ages. The burden of injuries among women differs from that of men by age, race/ethnicity, types of injuries, and resulting disabilities.

II. Health Promotion and Morbidity Prevention: Chapters 4 to 7

The chapters in this section identify long-standing cohort studies in which basic health behaviors have been strongly associated with reduced morbidity and prolonged life expectancy. With more women surviving to older ages, higher rates of chronic conditions are anticipated to cause considerable morbidity but not high mortality while adding to healthcare costs. As the rates of disabilities increase, the quality of life during elder years may decline.[30] However, the early work of Breslow, Fries, and others indicates that onset of chronic and disabling conditions may be prevented or delayed by healthy lifestyles during youth and early adulthood.[31,32] Krieger emphasized the impact of diverse social factors on health and disease onset from neighborhood exposures, access to high-quality health

care, and availability of healthy foods. She noted that patterns of social networking at young ages and especially during adolescence may contribute to subsequent inequalities in adult health and mortality.[33]

Among basic preventive services is maintenance of oral health for maximum benefit from preventive nutrition. Chapter 7 addresses complementary and alternative therapies that many women have found helpful and preferable for reducing physical and psychologic discomforts. Successful behavior changes through well-designed intervention programs expand the disease prevention goals of public health.

III. Sexual Health Across the Life Span: Chapters 8 to 11

American data indicate that changes in nutrition, physical activity, and social factors have influenced declining ages of menarche over the last century. The physical and psychosocial changes young girls experience before puberty and during adolescence significantly influence the emotional health of young women. Some of the studies discussed in Chapter 8 indicate maternal exposures to estrogen-disrupting chemicals may be transmitted during critical windows of fetal growth, potentially resulting in accelerated onset of puberty. As women mature and become emotionally involved with sexual partners, their reproductive health needs shift to include contraception, avoidance of unplanned pregnancy, appropriate timing of childbearing, treatment for infertility, etc. Chapter 9 addresses aspects of sexuality, contraception, and preparation for childbearing including new contraceptive options available in the 21st century.

Childbearing presents specific health burdens for women as epidemiology research has revealed some environmental and psychosocial exposures during pregnancy may adversely affect fetal development potentially influencing lifelong health risks.[34] More than 50 years ago the world learned of two medications tragically affecting pregnant women and their offspring with very different outcomes; the birth defects caused by one prescribed medication were recognized at the instant of birth, whereas the adverse effect of the other drug remained hidden until the exposed daughters experienced the hormonal surges of puberty. Both in utero exposures caused lifelong changes to the offspring and kindled the concept of life-course epidemiology research identifying influences of early life exposures on subsequent diseases. Treatment during pregnancy with thalidomide to control nausea[35] and diethylstilbestrol (DES)[36] to reduce preterm births are discussed in Chapter 10. Thalidomide produced developmental deformities of legs and arms; DES caused pelvic organ anomalies that complicated reproductive health and increased risks of several types of cancer. Cohorts of DES-exposed daughters and sons and their children (third generation) continue to be monitored.[37]

Women's health is often discussed politically with a primary focus on abortion rights; however, insurance coverage for contraceptive services to assist in avoidance of unplanned pregnancies remained limited. With prevention a focus of the new federal health care program, the ACA has mandated that contraceptives be covered by insurance without patient copay, a major accomplishment for women's health equity.[9] Although progress has been accomplished in reproductive health, some U.S. parameters lag far behind other industrialized countries in rates of maternal mortality, premature and low birth weight infants, and related reproductive health indicators, especially among low-income and minority women. Delayed childbearing has generated needs for assisted reproduction, a costly process enabled by new technology and willing young women. Life-course changes associated with menopausal symptoms present confusing options for women given the diversity of research findings that affect the quality of life at older ages. Ageism, prejudice toward older members of the population whose mental capacities are assumed to be in decline, has influenced the availability of employment and other activities for older women. With more females elected to political office and directing corporations, these images are slowly changing.

IV. Sexually Transmitted Infections: Chapters 12 to 14

Although the 20th century witnessed a sharp decline in infectious diseases through sound public health policies improving sanitation, development of antibiotics and vaccines for primary prevention, sexually transmitted diseases have remained a major public health issue for affected women and their offspring for centuries as discussed in Chapter 12. A new infectious disease was detected in 1981 shortly after the CDC declared smallpox totally eradicated. The first report described an unusual type of pneumonia diagnosed among five previously healthy men; subsequently, the disease was diagnosed in men and women across the globe. Thirty years later, the human immunodeficiency virus (HIV) infection is no longer inevitably fatal. The history of the acquired immune deficiency syndrome (AIDS) epidemic and research being conducted in the United States and elsewhere are discussed in Chapter 13 and 14.

The magnitude of the AIDS crisis grew rapidly in the United States, with rising mortality solidifying the activist community that demanded funding for research and treatment. Public and private funds enabled researchers with the benefit of technologic advances to rapidly identify the infectious agent, human immunodeficiency virus (HIV), and modes of transmission.[38] By 2008, an estimated 1.2 million Americans were living with HIV infection and almost 600,000 had died of AIDS. Figure 13-2 indicates that incidence rates among women vary considerably within the United States.

Treatment has changed the life-course trajectory of people living with AIDS and HIV infection. Although avenues for primary prevention of HIV infections are not yet available, Figure 1-6 indicates the changing patterns of the disease as the numbers of new diagnoses and deaths have declined and survival rates have continued to increase. Women and men with access to appropriate medication are able to live relatively normal lives

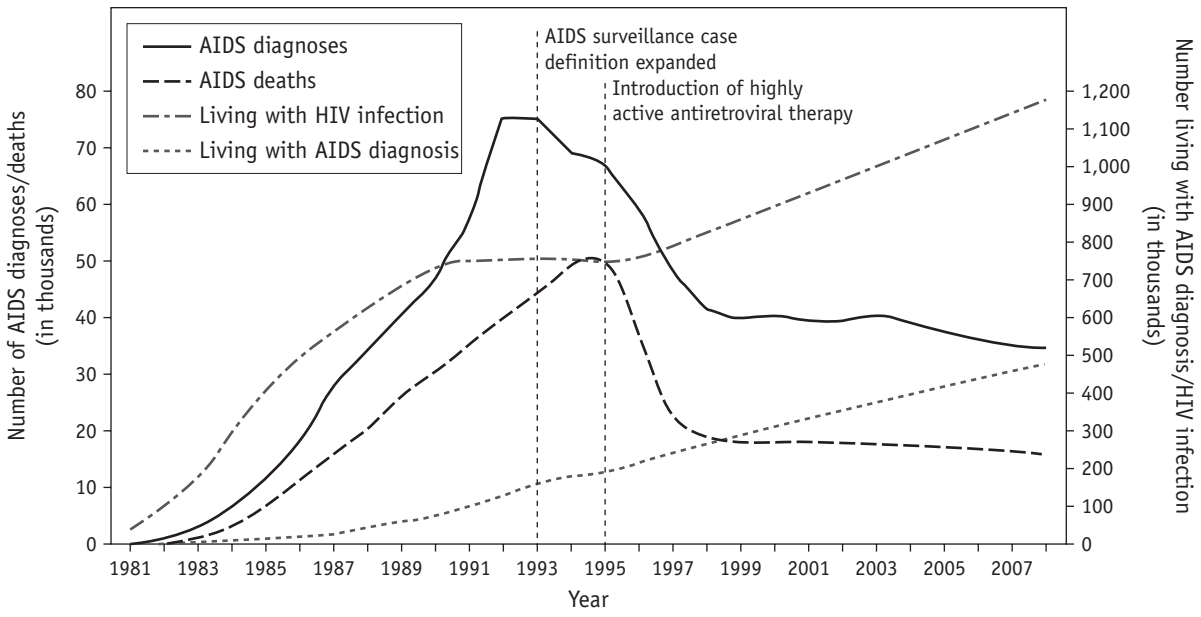


Figure 1-6 Estimated number of AIDS diagnoses and deaths and estimated number of people age > 13 living with diagnosed or undiagnosed HIV infection, United States 1981–2008.

Source: Reproduced from HIV surveillance – United States, 1981–2008. Morbidity and Mortality Weekly Report 2011;60:689–693.

and will subsequently be at risk for diseases common among older Americans without a history of HIV infection. Early in the history of AIDS, the focus on women was limited to potential maternal transmission during pregnancy or delivery; now the unique needs of female HIV/AIDS patients are also being addressed. The demands of activists resulted in the development of lifesaving antiretroviral therapies that have prolonged the lives of millions of Americans, although access to treatment is limited in some segments of the American population.

V. Psychologic and Psychosocial Conditions: Chapters15 to 20

The six chapters in this section present psychologic conditions that are experienced with greater frequency among women than men. Women are more likely to be diagnosed with episodes of depression and anxiety disorders, and greater than 90% of eating disorder patients are female. Although more men succeed in taking their own lives, among women, suicide is the fifth cause of death between ages 25 and 44 and the fourth cause of death at younger ages. Fluctuating ovarian hormones following puberty may precipitate emotional responses triggering some mental health conditions. Partner violence is a highly prevalent risk to women's physical and mental health and is closely associated with depression, posttraumatic stress disorder, and alcohol and substance use. Partner violence is the primary cause of intentional death to women; in 2007, intimate partner violence resulted in more than 1,600 female deaths in the United States.[39] Understanding the epidemiology of psychologic and psychosocial conditions has led researchers to appreciate the need for integrated care joining clinical and socioecologic public health approaches to prevent and to lessen the impact of these risks. Bipolar disease is among the most serious psychologic conditions affecting women owing to the difficulty in diagnosis, especially differentiating bipolar disorders from major depression. Suicide is more frequent among these bipolar patients than among women with other psychologic conditions. Alcohol use is a greater problem among men than women, although substance use disorders have adversely affected the physical and mental health of both women and men.

VI. Endocrine and Autoimmune Conditions: Chapters 21 to 24

According to the NIH, 23.5 million Americans have symptoms of an autoimmune disease. Among the more than 80 conditions influenced by women's endocrine system are lupus, diabetes, multiple sclerosis, and asthma, discussed in the chapters in this section. Autoimmune diseases are among the top 10 causes of death of women ages 15 to 64. Although these conditions may also affect men, more than 75% of those affected are female, and for some conditions the ratio is as high as 9:1. Research has not fully explained the gender differences in autoimmune disorders but hormonal influences appear to have a major role. Every organ system of the body is affected by these autoimmune conditions; symptoms vary widely among affected women and change over the life course, which often complicates diagnosis. Endocrine and autoimmune conditions producing long-term disability and requiring complex monitoring and treatment with multiple drugs are frequently diagnosed among younger women.[40] Pregnancy may exacerbate the course of some autoimmune conditions while improving the course of others; however, autoimmune diseases are a major cause of infertility and pregnancy loss. Hereditary patterns of some autoimmune conditions

have been noted within affected families; however, a wide range of environmental exposures have also been studied among clusters of cases, especially those with sudden onset of symptoms.

VII. Malignancies: Chapters 25 to 30

Responding to public demands, Congress passed the National Cancer Act in 1971 launching the "War on Cancer," which directed the National Cancer Institute (NCI) to "collect, analyze and disseminate all data useful in the prevention, diagnosis and treatment of cancer."[41] The knowledge gained from the vast amount of research conducted with federal funding has enhanced understanding of carcinogenesis, enabling improved detection, treatment, and avenues for prevention. Over the past 50 years, technologic advances have clarified the role of damaged DNA as a critical first step initiating malignant transformation, although the biologic mechanisms of carcinogenesis remain incompletely understood. Now the focus of research has shifted to identifying inherited genetic variations that increase cancer risk by interacting with environmental exposures that induce multiple genetic alterations, which ultimately initiate a malignancy.[42] The once-normal cell with controlled cell division becomes a growing cluster of rapidly dividing cancer cells. Genetic alterations may begin in utero followed by multiple exposures during youth, leading to diagnosis many years later. People with increased genetic susceptibility often develop more aggressive cancers at earlier ages.

Many epidemiology investigations rely on national data collected through the NCI-funded Surveillance, Epidemiology, and End Results (SEER) program, which has documented regional incidence and mortality patterns reflecting differences within the American population by race/ethnicity, culture, environmental exposures, immigration patterns, etc. The addition of state tumor registries has expanded data sources to include incidence and mortality information from hospital pathology departments, laboratories, treatment centers, and clinicians, enhancing researchers' ability to identify high-incidence regions and monitor mortality rates. Site-specific cancer rates vary considerably across the country by age, race/ethnicity, education level, and socioeconomic status, providing important clues to disease etiology. The chapters in Section VII each review recognized and suspected risk factors that have been studied in relation to cancer development of different organs.

CDC data from 1960 to 2007 (Figure 1-7)[43] indicated dramatic reductions in deaths from heart disease and stroke. During the past 50 years, heart disease mortality declined more than 60% and stroke more than 75%. If the death rates of 1960 had remained unchanged, more than 1.5 million more deaths from these two conditions would be occurring annually. Compared with the more limited success in cancer, progress has been more rapid in controlling heart disease, although research was initiated with the Framingham Study several decades before the war on cancer was launched. However, several chapters note that national data confirm results from small, targeted studies that reported modest declines in cancer mortality during the past decade.

Table 1-2 notes site-specific risk for women by age 85; the six chapters address specific risk factors and available screening methods for lung, breast, ovarian, colon, endometrial, and cervical cancer. Multidisciplinary research has recently identified specific bacterial and viral causes of some malignancies, including the association of *H. pylori* with stomach cancer[44] and human papillomavirus (HPV) with cervical cancer.[45] Development of HPV vaccines enables primary prevention and the potential for dramatic reductions of cervical cancer incidence and mortality in the United States and especially in developing countries if vaccines are provided to those at highest risk.[45] However, investigators have cautioned that susceptibility to these

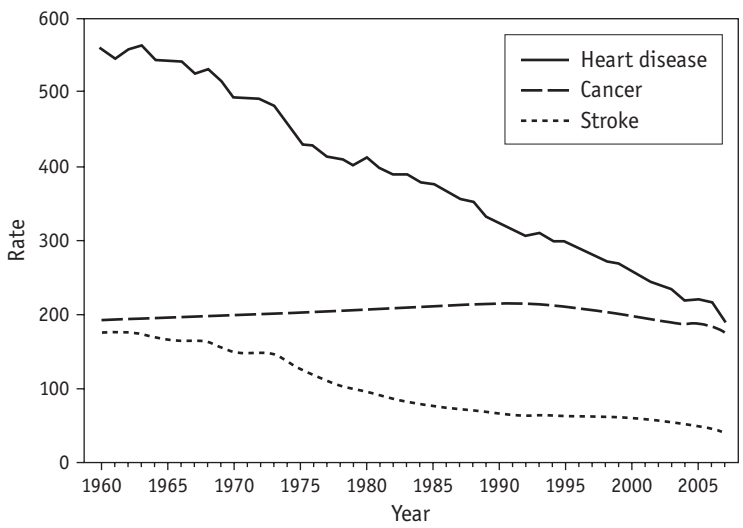


Figure 1-7 Age-adjusted death rates for heart disease, cancer, and stroke. United States, 1960–2007.

Data from National Center for Health Statistics. Health, United States, 2010: With Special Feature on Death and Dying. Hyattsville, MD. 2010. Available at www.cdc.gov/nchs/data/hus/hus10.pdf

Table 1-2

Estimated lifetime probability of developing cancer, by site, women by age 85, US, 2010

Site	Risk
All sites	1 in 3
Breast	1 in 8
Lung & bronchus	1 in 16
Colon & rectum	1 in 22
Uterine—endometrial	1 in 39
Non-Hodgkin lymphoma	1 in 56
Ovary	1 in 72
Melanoma	1 in 78
Pancreas	1 in 81
Urinary bladder	1 in 88
Uterine cervix	1 in 147

Data from Cancer Facts & Figures 2010, American Cancer Society http://www.cancer.org/acs/groups/content/@epidemiologysurveilance/documents/document/acspc-026238.pdf

cancers and many others is more complex than identification of single etiologic agents as social factors also affect disease risk.

Cancer develops through the interaction of genetic susceptibility and environmental exposures; risk may also vary due to person-specific time points of vulnerability. Social determinants interact with physiologic, emotional, and behavioral patterns to influence risk. Most epidemiologic research cannot predict cancer risk for specific individuals, but notes patterns to guide public health programs affecting the population at large.[24]

VIII. Chronic Conditions: Chapters 31 to 35

Significant declines in cardiovascular disease mortality compared with more limited reductions in cancer mortality are noted in Figure 1-7. Research conducted over the past 50 years identified factors associated with heart disease that led to changes in personal health behaviors associated with dietary patterns and diminished smoking that significantly reduced mortality. Preventive medications have lowered risks, and major advances in therapeutic interventions (discussed in Chapter 31) have greatly improved survival after cardiovascular events. Because symptoms of heart disease differ for women and men, the disease was often not recognized from the symptoms women reported, and some researchers have suggested women were not treated as aggressively as their conditions warranted, resulting in higher mortality. Greater public health attention needs to be focused on the known risk factors, including sedentary behavior, high body mass index, smoking, hypertension, and high cholesterol levels.

Chronic conditions are often characterized by musculoskeletal pain requiring medical treatment. The National Health Interview Survey of 2009 included a question about migraine-type pain lasting at least 24 hours; 22% of women compared with 10% of men reported they experienced migraine headaches that frequently affected their quality of life at varying ages from early adolescence to elder years. In contrast, back pain was almost equally reported by men and women as noted in Figure 1-8. Arthritis and fibromyalgia cause significant pain and disability for women; risk factors and treatment options are discussed in Chapters 33 and 34. Osteoporosis, a major cause of morbidity and mortality, affects many older females; hip fracture, specifically, has been found to be a final debilitating illness among a significant number of older women, as noted in Chapter 35. Comorbidity, diagnosis, and treatment of several simultaneous health conditions is a frequent occurrence complicating clinical options, especially at older ages.

IX. Aging: Chapters 36 to 39

As presented in several chapters, life expectancy has significantly lengthened, especially in the past few decades, increasing the importance of health maintenance during younger ages to preserve wellness and prevent illness at older ages. Health behaviors initiated during youth and maintained over time, especially practices such as exercise and weight control, are essential to maintaining mobility at older ages even in the face of increasing disabilities.

Many older women experience comorbid conditions that result in dependence on clinicians and healthcare providers. Researchers have been considering optimum approaches for providing clinical care with the greatest efficiency and compassion. The psychologic and emotional burdens associated with needing assistance, especially when performing activities of daily living, often precipitate depressive episodes. Bereavement associated

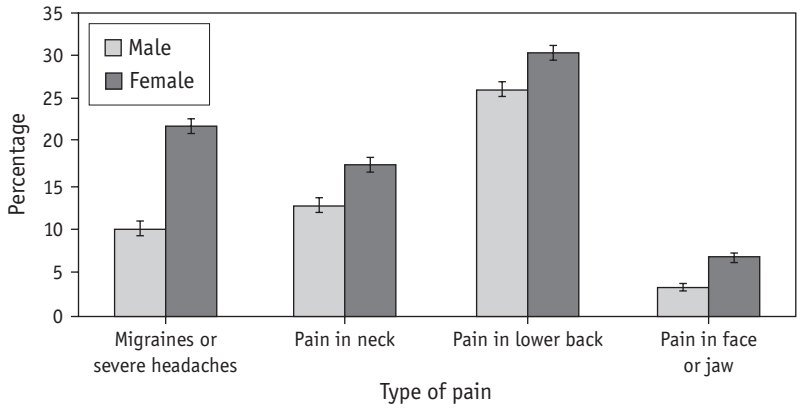


Figure 1-8 Percentage of adults [age >18] reporting pain lasting more than 24 hours by sex. National Health Interview Survey, 2009.

Source: Reproduced from QuickStats: Percentage of adults who had migraine or severe headaches, pain in the neck, lower back, or face/jaw, by sex – National Health Interview Survey, 2009. Morbidity and Mortality Weekly Report 2010;59:1557.

with the deaths of loved relatives or friends also takes its toll. Community-based organizations may provide important resources for social support and practical assistance.

New therapeutic interventions have reduced mortality from many chronic, disabling conditions that affect women more than men. As the media steadily report increasing prevalence of Alzheimer's disease, many older women fear developing this condition and the associated deterioration of mental functioning. Social interaction is essential for maintenance of an alert mind, although normal aging and genetic susceptibility may influence mental clarity. The four chapters in this section address clinical aspects of aging, psychosocial perceptions of aging women, prevention of unintentional injuries from falls, and Alzheimer's disease.

X. Impact of Research: Lessons from the Past, Future Challenges: Chapters 40 and 41

Cancer screening continues to command the attention of healthcare providers, advocacy organizations, and voluntary agencies; however, as Sackett stated more than 40 years ago, routine screening of the public is costly and may limit funds available for other programs that may offer greater health benefits for more people.[46] He also indicated that early detection modalities have both protective and harmful effects because minimally invasive screening occasionally detects suspicious findings that require more aggressive interventions to determine the true nature of the lesion, causing both physical and emotional harm.[46] These concerns have been debated for more than 60 years and continue to receive attention in the 21st century, as costs of unnecessary or harmful medical care are a pressing issue.[47] The history of mammography screening in Chapter 40 addresses these complex issues.

Studies referenced throughout the text note the role of family history and inherited risk associated with many conditions. Among the goals of the future often discussed in the media and among healthcare providers is personalized medical care based primarily on genetic analyses. Researchers recognize that genetic variations are not all equally likely to cause diseases; therefore, complex technologic methodology is required to identify genetic patterns and to interpret genetic test results. Criteria have been developed for genetic testing for inherited susceptibility to various conditions. The field is expanding as direct-to-consumer genetic analyses are now available. Chapter 41 presents an overview of some aspects of genetic testing and the role of genetic analyses in the future health of American women. Healthcare providers may consider epidemiologic research results when planning preventive modalities and treatment decisions with their female patients based on family history and genetic testing. However, population-based results may not pertain to individuals whose person-specific risk characteristics extend beyond gender, age, and family history categories. Inherited susceptibility, personal health behaviors, reproductive decisions, and environmental exposures are among the many others factors that influence an individual's risk of disease and age at onset.[24]

Summary

This textbook aims to identify and promote public health efforts that may lower premature morbidity and mortality among women by emphasizing avenues for health maintenance and identifying common causes of disease among American women. Many factors are believed to contribute to poor health of some segments of the population, including those with limited access to health care who often lack health insurance or have inadequate coverage.[48] Studies indicate health outcomes are improved when clinical care is synchronized by a team of concerned providers after establishing a trusting relationship with their patients. Currently, the U.S. healthcare system limits opportunities for consistent and personalized care. The potential for change exists under provisions of the 2010 Affordable Care Act or other legislation. Patients and healthcare providers may have unique opportunities to reduce disparities through greater access to health

education, coordinated care, and improved opportunities for disease prevention.

We planned this book to provide undergraduates, graduate students, and health professionals with baseline understanding of many conditions that affect women's health, hoping to stimulate career development among those using the text. Chapter topics were selected based on their frequency of occurrence, severity of symptoms, and effects on quality of life. Some normal health transitions across the life span as well as the effects of aging received attention, in addition to diseases requiring aggressive therapy. Although most health issues included in the text have a significant impact on the quality of women's lives, many other important problems could not be presented and may be explored by interested faculty and students. The collaborating authors are drawn from diverse public health and allied backgrounds, including clinicians and researchers. This overview of women's health across the life span should also be valuable for students entering fields outside of public health and the health professions who should benefit professionally and personally from greater understanding of some health issues women experience across the life span.

Discussion Questions

1. Why does women's health require special attention? What are some major health differences between women and men from early ages through the life course?
2. How has medical history in the 20th century influence health status of women in the 21st century? What role has reproduction played in overall health status?
3. How has treatment for HIV/AIDS, heart disease, and other conditions differed when men and women are compared?
4. Has the political climate in the United States influenced women's health or women's health research? Why women were often excluded for clinical trials that enrolled and studied only men?
5. How do psychologic and social factors interact with personal health behaviors to influence health status? In planning a public health intervention, how might the psychological and social issues contribute to the planning?

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