

Smoking Cessation: Recent Indicators of What's Working at a Population Level

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INTRODUCTION AND OVERVIEW

Smoking cessation is the principal means by which a current cigarette smoker can alter his or her future risk of disease (U.S.DHHS, 1990). Prevention of smoking initiation among adolescents can reduce smoking prevalence, but adolescents contribute little to rates of smoking-related illness until they have been smoking for 30 or more years.

Cessation is often examined at the individual level in order to determine the effects of cessation interventions or to define individual predictors of who will or will not be successful in their cessation attempts. However, for these individual effects to create a substantive public health benefit, they must sum to create a significant change at the population level. Powerful interventions that affect only a few individuals will have little impact on disease rates, whereas weaker interventions that impact large numbers of smokers will have important and cumulative effects on disease rates. In addition, many interventions (*e.g.*, price increases, changes in social norms, etc.) are delivered to the population as a whole rather than to individual smokers one at a time, and it is these population-based interventions that have formed the core of the tobacco control efforts currently underway in California, Massachusetts, and several other states.

This volume examines cessation at the population level. By population level, we mean that all segments of society form the denominator for evaluation of the effectiveness of tobacco control interventions. Therefore, this volume relies heavily on representative surveys of smoking behaviors in state and national populations. By doing so, it defines measures of cessation that can be used to assess the effects of tobacco control programs or public policy changes on smoking behavior. It then uses those measures to identify who is quitting, who is being successful, who is being exposed to various tobacco control interventions, and which tobacco control interventions are proving effective.

Can We Change Cessation Rates in the Population?

A persistently high smoking prevalence (CDC, 2000), coupled with the low rates of success of those trying to quit, is discouraging to those interested in tobacco control and has led to suggestions that tobacco control efforts should be redirected to focus predominantly on preventing smoking initiation during adolescence. This pessimism is not supported by actual experience with smoking cessation over the past several decades. Currently, almost 50 percent of all of those who have ever smoked are former smokers (CDC, 2000).

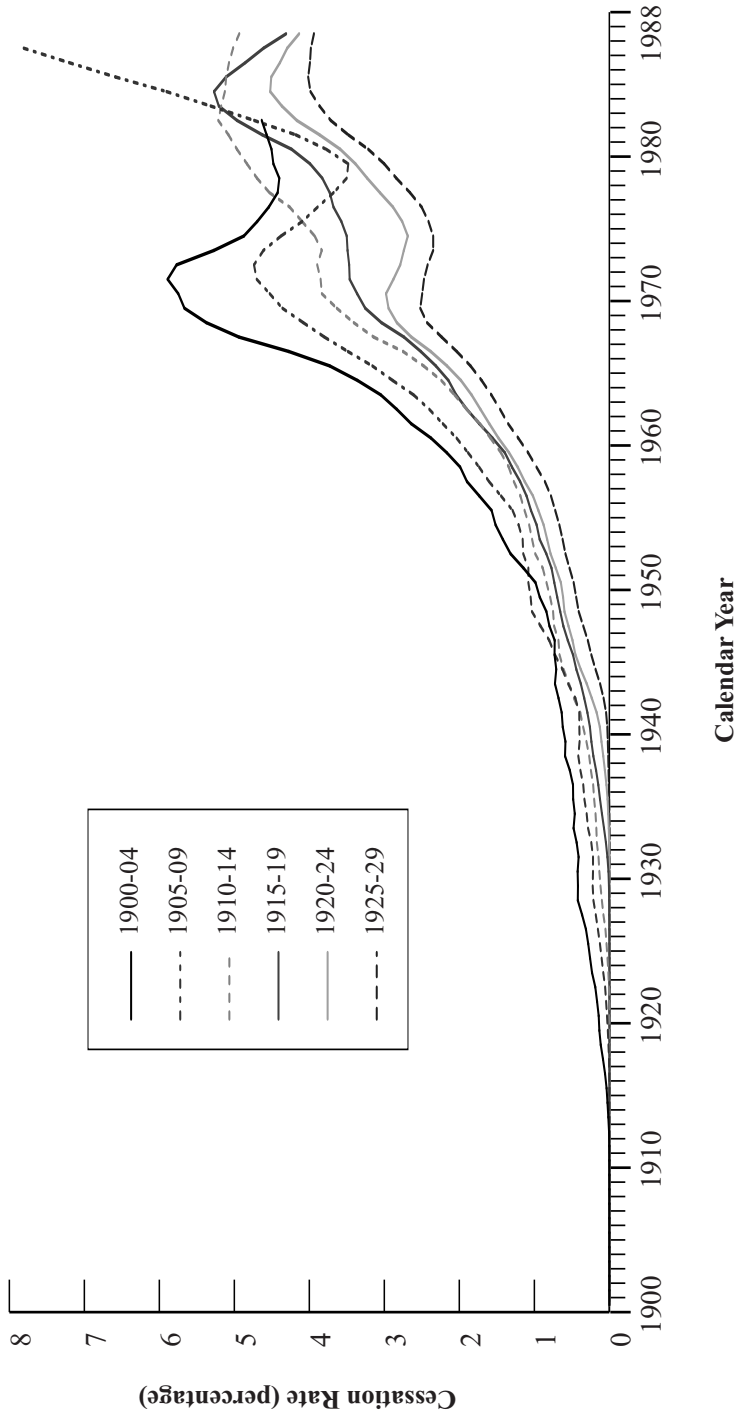
This high rate of cessation is neither accidental nor a result of the aging of the smokers in the population, nor is it due to other demographic shifts. Figure 1-1 presents cessation rates for White males born during sequential 5-calendar-year periods (birth cohorts) as they advance in time (and age) over the period from 1940 to 1988. Prior to the mid 1950s, cessation was uncommon at any age. With the scientific demonstration of the risks associated with smoking during the mid-1950s, and with widespread press coverage of lung cancer risks for smokers, cessation rates began to increase (Figure 1-1).

These observations provide strong evidence that cessation is not simply a naturally occurring consequence of aging. It has changed dramatically across all age groups following identification of, and widespread education about, the risks caused by smoking. Some individuals clearly do respond to risk information with a change in behavior, and the number of individuals responding is sufficient to influence cessation rates in the population; but the size of the effect on the population is modest and leaves the vast majority of smokers continuing to smoke.

Data on cessation rates over time also suggest that public health efforts to change smoking behavior can have an effect above and beyond the effect of information on risk alone. During the period from 1967 to 1970, anti-smoking television spots were broadcast in large numbers as a result of an FCC ruling that required the spots as a fairness doctrine in response to broadcast cigarette advertising (U.S.DHHS, 1989; Warner, 1989). Together with this counter-advertising, there was a substantial effort on the part of many professional and voluntary health organizations to help smokers quit. The result of this media-led activity was a substantial increase in cessation rates across all age and racial groups and in both genders (Burns *et al.*, 1997). When cigarette advertisements were removed from the broadcast media, and anti-smoking spots nearly disappeared as well (Lewit *et al.*, 1981), cessation rates leveled off or declined. The temporal association of change in cessation rates with these events strongly suggests that deliberate programmatic efforts *can* alter smoking behavior at the population level and provides one cornerstone of the foundation for current comprehensive tobacco control campaigns.

Since the 1970s, our understanding of effective tobacco control strategies has gradually shifted away from a focus solely on the individual smoker and toward a focus on changing the environment within which the smoker smokes (NCI, 1991). Initial efforts focusing on educating the smoker and providing clinic-based cessation assistance have been augmented by efforts to change community norms, increase the cost of cigarettes, restrict where smoking is allowed, and provide societal based persistent and inescapable messages to quit coupled with support for cessation. This shift is toward -multi-component programs that address norms as well as the needs of individuals. These concepts are reflected in the current state-based comprehensive tobacco interventions funded by the NCI, Centers for Disease Control and Prevention (CDC), and Robert Wood Johnson Foundation (CDC, 1999a). In California and Massachusetts, these comprehensive approaches have been funded at substantial levels for several years

Figure 1-1
Annual Smoking Cessation Rates by Calendar Year for 5-Year Birth Cohorts of White Males Born between 1900 and 1929



NHIS Data
 Burns et al., 1997

(since 1989 in CA, and 1993 in MA). More recently, Arizona, Oregon, and Florida have developed programs, and the Master Settlement Agreement between the State Attorneys General and the tobacco industry will provide resources that some other states may use to initiate their own programs.

The programs in California and Massachusetts have been associated with reductions in various measures of smoking behavior (Biener *et al.*, 1997; Pierce *et al.*, 1998), and their program elements are being replicated in other states. This volume examines what we know about the components and the effects of these existing programs in an effort to provide guidance to states as they develop or modify their own tobacco control campaigns. The analyses presented here are limited to the areas where we have data, and this limitation makes it difficult to evaluate every aspect of the current programs. In particular, the community organization components of the programs—widely accepted as a critical foundation for any successful tobacco control effort—are difficult to quantify and, therefore, are examined only in passing in this volume.

Measures of Cessation and Changes in Cessation Nationally

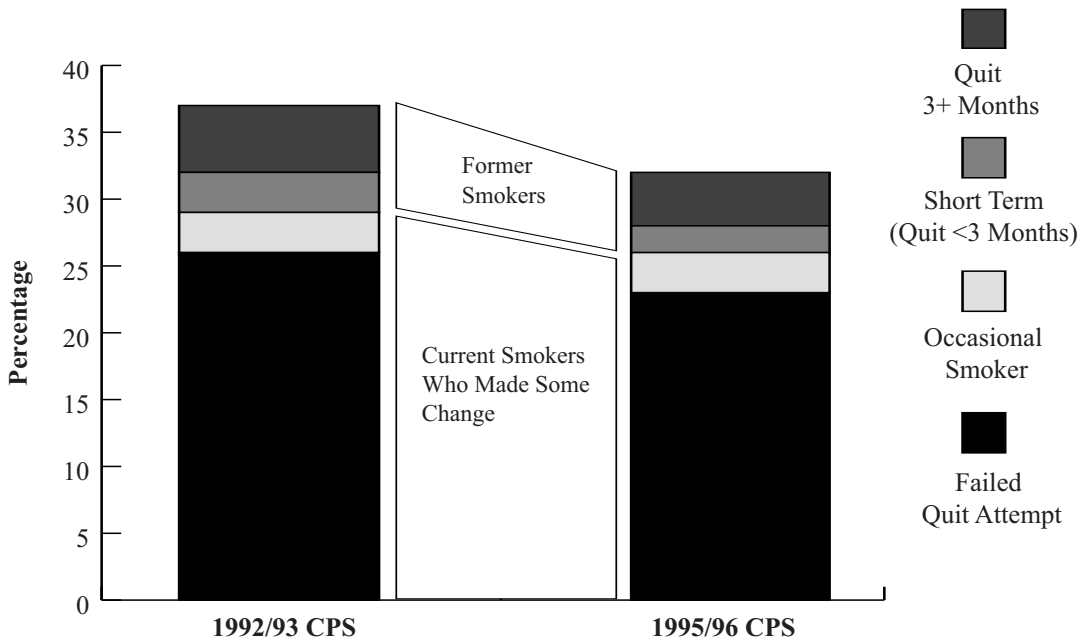
Traditional measures of cessation include cessation attempts, and measures of cessation success for various periods of time following a quit attempt, as well as cumulative measures of cessation such as the fraction of ever smokers who are currently former smokers. The cessation measures presented in this monograph differ somewhat from these traditional measures in order to improve their utility in evaluating different components of tobacco control programs. Traditional survey measures of cessation are intended to measure rates of cessation in the entire population of smokers and, therefore, must include all smokers in the denominator. We limit our analyses to those smokers of age 25 and older to ensure that changes in observed behavior are not related to the smokers still being in the process of becoming regular smokers. For similar reasons, and because occasional smokers may respond differently to a question about being off cigarettes for 24 hours or more (the definition of a quit attempt), we eliminate all those who were not daily smokers 1 year prior to the survey.

The goal of these limitations is to relate recent exposures to tobacco-control influences to recent cessation behavior; thus, cessation activity within the last year is the focus of all of the measures. During the year preceding the survey, individuals who were daily smokers 1 year prior to the survey may have quit and relapsed, may have become an occasional smoker, may have become a former smoker, or may have become a former smoker of 3 or more months' duration. This set of measures allows examination of cessation attempts and cessation success as separate measures, and it allows independent assessment of those factors that promote cessation activity and those factors that enable cessation success.

Figure 1-2 presents the above measures for the United States as measured by the Current Population Survey (CPS) for the years 1992/93 and 1995/96 (see Chapter 2). There is a clear and statistically significant decline in cessation activity and cessation success between these two surveys. The decline is statistically significant for each of the measures of cessation activ-

Figure 1-2

1992/93 and 1995/96 CPS: Percentage of Daily Smokers (Age 25+ Years) 1 Year Prior to the Survey Who Reported Some Change in Their Smoking Status during that Year



ity and cessation success, with the exception of “becoming an occasional smoker.” The decline is present for both genders and for all age, race, and educational groups. The decline in cessation is proportionately greater among those with higher levels of income. This decline in cessation contributes to the observed absence of a decline in per-capita cigarette consumption in the United States during those same years and is a major public health concern (CDC, 1999b).

When the demographic correlates of cessation are examined in the CPS (see Chapter 2), smokers aged 65 years and older are much less likely to make a cessation attempt than younger smokers, but they are much more likely to be successfully quit for 3 or more months. Thus, older smokers appear to be less likely to attempt to change their smoking behavior, but when they do, they are substantially more likely to be successful. Differences between racial and ethnic groups are less pronounced. African-Americans have significantly higher rates of cessation activity than non-Hispanic Whites, but they also have significantly lower rates of being quit for 3 or more months. Asian/Pacific Islanders also have significantly higher rates of cessation activity compared to non-Hispanic Whites, with a non-significant lower rate of 3+ month cessation success.

Rates of both cessation activity and 3+ month cessation success are significantly higher among smokers with higher levels of educational attainment. A similar pattern is seen with level of income, where both cessation activity and 3+ month cessation success are significantly higher among

smokers with higher family incomes. The percentage of all cessation activity that has resulted in 3+ months of successful cessation is relatively uniform across the middle strata of family income, but it is higher for the top income stratum and lower for the lowest income stratum.

There is a clear decline in cessation activity with increasing number of cigarettes smoked per day; however, the picture for cessation success is less clear. Those who reported smoking 1-4 cigarettes per day 1 year prior to the survey were significantly more likely to be successfully quit for 3+ months than were smokers who reported smoking 5-14 or 15-24 cigarettes per day. However, once the category of 1-4 cigarettes per day is excluded, there is no trend of lower likelihood of 3+ month successful cessation with increasing number of cigarettes smoked per day across the remaining number of cigarettes per day categories. These data suggest that, within that group of smokers who are likely to be dependent smokers (those who smoke 5+ cigarettes per day), heavier smokers are less likely to attempt to quit. However, when these heavier smokers do attempt to quit, they may be as likely to be successful in that attempt (*i.e.*, quit for 3 or more months) as those who smoke less than one pack per day. These cross-sectional data need to be interpreted with caution in the light of other data from a 5-year longitudinal follow-up of current smokers in the COMMIT study (Hymowitz *et al.*, 1997), which show a consistent decline in successful cessation with increasing number of cigarettes smoked per day. The reasons for the differences between these two forms of analyses are unclear.

Comparison of California and Massachusetts to the Remaining States

Since California and Massachusetts have conducted large, well-funded tobacco control interventions over the period covered by the Current Population Surveys, one measure of the success of these tobacco control efforts is to examine whether cessation rates are higher in these states compared to the remaining states where interventions have been more modest. Because smoking prevalence and cessation are influenced by differences between states in demographic characteristics and number of cigarettes smoked per day, we examined measures of cessation using multivariate logistic regression analyses to control for those variables (see Chapter 2).

Both California and Massachusetts had statistically significantly higher cessation activity compared to other states. Massachusetts had an increase in cessation attempts, and California had an increase in the likelihood of becoming an occasional smoker. Both Massachusetts and California also had increases in the likelihood of becoming a former smoker in the last year compared to other states. The likelihood of achieving 3+ months of cessation success was also significantly higher in California, and higher with borderline significance ($p = 0.051$) for Massachusetts, when compared to the remaining states.

These analyses demonstrate that California and Massachusetts had higher rates of cessation activity and cessation success when compared to the remaining states, and that the decline between surveys in cessation rates (particularly 3+ month successful cessation) is less in California than in the remaining states. While a national trend toward lower cessation

activity occurred between 1992/93 and 1995/96, the impact of this trend was less pronounced in California and Massachusetts than in the remaining states. The higher rates of cessation activity and cessation success in California and Massachusetts provide evidence for a substantial impact of the tobacco control programs on cessation in these two states.

WHAT WORKS The differences in cessation activity and success that exist in California and Massachusetts may support an overall effect of tobacco control programs on cessation, but they do little to define which components of the programs are working. In reality, it is probably never possible to definitively define the specific causal effects of a specific component of any of these programs because they are not delivered in isolation and because many of their effects may be created by synergistic interactions between program elements. However, by examining differences in cessation behaviors among individuals exposed or not exposed to different program elements, it is possible to identify those program components associated with increases in cessation activity and success. In addition, there are substantial variations across the states in public policies on tobacco, including taxes and restrictions on where people can smoke, and these differences can be compared to differences in rates of cessation to examine the association of these public policies and cessation.

Demonstrations of association do not meet traditional standards for defining causal relationships. The randomized controlled trials needed to define a cause-and-effect relationship are impossible to undertake for most public policy changes, especially taxation. However, the linkage of policy/program exposure to successful cessation provides valuable assistance to those developing and refining tobacco control programs. Analyses can define both the reach of these components into the smoking population and the ability of the programs to affect under-served segments of the population. They also define the changes in the smoking behavior of smokers exposed to each policy. The combination of reach and effect generates an estimate of the likely public health impact of each component, and estimating the impact for the population can aid those who are responsible for program design in allocating resources across the various components of a comprehensive tobacco control strategy.

Public Policy Components Changes in public policies on tobacco can affect large numbers of individuals at minimal cost. Increasing the cost of cigarettes through taxation (Chapter 6) and restrictions on smoking in the workplace (Chapter 3) are two public policy changes for which substantial bodies of information exist to define their effectiveness.

Changes in the cost of cigarettes repeatedly have been demonstrated to be associated with a reduction in measures of total and per-capita consumption of cigarettes, and most studies have shown a relatively consistent 4 percent decline in consumption for each 10 percent increase in price. More limited data are available for cessation, but there is a similarity in the annual changes in sales-weighted price of cigarettes and changes in calendar-year rates of 1 year successful cessation. In addition, when differences across states in cost of cigarettes are compared to differences in state-specific rates

of cessation activity and success, controlling for differences in demographic factors and number of cigarettes smoked per day, there is a statistically significant association between higher cost and higher rates of both cessation activity and cessation success. These observations support the probability that an increase in the cost of cigarettes can influence not only short-term cessation attempts but also long-term cessation success.

Recently, there has been a dramatic increase in the fraction of the working population protected by total bans on smoking in the workplace—from 3 percent in 1986 to 64 percent in 1996. Multiple workplace observations have demonstrated that instituting a change in workplace smoking restrictions is accompanied by an increase in cessation attempts and a reduction in number of cigarettes smoked per day by continuing smokers. Once restrictions on smoking in the workplace have been successfully implemented, they continue to have effects. Observations from the longitudinal follow-up in the COMMIT trial and from cross-sectional data from the CPS both demonstrate that being employed in a workplace where smoking is banned is associated with a reduction in the number of cigarettes smoked per day and an increase in the success rate of smokers who are attempting to quit (see Chapter 3). There may also be a small effect of increasing the frequency with which smokers attempt to quit. General environmental norms about smoking may also play a role in promoting smoking cessation, since multivariate logistic regression analyses of the effect of workplace restrictions on smoking show small independent effects on cessation activity and success for both the actual restrictions in the smoker's workplace and for the average level of workplace restrictions in the state as a measure of the social norms regarding smoking (Figure 1-3).

Pharmacological and Health Care Systems Interventions

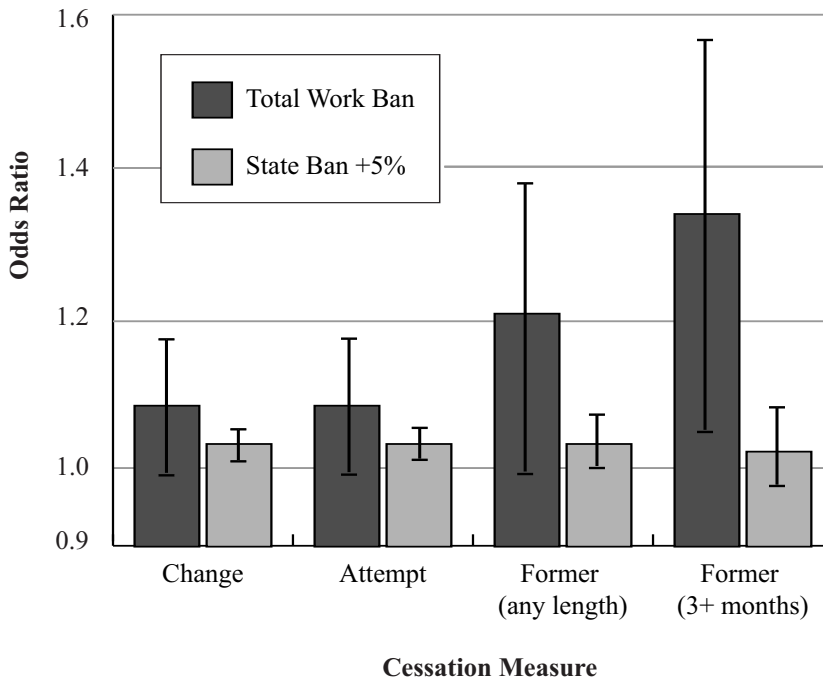
The health care system has long been recognized as a logical and potentially productive means of reaching smokers with a cessation message and promoting their successful cessation. Approximately 70 percent of smokers see a physician each year, creating the potential to reach large numbers of smokers with a cessation message. The fraction of patients who report having been advised in the last year by their physician to quit smoking remains too low, but it has been increasing over time and now exceeds 50 percent of smokers.

A variety of pharmacological approaches to smoking cessation have been approved by the FDA over the last two decades, including nicotine replacement therapy with gum, patches, nasal and oral inhalers, and bupropion. The patch and gum have been approved for over-the-counter sale since 1996.

Both physician advice and pharmacological treatment have been established in controlled clinical trials to have a substantive effect on long-term smoking cessation, and this volume addresses the evidence for an effect at the population level. Once these interventions move beyond the controlled investigational setting where there is careful attention to the intervention protocol, it is likely that they are used in isolation, without the additional support provided in the clinical trial, and without such support, they may be less effective. Analyses of cessation activity and success among those

Figure 1-3

Odds Ratios for Cessation Activity and Cessation Success for Smokers Working in Workplaces where Smoking Is Banned or Living in States where there Is High Prevalence of Workplace Smoking Bans—Data Source: 1995/96 CPS

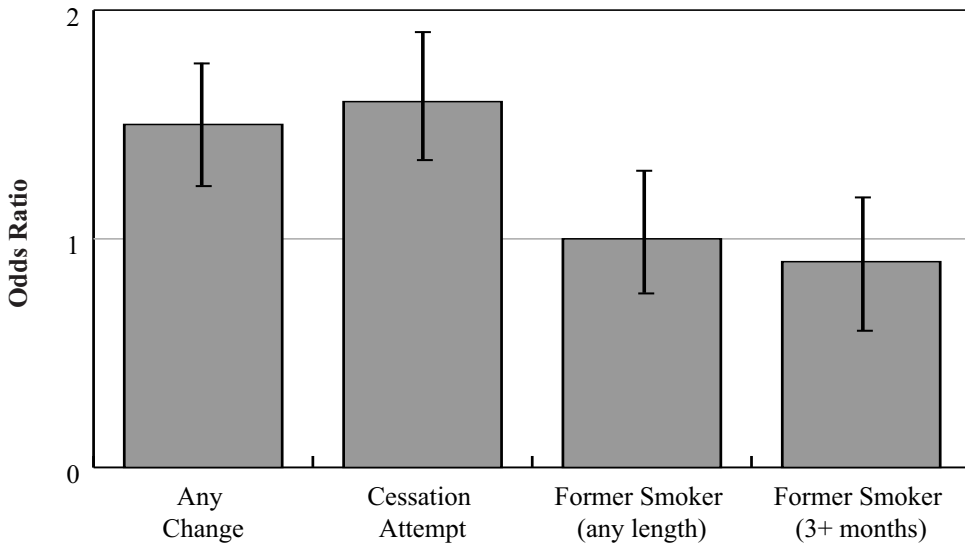


who were daily smokers 1 year prior to the 1996 California Tobacco Survey suggest that this may indeed be the case. When multivariate logistic regression analyses are performed on physician advice to quit, controlling for age, gender, level of education and income, race/ethnicity, and number of cigarettes smoked per day, there is a significant increase in the likelihood of making any change or making a cessation attempt among those receiving physician advice to quit, but there is no effect on likelihood of being successfully quit or being quit for 3 or more months (Figure 1-4). These data suggest that physician advice to quit in the real world is having an effect on cessation attempts, but little effect on long-term cessation success.

A similar, but more encouraging, picture is evident when population data on the effect of nicotine patches and gum on cessation activity and success are examined. About 21 percent of those who tried to quit during the year previous to the 1996 California Tobacco Survey reported using nicotine patches or gum. When the current smoking status of all those who had made a quit attempt in the last 12 months is examined by the method of cessation assistance they reported using, 17 ± 2 percent of those who reported using no cessation assistance were former smokers at the time of the 1996 California Tobacco Survey. Of those who reported using patch or gum, either alone or in combination with other methods, 32 ± 5 percent were former smokers at the time of the survey. When the data were ana-

Figure 1-4

Multivariate Logistic Regression Analysis of Physician Advice to Quit on Cessation Activity and Success, Controlling for Gender, Race/Ethnicity, Education Level, Income Level, and Number of Cigarettes Smoked per Day—Data Source: 1996 CTS



alyzed for those who had been quit for 3+ months at the time of the survey, results were less impressive (11.2 ± 2.6 percent for any use of patch or gum versus 9.7 ± 0.7 percent for no methods). The results for 3+ month cessation were not statistically different, possibly due to the small number of observations. Thus, examination of population-based data on gum and patch use suggest that they are a part of a large number of cessation attempts and are likely to make a substantive difference in the success rate of those attempts. However, the rates of success in the California population are well below those demonstrated in clinical trials, which suggests that there is substantial potential to increase both utilization of nicotine replacement products and the impact of these products on the success rate of smokers trying to quit.

The gap between the effect achieved in clinical trials and the population data defines the potential that can be achieved if these modalities are delivered in a more comprehensive and organized manner and integrated with the other available cessation resources. If physician advice achieves the effectiveness demonstrated in clinical trials, it could result in as many as 750,000 additional quits among the 35 million smokers who visit their physicians each year. If the success rate of pharmacological interventions matched that in the clinical trials, as many as 500,000 additional quits each year could be achieved, and an even greater number could be expected if larger numbers of smokers who are trying to quit could be persuaded to use pharmacological methods.

One approach to improving the results seen with physician advice and pharmacological interventions is to increase the fraction of smokers who receive advice or use cessation assistance. However, a great deal of research and programmatic support has already been committed to increasing the frequency with which physicians advise their smoking patients to quit, and this effort has shown a substantial increase in the fraction of patients who report that their physicians have advised them to quit. Independently, pharmaceutical companies have advertised the availability of cessation treatments extensively, which has resulted in substantial demand for and use of these interventions. Both of these efforts should continue, but it is not clear that additional resources would add to the number of individuals encountering either of these interventions, and given the limited evidence for a population-based effect on long-term cessation for either of these interventions as they are currently practiced, allocation of additional resources may not be appropriate.

The principal limitation for these two interventions is not simply that they are utilized by too few individuals, but rather that the promise of these interventions as established in clinical trials is not fulfilled in their real-world applications. One of the differences between the clinical trials and real-world applications is that in clinical trials, the investigatory team ensures that the intervention is delivered according to the research protocol. These protocols often specify the content and extent of physician advice, directions on how to best use the medications, an offer of additional support if desired, and an expressed intent to follow up on the individual's cessation effort. Many of these components may be lacking in the real-world application of these clinically proven interventions, and this lack may explain at least part of the difference in effectiveness between the clinical trials and the population-based data.

The answer to improving the effectiveness of these interventions may not lie in providing additional resources into the health care system to change physician behavior or additional promotional activity for pharmaceutical assistance with cessation. The answer may be to try to supplement these interventions by linking them with other components of comprehensive tobacco control interventions to improve their effectiveness. For example, linking physician advice with telephone hotline counseling, providing information on how to effectively utilize over-the-counter medications at community cessation events, and encouraging healthcare systems to view cessation as a population-based intervention delivered across all interactions with the system rather than as a process initiated exclusively by physicians.

If other components of a comprehensive tobacco control program can be linked to physician advice and pharmacological assistance, it may be possible to provide the enhanced level of support and follow-up that characterized the delivery of these interventions in the clinical trial setting as these interventions are delivered to large segments of the population. When this was done within a large HMO setting (Curry *et al.*, 1998), and when the barriers to accessing these modalities were reduced by lowering or eliminating the cost to smokers, cessation results were consistent with those

achieved in clinical trials. This experience suggests that the limited population effects of physician advice and pharmacological assistance represent limitations in the integration of the support provided to smokers who are trying to quit rather than absolute limitations of these approaches when they are utilized in the general population. The frequency with which physician advice is provided to smokers as well as the frequency with which smokers are using pharmacological assistance are both increasing, and these increases should be supported and encouraged. To obtain the maximal benefit from these effective interventions, we need to integrate them into health care delivery systems, link them to community cessation resources, and create an environment that encourages their access. Once these steps have been taken, dramatic improvements in population-based rates of cessation are possible (Curry *et al.*, 1998). Moreover, it is reasonable to expect that the experience could be replicated in other settings.

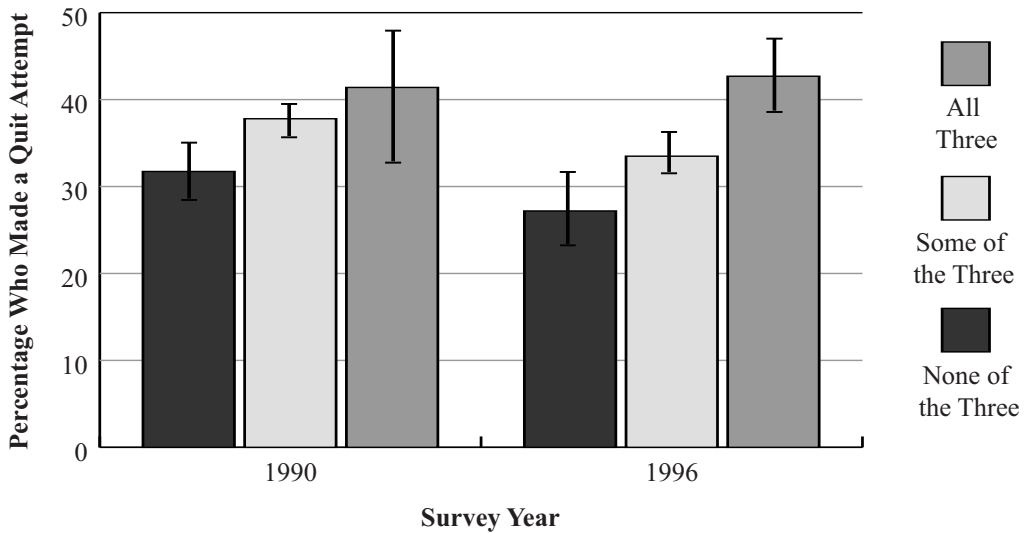
Self-Help Materials and Media Two common components of most comprehensive tobacco control programs are mass media messages and self-help materials. They share the ability to reach large numbers of individuals at relatively low cost. However, they are not autonomous interventions where-in goals are achieved simply by delivering the self-help materials to the smoker or by having the smoker exposed to the media message. Chapters 7 and 9 make it clear that both of these tobacco control channels are just that, channels. They are methods by which other tobacco control interventions can be facilitated, reinforced, and publicized and by which agendas can be set; but in isolation, without integration into a more comprehensive approach to cessation, they have little effect.

Evidence reviewed and presented in this volume supports the effectiveness of tobacco control programs that are media led and media intensive. It is impossible to separate the effect of the media from that of the rest of the program in those programs conducted in California and Massachusetts. This is partly due to the difficulty of causal attribution intrinsic to a multi-component program conducted with a non-experimental approach. However, the media component of these programs was never conceptualized as an independent intervention, but rather was integrated into the overall campaigns to support multiple program goals. Both California and Massachusetts use media as one of several integral components of the programs targeting each of their major tobacco control campaign goals, rather than viewing media as a single independent intervention. As a result, the effects of media are melded with the impacts of the other components used to accomplish their goals. Media messages and strategies are defined by, and customized for, each of the campaign goals, and there is no single, independent, and unified media intervention that can be evaluated for its contribution as a separate tobacco control intervention.

California and Massachusetts, and those media-led tobacco control trials that have demonstrated positive results, have used media in conjunction with community-based programs and public policy interventions. Media outlets have been used to set agendas for changing the restrictions on where smoking is allowed by educating smokers about the risks of second-

Figure 1-5

Percentage of Current Smokers Making a Quit Attempt by Number of Media Modalities in which Smoking Messages were Recalled



1990: Television, radio, or newspaper/magazine in the last week

1996: Television, radio, or billboard in the last month

Source: 1990, 1996 California Tobacco Surveys

hand smoke exposure, to trigger contemplation of cessation and cessation attempts in conjunction with referral to telephone counseling cessation services, and as one component of a multilevel campaign to de-normalize tobacco use.

Figure 1-5 demonstrates an association between media recall and cessation attempts for the 1990 and 1996 California Tobacco Surveys as support for the role of media in triggering cessation attempts as part of an overall campaign to promote cessation and facilitate cessation success through community organization, referral to telephone counseling and other cessation assistance, and de-normalization of tobacco use. In this context, the role played by the media campaign is to encourage smokers to consider quitting and to trigger quit attempts. The media is supported by the changing community norms about smoking and by other persistent and inescapable messages to quit in the smoker's environment.

Cessation success is facilitated by referral to cessation assistance and by other factors including restrictions on smoking in the workplace; therefore, media used in this way might not have a direct role in facilitating cessation success. Indeed, the same California surveys that showed an association between media exposure and cessation attempts, found no association with cessation success. Thus, were the media campaign to be viewed as a stand-alone intervention, it would be judged a failure, whereas, when the data are examined from the perspective of the media campaign as a component

intended to trigger cessation, with other aspects of the cessation intervention facilitating cessation success, the evidence is suggestive of a positive effect for those components of the overall media campaign that were targeting the smoker to promote cessation.

A similar perspective emerges when the evidence on self-help programs is evaluated. When self-help programs are looked at as independent tobacco control interventions, multiple trials and several meta-analyses have demonstrated that they have little independent effect (see Chapter 7). However, the role of self-help materials may not be as an independent intervention, but as a component of other interventions. Self-help materials can provide information on the availability of assistance or on appropriate use of medication, or they can translate advice into different languages and initiate or maintain contact between smokers and those offering cessation assistance, among other roles.

Community-Wide Approaches and Interaction across Channels

Changing the environment in which the smoker lives and smokes to provide persistent and inescapable messages to quit coupled with support for cessation have been goals of most comprehensive tobacco control approaches to cessation (NCI, 1991). But accomplishing these goals has been problematic. Approaches that attempted to stimulate communities into promoting smoking cessation, such as COMMIT (see Chapter 10), have yielded only modest results among light to moderate smokers and have had no effect on heavy smokers. The limited impact of these community activation approaches may be due to an underestimate of the time required for them to be implemented sufficiently enough to impact smoking behavior and by their decision to intervene at the level of small communities, rather than at the state level where more powerful policy options such as tax increases are possible.

However, almost all of the population-based interventions described in this volume impact smokers within their own communities, and all of the interventions are felt to be critically dependent on community norms about smoking behavior for their success. For example, changes in workplace restrictions are most often implemented in individual workplaces, and their passage into law is most often accomplished in local, rather than state jurisdictions. In addition, effective enforcement of restrictions on smoking in public locations and workplaces is dependent on the norms and expectations of smokers and nonsmokers alike.

In California, where the largest number of local ordinances has been implemented, it has been community organization in support of these ordinances that has allowed for their successful adoption and implementation. It is impossible to conceive of this success taking place without the activation of the local communities, and this local community activation has resulted in the adoption of comprehensive restrictions on smoking at the state level in all workplaces, including bars. The evidence contained in this volume suggests that restrictions on smoking in the California workplaces play a substantive role in the higher rates of successful cessation in California, as compared to other states. However, even with this operational success at the community level, it would be difficult, given current designs,

to demonstrate a direct association between the community activation that yielded the change in smoking restrictions and community-specific cessation rates.

Telephone counseling services—first demonstrated to be effective in clinic settings—have also been provided in California, and there is considerable data supporting their effectiveness in promoting long-term successful cessation (see Chapter 8). However, these services are implemented over large areas, and it is difficult to see their impact in population-based surveys. Clearly, their utility is dependent on the resources provided in terms of the number of smokers that can be reached, but even more critically, their success is dependent on their links to other community organizations for referrals and to media- and community-based promotions for self-referral of smokers. Absent these community-based roots, telephone counseling services are of very limited utility, and their success must be attributed to their associated community-level programs as much as to the counseling itself.

Several new approaches to providing individualized counseling have been developed, approaches that offer the potential to provide assistance to the general population of smokers. Interventions based on computer-driven algorithms that tailor the intervention and counseling provided to the individual smoker have been developed. The potential to provide this kind of tailored intervention over the internet—accessible in public locations where smokers would have access, on home computers, or on handheld devices provided to smokers—could overcome some of the resistance smokers traditionally have to more intensive, but more effective, smoking cessation interventions.

As Chapter 11 demonstrates, there are synergies created across tobacco control intervention channels, and the matrix for those synergies is local programmatic activity. Exposure to individual tobacco control program elements was associated with changes in anti-smoking attitudes and behaviors, and these effects were significantly greater among those who were exposed to more than one component.

What Works at the Population Level

Any analytic approach is limited by the tools it uses and also by its perspective on the problem it studies. This volume is no different; we have chosen to utilize a set of measures of smoking cessation activity and success, and we have linked them to various measures of policy and programmatic tobacco control interventions. These associations provide measures of the independent relationships between exposure to tobacco control interventions and changes in smoking behavior, and these associations provide useful insights into what components of tobacco control program are working. However, this approach is less able to examine the interactions and synergies across these programmatic elements, synergies that may be critical for their success.

With these caveats in mind, what can we say about what works? If the transtheoretical model of smoking behavior change (Prochaska and DiClemente, 1991) is used as a framework for examining population-based smoking cessation activity and success, one synthesis of how programmatic elements impact cessation is presented in Figure 1-6. This model postulates that smokers cycle through stages where they are disinterested in cessation, contemplate quitting, make a quit attempt, and are either successful or relapse to smoking. The relapse to smoking may be followed by a period of disinterest in cessation, or the smoker may think about making an additional cessation attempt. In the figure, cessation influences are at the stage of the process they are likely to influence, with internal personal characteristics presented inside the circle and external environmental influences presented outside the circle.

Together, the formulation in Figure 1-6 and the evidence presented in this volume suggest that individual components of a comprehensive tobacco control program may affect the process of cessation at different stages. For example, mass-media campaigns may get smokers to think about the need to quit, physician advice may trigger a cessation attempt, and working in a smoke-free environment may facilitate cessation once a cessation attempt is made. An additional advantage of the formulation is that it facilitates identification of potential synergistic interactions among different program components.

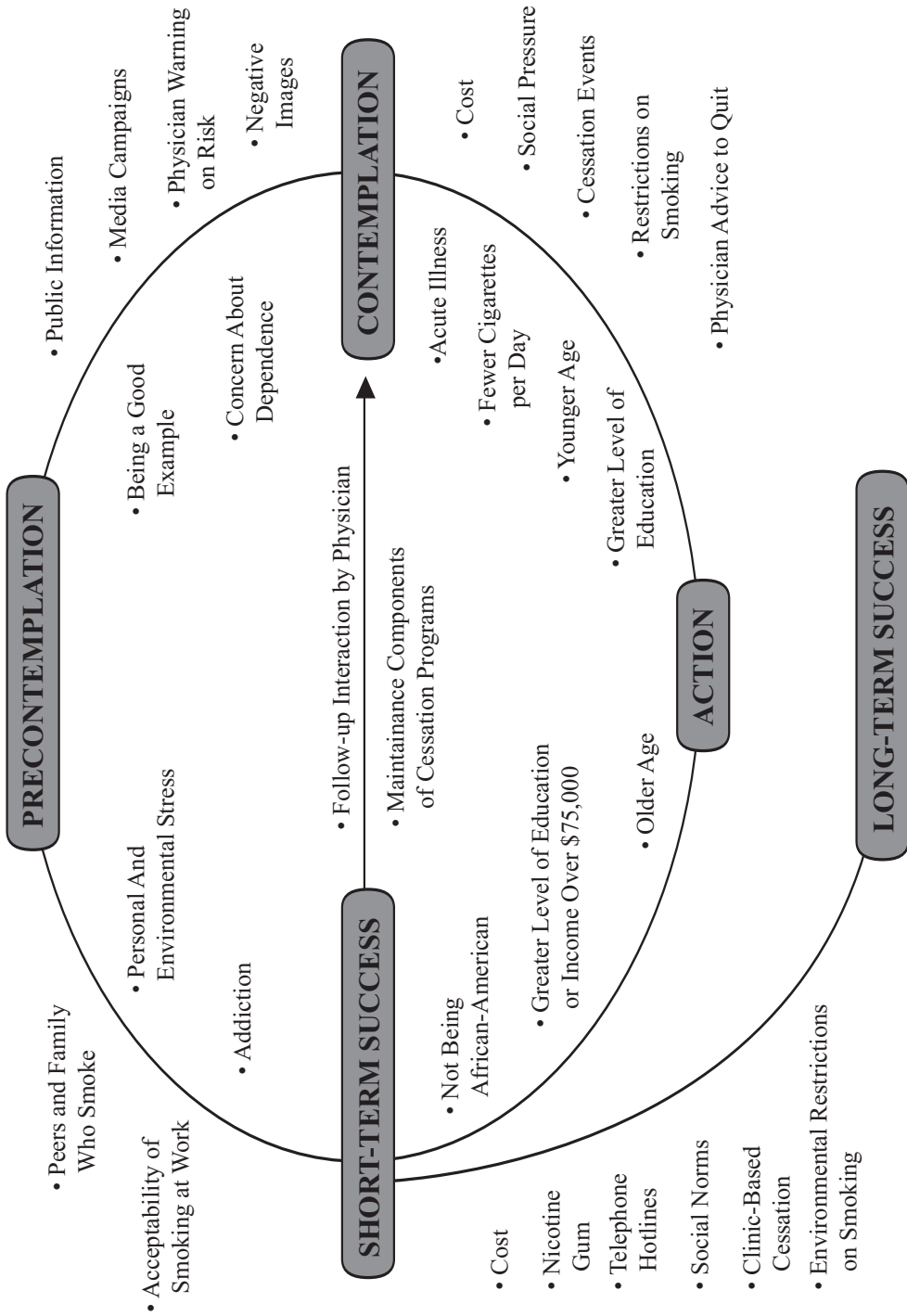
For example, physician advice seems to have a significant impact on the likelihood of a smoker making a quit attempt, but little effect on long-term cessation success; so as an isolated cessation intervention, it has little impact on smoking prevalence. But if the smokers who are attempting to quit can be linked to interventions that have their effect predominantly on improving long-term success (*e.g.*, telephone counseling, clinic-based cessation assistance, or pharmacological treatment), the net effect on long-term cessation is likely to be substantially greater than the sum of the effects of these interventions offered independently.

Public information about the risks of smoking, negative images about being a smoker, and physician warnings about the risk of smoking can all convert a smoker who is not interested in quitting into one who is considering a cessation attempt. Both the desire to set a good example for children and concerns about being dependent on smoking are reasons smokers give for wanting to quit; acute illness can often trigger cessation activity as well.

Data presented in this volume demonstrate that smokers of younger ages, with higher levels of education and income, and who smoke fewer cigarettes per day are more likely to try to quit. In addition, this volume provides evidence to support the impact of media campaigns, restrictions on smoking in the workplace, physician advice to quit, and increased cost of cigarettes as population-based influences increasing cessation activity.

The forces influencing smoking cessation attempts are different from those leading to longer term cessation success. For example, older smokers are less likely to report making a cessation attempt in the last 12 months,

Figure 1-6
The Process of Cessation



but they are more likely to be successfully quit for 3 or more months based on that cessation attempt, suggesting that efforts to promote cessation among older smokers can yield important cessation benefits. In contrast, African-American smokers report rates of cessation activity in the last 12 months similar to those of other racial and ethnic groups, but their likelihood of being successfully quit for 3 or more months based on that activity is significantly lower.

A variety of environmental and interventional influences have substantial impacts on successful cessation. Evidence provided in the remaining chapters of this volume supports an effect of changes in cost and environmental restrictions on smoking in the workplace on long-term success. Nicotine replacement therapy is shown to be associated with improved cessation success at the population level, confirming its demonstrated effect in clinical trials. Telephone counseling and clinic-based cessation efforts have been established as effective interventions for those who receive them, but there is little evidence that they are reaching a sufficient proportion of the smoking population to effect cessation at the population level. Physician advice—which has also been demonstrated effective for long-term cessation in clinical trials and shows a strong association with cessation activity in population data—appears to have little effect on cessation success in the overall population, at least as it is currently being practiced.

Quantifying the Effect of Population-Based Cessation Interventions

Figure 1-7 presents a simplified model of the cessation process, focusing on those interventions examined in subsequent chapters of this monograph. The evidence presented suggests that the principal population-based cessation effect of physician advice and media campaigns is on promoting cessation attempts, with less evidence supporting an effect of these interventions on longer term cessation success. In contrast, the predominant effects of restrictions on where smoking is allowed, increasing cost of cigarettes, pharmacological interventions, and comprehensive tobacco-control campaigns seem to be in promoting longer term cessation success.

The analyses presented in subsequent chapters are often formulated as odds ratios for cessation activity or success, and therefore it is possible to estimate the population-based impact of these interventions using the fraction of the population exposed to the intervention and the difference in cessation attempts or success between the exposed and non-exposed populations. Estimates derived from the subsequent chapters in this monograph are presented in Table 1-1 for comprehensive tobacco-control programs, physician advice, and bans on smoking in the workplace. In addition, estimates developed in subsequent chapters are utilized for physician advice (Chapter 4), use of medication (Chapter 5), and increases in taxes (Chapter 6). The goal is to provide a rough comparison of the effects on cessation across these modalities, with the understanding that effects presented for one intervention may contain direct and synergistic effects from other interventions, and therefore, the numbers presented are not mutually exclusive cessation effects.

Figure 1-7
Population Based Smoking Cessation

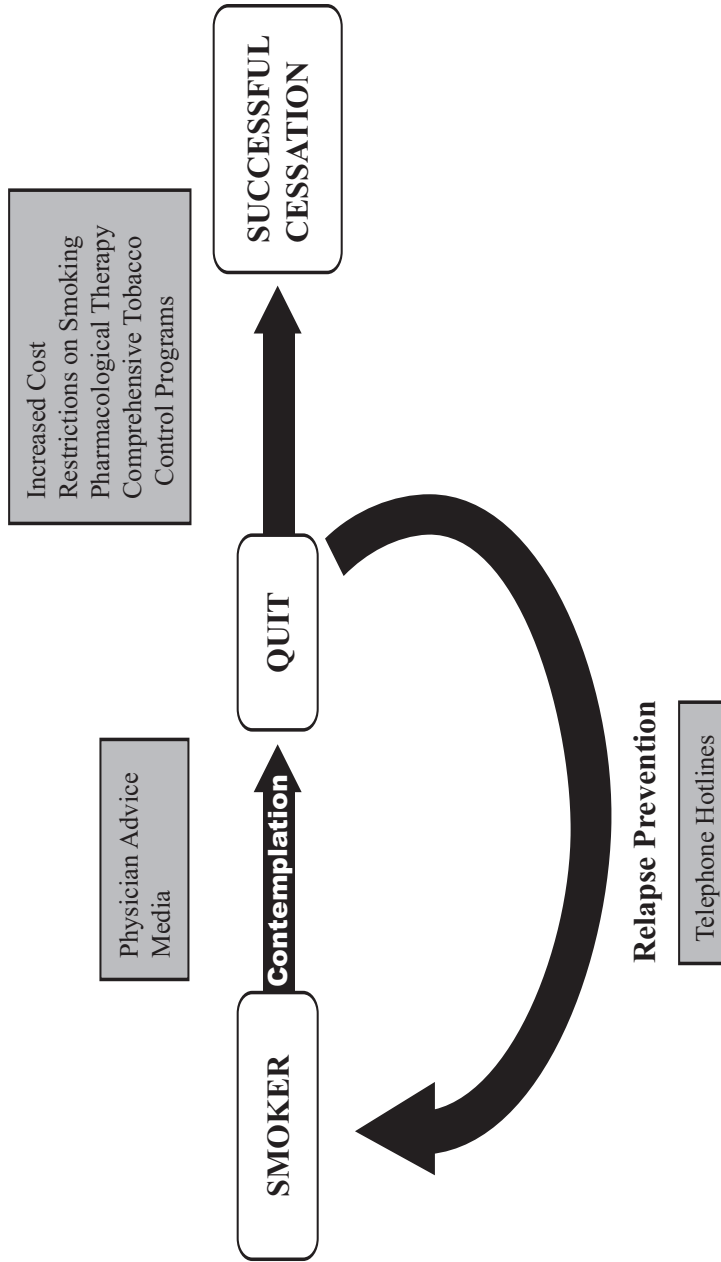


Table 1-1
Current and Potential Impact of Population-Based Smoking Cessation Interventions

| | Cessation Attempt | | | Former, 3+ Months | | | Conditions Required for Potential Effect |
|---|-------------------|----------------|------------------|-------------------|----------------|------------------|--|
| | Odds Ratio | Current Effect | Potential Effect | Odds Ratio | Current Effect | Potential Effect | |
| Comprehensive Tobacco Control Program | 1.04 | 57,049 | 506,360 | 1.32 | 57,246 | 508,111 | All states have tobacco control programs comparable in scope to California and Massachusetts |
| Advised by Physician to Quit | 1.60 | 2,276,986 | 3,497,231 | 0.91 | 0 | 189,000 | Effect of physician advice in the real world matches that in trials (Odds ratio for cessation = 1.3) |
| 20% Increase in Cigarette Cost | — | — | 1,139,309 | — | — | 222,298 | Cost increases 20 percent from 1996 values |
| Total Work Ban | 1.09 | 312,112 | 576,918 | 1.34 | 119,828 | 221,493 | All workplaces are smoke free |
| Medication | — | — | — | — | 150,000 | 500,000 | Effect of medication in the real world matches that in trials |
| Optimal Health Care System Intervention | | | | | | 756,000 | At least 90 percent of all patients are advised to quit and at least 45 percent are provided with optimal counseling |

In the United States, the CPS estimates that there are approximately 44 million smokers, and about one-third of them (14 million) attempt to change their smoking behavior each year. Only 3.6 percent (about 1.5 million) of those who were smoking every day 12 months ago are successful for 3 or more months at the time of the survey.

The estimates in Table 1-1 utilize the odds ratios for cessation attempts and cessation success presented in Chapter 2 for the state of California, as compared to other states, with the exclusion of Massachusetts. The numbers are estimates of the difference in cessation produced by these two well-funded tobacco control programs. Since most other states also have substantial tobacco control efforts underway (funded by ASSIST, IMPACT, and other sources), these estimates underestimate the true effect of tobacco control campaigns; and they estimate only the increment in effect that would be expected from the difference in intensity and funding between the programs in Massachusetts and California and those in the remaining states. The column in the table labeled *Potential Effect* presents an estimate for the effect expected if all states adopted programs similar to those of California and Massachusetts. It would appear that tobacco control programs have a modest effect on the already high rate of cessation attempts among smokers, but a much larger proportional effect on successful cessation. If comprehensive tobacco control programs were implemented nationally, rates of successful cessation might be increased by one-third, approaching 500,000 additional smokers who were abstinent for at least 3 months.

The largest current contributions to successful cessation come from total bans on smoking in the workplace (119,828 quits) and from pharmacological interventions (150,000 quits). If all workplaces were smoke-free, the rate of cessation lasting at least 3 months might increase by more than 100,000 quits per year, and if the success of pharmacological interventions in the general population matched that of clinical trials, an additional 350,000 quits might be achieved.

Physician advice to quit, as it is currently practiced in the general population, appears to have a large effect on cessation attempts, but little effect on long-term cessation success. If the success of physician advice were comparable to that found in clinical trials, an additional 189,000 successful quits might be expected. This number represents a substantial number of quits, but is only a small fraction of the increase in quit *attempts* promoted by this modality. In contrast, approximately 750,000 additional successful quits might be achieved if the health care delivery system were to deliver optimal cessation assistance to all of their insured population.

An increase in the cost of cigarettes could also increase both cessation attempts and cessation success, with a 20 percent increase in cost generating an additional 222,000 successful quits. The increase in cost of cigarettes (\$0.45 per pack) that may, over time, result from the Master Settlement Agreement of the state Attorneys General lawsuits would be approximately a 20 percent increase. If and when it is translated into an actual change in the price of cigarettes to the smoker (*i.e.*, when the additional discounting

that accompanied the increase in cost is no longer reducing the actual price paid by the consumer), this price increase may result in an increase in the number of cessation attempts and successful quits.

Summary and Synthesis of Policy Effects

Examination of the numbers in Table 1-1 suggests that there are powerful current and potential effects of existing tobacco control interventions for smoking cessation. However, it also demonstrates that there are significant gaps in their interactions with one another. The most obvious of these gaps is between the enormous number of estimated quit attempts generated by physician advice and the absence of an effect on successful cessation. However, there are also significant gaps between what is currently being realized with medication and what might be expected to be achieved—the same is true for comprehensive tobacco control programs. These gaps offer opportunities to improve tobacco control programs, particularly by taking advantage of synergies that might exist across these independent interventions.

Physician advice to quit is associated with over 2.2 million quit attempts currently and has the potential to be associated with almost 3.5 million quit attempts. However, these attempts are not translating into cessation success in large numbers. A substantial research and programmatic effort has been made by the NCI, CDC, and other professional and voluntary organizations to train physicians to intervene and provide cessation advice to all of their smoking patients. As Chapter 4 demonstrates, this effort has resulted in a substantive increase in the fraction of smoking patients who report that their physicians have advised them to quit smoking. These efforts to encourage physicians to provide cessation advice have been quite successful, with the fraction of patients reporting cessation advice from physicians more than doubling since 1974. However, this effort may not have improved successful long-term cessation rates substantively in the population, and the potential for cessation when this channel is utilized alone is a modest 189,000 quits.

The lesson from these estimates is not that more effort should be devoted to encouraging physicians to provide advice to quit, but rather that there is a substantial number of cessation attempts currently being generated by physician advice that are not being translated into successful cessation. This group of cessation attempts represents an enormous opportunity if we can link those making cessation attempts with other tobacco control interventions that can facilitate long-term success.

The simplest of these interactions would be linking physician advice to quit with telephone counseling or other community or health care system cessation assistance. An example of what might be possible to achieve through these linkages is provided at the bottom of Table 1-1, where increased physician advice is coupled with optimal cessation interventions to generate a 2.3-fold increase in the rate of successful spontaneous cessation (see Chapter 4). The potential for this linked approach is estimated to be over 750,000 successful quits, and these kinds of linkages have been demonstrated to be effective within a single health care delivery system (Curry *et al.*, 1998).

A second association with large numbers of cessation attempts can be found with an increase in the cost of cigarettes. Adding media messages promoting cessation, linking to telephone counseling services, energizing health care systems to provide cessation messages and assistance, and timing community and other local tobacco control efforts to coincide with and take advantage of the increased cessation activity provided by an increase in the cost of cigarettes may help convert more of the cessation attempts into cessation successes.

Table 1-1 provides estimates for those tobacco control interventions where there are sufficient data to generate estimates. It is likely that many of the community activation strategies and local lead agency efforts in California provide a critical foundation for implementation of some of the public policy interventions (*e.g.*, restrictions on smoking in the workplace). But the difficulty in quantifying and measuring these activities makes them less visible to the analytic approach used in this monograph. It is also likely that these program areas offer great opportunities for synergy in enhancing cessation success with the policy interventions described above. For example, linking local cessation assistance activities with workplaces who have made voluntary changes in smoking restrictions would increase the efficiency of the efforts to recruit smokers into these programs and would increase the effectiveness of the workplace change in creating successful cessation.

SUMMARY

Approximately one-half of current ever-smokers have become former smokers, and most of this cessation activity has coincided with a 40-year effort to educate and inform smokers about the risks of smoking. Large media-led tobacco control programs have also coincided with increases in smoking cessation, suggesting that tobacco control approaches *can* alter smoking behavior. This volume presents evidence supporting the effects of restrictions on where people can smoke, of increasing the cost of cigarettes, of providing physician advice to quit coupled with cessation assistance, of pharmacological assistance, and of telephone hotlines on cessation among smokers in the general population. It also provides evidence that many of these interventions are being implemented in the general population in ways that are less effective than expected based on clinical trials. Increasing the effectiveness of these interventions and linking multiple interventions to provide synergy offer great opportunities to improve rates of population-based smoking cessation.

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