

Chapter 15

The Changing Landscape of Tobacco Control— Current Status and Future Directions

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Introduction

This chapter addresses options for tobacco control in the United States moving forward after the 50 years of progress since the 1964 report. In this section, previous chapters have charted the course of the epidemic (see Chapter 13, “Patterns of Tobacco Use Among U.S. Youth, Young Adults, and Adults”) and the state-of-knowledge related to tobacco control (see Chapter 14, “Current Status of Tobacco Control”). They have also documented the burden of tobacco-caused disease and premature death (see Chapter 12, “Smoking-Attributable Morbidity, Mortality, and Economic Costs”). This chapter summarizes the modeling that demonstrates this burden will persist well into the twenty-first century, absent the acceleration in the decline of cigarette smoking. Chapter 16, “A Vision for Ending the Tobacco Epidemic: Towards a Society Free of Tobacco-Caused Death and Disease,” sets out a vision for the future, creating a society free of tobacco-related death and disease. This chapter addresses how that vision can be achieved, considers what we have learned and accomplished to date in tobacco control, and identifies challenges to accelerating the impact of tobacco control and to ending the tobacco epidemic. It considers what else we need to know through research and surveillance

and what are the possible evidence-based paths toward the elimination of premature death, disease, and economic costs caused by tobacco use.

The target for future tobacco control initiatives is already well described in two key national reports: The Institute of Medicine’s (IOM’s) report, *Ending the Tobacco Problem: A Blueprint for the Nation* (Bonnie et al. 2007) and *Ending the Tobacco Epidemic: A Tobacco Control Strategic Action Plan for the U.S. Department of Health and Human Services (Strategic Action Plan)* (U.S. Department of Health and Human Services [USDHHS] 2010a). Potential future directions are examined in the context of today’s rapidly changing tobacco control landscape, and plausible alternative strategies based on proven effective interventions and policies are discussed. Finally, proposed potential end game scenarios are reviewed. Some of these are potentially applicable in the United States, and others that are unlikely in the United States may be applicable elsewhere. They are presented to provide a starting point for exploring potential options that may profoundly reduce preventable disease and death as quickly as possible.

The Tobacco Control Landscape: Over a Hundred Years and Counting

This report’s previous chapters have described the origins of the tobacco epidemic and its century-long course. As discussed in prior Surgeon General’s reports (USDHHS 2000b, 2010b) and in Chapter 2, “Fifty Years of Change 1964–2014” of this report, tobacco has been grown and used in the Americas for many millennia, but widespread use of highly addictive cigarettes is relatively recent, beginning at the end of the nineteenth century. The massive cigarette-attributable disease epidemic we have faced since the middle of the twentieth century was precipitated by the emergence of the modern cigarette industry early in the twentieth century. The epidemic of morbidity and mortality in the United States has been largely driven by cigarette use, the most common form of tobacco use globally (with the exception of South Asia and parts of Africa) (USDHHS 2010b; Giovino et al. 2012).

Since tobacco consumption was first tracked in the 1880s, patterns of use of various combustible and noncombustible tobacco-derived nicotine products have varied

over time, geographically, and among population groups in the United States (Figure 13.1); these various products also have potentially different levels of addiction and toxicity (see Chapter 13 and previous Surgeon General’s reports for discussions of addiction and toxicity [USDHHS 1988, 2000b, 2010b, 2012b]). The rapidity of onset of the cigarette epidemic is notable; cigarette use increased tenfold in the United States between 1908–1925 (from 105 to 1,085 cigarettes per capita) (Figure 13.1) and by the 1940s cigarettes had almost replaced other forms of tobacco use in the United States (Centers for Disease Control and Prevention [CDC] 1999; Giovino 2002; Proctor 2011). This epidemic was fueled by the widespread marketing and dissemination of this product—a combustible, easily-inhaled mass-manufactured cigarette, instead of the less convenient pipes, cigars, and smokeless products widely used in earlier decades (USDHHS 2000b; Giovino 2002; World Health Organization [WHO] 2008; Proctor 2011).

Many factors are responsible for the rapid increase of cigarette smoking, but the tobacco industry was the central driver (see Chapter 2) through: (1) development of industrial technology enabling cigarette mass production, packaging, and distribution (USDHHS 2000b); (2) aggressive pricing and marketing combined with positive portrayals of cigarettes in movies—and endorsements by movie stars, sports idols, and even physicians (see Chapters 2 and 14) (USDHHS 2001, 2012b)—and including cigarettes in daily rations for soldiers in two World Wars (see Chapter 14, and Appendix 14.1 available online at www.surgeongeneral.gov); and (3) widespread industry actions throughout society to advance its interests, including lobbying and using tactics later found to constitute fraud and racketeering, such as misleading the public about the risks of smoking (see Chapter 14) (*United States v. Philip Morris 2006*).

The contemporary era of tobacco control, which originated in the 1950s and 1960s, was motivated by the recognition that tobacco smoking was having devastating and increasing consequences for public health. The rising numbers of cases of lung cancer reported by physicians in the 1920s became a well-documented epidemic of lung cancer deaths among men by the 1950s (see Chapter 4, “Advances in Knowledge of the Health Consequences of Smoking: From 1964–2014”; Figures 4.1 and 4.3). Early epidemiologic investigations readily found evidence that cigarette smoking had a primary role in this emerging lung cancer epidemic among men and also in the parallel epidemic of cardiovascular disease. Increasingly intense tobacco control over the last decades of the twentieth century brought success, considered one of the top public health achievements of the century (CDC 1999; Ward and Warren 2007). The prevalence of adult smoking was dramatically reduced from a high of 42.7% (1965) to 18.1% at present (2012) (see Chapter 13). Annual adult per capita cigarette consumption dropped by 72% from 4,345 cigarettes in 1963 to 1,196 in 2012 (see Figure 2.1). The many actions that drove this decline are described in Chapter 14 and in earlier Surgeon General's reports (see Chapter 14; online Appendices 14.1–14.5) (USDHHS 1989, 2000b).

Looking to the future, tobacco control needs to be shaped to address an increasingly heterogeneous pattern of use of tobacco products, including emerging non-combustible products (Chapter 13). Some of the highest prevalence rates are now among persons of lower socioeconomic status, some racial and ethnic minority groups, sexual minorities (including individuals who are gay, lesbian, bisexual and transgender, and individuals with same-sex relationships and/or attraction), high school dropouts (Fagan et al. 2007; Lee et al. 2009; Garrett et al. 2011; Substance Abuse and Mental Health Services

Administration [SAMHSA] 2013b), persons with mental illness and alcohol and substance abuse disorders (Prochaska et al. 2008; Schroeder and Morris 2010; Villanti et al. 2012; CDC 2013), American Indians and Alaska Natives as well as recent immigrants from high-prevalence countries, and people with complex comorbid medical illnesses (e.g., HIV/AIDS and cardiovascular disease) (Crothers et al. 2009; Hoffman et al. 2009; Marshall et al. 2009; Vidrine 2009; Levine et al. 2010; Tesoriero et al. 2010; Pines et al. 2011; Rahmanian et al. 2011). There is also substantial geographic variation with the highest prevalence rate in Appalachia and the South (Pickle and Su 2002).

Smoking cessation needs increased attention. Although there has been significant progress during the last 50 years, there is a major gap between the current level of successful quit attempts and the level needed to achieve the *Healthy People 2020* goal (Levy et al. 2010c). While adolescents and adults want to quit (70% plan to, and more than 50% try each year), far too few have been successful in quitting (about 4–6% of the smoking population as a whole succeed annually) (Burns et al. 2000; CDC 2011b). Utilization of proven treatments remains low among those attempting to quit, and little has been done to improve the success rates of unassisted smoking cessation efforts (Chapman and MacKenzie 2010; Chapman and Wakefield 2013). Since these unaided quit attempts (e.g., called quitting “cold turkey,” or described as quitting without seeking help from health care provider, program, or other cessation services) have historically accounted for up to 90% of those who quit each year, it has been suggested that price increases, smoke-free policies, media campaigns, and other factors that decrease the social acceptability of smoking could enhance the success of these unassisted smoking cessation efforts (Chapman and MacKenzie 2010; Chapman and Wakefield 2013).

More aggressive prevention is also needed. Even after decades of using multiple, comprehensive strategies, each day more than 3,200 youth younger than 18 years of age smoke their first cigarette and another 2,100 youth and young adults who are occasional smokers go on to become daily smokers (SAMHSA 2013a). Nearly 9 out of 10 smokers experiment before 18 years of age, and 98% start smoking by 26 years of age (see Chapter 13, Table 13.2). Adolescents are highly vulnerable to tobacco industry marketing, smoking imagery in movies, and peer influence, and are not fully able to appreciate the health risks they face in the future (USDHHS 2012b). While progress has been made in reducing the prevalence of smoking among high school students, the rate of decline in recent years has slowed (see Chapter 13, Figure 13.8), and the number of youth and young adults who annually initiate smoking was significantly higher in 2012 (2.3 million) than it was in 2002 (1.9 million) (see Figure 13.26).

Although the 50 years of progress should be celebrated, modeling shows a large gap between what has been achieved in reducing the tobacco epidemic and what could have been achieved if smoking had been eliminated after the 1964 Surgeon General's report (Moolgavkar et al. 2012). In a recent analysis by the National Cancer Institute's Cancer Intervention and Surveillance Modeling Network, a consortium of six research groups provided an estimate of the cumulative impact of the changes in smoking behavior that started in the mid-1950s on lung cancer mortality in the United States during 1975–2000 (Moolgavkar et al. 2012). Approximately 800,000 lung cancer deaths were estimated to have been averted in the United States during 1975–2000, but this figure comprises only about 32% of the lung cancer deaths that could have been avoided if tobacco smoking had been completely eliminated after the 1964 Surgeon General's report.

For the future, tobacco control needs to more forcefully impact the burden of avoidable disease and premature death. About one-half of the 42.1 million smokers in the United States in 2012 (CDC 2013) who continue smoking into later decades of life will die prematurely of a tobacco-related disease, primarily from cigarette smoking (Jha et al. 2013). By 2015, tobacco use is expected to be responsible for 10% of all deaths globally (Mathers and Loncar 2006). Should such trends continue without any change in interventions and policy, the tobacco epidemic will be prolonged well into the twenty-first century. In fact, the scope of the epidemic may even increase if any of the tobacco control measures that are in place today are eroded (see Appendix 15.1 available online at www.surgeongeneral.gov); (Mendez et al. 1998; Mendez and Warner 2000, 2004, 2007, 2008; Levy et al. 2001).

The various patterns of using more than one type of combustible product raises additional concerns about our progress toward ending the epidemic of tobacco-related disease. Although the prevalence of current smoking among adults has declined in recent years (see Chapter 13, Figure 13.4 and Table 13.19), a high percentage of adolescent and young adult cigarette smokers report using more than one tobacco product (see Chapter 13, Tables 13.16 and 13.17). The prevalence of adults 18 years of age and older who report smoking cigarettes, cigars, or roll-your-own cigarettes using pipe tobacco presents a much less optimistic picture than looking at the prevalence of cigarette smoking only (see Chapter 13, Table 13.19). While the prevalence of using any of these smoked products has declined since 2002 (from 28.8%), 25.2% of adults reported current use in 2012 (see Table 13.19).

Given the urgency of reducing smoking and the only partial success of tobacco control to date, this chapter considers potential additions to what we are already doing. Given the growing awareness of the highly lethal

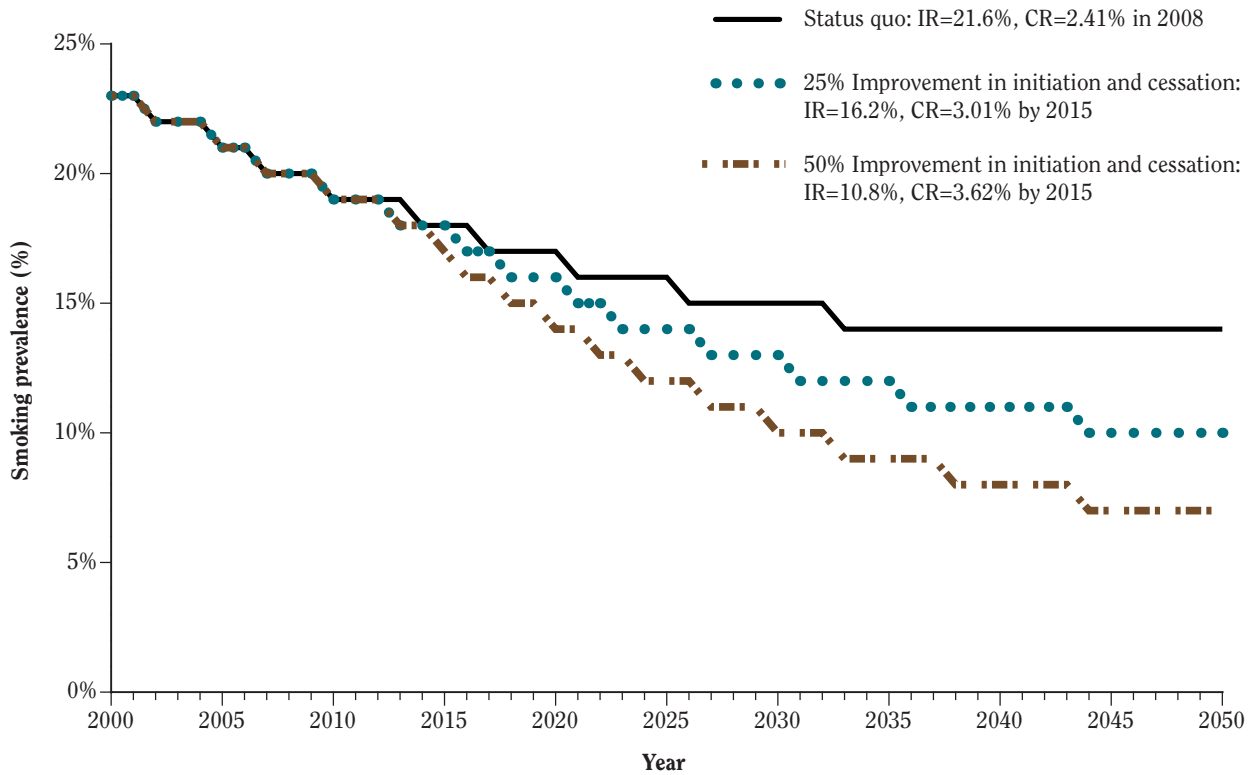
and addictive nature of cigarettes, more dramatic restrictions on the manufacture, distribution, marketing, and sale of tobacco products are being proposed (Daynard 2009; Proctor 2013). The public health community has begun discussion of end game strategies, described subsequently in this chapter, that can be used to augment existing strategies. A further and emerging consideration is the role of the new products being introduced rapidly into the marketplace that can deliver aerosolized nicotine without the harmful products of combustion in cigarette smoke. Their availability and marketing could result in a significant fraction of smokers switching completely to them (Sumner 2003). However, there is also the potential for such products to have effects on youth initiation, to lead to a renormalization of public use of nicotine, and to result in sustained dual use of both aerosolized nicotine and cigarettes.

Modeling Plausible Futures: What Is Possible Using our Current Policy Tools?

In considering how to accelerate the end of the tobacco epidemic, models are an essential tool for projecting the potential consequences of tobacco control strategies. Models are used to project future patterns of tobacco use, given various scenarios of tobacco control measures. Appendix 15.1 provides an overview of tobacco control simulation models and how they have been applied to such scenarios. The results of modeling document the need for more aggressive action than the current level of implementation. Projections indicate that the prevalence of adult smoking could likely still be above the *Healthy People 2020* objective of 12% even by mid-century, if there is little change to current strategies (Figure 15.1) (Warner and Mendez 2010; Mendez et al. 2013). Further modeling shows that the goal of 12% prevalence cannot be reached by 2020 unless national initiation and cessation rates become similar to those observed in California in 2005, when California led the nation in declining smoking prevalence (Figure 15.2) (Mendez and Warner 2008). The success of the California comprehensive statewide tobacco control program (see Chapter 14) demonstrates that existing tobacco control strategies are effective when implemented on a sustained basis and argue for more robust and sustained implementation of these existing strategies nationally (see Appendix 15.1, Figure 15.1.13).

Models have been used to examine the impact of strengthening existing tobacco control policies (taxation, smokefree indoor air, and mass media campaigns), and the components of cessation interventions and their delivery

Figure 15.1 Predicted rates of smoking initiation and cessation for U.S. adults, University of Michigan Tobacco Prevalence and Health Effects Model



Source: University of Michigan, unpublished data.
 Note: **CR** = cessation rate; **IR** = initiation rate.

(Figure 15.3) (Abrams et al. 2010; Levy et al. 2010a,b,c). Model results suggest that boosting quit attempts, treatment use, and treatment effectiveness by 100% would lead to moderate to dramatic reductions in the prevalence of adult smoking, by as early as 2020, to national levels ranging as low as 6.3–11.5% (Levy et al. 2010a). Building on the model of cessation treatments (Levy et al. 2010a), a broader simulation model explored the effects of implementing a comprehensive tobacco control strategy with four components directed at reducing the prevalence of smoking in the population: (1) price increases including those that result from cigarette tax increases, (2) smoke-free indoor air laws, (3) mass media/educational policies, and (4) evidence-based and promising new cessation treatment policies (Levy et al. 2010c). The goal of the models was to examine the relative effectiveness of the four policies and their potential combined contributions towards meeting the *Healthy People 2010* goal of 12% smoking prevalence. The modeling showed that implementing all four policies simultaneously at optimal levels in 2008,

without considering other potentially limiting factors, would increase the population quit rate by about 300% by 2013 (Levy et al. 2010c). Such aggressive efforts over a short period would have been needed to lower the prevalence from 20.1% in 2008 to the 12% *Healthy People 2010* goal by 2013. In actuality, in 2012, the prevalence was well above the *Healthy People 2010* goal (Figure 15.4).

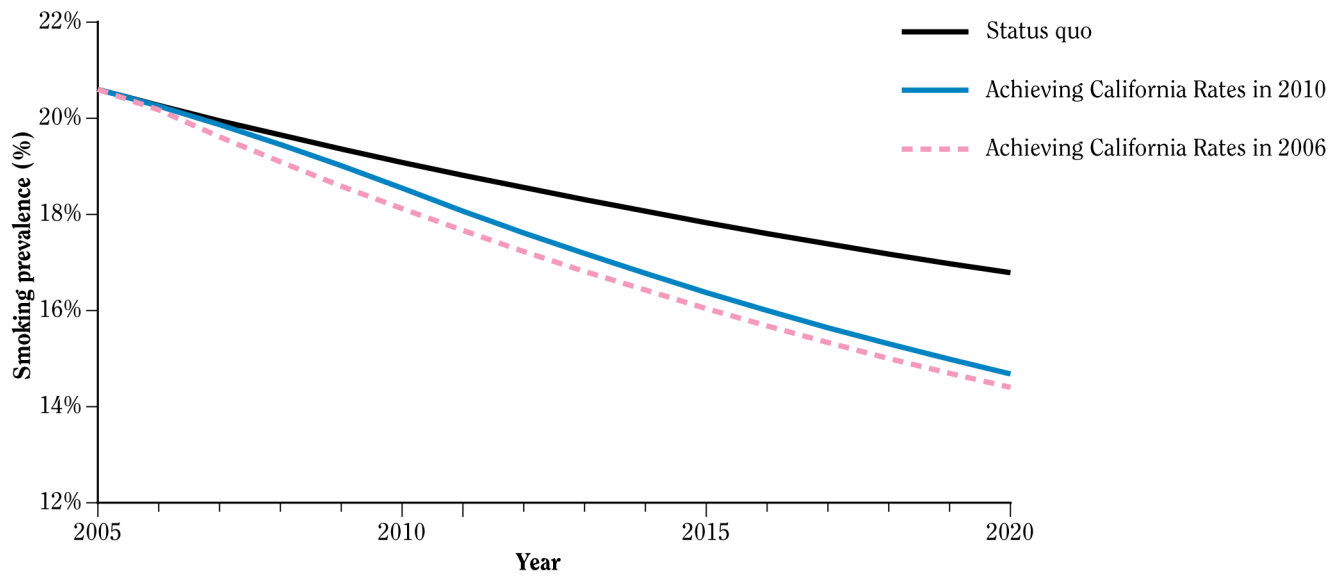
Although a scenario with implementation of all four tobacco control policies at optimal levels at the same time was shown to produce a more optimistic projection, the projected increase of the population quit rate to about 300% would require significantly more effort than at present. Nevertheless, this simulation model illustrates the outcome of one scenario which produces higher impact estimates, involving the full suite of approaches currently known to be effective and implementing them with aggressive strategies, for example, improving the amount of reimbursement for the mandated insurance coverage of, and access to, evidence-based prevention and cessation services (Abrams 2007; Orleans et al. 2010).

The implications of the modeling carried out by Mendez and Warner (2007, 2010) are similar. Using a model that has forecast the prevalence of smoking in the United States quite accurately over a decade, Mendez and Warner (2007, 2010) demonstrated that if smoking initiation and cessation rates remain unchanged, the prevalence of adult smoking will stabilize at about 13.5% by the middle of the present century, a level of smoking that would exceed the *Healthy People 2020* goal of 12% and would still be higher than the percentage already achieved in California (Figure 15.2). Their analysis demonstrated that if the smoking initiation rate could be quickly brought down by 25% at the same time that cessation rates increased by 25%, the prevalence of smoking would fall to an estimated 10% by 2050. If initiation dropped by 50% and cessation rates increased by 50%, prevalence would drop to 6.7% by 2050. For 2020, the model predicts a smoking prevalence of 16.7% with status quo initiation and cessation rates, 15.5% with initiation and cessation improving by 25%, and 14.3% with initiation and cessation each improving by 50%. Even the most optimistic of these scenarios suggests that the *Healthy People 2020* target of 12% prevalence of adult

smoking will not be achieved in 2020 (USDHHS 2012a). Even if this prevalence rate were achieved, one-eighth of adults would remain smokers, ensuring an annual mortality toll caused by smoking that would remain at hundreds of thousands of Americans for decades.

Simulation models are useful, but the projections are only as valid as their underlying assumptions and their input and transitional probability parameters, which are generally based on available data and sensitivity analysis (see Appendix 15.1). Nevertheless, there is utility in using simulation modeling to ask complex questions about future possibilities and then to suggest possible leverage points that could provide more efficient ways to reduce tobacco use. The results of simulation models also illustrate the potential population impact of systems integration of all intervention and policy elements, as recommended in IOM's report and the *Strategic Action Plan* (Bonnie et al. 2007; USDHHS 2010a). Systems-level modeling will remain a needed tool for continually revising tobacco control strategies, reflecting the dynamic nature of the tobacco epidemic and its drivers (see Figure 15.3).

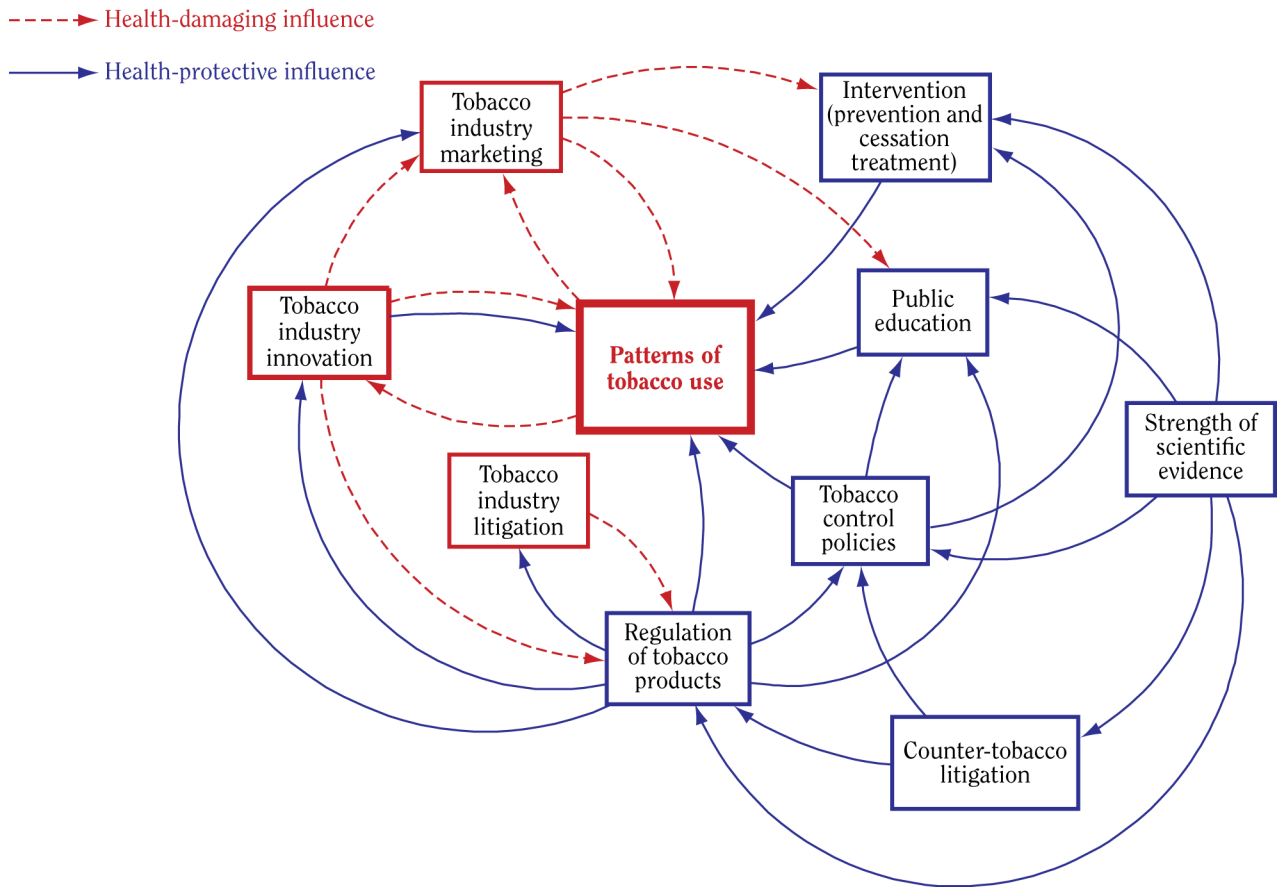
Figure 15.2 Projection of U.S. adult smoking prevalence rates under status quo scenario and California rate scenarios, 2005–2020



Source: Mendez and Warner 2008. Reprinted with permission from The Sheridan Press, © 2008.

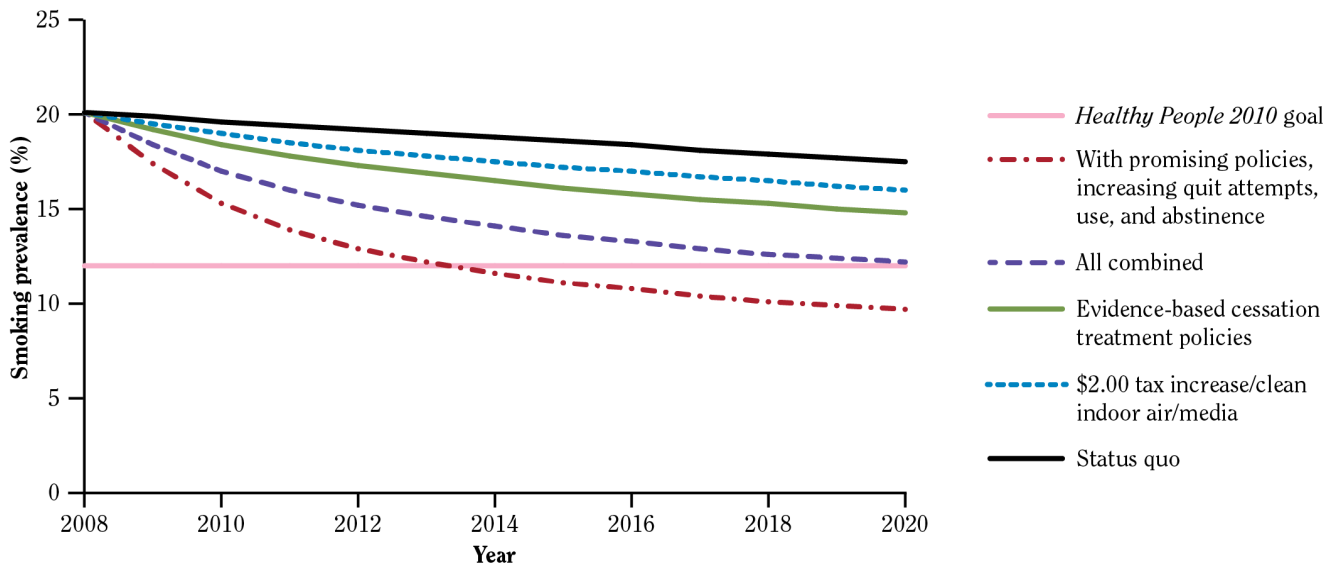
Note: The bottom two lines depict corresponding scenarios assuming that the United States as a whole achieves California's 2005 rates (20% initiation rate and 3.33% cessation rate). The dotted line reflects the assumption that such rates are attained instantaneously (in 2006), whereas the solid line reflects the more plausible scenario that such rates will be achieved gradually (by 2010). The status quo initiation rate is 25%, and the cessation rate is 2.59%.

Figure 15.3 Simplified dynamic model of protobacco and antitobacco forces on patterns of tobacco use



Source: Created by A. Villanti and D. Abrams for this Surgeon General's Report.

Figure 15.4 Effects of a 100% reduction in the quit attempt rate, treatment use, and treatment effectiveness on smoking prevalence, 2008–2020



Source: Levy et al. 2010b.

Since the simulation models reviewed were completed, several additional years of survey data have been released, as reviewed in Chapter 13. As shown in Figure 13.4, the 2012 National Health Interview Survey estimate for the prevalence of current smoking among adults 18 years of age and older has declined to 18.1% and the trend downward from 2009 (20.6%) shows a more optimistic pattern than the data showing little change from 2005 (20.8%) to 2009, which were the basis for several of the simulation models reported above. However, other survey data from the National Survey on Drug Use and Health (see Table 13.19) show a small decline in the prevalence of current cigarette smoking among adults 18 years of age and older from 23% in 2009 to 22% in 2012, but almost no decline in the prevalence of adult current smoking between 2011 (21.7%) and 2012. Additional simulation models using these more recent data are needed to help provide further perspectives on progress toward meeting the *Healthy People 2020* objective of reducing the prevalence of adult smoking to 12% or less by 2020.

Looking to the Future

As noted above, the favorable impact of increasingly intense tobacco control efforts in the last decades of the twentieth century is considered one of the top public health achievements of the century (CDC 1999; Ward and Warren 2007). Nevertheless, the results from the models reviewed above exploring future scenarios of tobacco control indicate that the projected decline in tobacco use over coming decades will not be sufficiently rapid to meet the *Healthy People 2020* objective of 12% for adult smoking prevalence. A review of the effectiveness of evidence-based tobacco control interventions concluded that “further reductions in smoking in those developed countries that have achieved the most tobacco control success are likely to come frustratingly slowly; as well, smoking prevalence could level out at a rate far higher than anyone in tobacco control wants to contemplate” (Warner and Mendez 2010, p. 884). This observation by Warner and Mendez (2010) and the results of the models reviewed above suggest that without an acceleration in the rate of decline in the prevalence of smoking in the United States, the burden of tobacco-caused disease and premature deaths will persist well into the twenty-first century. Hence, the goal of ending the tragic burden of avoidable disease and premature death appears elusive for the near-term.

The 2007 IOM report (Bonnie et al. 2007) and the *Strategic Action Plan* (USDHHS 2010a) suggest that the rate of decline in youth and adult rates of smoking and tobacco use could be accelerated if the most effective tobacco control interventions were more fully imple-

mented simultaneously and the implementation was sustained. This report is also written at a time when legislation has brought new possibilities for strengthening tobacco control (see Chapter 14). Passage of the *Family Smoking Prevention and Tobacco Control Act (Tobacco Control Act)*, Public Law 111-13, *U.S. Statutes at Large* 123 (2009):1776, which provides the U.S. Food and Drug Administration (FDA) the authority to regulate tobacco products; the *Health Information Technology Economic and Clinical Health Act*, Public Laws 111-5, *U.S. Statutes at Large* 123 (2009):227, which will facilitate screening for tobacco use behaviors and implementation by health care providers of cessation services; and the *2010 Patient Protection and Affordable Care Act*, Public Law 111-148, *U.S. Statutes at Large* 124 (2010):119, in combination with investment in tobacco control and prevention through the *2009 American Recovery and Reinvestment Act*, Public Law 111-5, *U.S. Statutes at Large* 123 (2009):115, have resulted in substantial support for the implementation of evidence-based policies and programs to reduce tobacco use in recent years. Chapter 14 and Appendices 14.1–14.5 review the current status of tobacco control interventions that are known to be effective and could reach all the critical priority populations of at-risk youth and young adults, as well as those who are at greatest risk of dying in the short-term from a smoking-caused disease—adult smokers who have smoked for decades. Many have suggested that with full implementation of these strategies, far fewer youth and young adults would become smokers, and more smokers would successfully quit (USDHHS 2000b, 2012b; Abrams et al. 2010; Levy et al. 2010a,b; Orleans et al. 2010). The evidence reviewed in this and many previous reports document the benefits of smoking cessation. Additionally, the modeling results reviewed above show that increased access to evidence-based cessation treatments and aggressive promotion for all population groups would increase rates of successful cessation and thus reduce the consequences of smoking. With this imperative, and the opportunities provided by the *Affordable Care Act*, all groups of health care providers and systems should examine how they can establish a strong standard of care for smoking cessation for all (see Chapter 14). Additionally, the 2012 Surgeon General’s report stated that “we have evidence-based strategies and tools that can rapidly drop youth initiation and prevalence rates down into the single digits” (USDHHS 2012b, p. 856). Although increased application of comprehensive tobacco control strategies recommended in that report could be highly effective, the current levels of implementation of these key strategies are far below the most effective levels.

Additional concerns about achieving more rapid progress have been raised. It has been suggested that some of these evidence-based policies and programs could be

less effective or less likely to be implemented in the future (Warner and Mendez 2010; Warner 2013). Evidence shows that large tax and, hence, price increases will decrease tobacco use each time they are implemented. But legislative willingness to substantially increase taxes would need to increase dramatically. Similarly, mass media campaigns can be very effective (McAfee et al. 2013); however, to produce large declines in the prevalence of adult smoking at the national level, these campaigns need to be implemented on a sustained basis with updated content (USDHHS 2012b). The impact of smokefree policies, and other factors affecting social norms, has increased dramatically during the last 50 years (see Chapters 2 and 14). However, since fewer states have implemented new comprehensive smokefree policies in the last few years, the pace of social norm change may have slowed. The pace of social norm change could be slowed by the recent increase in the level of tobacco depictions in top-grossing U.S. movies (see Chapter 14, Figures 14.3A and 14.3B) and the aggressive marketing and promotions for electronic cigarette brands (U.S. House of Representatives 2013).

Although the *Strategic Action Plan* provides a critical framework to guide and coordinate the implementation of comprehensive tobacco control policies and programs (USDHHS 2010a), we need to assure implementation of these evidence-based policies and programs on a sustained basis with strong intensity. For example, despite strong

evidence of the efficacy of comprehensive state-wide tobacco control programs in reducing the initiation, prevalence, and intensity of smoking among youth and young adults (USDHHS 2012b), in 2010 the states were appropriating only 2.4% of their tobacco revenues for tobacco control (CDC 2012). Further, it has been noted that reaching CDC's recommended funding level would have required an additional 13% of tobacco revenues, or \$3.1 billion of the \$24 billion collected from the industry, yet the annual total state funding level has declined from the high in fiscal year 2003 and has declined even more sharply in several states where the efficacy of the programs was being demonstrated (CDC 2012) (see Chapter 14, Figure 14.7 and Table 14.5). Since the current levels of implementation of the evidence-based policies and programs need to be substantially increased and much more rapid declines in youth and adult rates of tobacco use are needed to end the tobacco epidemic, the academic and policy communities have proposed additional approaches that augment existing strategies to more quickly bring the tobacco epidemic to an end (Smith 2013; van der Eijk 2013). Some of these nascent strategies may eventually provide further possibilities for the United States, particularly as they are implemented and evaluated in international contexts. Others that may be impractical or inappropriate in the United States may have relevance in other countries.

Potential End Game Strategies

Faced with the challenge of achieving a vision of a society free of tobacco-related death and disease, a discussion has begun within the field of tobacco control about what has come to be called the tobacco "end game" in the published literature. This literature considers strategies that could be used, in addition to the expanded implementation of the proven tobacco control interventions, to accelerate declines in the use of cigarettes and other combusted tobacco products and end the epidemic of disease and premature death caused by tobacco. Scholars and the policy community have proposed interventions that could dramatically reduce the use of tobacco products, especially cigarettes (Benowitz and Henningfield 1994; Borland 2003; Callard et al. 2005a; Daynard 2009; Khoo et al. 2010; Proctor 2011; Thomson et al. 2010; Smith 2013). The editor of *Tobacco Control* has called for a robust discussion of the concept (Malone 2010); meetings of prominent tobacco control professionals have focused on individual proposals or on the concept more broadly (Smith 2013);

and sessions of both international and national tobacco control meetings have presented and debated the central ideas (2012 National Conference on Tobacco or Health, 2012 World Conference on Tobacco or Health, 2013 Annual Meeting of the Society for Research on Nicotine and Tobacco). This section briefly reviews what underlies the emergence of this discussion, considers the myriad ends toward which an end game might be oriented, and describes the principal end game proposals developed and discussed in the literature to date. Although some of these proposals are likely more potentially relevant to the U.S. situation than others, the consideration and potential implementation of less likely proposals elsewhere across the globe may eventually provide insights and evidence applicable for the United States as well. For example, decreases in morbidity and mortality resulting from rapid drops in cigarette use will be relevant regardless of the particular form of end game strategy applied. The principal approaches are summarized in Table 15.1.

Table 15.1. End game strategies discussed in the scientific literature

| Proposal | Description | Source |
|---|---|--|
| Reducing nicotine yields | Gradual reduction of cigarette nicotine content to nonaddicting levels through government action | Benowitz and Henningfield 1994, 2013; Hatsukami et al. 2012, 2013 |
| Reducing product toxicity | Implementation of product regulatory standards to require manufacture of tobacco products with very low toxicity | Hatsukami et al. 2010, 2013; Benowitz and Henningfield 2013 |
| Gradual supply reduction | Phasing out tobacco use on a timetable by gradual reduction of supply to zero or some minimal level | Thomson et al. 2010; Wilson et al. 2013 |
| Prohibiting sales to future generations | Implementing a ban on sales for people born after a particular date, so that smokefree cohorts are created that progressively increase in coverage and size | Khoo et al. 2010; Berrick 2013 |
| Banning cigarettes and/or cigarettes plus additional tobacco products | Ban on the production and sale of cigarettes and/or cigarettes and additional tobacco products | Daynard 2009; Proctor 2011, 2013 |
| Selling tobacco through a not-for-profit agency | To avoid the profit motive, transfer control of supply and sales to a not-for-profit agency that has the goal of reducing consumption | Borland 2003, 2013; Callard et al. 2005b; Callard and Collishaw 2013 |

One of the first such proposals was made in a 1994 article by Benowitz and Henningfield (1994), who described a policy approach of gradually reducing the nicotine in cigarettes to nonaddicting levels. Nearly a decade later, Borland (2003) advocated a “Regulated Market Model” for tobacco that would end direct-to-consumer marketing through the creation of a distribution agency with a harm reduction mandate. A subsequent paper by Callard and colleagues (2005b) also called for the removal of the profit incentive by transferring the tobacco market to a nonprofit entity. Only in the past 4 years, however, has the explicit notion of seeking an end game for cigarette smoking found its way into the scholarly literature (Malone 2010). Additional ideas range from a “sinking lid on supply” approach (Thomson et al. 2010; Wilson et al. 2013), to prohibiting the supply of cigarettes to people born in 2000 or later (Khoo et al. 2010; Berrick 2013), to outright abolition or banning of the sale and manufacture of cigarettes (Daynard 2009; Proctor 2011, 2013).

For this country, the feasibility and applicability of these various proposals range from possible (reducing the nicotine in cigarettes to nonaddicting levels) to almost certainly infeasible (transferring the tobacco product market to a nonprofit entity). Considering the weaknesses and limitations of several of these potential end game proposals, any application of them should come as an integrated national tobacco control strategy which is based on a foundation of enhanced implementation of the proven strategies: taxation, smokefree areas, increased cessation support, warning labels, public health campaigns, and

restrictions on advertising, promotions, and sponsorship (van der Eijk 2013). Although more aggressive use of those evidence-based policies and programs (reviewed in Chapter 14) is an essential starting point, the simulation modeling results reviewed above suggest that new strategies may be needed to more rapidly reduce rates of smoking.

Ironically, the end game debate has arisen before there was any consensus on how the end related to tobacco should be defined, although there is recognition that the overriding objective is to maximize health (Smith 2013). There is no consensus to date, however, as to how that objective can best be achieved with regard to tobacco control. Some have focused on the complete elimination of all tobacco use as well as the use of any nicotine-containing product. Others counter that this target is unattainable and unnecessary to achieve dramatic reductions in morbidity and mortality, since eliminating (or nearly eliminating) the use of combusted tobacco products is more feasible and would come close to achieving the overall goal of maximizing health.

In perhaps the first end game proposal, Benowitz and Henningfield (1994) raised the possibility of greatly reducing cigarette smoking by requiring the reduction, over a number of years, of cigarette nicotine content to nonaddicting levels. This proposal has received greater attention in this country following passage of the *Tobacco Control Act* in 2009. The *Tobacco Control Act* gives FDA a number of powerful tools to regulate cigarettes and smokeless tobacco products, both extant and new. Among

its authorities is the ability to establish product standards. One such standard might include reducing maximal nicotine content to levels so low that they would be insufficient to cause or sustain nicotine addiction. The *Tobacco Control Act* specifically forbids FDA from requiring the complete (100%) removal of nicotine. The *Tobacco Control Act* also gives FDA the authority to address product toxicity, offering another avenue to reduce the harm from cigarettes.

Relevant research studies have been completed or are in progress, addressing questions such as whether and how much smokers might compensate (e.g., by smoking more cigarettes or inhaling more deeply) as nicotine content is reduced and how quickly smokers can transition from their regular higher nicotine cigarettes to extremely low nicotine cigarettes (Benowitz et al. 2012; Benowitz and Henningfield 2013). Of all the end game proposals, nicotine reduction is the one that appears to have created the most interest within the U.S. scientific and policy research communities, in part because the regulatory structure needed to implement it is already in place (Hatsukami et al. 2010, 2013). A parallel regulatory approach to reducing product toxicity can also be envisioned (Hatsukami 2013), although not considered in the original proposal from Benowitz and Henningfield (1994). This might include regulations that would further decrease the already lower toxicity of noncombustible products that may be substituted for nonaddictive cigarettes.

The Benowitz and Henningfield (1994) proposal was also made long before the current wave of noncombustible nicotine-containing products, such as those shown in Table 14.1. The rapid growth and development of emerging products, which may closely mimic the pharmacologic product characteristics of cigarettes while potentially minimizing harm, may make this approach even more appealing and potentially achievable. The availability of an acceptable substitute nicotine delivery system could mitigate some of the arguments that may be raised regarding reduction of nicotine content of cigarettes. A substitute delivery system may allow for a more rapid reduction, rather than the original plan of phasing in the reduction over a decade or more. Reduction of nicotine in cigarettes could thus provide smokers with the option of cessation, a switch to less harmful products such as nicotine replacement therapies or some noncombustible tobacco products, or continuing to smoke nonaddictive but deadly cigarettes.

The technical, social, medical, and regulatory feasibility of this concept continues to grow quickly (Hatsukami et al. 2010, 2013; Benowitz and Henningfield 2013). Reducing the addictiveness of cigarettes is increasingly viewed as a possible approach to prevent children from

becoming smokers and to provide smokers with assistance to stop smoking. Additionally, the role of regulatory product standards by which tobacco companies could be required to manufacture and market noncombustible products with very low toxicity has been discussed (Hatsukami 2013). The *Tobacco Control Act* empowers FDA to issue product standards to control the allowable levels of chemicals or chemical compounds, or ingredients in tobacco products or smoke for the protection of public health. In addition to a product standard reducing the nicotine in tobacco products, strict standards for levels of toxicants in tobacco products could be established, as well as standards to make some or all tobacco products less appealing.

Several of the other end game proposals relate to reducing the supply of tobacco products. However the *Tobacco Control Act* specifically forbids FDA from banning cigarette sales. Nevertheless, as discussed in the section above, the *Tobacco Control Act* does authorize FDA to set standards for tobacco products which could significantly impact regulated tobacco products marketed (Hatsukami 2013). Additionally, the prohibition of FDA banning categories of products in the *Tobacco Control Act* does not apply to states or localities. It has been noted that every state (and municipality) in the United States has the power to ban the sale of cigarettes, a power upheld by the U.S. Supreme Court in *Austin vs. The State of Tennessee* (Proctor 2011). However, while states generally may have the capability, other factors including states' constitutions or other state laws, could preempt some municipalities from enacting such measures.

The following proposals, while certainly not feasible for implementation in the United States are reviewed to provide a description of options under discussion internationally. Borland (2003, 2013), Callard and colleagues (2005a,b), and Callard and Collishaw (2013) have observed that the tobacco industry's objective—maximizing profits (or maximizing shareholder value)—is fundamentally antithetical to reducing tobacco use. As such, the researchers argued, moving toward the end of tobacco-produced harms requires that control over the supply of tobacco products be transferred from the for-profit sector to a not-for-profit agency (either governmental or governmentally supervised) with a public health mandate to reduce tobacco use. Tobacco farmers would continue to produce tobacco, and product manufacturers would continue to produce cigarettes and other tobacco products. However, the agency (Borland calls it the "Tobacco Products Agency") would determine how many products would be acquired for sale to the public, and how it would control the conditions of sale (when, where, to whom, at what price, and with what packaging). Driven by its directive to

reduce the population harm caused by tobacco, the goal of the agency would be to reduce tobacco consumption, especially consumption of cigarettes. Some have argued that the development of noncombustible aerosolized forms of nicotine delivery could enable tobacco companies, with firm regulatory oversight and pressure on combustibles, to mobilize the profit motive to speed up the conversion of the population to much lower-risk products, while still retaining shareholder value.

Diverse challenges can be anticipated in the implementation of an integrated strategy that includes any of the proposed end game policies (Isett 2013; Rabe 2013; Thomas and Gostin 2013). The challenges will likely come from two constituencies: those with a financial stake in the survival and continuing economic success of cigarette (and other tobacco products) sales; and some smokers and others who would be opposed to any policy that significantly threatened the availability of cigarettes in their current form, and the ability of adults to choose to consume them. Another challenge will be the tobacco industry's attempts to influence decision makers to oppose effective strategies (Rabe 2013). Legal issues would be raised as well (Thomas and Gostin 2013).

Additional Concepts that Complement National Tobacco Control Efforts

There are additional approaches that embody the evidence-based interventions that have defined the success of the first 50 years of tobacco control. They represent extensions of measures that have been used, but with changing the application of empirical and theory-based measures.

Beginning with Canada in 2000, the new generation of larger graphic warning labels has been implemented in nearly 50 countries. Research has demonstrated that the new labels attract the attention of smokers and lead them to report that the labels have motivated them to consider quitting (Hammond 2011). To date, direct effects of such warnings on quitting are still being evaluated (Borland et al. 2009a,b; Partos et al. 2013). For example, a recent analysis of the Canadian pack warnings that disentangled the effects of concomitant price increases found the graphic warning labels resulted in a decline in smoking prevalence of 2.9–4.7%, a relative reduction of 12.1–19.6% (Huang et al. 2013). Many of the laws initially implemented require labels to occupy 50% of the front and back of cigarette packs, but even larger warnings are now emerging. At least 2 countries have far more substantial requirements:

Uruguay has required that 80% of the front and back of packs bear graphic warning labels; Australia implemented a law requiring that 75% of the front of the pack and 100% of the back be devoted to warning labels (WHO 2013). As the fraction of pack coverage changes, researchers will face a moving target in their evaluation of the effectiveness of graphic warning labels.

Another new approach is plain packaging, adopted by Australia in early 2013. The health ministries of several other countries are now considering implementing this strategy (Freeman et al. 2008; Quit, Cancer Council Victoria 2011; Moodie et al. n.d.). Plain packaging requires the use of a uniform, standard pack color (for that portion of the pack not bearing the warning label) with the brand name printed in a uniform, standard, same-sized font. Increasing evidence indicates that plain packaging has the potential to decrease smoking (Hammond and Parkinson 2009; Hoek et al. 2011; Gallopel-Morvan et al. 2012; Hammond et al. 2013; Wakefield et al. 2013). In Australia, the process by which the pack color was chosen involved a great deal of scientific investigation, including extensive use of focus groups (Wakefield 2012).

Other unlikely but potentially complementary policies exist only in concept at present. Glantz (2012) recently reintroduced the concept that the government impose large fines on tobacco companies based on the quantity of their products consumed by minors with the fines needing to be substantially larger than the revenues gained from sales. This approach would create an economic incentive for the industry to work hard to avoid illegal sale or distribution to children. Another example is Chapman's (2012) notion of licensing smokers. The ability to buy cigarettes, in a specific daily quantity, would require possession of an annual license purchased from the state by the smoker. If the smoker decided to quit, he or she could get the license expenses refunded, but with the provision that this would be a one-time only incentive. Given the novelty of these concepts, there is every reason to expect the development of other new ideas that could be useful in the search for ways to end the disease toll caused by tobacco.

End game strategies might be aided by future approaches and devices for nicotine delivery that better substitute for the cigarette. As discussed in Chapter 14, various new products are increasingly being introduced into the market. In 2012 Lorillard acquired Blu Electronic Cigarettes, in 2013 R.J. Reynolds Tobacco Company introduced Vuse electronic cigarettes in limited markets, and Altria announced that it will introduce an electronic cigarette in 2014 (Esterl 2013; Lorillard 2013; Reynolds American 2013; Wells Fargo Securities Research 2013). Additionally, other electronic nicotine delivery systems have been developed and marketed by companies

with little or no experience in developing and marketing traditional tobacco products (WHO 2009; Henningfield and Zaatari 2010; Cobb and Abrams 2011). Warner (2013) suggests that the introduction and marketing of new products like these could complement an end game strategy. However, the potential risks of continuing the use of addictive levels of nicotine on the population would need careful consideration (see Chapter 5, "Nicotine") if users completely switch from traditional (or conventional) combusted cigarettes to noncombusted products which continue to deliver high levels of nicotine. Also, as noted in Chapter 13, given the rapid increase in electronic cigarette use among both adults and adolescents, rigorous surveillance of these products is particularly important, including their impact on the initiation and cessation of conventional tobacco use and concurrent use with other conventional tobacco products.

Ending the Tobacco Epidemic in the United States

The *Strategic Action Plan* provides a framework for achieving a society free of tobacco-related death and disease by emphasizing the implementation of proven tobacco control strategies (USDHHS 2010a). This chapter makes the case for dramatically increasing and sustaining the level of this implementation. This chapter also discusses various new "end game" strategies; the feasibility and applicability are reviewed above. It has been suggested that an integrated national tobacco control strategy should be considered—based on a foundation of enhanced implementation of the proven strategies (taxation, smoke-free areas, increased barrier-free cessation support, warning labels, public health campaigns, and restrictions on advertising, promotions, and sponsorship) into which the most feasible end game strategies are included (van der Eijk 2013). Thus, a more aggressive use of those evidence-based policies and programs reviewed in Chapter 14 would strengthen current tobacco control measures and create a climate that enhances the feasibility of the implementation of end game strategies (van der Eijk 2013). Examples of end game options which could complement the proven interventions in accomplishing our overall goal of a society free of tobacco-related death and disease include but are not limited to:

- (1) reducing the nicotine content to make cigarettes less addictive (Benowitz and Henningfield 2013), and
- (2) greater restrictions on sales, particularly at the local level, including bans on entire categories of tobacco products (Berrick 2013; Malone 2013).

In November 2010, HHS released its *Strategic Action Plan*—the first enunciation of a national plan in the United States to curb the tobacco-produced disease epidemic. The plan focuses on a number of interventions that, collectively, could significantly diminish the toll of tobacco (USDHHS 2010a). The plan, which came 3 years after IOM's report *Ending the Tobacco Problem: A Blueprint for the Nation* was issued (Bonnie et al. 2007), announced that ending the epidemic is in fact a national goal. The IOM report also developed a strategy that, if fully implemented, would significantly decrease tobacco use and its burden. To successfully implement both the IOM blueprint and the *Strategic Action Plan* will require vigorous action at the federal, state, and local levels, as well as by the private sector.

Frustration with the slowness of recent progress in tobacco control that motivates the end game discussion reflects, in part, heightened expectations due to how much success has been achieved in the last 50 years. To date, tobacco control strategies have cut the prevalence of cigarette smoking by nearly 60%, per capita consumption is one-fourth of what it was at the dawn of the anti-smoking era, and relative to the size of the population, the disease toll of tobacco in the United States has declined substantially. It has been estimated that this decline in smoking since 1964 was associated with the avoidance of 8 million premature smoking-attributable deaths, with 157 million life years saved (Holford et al. in press). The analysis also demonstrated that tobacco control since 1964 had an important impact on the life expectancy of U.S. adults, contributing an increase of 2.3 years for males and 1.6 years for females, or about 30% of the overall national increase in life expectancy over the period 1964–2012 (Holford et al in press). More background on this analysis and findings in this paper are provided in Appendix 15.1

Despite this success, the authors note that over the half century since 1964, for each of the 8 million premature smoking-attributable deaths averted, two deaths were

caused by smoking (Holford et al. in press). They further correctly observe that “no other behavior comes close to contributing so heavily to the nation’s mortality burden” (Holford et al. in press). The evidence reviewed in

this chapter emphasize that making more rapid progress toward eliminating the remaining burden of tobacco will be more challenging, but history teaches that the obstacles to success are not invariably insurmountable.

Chapter Summary

Since the first Surgeon General’s report in 1964, significant progress has been made in mitigating the tobacco-caused epidemic of disease and premature death. This progress has been accomplished through the implementation of effective tobacco control programs and policies focused on prevention and cessation. This chapter discussed the current status of tobacco control efforts in relation to two key national reports: IOM’s *Ending the Tobacco Problem: A Blueprint for the Nation* (Bonnie et al. 2007) and *Ending the Tobacco Epidemic: A Tobacco Control Strategic Action Plan for the U.S. Department of Health and Human Services* (USDHHS 2010a). Potential future directions are examined in the context of today’s rapidly changing tobacco control landscape, and plausible alternatives based on proven effective interventions and policies are discussed. Finally, proposed potential end game scenarios are reviewed.

The evidence is clear—we know what works. Chapter 14 and Appendices 14.1–14.5 review the current status of tobacco control interventions that are known to be effective and could reach all the critical priority populations of at-risk youth and young adults, as well as those who are at greatest risk of dying in the short-term from a smoking-caused disease—older adult smokers who have smoked for decades. Many have suggested that with full implementation of these strategies, far fewer youth and young adults would become smokers, and more smokers would successfully quit (Abrams et al. 2010; Levy et al. 2010a,b; Orleans et al. 2010; USDHHS 2000b, 2012b). Health care policies following from the *Health Information Technology Economic and Clinical Health Act* and the *Affordable Care Act* should increase screening for tobacco use and offering cessation counseling in health care settings. The 2007 IOM report (Bonnie et al. 2007) and the *Strategic Action Plan* (USDHHS 2010a) suggest that the rate of decline in youth and adult levels of smoking and tobacco use could be accelerated if the most effective tobacco control interventions were more fully implemented simultaneously and this implementation was sustained. However, the current levels of implementation of these key strategies are far below the most effective

levels. In 2000, Surgeon General Dr. David Satcher stated the challenge we face, namely, “Our lack of greater progress in tobacco control is more the result of failure to implement proven strategies than it is the lack of knowledge about what to do” (USDHHS 2000a).

Looking to the future, tobacco control needs to be shaped to address an increasingly heterogeneous pattern of use of tobacco products, including emerging noncombustible products, and changing demographics of users of these tobacco products (Chapter 13). Some of the highest prevalence rates of smoking are now among persons of lower socioeconomic status, some racial and ethnic minority groups, sexual minorities (including individuals who are gay, lesbian, bisexual and transgender, and individuals with same-sex relationships and/or attraction), high school dropouts (Fagan et al. 2007; Lee et al. 2009; Garrett et al. 2011; SAMHSA 2013b), persons with mental illness and alcohol and substance abuse disorders (Prochaska et al. 2008; Schroeder and Morris 2010; Villanti et al. 2012; CDC 2013), American Indians and Alaska Natives as well as recent immigrants from high-prevalence countries, and people with complex comorbid medical illness (e.g., HIV/AIDS and cardiovascular disease) (Crothers et al. 2009; Hoffman et al. 2009; Marshall et al. 2009; Vidrine 2009; Levine et al. 2010; Tesoriero et al. 2010; Pines et al. 2011; Rahmanian et al. 2011). There is also substantial geographic variation with the highest prevalence rates in Appalachia and the South (Pickle and Su 2002). The patterns of using more than one type of smoked tobacco product raises additional concerns about our progress toward ending the epidemic of tobacco-related disease. Chapter 14 discusses several of the strategies that are in current use to address these disparities. Comprehensive statewide tobacco control programs have been leading innovators in implementing culturally appropriate interventions which effectively reach and impact diverse populations with the highest prevalence of tobacco use. Also, nationwide campaigns and health communication interventions can successfully reach diverse populations with high impact messages. CDC’s Tips from Former Smokers campaign and the proposed FDA prevention campaigns are examples

of such interventions. As reviewed in Appendix 14.4, integrating tobacco use cessation treatment with treatment for substance use disorders increases the efficacy of both efforts. More forceful implementation of these and other current initiatives presented in the *Strategic Action Plan* (USDHHS 2010a) can help to eliminate these disparities in tobacco use.

This report is also written at a time when legislation has brought new possibilities for strengthening tobacco control. Passage of the 2009 *Tobacco Control Act*, which provides FDA the authority to regulate tobacco products, and the 2010 *Affordable Care Act*, in combination with investment in tobacco control and prevention through the 2009 *American Recovery and Reinvestment Act*, have resulted in substantial support for the implementation of evidence-based policies and programs to reduce tobacco use in recent years. The global and U.S. tobacco industries have indicated in various ways that they plan to undergo a major paradigm shift toward making and marketing a wider range of tobacco-derived nicotine delivery products with a purported reduced harm goal (Calantzopoulous 2012; Delen 2012). The *Tobacco Control Act* gives FDA a number of powerful tools to regulate cigarettes and smokeless tobacco products, both extant and new. Among its authorities is the ability to establish product standards.

Much more rapid declines in youth and adult rates of tobacco use are needed to end the epidemic of tobacco-caused disease and death, but the current levels of implementation of the evidence-based policies and programs are below the most effective levels. Academic and policy communities have proposed untested approaches that could be combined with more robust implementation of

existing strategies to more quickly bring the tobacco epidemic to an end (Smith 2013; van der Eijk 2013). Some of these still untested strategies may eventually provide further possibilities for the United States, particularly as they are implemented and evaluated in international contexts. Others that may be impractical or inappropriate in the United States may have relevance in other countries. Examples of end game options which could complement the proven interventions in accomplishing this nation's overall goal of a society free of tobacco-related death and disease include but are not limited to:

- (1) reducing the nicotine content to make cigarettes less addictive (Benowitz and Henningfield 2013), and
- (2) greater restrictions on sales, particularly at the local level, including bans on entire categories of tobacco products (Berrick 2013; Malone 2013).

It is important to remember that many policy innovations in tobacco control, once thought inconceivable, have now become the law of the land. Just a decade ago, few if any, public health experts would have envisioned that 26 U.S. states and more than 30 entire countries would have legally mandated smokefree workplaces (including all restaurants and bars) in 2014. The history of tobacco control suggests that it would be unwise not to contemplate the end game. New developments will continue to occur, and the public health community will be far better positioned to address them if the community has thought seriously about them.

Conclusions

1. Together, experience since 1964 and results from models exploring future scenarios of tobacco control indicate that the decline in tobacco use over coming decades will not be sufficiently rapid to meet targets. The goal of ending the tragic burden of avoidable disease and premature death will not be met quickly enough without additional action.
2. Evidence-based tobacco control interventions that are effective continue to be underutilized and implemented at far below funding levels recommended by the Centers for Disease Control and Prevention. Implementing tobacco control policies and programs as recommended by *Ending the Tobacco Epidemic: A Tobacco Control Strategic Plan* by the U.S. Depart-

ment of Health and Human Services and the *Ending the Tobacco Problem: A Blueprint for the Nation* by the Institute of Medicine on a sustained basis at high intensity would accelerate the decline of tobacco use in youth and adults, and also accelerate progress toward the goal of ending the tobacco epidemic.

3. New "end game" strategies have been proposed with the goal of eliminating tobacco smoking. Some of these strategies may prove useful for the United States, particularly reduction of the nicotine content of tobacco products and greater restrictions on sales (including bans on entire categories of tobacco products).

Implications for Ending the Tobacco Epidemic

Ending the Tobacco Epidemic: A Tobacco Control Strategic Plan (USDHHS 2010a) and the *Ending the Tobacco Problem: A Blueprint for the Nation* (Bonnie et al. 2007) set out a vision for the future, calling for ending the epidemic of tobacco smoking as rapidly as possible. This chapter addresses how that vision can be achieved, considers what we have learned and accomplished to date in tobacco control, and identifies challenges to accelerating the impact of tobacco control and to ending the tobacco epidemic. The evidence makes clear that we need to fully implement and sustain the most effective tobacco control interventions as well as fully realizing the potential of FDA's tobacco product regulation. The evidence also emphasizes the need for more rapid progress in reducing tobacco use among youth and adults. If smoking persists at the current rate among young adults in this country, 5.6 million of today's Americans younger than 18 years of age are projected to die prematurely from a smoking-related illness (see Chapters 12 and 13).

In today's changing landscape, there are multiple factors influencing the state of the tobacco epidemic and how it changes. First, the clear mandate of the new FDA authority is to employ science-based rulemaking to reduce the impact of tobacco products at the population level, taking into account both users and nonusers who may become users. FDA has broad new authority to regulate existing and new tobacco products and can educate the public in order to reduce the death, disease, and other costs associated with use of tobacco products. Second, although rates of use of cigarettes have declined modestly in the past decade, alternative, noncigarette forms of tobacco and the dual use of combustible and noncombustible tobacco products are being aggressively promoted. A variety of unregulated noncombustible products with potential modified risk or reduced harm are being developed and aggressively marketed. This shift in patterns of tobacco use could have a number of potential impacts, ranging from the positive effect of accelerating the rate at which smokers quit smoking cigarettes completely to a

negative effect of slowing down the decrease in the use of all tobacco products, especially cigarettes. Availability of these products may reduce or increase harm to the population.

New regulatory actions described as end game strategies may offer tremendous opportunities to address these challenges and transform approaches to ending the tobacco epidemic. In addition to a product standard reducing the nicotine content to make cigarettes less addictive, FDA has the authority to establish strict standards for levels of toxicants in tobacco products, as well as standards to make some or all tobacco products less appealing (see "The influence of the design of tobacco products on the use of tobacco by young people," Chapter 5, pages 535-541, USDHHS 2012). The impact of the noncombustible aerosolized forms of nicotine delivery on population health is much more likely to be beneficial in an environment where the appeal, accessibility, promotion, and use of cigarettes and other combusted tobacco products are being rapidly reduced, especially among youth and young adults. For example, other end game strategies which could involve greater restrictions on sales, particularly at the local level, including bans on entire categories of tobacco products, could significantly alter the strategic environment for tobacco control.

These conclusions show that we have still underutilized approaches for reducing use of tobacco products. Together, they indicate a need for coordination within the federal government and across the local, state, and national levels. A strategic framework is available, and recent legislation has brought new approaches for tobacco control. As potential future directions are examined in the context of today's rapidly changing tobacco control landscape, sustained implementation of evidence-based tobacco control interventions at high intensity would accelerate the decline of tobacco use in youth and adults, and also accelerate progress toward the goal of ending the tobacco epidemic.

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Chapter 16

A Vision for Ending the Tobacco Epidemic: Toward a Society Free of Tobacco-caused Death and Disease

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A Vision for Ending the Tobacco Epidemic

This nation must create a society free of tobacco-related death and disease. The leadership of U.S. Department of Health and Human Services (USDHHS) committed to this vision when it published the first ever tobacco control strategic action plan for the United States in 2010—*Ending the Tobacco Epidemic: A Tobacco Control Strategic Action Plan for the U.S. Department of Health and Human Services* (hereafter referred to as the *Strategic Action Plan*) (USDHHS 2010a). This 50th anniversary Surgeon General’s report provides the scientific basis for accelerating the implementation of this national action plan. Our work to protect our children’s health and improve the public’s health is not close to completion; this report finds that if more is not done to combat tobacco use, then 5.6 million of today’s youth will die prematurely from a smoking-related illness.

This report provides an historical perspective that reviews and updates evidence on the health consequences of smoking and exposure to tobacco smoke as well as the extensive evidence base on effective tobacco control interventions. The report also presents findings of models of future tobacco use that show the challenge ahead: at the current trajectory of decline of tobacco use, it is not possible to meet the goal of ending the tobacco epidemic quickly enough. Finally, the report discusses different ways to achieve a society free of premature death and disease caused by tobacco.

Historical Perspective

The *Strategic Action Plan* stated “The United States has made historic progress in combating the epidemic of tobacco-caused illness and death since the landmark 1964 Surgeon General’s Report on the health effects of cigarette smoking” (USDHHS 2010a, p. 9). The evidence in this Surgeon General’s report provides a wealth of findings supporting that statement.

- Per capita cigarette consumption has declined by 72% from 4,345 cigarettes in 1963 to 1,196 in 2012 (see Figure 2.1);
- The prevalence of high school students who currently smoke¹ declined from 36.4% in 1997 to 18.1%

in 2011, the lowest level since the start of national surveys (see Chapter 13);

- The prevalence of current smoking² among adults has declined from 42.7% in 1965 to 18.1% in 2012 (see Chapter 13).

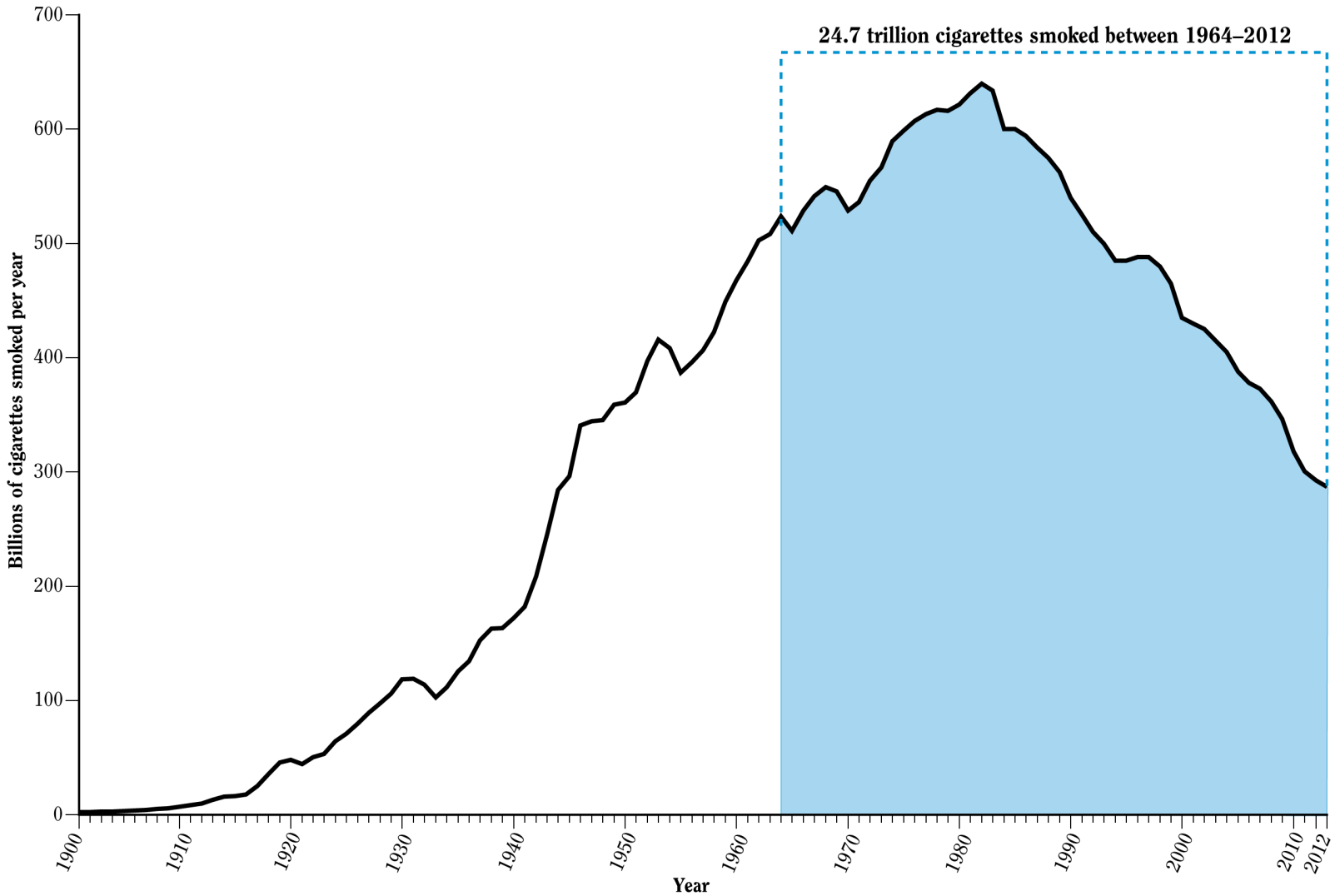
This progress is considered one of the top public health achievements of the twentieth century (Centers for Disease Control and Prevention [CDC] 1999; Ward and Warren 2007). However, smoking continues to cause unacceptable harm to public health. Several key findings of this report highlight the continuation of the still massive tobacco epidemic in the United States:

- Despite the dramatic decline in per capita cigarette consumption (see Figure 2.1), almost 25 trillion cigarettes have been consumed since 1965 (Figure 16.1).
- More than twenty million Americans have died from smoking-attributable illnesses since 1964 (see Chapter 12).
- Nearly one-half million adults still die prematurely from tobacco use each year (see Chapter 12).
- Approximately 800,000 lung cancer deaths were estimated to have been avoided in the United States during 1975–2000. However, these averted lung cancer deaths are only about 32% of the lung cancer deaths that could have been avoided if tobacco smoking had been completely eliminated after the 1964 Surgeon General’s report (Chapter 15).
- The tobacco industry continues to position itself to sustain its sales by recruiting youth and young adults and by maintaining current smokers as consumers of all their nicotine-containing products including cigarettes (see Chapters 13, 14, 15).
- For each smoker who dies from tobacco-related disease, there are two new, younger replacement smokers (USDHHS 2012).

¹Based on respondents who reported that they smoked cigarettes on at least 1 day during the 30 days before the survey.

²Based on adult respondents who reported smoking ≥100 cigarettes in their lifetime and smoking every day or on some days.

Figure 16.1 Total cigarette consumption, United States, 1900–2012



Sources: Miller 1981; U.S. Department of Agriculture, 1987, 1996, 2005, 2007a,b; Centers for Disease Control and Prevention 2012.

Note: Data shown are annual total consumption of cigarettes. This differs from Figure 2.1, which reports the annual adult (18 years of age and older) per capita consumption.

- Disparities in smoking rates persist. Some of the highest prevalence rates are among persons of lower socioeconomic status, some racial/ethnic minority groups, sexual minorities, high school dropouts, and other vulnerable populations including those living with mental illness and substance use disorders.
- Due to the persisting prevalence of smoking among young adults in this country, 5.6 million Americans younger than 18 years of age are projected to die prematurely from a smoking-related illness (see Chapters 12 and 13).

Previous Surgeon General's reports have tracked the evolution of cigarettes into the current highly engineered, addictive, and deadly products containing thousands of chemicals that are themselves harmful. The burning of tobacco produces the complex chemical mixture of over 7,000 compounds that cause a wide range of diseases and premature deaths as a result (USDHHS 2010b). Although the prevalence of smoking has declined significantly over the past half century, risks for smoking-related disease and mortality have not. In fact, today's cigarette smokers—both men and women—have a much higher risk for lung cancer and chronic obstructive pulmonary disease than smokers in 1964, despite smoking fewer cigarettes (see Chapters 6, 7, and 11, and Figures 12.2 and 13.16).

Since 2000, each Surgeon General's report has ended with a call for action. In 2000, Surgeon General Dr. David Satcher clearly stated the challenge that is still applicable today, namely, "Our lack of greater progress in tobacco control is more the result of failure to implement proven strategies than it is the lack of knowledge about what to do" (USDHHS 2000). Knowledge garnered over the subsequent 14 years makes this statement even more cogent today.

In 2007, the Institute of Medicine's report, *Ending the Tobacco Problem: A Blueprint for the Nation*, provided 42 recommendations with the ultimate goal stated as: "... to end the tobacco problem; in other words, to reduce smoking so substantially that it is no longer a significant public health problem for our nation" (Bonnie et al. 2007, p. 1). The 2010 Surgeon General's report (2010b) listed these recommendations along with the detailed recommendations of the President's Cancer Panel for addressing tobacco use prevention and treatment and exposure to secondhand tobacco smoke (Reuben 2007). The 2012 Surgeon General's report built upon recommendations in previous reports in its final chapter: "A Vision for Ending the Tobacco Epidemic" by noting that "we have evidence-based strategies and tools that can rapidly drop youth initiation and prevalence rates down into the single digits" (USDHHS 2012, p. 856).

There is extensive knowledge about what needs to be done—not achieving greater progress results in part from not fully implementing existing knowledge about what works, and in part from the continued efforts of the tobacco industry to promote and market cigarettes and other products. The vision set forth in the *Strategic Action Plan* (USDHHS 2010a) recognizes that dramatic action is needed to change social norms further and to continue to decrease the acceptability of tobacco use (USDHHS 2012), especially smoking.

In recent years, a number of critical legislative steps have been taken to reduce tobacco use, including measures that can reduce the ability of the tobacco industry to promote tobacco use. These legislative measures bring new possibilities for tobacco control.

In February 2009, the *Children's Health Insurance Program Reauthorization Act*, Public Law 111-3, *U.S. Statutes at Large* 8 was signed, which included an unprecedented \$0.62 increase in the federal excise tax on cigarettes to \$1.01 per pack. This single legislative act—increasing the price of cigarettes—is projected to have reduced the number of middle and high school students who smoke by over 220,000 and the number using smokeless tobacco products by over 135,000 (Huang and Chaloupka 2012).

Raising prices on cigarettes is one of the most effective tobacco control interventions (USDHHS 2012; International Agency for Research on Cancer [IARC] 2011). Even with this tax increase in 2009, the average retail price of cigarettes in this country is still too low in comparison with other countries (World Health Organization [WHO] 2013). Additional price increases would accelerate progress in reducing youth and young adult rates of tobacco use (IARC 2011; USDHHS 2012; WHO 2013). The understanding of price elasticity suggests that the average retail price of cigarettes in the United States across the country would need to be raised to at least \$10 a pack, similar to prices in many other countries, in order to have a large and rapid impact (IARC 2011; USDHHS 2012; WHO 2013; Jha and Peto, in press).

In June 2009, the *Family Smoking Prevention and Tobacco Control Act (Tobacco Control Act)*, Public Law 111-31, *U.S. Statutes at Large* 123, was signed, thereby granting the U.S. Food and Drug Administration (FDA) the authority to comprehensively regulate thousands of tobacco products for the first time in history. This law gives FDA a number of powerful tools to regulate tobacco products, both existing and new (see Chapter 14). Effective implementation of FDA's tobacco product regulation mandate is needed to reduce the harm caused by tobacco products.

In March 2010, the *Patient Protection and Affordable Care Act (Affordable Care Act)*, Public Law 111-148,

U.S. Statutes at Large 124 (2010):119, was signed into law. As part of its emphasis on prevention and health promotion, the law (a) requires private insurance plans and Medicaid expansion plans to cover tobacco cessation treatments, including medications that help people quit smoking; (b) requires state Medicaid programs to cover tobacco cessation medications; (c) expands smoking cessation coverage for pregnant women who receive Medicaid; and (d) provides Medicare beneficiaries with an annual wellness visit that includes personalized prevention plan services with referrals for tobacco cessation services. The *Affordable Care Act* also established the Prevention and Public Health Fund, which represents the most significant investment in U.S. history to scale up and promote effective public health and preventive measures, including programs to prevent and reduce tobacco use. The *Affordable Care Act* strengthens a key element of tobacco use cessation services by making them more available and barrier-free to almost all smokers.

The extensive evidence base supports the conclusion in Chapter 14 that mass media campaigns, comprehensive community programs, and comprehensive statewide tobacco control programs prevent initiation of tobacco use and reduce the prevalence of tobacco use among youth and adults. Although increased application of these and other proven tobacco control strategies would be highly effective, the current levels of implementation of these key strategies are far below the most effective levels according to the evidence base. State funding of tobacco control programs has been declining for years. For example, in 2010 states were only appropriating 2.4% of their tobacco revenues from both tobacco excise taxes and Master Settlement Agreement payments for tobacco control. Reaching CDC's recommended funding level would have required an additional 13% of tobacco revenues, or 3.1 billion of the \$24 billion collected (see Chapter 14) (CDC 2012).

Health Consequences

The 2004 Surgeon General's report showed that smoking impacts nearly every organ of the body (USDHHS 2004). The 2006 report concluded that the scientific evidence indicates that there is no risk-free level of exposure to secondhand smoke (USDHHS 2006). The new evidence in this report provides still more support for these conclusions. Fifty years after the first report in 1964, it is striking that the scientific evidence in this report expands the list of diseases and other adverse health effects caused by smoking and exposure to tobacco smoke. Figures 1.1A and 1.1B highlight these new findings and show that the risks for disease are even greater than presented in previous reports. These new findings include:

- Liver cancer and colorectal cancer are now added to the long list of cancers caused by smoking;
- Exposure to secondhand smoke is a cause of stroke;
- Smoking increases the risk of dying from cancer and other diseases in cancer patients and survivors;
- Smoking is a cause of diabetes mellitus; and
- Smoking causes general adverse effects on the body including inflammation and it impairs immune function. Smoking is a cause of rheumatoid arthritis.

This report also updates the estimates of disease, death, and economic costs attributable to smoking and exposure to tobacco smoke. The morbidity burden caused by smoking-attributable diseases is large, and new evidence suggests that over 16 million people alive today live with disease caused by smoking (see Chapter 12). In addition, the risks of death from diseases already on the causal list have increased in recent decades. This is particularly true for lung cancer risk among female smokers and chronic obstructive pulmonary disease risk for both male and female smokers (see Chapters 6 and 7). As the list of diseases caused by smoking has continued to grow, the updated estimate of the annual number of deaths attributable to smoking and exposure to secondhand smoke is now approaching 500,000 (see Chapter 12). This increase has occurred despite decreases in per capita cigarette consumption and prevalence, emphasizing our enhanced understanding of the lethality of cigarettes.

The estimated economic costs attributable to smoking and exposure to tobacco smoke have also increased. The annual indirect costs due to productivity losses are now estimated to be over \$150 billion (see Chapter 12). The estimates of direct medical expenditures have also increased as well, now ranging from at least \$130 billion annually up to \$176 billion or more (see Chapter 12).

Ending the Tobacco Epidemic

The burden of smoking-attributable disease and premature death and its high costs to the nation will continue for decades unless smoking prevalence is reduced more rapidly than the current trajectory. The evidence in this report shows that the nation will fail to achieve the *Healthy People 2020* objective of reducing the prevalence of smoking among adults to 12%. Model estimates sug-

gest that if the status quo in tobacco control in 2008 were maintained, the projected prevalence of smoking among adults in 2050 could still be as high as 15% (see Chapter 15). Trends in smoking rates among youth and adults show progress, but the prevalence of current smoking among youth and adults is only slowly declining and the actual number of youth and young adults starting to smoke has increased since 2002 (see Chapter 13). Additionally, the use of multiple tobacco products is increasingly common, especially among young smokers. Concerns remain that use of these new products may increase initiation rates among youth and young adults, delay quitting, and prolong the smoking epidemic.

As reviewed in this report, the root cause of the smoking epidemic is also evident: the tobacco industry aggressively markets and promotes lethal and addictive products, and continues to recruit youth and young adults as new consumers of these products (see Chapter 14) (USDHHS 2012). As reviewed in Chapter 14, U.S. District Judge Gladys Kessler entered her final opinion and order on August 17, 2006, and found that the tobacco industry defendants violated the *Racketeer Influenced and Corrupt Organizations Act*, Public Law 91-452, *U.S. Statutes at Large* 84 (1970):992, codified at *U.S. Code* 18§§ 1961–68 (1994), by lying, misrepresenting, and deceiving the public “including smokers and the young people they avidly sought as ‘replacement smokers,’ about the devastating health effects of smoking and environmental tobacco smoke” (*United States v. Philip Morris*, 449 F. Suppl. 2d1(D.D.C. 2006):852). The *Tobacco Control Act* incorporates as congressional findings of fact Judge Kessler’s determinations that “the major United States cigarette companies continue to target and market to youth,” that the companies sought to “encourage youth to start smoking subsequent to the signing of the Master Settlement Agreement in 1998,” and that they “have designed their cigarettes to precisely control nicotine delivery levels and provide doses of nicotine sufficient to create and sustain addiction while also concealing much of their nicotine-related research” (*Tobacco Control Act* 2009, §2(47) – (49)).

Therefore, this report addresses the question: what steps are needed to end the tobacco epidemic? There are different ways to achieve this vision. Should the emphasis be on ending cigarette use; ending the use of the most harmful tobacco products while reducing the harm of remaining products; or ending the use of all tobacco products?

The scientific findings of the 2012 Surgeon General’s report (USDHHS 2012) show that there are evidence-based strategies that can rapidly drop initiation and prevalence

rates of smoking among youth to single digits. To reach this target, these strategies need to be fully implemented and sustained with sufficient intensity and duration. Without such increased and sustained action, 5.6 million youth younger than 18 years of age in this country today are projected to die prematurely from a smoking-related illness. But millions of these projected deaths could be averted, making tobacco control a highest priority in our overall public health commitment and strategy.

Achieving this goal of rapidly reducing rates of smoking among youth still leaves 42 million current adult smokers who are at risk of dying from a smoking-related disease. The evidence in this and previous reports highlights how deadly inhaling tobacco smoke is, especially from burning cigarettes (USDHHS 2004, 2006, 2010, 2012). Approximately 85% of the tobacco products used since 1964 have been cigarettes (U.S. Department of Agriculture 2008).

The scientific findings of the 2010 Surgeon General’s report were definitive on the causation of disease by smoking:

- Major Conclusion #2: “Inhaling the complex chemical mixture of combustion compounds in tobacco smoke causes adverse health outcomes, particularly cancer and cardiovascular and pulmonary diseases, through mechanisms that include DNA damage, inflammation, and oxidative stress.”
- Major Conclusion #4: “Sustained use and long-term exposures to tobacco smoke are due to the powerfully addicting effects of tobacco products, which are mediated by diverse actions of nicotine and perhaps other compounds, at multiple types of nicotinic receptors in the brain” (USDHHS 2010b, p. 9).

The scientific evidence is incontrovertible: inhaling the combustion compounds from tobacco smoke, particularly from cigarettes, is deadly. It has been stated that “The cigarette is also a defective product, meaning not just dangerous but *unreasonably* dangerous, killing half its long-term users. And addictive by design” (Proctor 2013, p. i27). The high risks of cigarette smoking and the historic and current patterns of tobacco use in the United States lead to a primary conclusion of this report:

- The burden of death and disease from tobacco use in the United States is overwhelmingly caused by cigarettes and other combusted tobacco products; rapid elimination of their use will dramatically reduce this burden.

Could the use of cigarettes and other combusted tobacco products be rapidly reduced in this country? As noted above, evidence-based strategies that can rapidly drop youth initiation and prevalence rates down to single digits have already been identified and used (USDHHS 2012). Chapter 14 reviews a broad range of well-defined and effective interventions proven to reduce adult smoking rates if implemented and sustained at funding levels consistent with CDC's recommended levels (see Chapter 14). This and previous reports outline effective programs and policies:

- Fully funded comprehensive statewide tobacco control programs funded at levels recommended by CDC;
- A higher average retail price of cigarettes in the United States. Experience from across the globe suggests at least \$10 a pack in the United States;
- Complete protection of the entire U.S. population from exposure to tobacco smoke through comprehensive smokefree indoor air policies;
- High-impact media campaigns, such as CDC's Tips from Former Smokers campaign and the proposed U.S. Food and Drug Administration prevention campaigns at a high-frequency level and exposure for 12 months a year for a decade or more; and
- Full access to cessation treatment for nicotine addiction including counseling and medication for all smokers, especially those with mental and physical comorbidities.

However, these five actions are not all that needs to be done. Although more aggressive use of those evidence-based policies and programs reviewed in Chapter 14 is a starting point, the simulation modeling results reviewed (see Chapter 15) suggest that new strategies may be needed to more rapidly reduce rates of smoking. Recently, such tobacco control strategies are beginning to be formulated that might dramatically reduce the use of tobacco products, especially cigarettes. These proposed strategies have been labeled tobacco end game scenarios (see Chapter 15). For the United States, the feasibility and applicability of these various proposals range from possible (reducing the nicotine in cigarettes to nonaddicting levels) to almost certainly infeasible (transferring the tobacco product

market to a nonprofit entity). Any application of these end game interventions should come as an integrated national tobacco control strategy that is based on a foundation of enhanced implementation of the proven strategies. Examples of end game options (see Chapter 15), which could complement the proven interventions in accomplishing our overall goal of a society free of tobacco-related death and disease, include but are not limited to: (1) reduce the nicotine content to make cigarettes less addictive (Benowitz and Henningfield 2013), and (2) greater restrictions on sales, particularly at the local level, including bans on entire categories of tobacco products (Berrick 2013; Malone 2013).

In considering options for reducing the health burden caused by smoking, many additional recommended actions have been defined in evidence reviews and guidance documents discussed in this report. For example, selected state experience suggests that all levels of government can enhance revenue collection and minimize tax avoidance and evasion through several policy approaches, such as implementing a high-tech cigarette tax stamp, improving tobacco licensure management, and making the stamps harder to counterfeit (see Chapter 14). These state practices could also be expanded to the national level with a national track and trace system. A track and trace system, in the tobacco control context, is a system that can track goods from manufacture to distribution to sale, identifying points in the supply chain where taxes should be paid and confirm payment. Enforcement enhancements would also be beneficial. Implementing such systems would also simultaneously retain the positive public health effects of taxation and protect product regulation in the market.

In addition to actions taken by the federal government, actions by national and local nongovernmental organizations can have significant impacts on social norms. As reviewed in Chapter 14, the portrayals of tobacco use in U.S. films appear to have rebounded upward in the last 2 years (see Chapter 14, Figures 14.3A and 14.3B). Based on box office attendance data, it has been estimated that youth were exposed to 14.9 billion in-theater tobacco-use impressions³ in youth-rated films in 2012. Youth who are exposed to images of smoking in movies are more likely to smoke; those who experience the most exposure to onscreen smoking are approximately twice as likely to begin smoking as those who receive the least exposure (USDHHS 2012). Actions that would eliminate depiction of tobacco use in movies that are produced and rated as appropriate for children and adolescents could have a sig-

³One impression equals one tobacco use incident on screen viewed by one audience member.

nificant benefit in reducing the numbers of youth who become tobacco users. It has been suggested that the movie industry modernize the Motion Picture Association of America voluntary rating system to eliminate smoking from youth-rated films by awarding any film with smoking or other protobacco imagery an R rating (with exceptions for real historical figures who actually smoked or films that actually depict the dangers of smoking or exposure to secondhand smoke) (Glantz and Polansky 2012; Sargent et al. 2012). Further, if such a change in the Motion Picture Association of America rating system would reduce in-theater exposures from a current median of about 275 annual exposures per adolescent from PG-13 movies down to approximately 10 or less, adolescent smoking would be reduced by an estimated 18% (95% confidence interval, 14–21%) (Sargent et al. 2012).

The increasing availability of noncombustible products raises the question of using them to help eliminate the harm caused by tobacco. The *Tobacco Control Act* is governed by a requirement to protect public health, an acknowledgement that the goal of tobacco control is to improve public health overall. A public health standard is critical because strategies that reduce potential harm from toxicant exposure to individual users of tobacco products could adversely affect other individuals and public health by increasing the number of new users of cigarettes and by reducing the number of quitters (Figure 16.2).

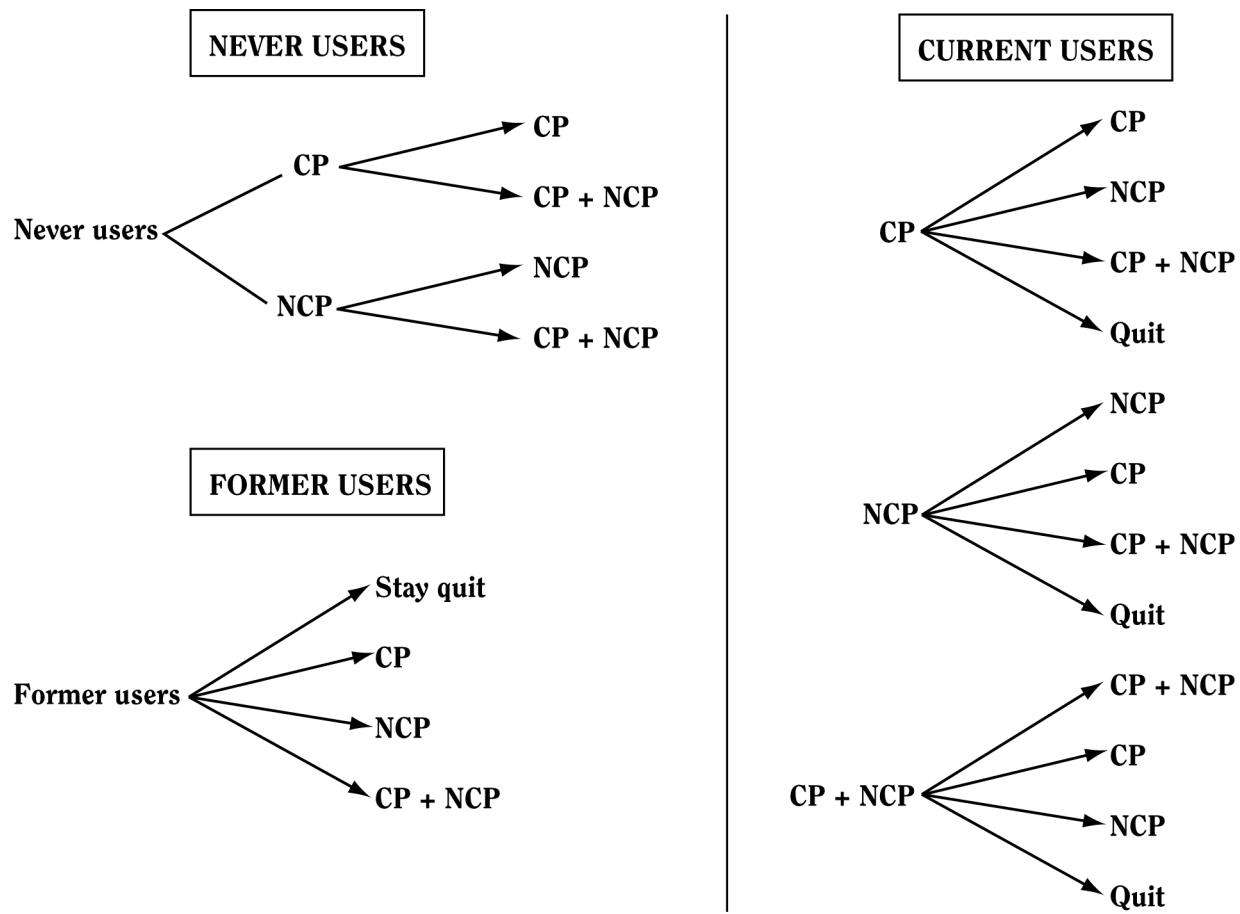
This issue of reducing direct *individual* harm in those substituting noncombustibles for cigarettes while minimizing impact on other individuals, who may start or not stop using cigarettes (Figure 16.2), arises in facing the regulatory challenge posed by electronic cigarettes (e-cigarettes or electronic nicotine delivery systems). Although these new products are entering the marketplace rapidly, and will soon be marketed by all three major tobacco manufacturers in the United States, significant questions remain about (1) how to assess the potential toxicity and health effects of the more than 250 electronic cigarette brands; (2) the magnitude of the potential reduced risk from electronic versus continuing use of conventional cigarettes for individual smokers; (3) the need to weigh the potential individual benefits and risks versus population benefits and risks; (4) how the advertising and marketing of these new products should be regulated; and (5) even assuming that electronic cigarettes could be sufficiently safe to users and offer net public health benefits, there are significant questions about the manner in which they should be regulated (Benowitz 2013).

The issue of weighing the relative benefits and risks to individuals and populations is critical when considering the potential role of any noncombustible tobacco products

in reducing the occurrence of smoking-caused diseases and morbidity. Currently, there are varying scenarios being discussed. In one scenario, noncombustible tobacco products would be substituted for cigarette smoking among a subset of smokers (people who otherwise would not quit smoking and thus are at high risk for smoking-caused diseases). Proponents claim that such a switch would significantly reduce the burden of death and disease attributable to smoking if smokers completely substituted combustible products with noncombustible products. The perspective rests on the assumption that (a) noncombustible tobacco products, used alone, are far less dangerous to individual users than continued smoking, a conclusion that appears correct based on current understanding (Levy et al. 2004; USDHHS 2010b); (b) with proper marketing, differential taxation, and other carefully calibrated policies, noncombustible products would be adopted as a complete substitute for smoking by significant numbers of current smokers, a thus far unproven assumption; (c) smokers who switched to noncombustible products otherwise would continue to smoke (as opposed to quitting), another area with significant uncertainty; and (d) the net impact on health of all the various outcomes, intended and unintended, would contribute meaningfully to tobacco harm reduction, a proposition that has been explored only once in the literature (Mejia et al. 2010). In that analysis which related only to snus, it was concluded that it would be unlikely that the promotion of the snus form of smokeless tobacco would be associated with substantial health benefits. The probability that the use of snus could delay complete cessation of cigarette smoking among health-concerned smokers would decrease the potential health benefit at the population level.

An alternative scenario regarding noncombustible products as a harm reduction strategy holds that the availability and promotion of noncombustible tobacco products would increase the aggregate damage to health produced by tobacco. Proponents of this position vary on how much they emphasize the inherent dangers of noncombustible tobacco products. Even those who concur that the use of noncombustible tobacco products may not constitute a large direct risk to individual health propose that a strategy based on their use would increase total tobacco-related harm to health. Proponents of this position argue that the availability of noncombustible products can have adverse consequences, especially under current conditions with the widespread marketing and use of cigarettes. These consequences include (a) encouraging children to experiment with tobacco products (with the expectation that a percentage of those who become regular users of noncombustible products will graduate

Figure 16.2 Potential patterns of use of combustible products (CP) and non-combustible products (NCP)



Source: Created by J. Samet for this Surgeon General's Report.

to smoking); (b) helping smokers maintain their addiction by using noncombustible products in environments where they cannot smoke; (c) acting as a non-risk-free substitute for cigarettes for smokers who otherwise would have quit; and (d) giving smokers an alternative means of satisfying their addiction that may lead to higher levels of recidivism to smoking. The evidence indicates that current industry practices raise concerns about all of these potential adverse consequences (USDHHS 2012). One study found that transnational tobacco companies promote less harmful tobacco products in order to maintain and extend the sales of cigarettes and to create alternative

forms of tobacco use among young people who are no longer smoking (Peeters and Gilmore 2013). Uncertainties as to the role of noncombustible tobacco products as part of a harm reduction strategy raises issues of promotion of noncombustible tobacco. Further research with attention to their individual and population-level consequences will be helpful to fully address these questions. However, the promotion of noncombustible products is much more likely to provide public health benefits only in an environment where the appeal, accessibility, promotion, and use of cigarettes and other combusted tobacco products are being rapidly reduced.

Accelerating the National Movement to Reduce Tobacco Use

These key conclusions of this report provide evidence that calls for dramatic action:

- The current rate of progress in tobacco control is not fast enough. More needs to be done.
- High levels of smoking-attributable disease and death costs will persist for decades into this twenty-first century unless more rapid progress is made in tobacco control. The current burden is unacceptable.
- The almost 500,000 annual premature deaths due to smoking and exposure to tobacco smoke are far too many. Even 100,000 or 200,000 annual attributable deaths are far too many; yet this is a realistic projection of the burden well into the middle of this twenty-first century if more rapid progress is not made in tobacco control.
- The burden of death and disease from tobacco use in the United States is overwhelmingly caused by cigarettes and other combusted tobacco products; rapid elimination of their use will dramatically reduce this burden.

There are important lessons to be learned from other successes in public health. In confronting worldwide epidemics caused by smallpox and polio, the eradication of the diseases was the clear objective. From this single-minded focus, the best strategies and actions based on public health science and practice were applied, evaluated, refined, and sustained for decades. The results are now evident: smallpox was eradicated decades ago and polio is on the verge of elimination. The nation should firmly commit to this goal of creating a society free of tobacco-related death and disease by engaging all sectors of society to an equally single-minded focus.

In the last 50 years, the smoking rate in the United States has been cut by more than one-half (from 42.7% in 1965 to 18% in 2012). The *Strategic Action Plan* provides a critical framework to guide and coordinate efforts to reduce the smoking rate to less than 10% for both youth and adults in 10 years, averting millions of smoking-related deaths. This national commitment will require increased and sustained action to rapidly eliminate the use of cigarettes and other forms of combustible tobacco products. As end game strategies are being developed, the following actions should be implemented:

- Counteracting industry marketing by sustaining high impact national media campaigns like the

CDC's Tips from Former Smokers campaign and FDA's youth prevention campaigns at a high frequency level and exposure for 12 months a year for a decade or more;

- Raising the average excise cigarette taxes to prevent youth from starting smoking and encouraging smokers to quit;
- Fulfilling the opportunity of the *Affordable Care Act* to provide access to barrier-free proven tobacco use cessation treatment including counseling and medication to all smokers, especially those with significant mental and physical comorbidities;
- Expanding smoking cessation for all smokers in primary and specialty care settings by having health care providers and systems examine how they can establish a strong standard of care for these effective treatments;
- Effective implementation of FDA's authority for tobacco product regulation in order to reduce tobacco product addictiveness and harmfulness;
- Expanding tobacco control and prevention research efforts to increase understanding of the ever changing tobacco control landscape;
- Fully funding comprehensive statewide tobacco control programs at CDC recommended levels; and
- Extending comprehensive smokefree indoor protections to 100% of the U.S. population.

Former WHO Director General Gro Brundtland was correct in 1999 in stating the need to evaluate current action from the perspective of our grandchildren and their children (Asma et al. 2002). As future generations look back on our current actions and knowledge of the tobacco epidemic, will current efforts show the commitment to public health and social justice set forth in our national plans and objectives?

This nation's decades-long battle against the tobacco epidemic has successfully prevented millions of premature deaths that would otherwise have occurred—an historic achievement by any measure. On the fiftieth anniversary of the landmark 1964 Surgeon General's report, this nation must rededicate itself not only to carrying forward the successful tobacco control efforts that have long been under way but also to expanding and accelerating those efforts in full recognition of the challenge that remains.

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