

Section I
Overview and Epidemiology

Chapter 1
Introduction and Overview

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Introduction

The 1964 Surgeon General’s report, *Smoking and Health*, is now widely viewed as a transformative report that helped initiate concerted efforts to reduce tobacco use in the United States.^{1,2} Decades of research and implementation of evidence-based measures have produced significant declines in cigarette smoking, reduced exposure to secondhand smoke (SHS), and reduced tobacco-related mortality.³ For example, the overall prevalence of cigarette smoking among U.S. adults declined from 42% in 1965³ to 15.1% in 2015.⁴ Additionally, tobacco control efforts dating from 1964 are credited with averting an estimated 8 million premature deaths by 2012.⁵

However, progress in reducing tobacco use and related morbidity and mortality has not been equally distributed across population groups. Indeed, the 2014 Surgeon General’s report, *The Health Consequences of Smoking—50 Years of Progress*, concluded that “although cigarette smoking has declined significantly since 1964, very large disparities in tobacco use remain across groups defined by race, ethnicity, education level, and socioeconomic status (SES) and across regions of the country.”^{3,p.7} As of 2016, few groups have met the Healthy People 2020 objective of reducing adult cigarette smoking prevalence to 12.0%. Some racial/ethnic and other vulnerable population groups have made less progress toward meeting this objective than others⁶ and these population groups experience substantial disparities in smoking-related disease and death.

Tobacco use, particularly in the form of cigarette smoking, remains the leading preventable cause of death in the United States, causing nearly one-third of deaths from cancer.⁷ Today, many of the major aggregate U.S. racial/ethnic groups, particularly African Americans or Blacks, American Indians and Alaska Natives, and Native Hawaiians and Other Pacific Islanders, continue to experience health disparities from the adverse effects of tobacco use and SHS exposure. Studies have also documented higher smoking prevalence among lesbian, gay, bisexual, and transgender (LGBT) populations.⁸ As with racial/ethnic minorities, people who live in poverty or have low educational attainment, blue-collar and service workers, and other vulnerable groups continue to experience disproportionately greater adverse effects of tobacco use and SHS exposure.

The persistence of disparities in tobacco use and subsequent tobacco-related disease underscore the importance of focusing on understanding tobacco-related health disparities (TRHD). The goal of this NCI monograph, *A Socioecological Approach to Addressing Tobacco-Related Health Disparities*, is to synthesize the research literature on the many factors that influence and contribute to TRHD across the tobacco use continuum, and to provide guidance for future research studies.

Health Disparities

In 2002, Carter-Pokras and Baquet published what may be the first review of definitions of health disparities; these authors suggest that “a health disparity should be viewed as a chain of events signified by a difference in: (1) environment, (2) access to, utilization of, and quality of care, (3) health status, or (4) a particular health outcome that deserves scrutiny.”^{9,p.427} During the early 1990s, researchers, government agencies, and public health practitioners began referring to health differences in population groups in the United States as “health disparities,”⁹ reflecting a focus on eliminating disparities at local, state, and national levels. Other authors have also contributed to our understanding of health disparities, health inequalities, and related concepts.^{10–13}

As definitions of disparities have evolved in the scholarly literature, Healthy People, which delineates 10-year national objectives for improving the health of the U.S. population,⁶ has also refined its definition of disparities and changed its goals in relation to them.¹⁴ Healthy People 2000 established the goal of *reducing* health disparities,¹⁵ which was expanded to *eliminating* health disparities in Healthy People 2010.¹⁴ Healthy People 2020 includes addressing both *health equity* and *health disparity*:

1. Health equity: “attainment of the highest level of health for all people. Achieving health equity requires valuing everyone equally with focused and ongoing societal efforts to address avoidable inequalities, historical and contemporary injustices, and the elimination of health and health care disparities.”¹⁴
2. Health disparity: “a particular type of health difference that is closely linked with social, economic, and/or environmental disadvantage. Health disparities adversely affect groups of people who have systematically experienced greater obstacles to health based on their racial or ethnic group; religion; socioeconomic status; gender; age; mental health; cognitive, sensory, or physical disability; sexual orientation or gender identity; geographic location; or other characteristics historically linked to discrimination or exclusion.”¹⁴

The Healthy People 2020 goal combines both concepts: “to achieve health equity, eliminate disparities, and improve the health of all groups.”¹⁴

History of Research on TRHD

Recognition of the importance of studying TRHD has grown over time. This section discusses major milestones in this effort: two landmark Surgeon General’s reports, the first U.S. national conference devoted to this topic, and the Tobacco Research Network on Disparities, a research network funded by the National Cancer Institute (NCI) in partnership with the American Legacy Foundation (now known as the Truth Initiative).

The Surgeon General’s Report on the Health Consequences of Smoking in the Workplace

The 1985 Surgeon General’s report, *The Health Consequences of Smoking: Cancer and Chronic Lung Disease in the Workplace*,¹⁶ focused on the role of cigarette smoking and occupational exposures in the development of lung cancer and chronic lung disease. This report helped set the stage for more in-depth investigations of the relationship between social and occupational class and tobacco use, exposure to secondhand smoke, and disease outcomes. The report highlighted the intersection of racial disparities and occupational status, and drew several conclusions relevant to health disparities by race/ethnicity, sex, and employment, which include:

1. Among men, a substantially higher percentage of blue-collar workers than white-collar workers currently smoke cigarettes. Operatives and kindred workers have the highest rate of current smoking (approaching 50 percent), with professional, technical, and kindred workers having the lowest rates of current smoking (approximately 26 percent).^{16,p.53}
2. Blue-collar occupations have a lower percentage of former smokers than white-collar occupations; this difference is most pronounced among men. Among women, the pattern for homemakers closely parallels that of white-collar women.^{16,p.55}

3. Black workers have higher smoking rates than white workers, with black male blue-collar workers exhibiting the highest smoking rate. Black workers also have lower quit rates than white workers. In contrast, white workers of both sexes are more likely to be heavy smokers regardless of occupational category.^{16,p.55}

One chapter of this Surgeon General's report highlighted research on workplace smoking intervention programs, concluding that they should be a major component of worksite-based health promotion efforts.

The Surgeon General's Report on Tobacco Use Among Racial/Ethnic Minority Groups

Although several previous Surgeon General's reports have addressed differences in tobacco use by various subgroups, the tobacco disease burden among racial and ethnic groups in the United States was the specific focus of the 1998 Surgeon General's report *Tobacco Use Among U.S. Racial/Ethnic Minority Groups: African Americans, American Indians and Alaska Natives, Asian Americans and Pacific Islanders, Hispanics*.¹⁷ This landmark report summarized information on risk factors and patterns of tobacco use as well as national and regional efforts to reduce tobacco use among four major racial and ethnic minority groups. The report reached five major conclusions:

1. Cigarette smoking is a major cause of disease and death in each of the four population groups studied in this report. African Americans currently bear the greatest health burden. Differences in the magnitude of disease risk are directly related to differences in patterns of smoking.
2. Tobacco use varies within and among racial/ethnic minority groups. Among adults, American Indians and Alaska Natives have the highest prevalence of tobacco use, and African American and Southeast Asian men also have a high prevalence of smoking. Asian American and Hispanic women have the lowest prevalence.
3. Among adolescents, cigarette smoking prevalence increased in the 1990s among African Americans and Hispanics after several years of substantial decline among adolescents of all four racial/ethnic minority groups. This increase is particularly striking among African American youths, who had the greatest decline of the four groups during the 1970s and 1980s.
4. No single factor determines patterns of tobacco use among racial/ethnic minority groups; these patterns are the result of complex interactions of multiple factors, such as socioeconomic status, cultural characteristics, acculturation, stress, biological elements, targeted advertising, price of tobacco products, and varying capacities of communities to mount effective tobacco control initiatives.
5. Rigorous surveillance and prevention research are needed on the changing cultural, psychosocial, and environmental factors that influence tobacco use to improve our understanding of racial/ethnic smoking patterns and identify strategic tobacco control opportunities. The capacity of tobacco control efforts to keep pace with patterns of tobacco use and cessation depends on timely recognition of emerging prevalence and cessation patterns and the resulting development of appropriate community-based programs to address the factors involved.^{17,p.6}

Recognizing the disproportionate burden of tobacco-related disease for the four major racial/ethnic groups, the 1998 report also concluded that "rates of tobacco-related cancers (other than lung cancer) vary widely among members of racial/ethnic groups, and they are particularly high among African American men."^{17,p.185} The report also concluded that "levels of serum cotinine (a biomarker of tobacco exposure) are higher in African American smokers than in white smokers for similar levels of daily

cigarette consumption. Further research is needed to clarify the relationship between smoking practices and serum cotinine levels in U.S. racial/ethnic groups. Variables such as group-specific patterns of smoking behavior (e.g., number of puffs per cigarette, retention time of tobacco smoke in the lungs), rates of nicotine metabolism, and brand mentholation could be explored.”^{17,p.185}

Tobacco Use Among U.S. Racial/Ethnic Minority Groups was also the first Surgeon General’s report to document the historical context of tobacco use for various groups. As the report describes:

- Blacks contributed to the British and American economies by working in tobacco fields as slaves; after emancipation, they farmed tobacco as a cash crop in the same southern states where slavery had previously been legal.
- Many North and South American Indians and Alaska Native groups cultivated and traded tobacco and used it for ceremonial, sacred, and medicinal purposes. Some American Indians continue these traditional practices, and some American Indians have come to rely on revenue derived from tobacco sales on reservations.
- Migrants to the United States bring with them the cultural attitudes and practices characteristic of tobacco use in their native countries, such as the custom of giving gifts of tobacco in some Asian countries.

This Surgeon General’s report also discusses tobacco industry support for racial/ethnic minority communities, including direct employment, advertising revenue, support for community organizations, and financial support for education, cultural, civic, sporting, arts, and other programs and events.¹⁷

The National Conference on Tobacco and Health Disparities

The first comprehensive definition of TRHD was developed by the 2002 National Conference on Tobacco and Health Disparities: Forging a National Research Agenda to Reduce Tobacco-Related Health Disparities, co-sponsored by NCI, the Centers for Disease Control and Prevention (CDC), the American Legacy Foundation (now known as the Truth Initiative), the Robert Wood Johnson Foundation, the American Cancer Society, the Campaign for Tobacco-Free Kids, the National African American Tobacco Prevention Network, and the National Latino Council on Alcohol and Tobacco. The 2002 National Conference sought to follow up on recommendations in the 1998 Surgeon General’s report and galvanize research aimed at reducing disparities. This conference brought together practitioners and researchers from multiple disciplines to review current research, identify gaps, and develop a comprehensive research agenda to eliminate TRHD, which resulted in more than 100 recommendations from the meeting participants.

The conference defined TRHD as “differences in patterns, prevention, and treatment of tobacco use; the risk, incidence, morbidity, mortality, and burden of tobacco-related illness that exist among specific population groups in the United States; and related differences in capacity and infrastructure, access to resources, and environmental tobacco smoke exposure.”^{18,p.211} Fagan and colleagues¹⁹ later modified the definition to capture more details about patterns of tobacco use that affect prevention and treatment—that is, differences in the tobacco use continuum: exposure to tobacco, tobacco use initiation, current use, number of cigarettes smoked per day, quitting/treatment, relapse, and health consequences. In addition, the authors specified that differences in capacity, infrastructure, and access to resources include differences in access to care, quality of health care, socioeconomic indicators that impact health care, and psychosocial and environmental resources.¹⁹ The definitions were intended to help guide empirical

inquiry into the proximal and distal determinants of tobacco use, nicotine addiction, and the health consequences of tobacco use among understudied and historically underserved populations in the United States.

The Tobacco Research Network on Disparities

In 2004, NCI in partnership with the American Legacy Foundation launched the first national research initiative focused on TRHD, the Tobacco Research Network on Disparities (TReND), with the mission of “eliminating tobacco related disparities through transdisciplinary research that advocates the science, translates this scientific knowledge into practice and informs public policy.”^{20,p.ii3} TReND’s specific purposes were to advance the science on TRHD by stimulating new studies, challenging existing paradigms, and addressing significant gaps in research on understudied and underserved populations. TReND sought to:

- Encourage collaborations among multiple research disciplines
- Serve as a forum for generating new ideas and research projects focusing on TRHD
- Establish a translation mechanism for communicating and interacting with other networks and community advocacy groups
- Promote the involvement and training of junior investigators and the participation of senior researchers in health disparities research, and
- Provide scientific information and serve as a resource on tobacco and health disparities issues.

During its tenure, TReND engaged its core members as well as other U.S. and internationally based experts in its research mission. Among its many accomplishments, TReND was the first research network to study the effects and unintended consequences of tobacco control policies on low-SES women and girls.^{21,22} TReND also played a critical role in providing scientific evidence on the potential harm of menthol cigarette smoking in relationship to initiation, current smoking, nicotine dependence, and quitting behaviors.²³

Collectively, the aforementioned reports, conferences, and initiatives have demonstrated the complexity of TRHD. This monograph aims to summarize the extant literature so as to better understand the many factors associated with TRHD, as discussed below.

TRHD: A Multilevel Perspective

Conceptual Framework: The Socioecological Model

Many factors cause different population groups to experience the effects of tobacco use in different ways. This was recognized in the 1998 Surgeon General’s report, *Smoking and Health*, which stated:

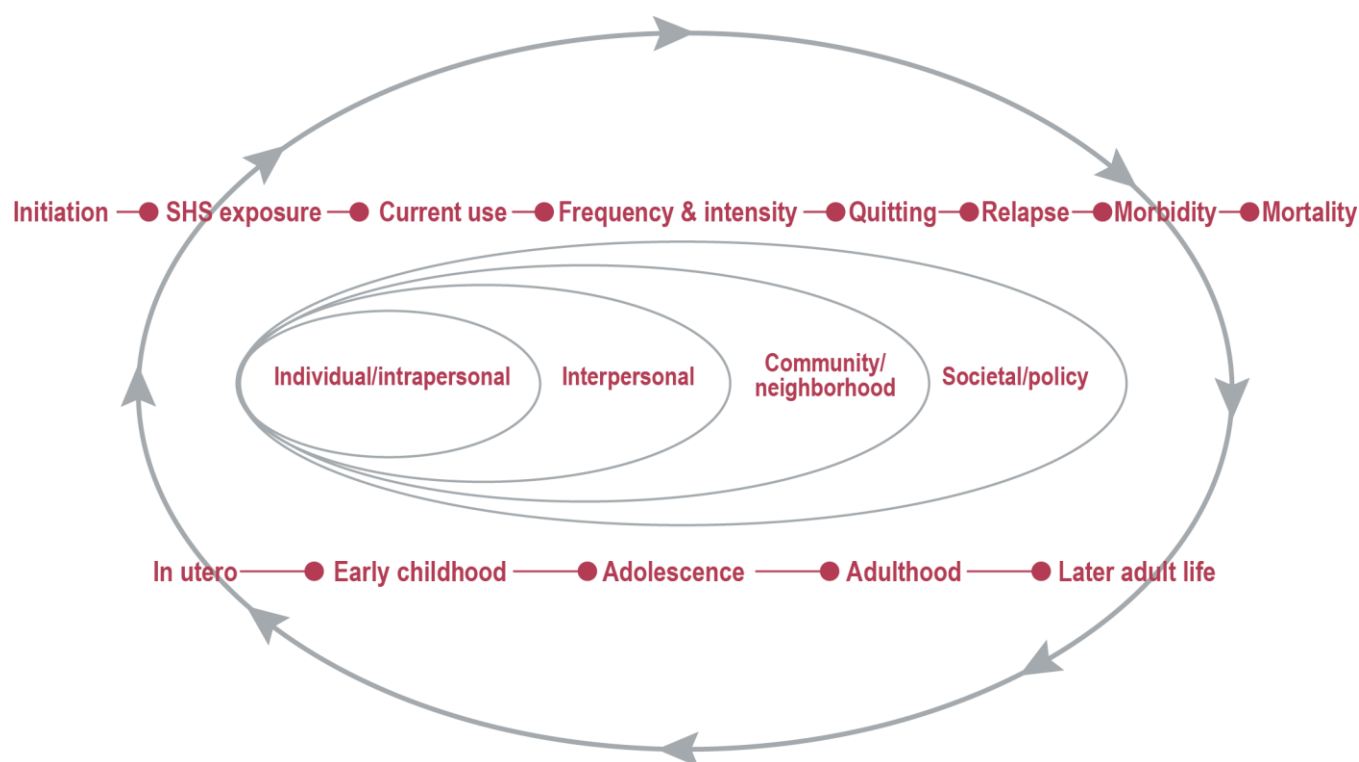
No single factor determines patterns of tobacco use among racial/ethnic groups; the patterns are a result of complex interactions of multiple factors such as socioeconomic status, cultural characteristics, acculturation, stress, biological elements, targeted advertising, price of products, and varying capacities of communities to mount effective tobacco control initiatives.^{17,p.6}

This monograph uses the socioecological model (SEM), which provides a framework for examining how multilevel factors can influence TRHD across the life span.²⁴ The SEM is a commonly used

framework for examining multiple levels and interrelated influences on human behavior and the health of individuals within a system.²⁴ In addition to explicating these multiple interrelated influences, the model has been used to design interventions to influence health behaviors and the health of individuals. The socioecological model evolved from Bronfenbrenner's conceptual ecological systems model and has undergone multiple iterations over the years.²⁵ Bronfenbrenner hypothesized that human behavior could be understood in terms of the individual's entire ecological system, made up of four subsystems that influence behaviors: individual; interpersonal; community/organizational; and policy/society.²⁵

As shown in Figure 1.1, individual/intrapersonal, interpersonal, community/neighborhood, and societal/policy factors influence TRHD across the tobacco use continuum and across the life course. These systems do not operate in isolation, and the interactions between them are complex. Exposures to a number of factors may occur early in life, cumulatively, and chronically; they may help explain TRHD observed among racial/ethnic minority groups and low-SES groups, and at the intersection of these groups.

Figure 1.1 The Socioecological Model: Factors Influencing TRHD Across the Tobacco Use Continuum and Life Course



Notes: In addition to the experience of TRHD over time, there may be critical periods during development and throughout the life course when tobacco use or secondhand smoke exposure is significantly more detrimental than at other times. SHS = secondhand smoke.

The system within which many minority racial/ethnic and low-SES groups live and work incorporates substantial disparities. That is, the neighborhoods in which they live are often largely segregated^{26,27} and have fewer neighborhood resources, including resources related to health care, education, economic opportunity and security, and political capital, relative to more advantaged groups. Among African Americans and Hispanics, poverty rates are approximately double those of whites and Asian Americans; these groups also have lower median incomes than whites and Asian Americans.²⁸ As the monograph

will describe, tobacco advertising is often disproportionately targeted toward low-income and minority communities, which typically lack the resources to prevent and treat tobacco use; some of these communities also have a cultural or economic connection to tobacco and/or to the tobacco industry. In 2014, African American men had the highest incidence of and mortality from several tobacco-related cancers, including cancer of the lung and bronchus, kidney and renal pelvis, pancreas, and larynx (see chapter 2).

The socioecological model underscores the interrelationships between tobacco use and multiple disparate circumstances—social, educational, health, residential, economic, and political disparities—and how each influences the other. This model makes it possible to critically examine the dynamic influences of factors (e.g., stressors, social or financial difficulties) on tobacco–disease trajectories, the timing of exposure to these factors, and the clustering of these factors at different points in relationship to disease outcomes. The socioecological model calls attention to the chronicity and incidence of disadvantages (e.g., discrimination, disenfranchisement, low SES) and how these disadvantages influence disparities even if conditions improve for individuals or population groups.

About This Monograph

This NCI monograph, *A Socioecological Approach to Addressing Tobacco-Related Health Disparities*, is the most comprehensive review of tobacco use among racial/ethnic minority and low socioeconomic status populations since publication of the 1998 Surgeon General’s report. The monograph takes a socioecological approach to describe differences between population groups across the tobacco use continuum (i.e., initiation, secondhand smoke exposure, current tobacco use, number of cigarettes smoked per day, cessation, morbidity, and mortality) as well as differences in access to tobacco dependence treatment among minority racial/ethnic and low socioeconomic status groups.^{18,19} Where possible, the monograph presents the evidence by age, sex, sexual orientation, and gender identity within the context of racial/ethnic and socioeconomic status groups. (The appendix to this chapter provides information about terminology regarding race/ethnicity and sexual orientation as used in this monograph.)

Additionally, where possible, the monograph takes an intersectionality approach, by focusing on the intersection or interrelationship among two or more demographic factors that are associated with TRHD, including race/ethnicity, sex, and socioeconomic status. Individuals and population groups experience all aspects of their identity simultaneously, and these social distinctions or systems may work together to produce health disparities. Researchers suggest that the interaction of sociodemographic factors shapes a person’s unique life experiences, which ultimately affect their health status.^{29,30}

It is important to note that this monograph is not a review of TRHD for all socially, economically, and otherwise disadvantaged populations in the United States, because no single report could adequately capture the entire range of tobacco use behaviors for all at-risk populations. For example, future reports might describe the complex associations surrounding tobacco use among people with mental health disorders, or examine tobacco use in the context of the addiction, relapse, and recovery cycle as it relates to other substance use (e.g., alcohol, marijuana, and other drugs).

The development of this monograph was informed by several previous efforts to study population differences, strengthen capacity to address differences, and develop interventions to eliminate or reduce TRHD. In particular, major recommendations from the 2002 National Conference on Tobacco and

Health Disparities resulted in a scientific blueprint for examining the complex nature of TRHD.¹⁸ This evidence-based blueprint recommended a renewed focus on surveillance as well as a more comprehensive understanding of the roles that biology, psychosocial factors, socioeconomic factors, tobacco marketing, and tobacco control policy play in preventing tobacco use and treating tobacco dependence. This renewed focus and more complete understanding could help develop the research infrastructure needed to address TRHD.¹⁸

Other nationally funded initiatives that have addressed TRHD include NCI's Special Population Networks,³¹ and a number of cooperative agreements with the CDC, including the Consortium of National Networks to Impact Populations Experiencing Tobacco-Related and Cancer Health Disparities,³² A Comprehensive Approach to Good Health and Wellness in Indian Country,³³ Racial and Ethnic Approaches to Community Health,³⁴ Communities Putting Prevention to Work,³⁵ and Community Transformation Grants.³⁶

Goals of the Monograph

The goal of this NCI monograph is to synthesize the research literature on the many factors that influence and contribute to TRHD across the tobacco use continuum so as to guide future research on TRHD, and to inform the design and implementation of interventions to improve the health of individuals and populations that bear the greatest burden of TRHD. It is hoped that such interventions can be applied at critical points along the tobacco use continuum, at the appropriate times and places during the lives of individuals, and for populations at risk for continued tobacco use and SHS exposure.

The review of the literature presented in this monograph is intended to inform researchers, policymakers, funding agencies, community-based organizations, faith-based institutions, stakeholders in diverse communities, institutions of higher education, and organizations that focus on reducing health disparities. Because this monograph was written to meet the different needs of these varied groups, some chapters are written in more technical language than others.

Preparation of the Monograph

This monograph underwent a rigorous development process that drew upon the expertise of many subject matter specialists—52 contributing authors, 8 section editors, a senior volume editor, and a scientific advisor—with extensive experience in the science of TRHD. The Senior Volume Editor and the Scientific Advisor led the editorial team, which developed the shared vision of the monograph's purpose, focus, and content; they also provided guidance and feedback on the monograph's content. Section editors were selected based on their expertise in areas aligned with the conceptual framework of the monograph. Given responsibility for specific topics, the section editors helped develop chapter outlines; identified authors and reviewers; and contributed to development, review, and editing of chapters. Chapter authors were selected by the editors and NCI based on their expertise and its relevance to the monograph. In addition to multiple internal reviews by the editorial team, each chapter was reviewed by external expert peer reviewers, and the monograph also underwent a full volume review. The monograph also received a final review by NCI before publication. In all, 47 reviewers participated in this process.

In general, the monograph examines the research literature through December 2013. Where necessary, key publications and reports published after 2013 were added to individual chapters. The landscape of tobacco use and tobacco control continued to change during the development of this monograph. For example, the use of emerging products such as electronic cigarettes and flavored cigars increased among some populations, and policies implemented by the Food and Drug Administration (FDA) under the Family Smoking Prevention and Tobacco Control Act of 2009 took effect. Because cigarette smoking is the leading cause of preventable death in the United States, this monograph focuses primarily on cigarette smoking and secondhand smoke exposure; where possible, studies on TRHD related to the use of other tobacco products are also included.

Major Conclusions of the Monograph

The five broad conclusions that emerge from this volume are as follows:

1. **Enormous progress has been made in reducing overall tobacco use. However, some population groups have benefited less or at a slower pace from efforts to reduce tobacco use. As a result, they experience higher tobacco-related morbidity and mortality, including mortality from cancer.** Progress in reducing tobacco use has been uneven in the United States, and substantially higher rates of tobacco use persist among population groups defined by race/ethnicity, occupation, socioeconomic status, sexual orientation, and other factors. Currently, individuals with low levels of education are at especially high risk of tobacco use, and African Americans have the highest incidence and mortality rates of tobacco-related cancer of all race/ethnicities.
2. **Many factors at multiple levels contribute to TRHD.** Our understanding of TRHD is enhanced by considering the interaction of factors at the individual, interpersonal, community/neighborhood, and societal/policy level and by considering the impact of diverse factors across the tobacco use continuum over the life span.
3. **Research, including simulation modeling, indicates that broader implementation of known effective strategies to reduce tobacco use would contribute substantially to reducing TRHD. However, it is likely that additional strategies will be needed to accelerate reductions in tobacco use among all population groups.** The Family Smoking Prevention and Tobacco Control Act (2009), which gives the FDA the authority to regulate the manufacture, marketing, and distribution of tobacco products to protect public health and to reduce tobacco use, has strong potential to reduce TRHD. In addition, continued innovation in policies and programs at the state and local level holds promise to address TRHD.
4. **Research to understand and address TRHD is of increasing importance to reducing the burden of tobacco use and tobacco-related cancer in the United States.** Disparities in tobacco use contribute substantially to disparities in the burden of cancer by race/ethnicity, SES, and other factors. As overall tobacco use rates have declined, the persistence of higher rates of tobacco use among groups based on race/ethnicity, socioeconomic status, sexual orientation, and other factors plays a larger role in slowing progress towards ending the tobacco epidemic.
5. **Improved surveillance of individual populations and factors that contribute to TRHD will increase our ability to understand and address TRHD.** The marketplace of tobacco products is increasingly diverse, and youth and adult patterns of tobacco use—including light and intermittent use and dual/poly use—are complex and dynamic. Communication technologies continue to evolve at a rapid pace, increasing the need for surveillance of tobacco industry

communication strategies. Enhancing surveillance to allow population-wide categories (such as race/ethnicity) to be disaggregated by sub-groups will facilitate research to understand TRHD.

Monograph Organization and Chapter Overviews

This monograph's organization in 4 sections reflects the socioecological model.

Section I: Overview and Epidemiology

Chapter 1: Introduction and Overview

Chapter 1 provides an introduction to TRHD research, gives a brief history of research in this area, and introduces the reader to the socioecological model, before describing the goals and preparation of this NCI monograph. The chapter also includes the overall monograph conclusions, brief descriptions of topics addressed by the other chapters of this volume and discusses cross-cutting issues for future research.

Chapter 2: The Epidemiology of TRHD

Chapter 2 presents a detailed overview of the epidemiology of TRHD across the tobacco use continuum among youth (12–17 years old), young adults (18–25 years old), and adults in the United States. Using nationally representative data, the chapter highlights trends and current patterns of tobacco use for racial/ethnic minority groups, low-SES, and LGBT populations. This chapter presents the epidemiological data for sociodemographic groups, including trends in (1) youth and young adult susceptibility to cigarette smoking, cigarette smoking initiation, cigarette smoking prevalence and prevalence of other tobacco product use; (2) adult cigarette smoking prevalence, cigarette consumption, cigarette smoking duration, quitting behaviors, and other tobacco use; (3) secondhand and prenatal tobacco smoke exposure; (4) insurance coverage of tobacco dependence treatment; and (5) tobacco-related cancer morbidity and mortality. The chapter concludes with a discussion of some methodological limitations and challenges in the TRHD literature.

Section II: Intrapersonal/Individual Factors Associated With TRHD

Chapter 3: Genetics, Physiological Processes, and TRHD

Chapter 3 explores the relationships between genetic factors and tobacco use behaviors and tobacco-related cancers. First, the chapter discusses genetic factors associated with nicotine metabolism and smoking initiation, progression to established smoking, smoking prevalence, and smoking cessation. Genetic risk factors typically vary in prevalence across racial/ethnic populations and thus can contribute to TRHD among racial/ethnic groups. Second, the chapter describes genetic factors associated with tobacco-related cancers, specifically lung cancer, as well as genetic factors that may influence how the body responds to carcinogens in tobacco smoke. The chapter closes with a discussion of the current state of knowledge about genetic influences on TRHD, including critical knowledge gaps such as the contribution of genetic factors to TRHD in the context of complex socioeconomic environments.

Chapter 4: Flavored Tobacco and Chemosensory Processes

Chapter 4 focuses on the chemosensory effects of flavors in cigarettes and, in particular, on menthol. Flavor additives and ingredients are used to make the experience of smoking more palatable. Menthol, the most common characterizing flavor in cigarettes, has been added to cigarettes since the 1920s.

Menthol is the primary focus of this chapter because when used in cigarettes as a characterizing flavor, the compound affects multiple chemical senses, including the olfactory, gustatory, and trigeminal systems. The chapter describes the characteristics of the menthol compound, the role of the chemical senses in sensory response, the genetics of taste/sensory factors, the characteristics of flavor additives in tobacco, and menthol's effect on the chemical senses and how this may contribute to TRHD.

Chapter 5: Stress-Related Processes and TRHD

Chapter 5 provides an overview of stress processes and relevant conceptual frameworks, discusses physiological responses to stress, how perceived stress may influence tobacco use, and specific stressors such as racism and discrimination and their relationship to tobacco use. It also discusses how stressful events and stress-related processes, such as post-traumatic stress disorders resulting from childhood trauma, or stress as a function of interpersonal factors such as intimate partner violence, may also play a role in TRHD. Where possible, the research is presented separately by sex, race/ethnicity, and sexual orientation.

Section III: Interpersonal and Contextual Factors That Contribute to TRHD

Chapter 6: Social Relationships and TRHD

Chapter 6 addresses the various aspects of social relationships and how they may influence stages of the tobacco use continuum and potentially contribute to TRHD. The chapter begins with a discussion of the structural and functional characteristics of social relationships and then describes measures of social relationships and tobacco use, including social network structure, social influence and comparison, social control, social support, and discrimination. This chapter then reviews the evidence on how social relationships can create or exacerbate TRHD for youth and adults across racial/ethnic groups, SES groups, and sexual orientation groups over the tobacco use continuum.

Chapter 7: TRHD Among Immigrant Populations

Chapter 7 examines how immigration status, nativity, sex, SES, and ethnicity operate individually and synergistically to influence smoking behavior. Patterns of immigration to the United States are briefly discussed, and the literature on the smoking behavior of foreign-born people in the United States is reviewed, including differences within and between immigrant groups, comparisons between immigrant groups and the majority population, and differences between immigrants and their U.S.-born racial/ethnic counterparts. Where possible, the data for adolescents and adults are explored within the context of race/ethnicity, sex, and SES. Issues related to immigrant health generally and smoking behavior specifically are also discussed, and intersections of tobacco use, immigration, and demographic and socioeconomic factors are highlighted.

Chapter 8: Occupation, the Work Environment, and TRHD

Occupational status and the work environment help shape patterns of tobacco use. Chapter 8 examines occupational disparities across the tobacco use continuum and the causal pathway in the progression of smoking to disease, including initiation, current use and intensity, intentions to quit and quit attempts, cessation, relapse, and tobacco-related morbidity and mortality. This chapter also discusses the contributions of the work environment and job experiences to disparities in tobacco use. Because disparities by occupation can interact with other indicators of social disadvantage, this chapter explores the intersections between occupation and race/ethnicity, sex, age, and sexual orientation. Disparities by employment status are also reviewed, given the potential influence of the work environment, working conditions, and social status on tobacco use behaviors.

Chapter 9: Socioeconomic Status and TRHD

Socioeconomic status, whether measured by educational attainment or economic measures, influences health through multiple direct, indirect, and overlapping causal pathways. Chapter 9 provides an overview of the literature on the relationship between SES indicators and TRHD across the tobacco continuum; it reviews this evidence using nationally representative and non-nationally representative data sets for adolescents, racial/ethnic groups, LGBT groups, and pregnant women. The chapter also discusses neighborhood socioeconomic status and the influence of life-course socioeconomic status. Studies show that education—a key factor influencing other socioeconomic indicators such as occupation, income and wealth, and the neighborhood where people live—is closely linked with tobacco use across the continuum.

Section IV: Societal-Level Influences on Tobacco Use

Chapter 10: Communications, Marketing, and TRHD

As discussed in NCI Tobacco Control Monograph 19, *The Role of the Media in Promoting and Reducing Tobacco Use*, both pro-tobacco and anti-tobacco communications and marketing help shape the public's knowledge, attitudes, beliefs, and behaviors around tobacco. Chapter 10 expands and updates the literature to examine the effects of tobacco-related communications on population groups based on age, race/ethnicity, socioeconomic status, and sexual orientation. It begins by describing theoretical frameworks for understanding communications inequalities, then discusses research on the influence of diverse anti-tobacco and pro-tobacco communications on TRHD and on the role of the news media. Studies of how new communication technologies may serve as channels for anti- and pro-tobacco communications are discussed, recognizing that the rapid pace of change in communications technology poses a challenge for researchers.

Chapter 11: Federal, State, and Local Tobacco Control Policy and TRHD

As explained in the 2014 Surgeon General's report, *The Health Consequences of Smoking—50 Years of Progress*, “public health efforts to control tobacco use have been bolstered by policies at the national, state, and local levels.”^{3,p.788} Chapter 11 provides an overview of research on the ability of specific tobacco control policies (including those focused on restricting youth access to tobacco, tobacco tax and price, smoke-free environments, and tobacco treatment) and state-level comprehensive tobacco control programs to reduce TRHD. The chapter also discusses the potential for FDA regulation of the manufacturing, marketing, and distribution of tobacco products (authorized by the Family Smoking Prevention and Tobacco Control Act of 2009) to contribute to reducing TRHD. It also provides

examples of local approaches to reducing the prevalence of youth's tobacco use, such as efforts to ban flavored tobacco products and to raise the minimum age of legal access to tobacco products to 21 years.

Chapter 12: Simulation Modeling of TRHD: SimSmoke

This chapter discusses a modified version of the *SimSmoke* tobacco control simulation model, a statistical model that examines trends in smoking and smoking-attributable death rates and projects the possible effects of various policies. The modified version was developed to examine trends in smoking rates related to income disparities and the potential effects of tobacco control policies on smoking trends. The modified version of *SimSmoke* considers policies in seven areas: cigarette taxes, smoke-free laws, mass media anti-tobacco campaigns, marketing restrictions, health warnings, cessation treatment policies, and preventing youth access. The model's predicted results are presented for recommended policies using the status quo scenario and scenarios with stronger policies. Best-case scenarios with a set of comprehensive policies are also described. This chapter illustrates the potential of broader implementation of evidence-based tobacco control policies to reduce tobacco use and tobacco-related mortality among low-income populations.

Future Directions in TRHD Research

Cross-Cutting Research Issues

Several cross-cutting issues are relevant to future research, particularly as the cultural, policy, and communications contexts of tobacco use and TRHD continue to change. Most studies of TRHD have focused on race/ethnicity, with an emphasis on the largest population groups: African Americans and Hispanics. Although research among these groups remains vital, research is also needed on less populous racial/ethnic groups with high smoking prevalence, including American Indians/Alaska Natives, Native Hawaiians/Pacific Islanders, and Asian American groups such as Filipinos, Koreans, and Vietnamese. In addition, it is now recognized that aggregating ethnic and nationality groups into a larger category can mask underlying differences in smoking prevalence. For example, the Asian American group includes people of Indian, Chinese, Filipino, Japanese, Korean, and Vietnamese origin, and the Hispanic group includes people from Central or South America, Cuba, Mexico, and Puerto Rico. Examining more specific ethnic or nationality groups is important, but can lead to smaller sample sizes, which limits statistical power and/or the generalizability of findings. Thus, the desirability of examining specific ethnic or nationality groups separately must be weighed against the benefits of aggregating groups into a larger category. In addition, although surveys indicate that LGBT groups are at increased risk for tobacco use, there is limited evidence on their tobacco use knowledge, attitudes, and behaviors, and disease-related disparities. The inclusion of questions about sexual orientation and gender identity in national and sub-national surveys will facilitate research in this area.

Most studies reviewed in this monograph have focused on the impact of membership in a single population group (by race/ethnicity, SES, or sexual orientation); however, people who are part of more than one vulnerable population group may be at especially high risk of experiencing TRHD. Currently, we lack sufficient data on which to base conclusions about how identification with multiple minority groups might create or exacerbate TRHD. Advancing our understanding of the effect of membership in more than one vulnerable group on tobacco-related morbidity and mortality is an area requiring further research.

The degree to which tobacco control interventions should be adapted to different cultures and populations remains unclear. Research is needed to determine whether and to what extent programs that are effective among the general population are sufficient to address tobacco use among specific populations, or whether tailored programs are needed. Tailoring can be time-consuming and costly but may increase the effectiveness of the intervention. How to best develop culturally relevant programs to reduce tobacco use and TRHD among populations of interest (i.e., not simply tailoring existing programs) is also an important area for further inquiry and may help determine if such programs lead to faster declines in smoking prevalence.

Tracking trends in the use of new and emerging tobacco products, such as electronic cigarettes, among vulnerable population groups is important and may require expansion of existing surveillance systems or the creation of new ones. Future research on TRHD should also address the use of flavored tobacco products, including menthol products, particularly among youth and young adults. Research to prevent future TRHD related to the use of new and emerging tobacco products is an important area of focus.

Linking national studies and surveillance systems to systems for monitoring federal, state, and local policies would result in more robust surveillance systems and contribute to a more complete picture of tobacco use behaviors and TRHD. Multiple linked surveillance systems are critical to tracking the rapidly changing tobacco marketplace. As measures of emerging tobacco product use are fine-tuned, it will be important to standardize them across these studies and surveillance systems. Including population groups targeted by the tobacco industry in federal, state, and local surveillance systems will be critical to effectively monitor tobacco industry marketing practices across various levels. Surveillance systems should be augmented by the study of contextual factors that affect TRHD, including social norms, cultural values, and community factors, and how they interact with individual psychosocial, genetic, and biological factors.

New challenges to TRHD will continue to emerge. For example, changes in state marijuana laws (including laws that decriminalize or legalize marijuana use or permit the use of medical marijuana) may well influence tobacco use behaviors.^{37–39} Understanding how changing marijuana laws may influence tobacco use initiation, progression to established tobacco use, successful cessation, and dual/poly product use across populations is likely to be increasingly important. Rapidly evolving communications technologies pose both challenges to and opportunities for tobacco control; these deserve attention from researchers.

Conclusion

As noted above, no single monograph can encompass the science of TRHD for all at-risk populations. This monograph focuses on TRHD among groups defined by race/ethnicity and socioeconomic status, presenting the evidence by age, sex, and sexual orientation where possible. It explains the complex and multifactorial nature of TRHD, gleaned by countless researchers and practitioners working to eliminate TRHD. This review of the evidence demonstrates that continued effort is needed to accelerate declines in tobacco use and SHS exposure in order to both reduce current TRHD and to prevent TRHD from increasing in the future.

Improving federal, state, and local infrastructure and resources for designing, delivering, and evaluating programs and policies aimed at reducing tobacco use and SHS exposure is critical to advancing our understanding of TRHD and to reducing the disproportionate burden of tobacco-related cancer among

at-risk populations. Training and mentoring the next generation of TRHD researchers is essential to accelerate progress in reducing TRHD. Collaborative networks and partnerships between researchers and community groups may contribute to this effort.

Over time, tobacco use has evolved from a mainstream behavior to one that is highly concentrated among population groups defined by socioeconomic status, race/ethnicity, sexual orientation, and other factors. Decades of research have documented the extraordinary hazards of tobacco products, helping to transform tobacco-related social norms, policies, and patterns of tobacco use behaviors. The result has been striking declines in tobacco-related deaths, including deaths from lung cancer. Indeed, it has been estimated that 20th-century tobacco control programs and policies are responsible for preventing more than 795,000 lung cancer deaths in the United States from 1975 through 2000.^{40,41} As this monograph demonstrates, a central challenge for cancer control is to ensure that all Americans benefit from advances in tobacco control research and practice.

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Appendix I: Monograph Terms

Racial/Ethnic Groups

The term *race/ethnicity* recognizes both racial and ethnic identities. *Race* is a term that has been used to classify groups based on skin color, physical traits, ancestry, genetics, and social relations. The characterization of race has often been reduced to a simple biological construct; this monograph views race as a social, rather than a biological, construct that has historical and cultural context. In 1997, the U.S. Office of Management and Budget (OMB) provided guidelines for classifying individuals by race. The OMB standards permit the reporting of more than one race and rely on self-identification.¹ The five OMB categories are as follows:

- White – A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.
- Black or African American – A person having origins in any of the black racial groups of Africa.
- American Indian or Alaska Native – A person having origins in any of the original peoples of North and South America (including Central America) and who maintains tribal affiliation or community attachment.
- Asian – A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent, including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam.
- Native Hawaiian or Other Pacific Islander – A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.

The term *ethnicity* refers to distinct groups that have a common culture, heritage, and place of origin. Ethnic groups can be characterized to some extent by the norms, values, and attitudes that arise from their culture of origin and may shape their behavior. However, culture and race/ethnicity are not equivalent, and cultures change over time as groups adapt to new settings and historical contexts. The distinctions between culture and race/ethnicity are particularly important when considering how historical context, psychosocial factors, and psychological processes influence health behaviors and outcomes.

Ethnic groups are also distinguished by more than their culture, and may have attributes associated with their status as minorities within the United States. For example, some ethnic groups are over-represented in lower socioeconomic strata and are subject to stereotypes and prejudices and discrimination related to social class or race. Thus, psychosocial processes related to their experiences, in addition to their culture of origin, may differentiate particular racial/ethnic groups. This monograph uses the term *racial/ethnic group* to encompass the full spectrum of identities within and between groups.

The categorization of blacks or African Americans includes the diverse terminology people use to identify themselves as members of the group. For example, people born in the United States might identify as African American, a social-political term used to affirm ancestry, culture, history in the United States, and U.S. citizenry that goes beyond skin color. People of Caribbean descent or immigrants from other countries might identify as black, the term used in their countries of origin. Where possible, this monograph uses black and African American or black/African American to capture different self-identities and racial/ethnic terms used in national surveys or, when standardizing terms is not appropriate, the terms appear as they do in the literature referenced.

The monograph uses Hispanic/Latino American, Hispanic/Latino, Hispanic, or Latino because various ethnic groups within this aggregate category self-identify with different terms.² This aggregate group includes people of Spanish origin, Puerto Ricans, Cubans, Chicanos, Mexican Americans, and ethnic groups from South or Central America.

American Indians and Alaska Natives include descendants of the original peoples of North, South, and Central America, many of whom maintain their tribal affiliation or community attachment.^{1,3} In 1997, the U.S. OMB expanded its definition of American Indians to include people of South and Central American Indian descent. The approximately 566 federally recognized tribes⁴ and non-federally recognized tribes have their own cultures, languages, beliefs, and practices. Over 200 tribes are located in Alaska alone.⁵ These populations live across the United States in urban and rural areas and on or off reservations or land trust areas. Nearly 60% of American Indians and Alaska Natives live in metropolitan areas.⁶ American Indians and Alaska Natives are the only groups whose tribes are recognized as sovereign nations within the United States. Unfortunately, individual tribal data are often masked within this aggregate category because as a whole, American Indians and Alaska Natives represent 2% of the U.S. population.⁶

The current categorization of Asian Americans and Native Hawaiians and Other Pacific Islanders differs slightly from what was reported in the 1998 Surgeon General's report. The 1997 OMB guidelines required that Asians be considered a separate group from Native Hawaiian and Other Pacific Islanders.¹ A distinction was made between these racial/ethnic groups because Native Hawaiians (descendants of the original people of the Hawaiian Islands, whose origins can be traced back to Polynesian and other cultures) made up only 3% of the Asian and Other Pacific Islander population. Other Pacific Islander is a broad term that may include Samoans, Guamanians, and Chamorros; Polynesians such as Tahitians, Tongans, and Tokelauans; Micronesians such as Chuukese, Palauans, Marshallese; or Melanesians such as Fijians, Guineans, or Solomon Islanders.⁷

All five minority racial/ethnic groups are aggregate categories that include multiple ethno-linguistic groups and multiple ancestries. These groups may have different histories of entry to the United States, settlement in this country, and evolution as racial, ethnic, and minority groups. Race and ethnicity are socially based constructs, but each category, whether in aggregate or disaggregate form, is used to describe the data and explain more about how people who identify as members of aggregate or disaggregate racial/ethnic groups experience TRHD. National, state, and local survey data rely on self-identification for each racial/ethnic group.

Lesbian, Gay, Bisexual, and Transgender Groups

LGBT is an aggregate category that includes groups that are defined by sexual orientation, gender identification, and gender expression. Sexual orientation includes three dimensions—self-identification, sexual behavior, and sexual attraction.⁸ Sexual orientation is most often used to assess health behaviors among LGBT groups. The survey question most often asked to elicit respondents' identification of sexual orientation is, "Do you consider yourself to be . . . heterosexual/straight, gay or lesbian, or bisexual?"⁹ The question that assesses sexual behaviors asks about the sex of the respondent's sexual partners (e.g., men only, women only, both, or no sexual partners). Sexual attraction is often assessed by asking respondents to describe their feelings related to their attractions (e.g., attractions to males and females). Gender identification questions assess the sex of the respondent at birth and the gender reported at the time of the survey.⁸ According to analyses conducted by Flores and colleagues,¹⁰

individuals who identify as transgender are less likely to be white and more likely to be African American/black or Hispanic/Latino than the general U.S. adult population. Those who identify as transgender are often marginalized and are among the most disadvantaged groups in the United States. Many other terms are used to describe LGBT groups, which reflect diversity in identification within the aggregate category.⁹

Note: Socioeconomic status, an overarching theme of this monograph, is defined in chapter 9.

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