

# Assessing the Effectiveness of the Mass Media in Discouraging Smoking Behavior

*Mass media have been used as a population-level strategy to reduce tobacco use for several decades. However, studies of media interventions pose numerous methodological challenges. This chapter studies the use of mass media in tobacco control and health promotion, on the basis of a literature review, and examines research results relative to changing smoking behavior in light of the methodological issues. The following specific areas are covered:*

- *Controlled field experiments involving antismoking media campaigns aimed at youth and adults. These include longitudinal community-based studies promoting cardiovascular health, such as the North Karelia Project in Finland and the Stanford Three Community Study. In addition, controlled field experiments are addressed that included mass media as only one part of a multicomponent community- or school-based intervention.*
- *Population-level studies, including longitudinal and cross-sectional studies of national and state media campaigns. Some of these are part of multicomponent tobacco control programs. Examples include the Fairness Doctrine campaign, Australia's "Quit for Life" and National Tobacco Campaign efforts, the national "truth" campaign in the United States, the tobacco industry's own youth tobacco use prevention efforts, and the California Tobacco Control Program.*

*The methodological challenges of evaluating these studies include quasi-experimental designs without randomization, lack of accounting for homogeneity within intervention or control conditions, baseline differences, contamination of control groups, the presence of secular trends, and problems inherent in both cross-sectional and longitudinal studies. Many of the studies reviewed show a relationship between mass media interventions and positive outcomes for reduced tobacco use. Although methodological limitations present problems in interpretation, the preponderance of evidence suggests that mass media can be effective in reducing tobacco use.*

## Introduction

This chapter reviews the evidence mainly from two types of studies on the effects of mass media campaigns on tobacco use behaviors: controlled field experiments and population-based studies. Controlled field experiments, often called quasi-experimental designs, generally were feasibility or demonstration projects funded through research grants. In these studies, mass media interventions were delivered alone or in combination with other interventions (e.g., school or community programs) to subsets of a defined population, usually at the community level. The goal was to assess whether the intervention(s) could alter health behavior, including smoking, in the targeted communities. Comparison or control groups (in a few cases randomly selected) not receiving the intervention(s), and consisting of subsets of communities that are more or less comparable, were used as the basis for determining intervention efficacy. As will be seen below, these studies, although not definitive, were promising enough to warrant investigators' continued efforts in this area.

On the basis of the results of these controlled field experiments, mass media and other interventions subsequently were delivered to entire populations via specially funded government programs, generally at the state or national level. To justify continued program funding, evaluations of program effectiveness were conducted. In some of these population studies, preprogram measures were obtained for comparison with postprogram measures to determine whether changes in smoking behavior had occurred. In other cases, trends in behavior over time for the population (e.g., state) receiving the intervention were compared to trends in other populations not receiving it (e.g., all other or selected groups of states).

Some studies do not fit neatly into either of the groups described above and are discussed below under the broad heading that is most appropriate. The analytical challenges facing the evaluation of both controlled field experiments and population studies are outlined at the beginning of each of the main sections below.

## Research Methodology

For this chapter, a comprehensive and systematic review of the literature was conducted using standard search tools and the databases PubMed, PsycINFO, Web of Science, Scopus, and EMBASE. Search terms included (*tv* OR *television* OR *radio* OR *broadcast\** OR *mass media* OR *advertis\** OR *marketing* OR *countermarketing*) AND (*prevent\** OR *cessation* OR *initiat\**) AND (*tobacco* OR *smoking*). Articles published in languages other than English and editorials and letters were excluded. The review extended from 1970 through May 2007. The focus was on studies that assessed the influence of mass media interventions (e.g., television, radio, print, and outdoor advertising) alone or in combination with other interventions (e.g., school, community, policy). The goal was to review how these interventions influenced tobacco use outcomes among youth and adults in the United States and elsewhere. Studies selected for formal review fit either the definition of controlled field experiments or of population studies as described above. Existing review articles also were obtained and are mentioned below.

## Prior Reviews

The use of mass media to influence health behavior has been studied extensively. Some previous reviews specifically focused on media efforts to change smoking behavior.<sup>1-8</sup> With few exceptions,<sup>1,5,7</sup> these dealt only with the effects of mass media on youth. The scope of other reviews included

studies of a number of health behaviors, such as drug or alcohol use, cancer screening, AIDS prevention, and seat belt use; smoking was just one of the behaviors considered.<sup>9-12</sup> Despite the presence in all these reviews of studies that did not find significant intervention behavioral effects, the authors concluded, in general, that mass media campaigns, alone or in conjunction with other interventions, have brought about changes in health behavior.

The introduction to a book edited by Hornik<sup>13</sup> reviews the reasons for the mixed results of studies in this area. In some cases, controlled field experiments were not well enough funded to deliver enough media messages so that exposure was sufficiently different in the intervention and control communities. In other cases, media from other sources, or effects of other ongoing programs, generated changes in population norms that made the studies difficult to evaluate. At times, favorable secular trends were present in the control communities, diminishing the chances of showing a difference. Furthermore, the design and evaluation of such trials are not as straightforward as they are for controlled clinical trials of new medications or therapies. Hornik notes that studies (generally adequately funded population studies) that have demonstrated a behavioral outcome effect tend to achieve high levels of media exposure in the target group or population. This media exposure apparently fostered a process that led to a change in social norms and in turn affected behavior.

The design and context of the controlled field experiments and population studies aimed at addressing the impact of antismoking media messages on smoking behavior have varied widely. The types, extent, and length of media campaigns have differed. Some studies used purchased broadcast time, and others relied on donated time or public service announcements (PSAs). There were differences in the

outcomes measured, the types of assessment surveys (cross-sectional or longitudinal), the timing of outcome assessment, the theoretical foundations, and the advertising style and messages. A number of articles have aimed to synthesize the lessons learned from these previous studies and provide guidelines for the design of future controlled field experiments and population-based media programs, both alone and in conjunction with other communitywide interventions.<sup>7,9,13-19</sup> All of the differences among the studies mentioned above complicate efforts to synthesize study findings, but it is agreed that sufficient resources to assure adequate campaign exposure are essential. Much remains to be learned regarding the intensity, timing, duration, and targeting of mass media campaigns to achieve and optimize reductions in smoking. Chapter 15 further discusses this point.

## Chapter Focus

This chapter serves as part of a broader framework within this monograph for examining the role of media in influencing tobacco use. Chapter 2 discusses how media work to influence behavior in general. Chapter 9 discusses the role of news media (as opposed to paid advertising or PSAs) in influencing behavior. News media coverage of communitywide, statewide, and national health promotion campaigns and their associated activities help raise public awareness. Finally, Chapter 11 reviews the variety of campaign messages that have been broadcast, as well as the characteristics of antitobacco media messages that appear to perform well, in terms of target audience appraisal and indicators of message processing.

This chapter examines previous media interventions to reduce tobacco use within the context of the methodological challenges associated with both controlled field experiments and population studies.

It outlines the statistical methodological principles that enable a meaningful evaluation to be conducted and the resulting limitations of the conclusions that can be drawn. Other resources that address these issues include a book edited by Hornik<sup>10</sup> and a series of articles concerning the evaluation of the National Youth Anti-Drug Media Campaign published in an edition of *Social Marketing Quarterly*.<sup>20</sup>

# Controlled Field Experiments

## Overview

Early community-based studies of cardiovascular disease prevention evaluated communitywide education activities aimed at modifying a broad array of behavioral risk factors, including smoking. These mostly quasi-experimental efficacy studies included the North Karelia Project in Finland<sup>21–24</sup> and the Stanford Three Community Study.<sup>25</sup> In particular, the youth component of the North Karelia Project (described in more detail below) placed a strong emphasis on smoking prevention by using peer- and teacher-led social influence programs in schools, in addition to an adult-focused antismoking mass media campaign, and community activities. Results from these studies for both youth and adults provide initial indications that community-based interventions can effectively reduce aggregate levels of cardiovascular disease risk factors.

Later studies concerning cardiovascular disease prevention, with smoking as an associated risk factor, used approaches similar to the North Karelia Project and the Stanford Three Community Study. Like the earlier studies, this second wave of studies (e.g., the Stanford Five-City Project, the Minnesota Heart Health Program) documented declines in cardiovascular

disease risk factors.<sup>26,27</sup> However, some of these studies also observed that favorable secular trends occurred simultaneously with the interventions, so researchers were unable to differentiate the intervention from the control communities after secular trends were taken into account.<sup>10</sup> Some of the studies that focused on prevention of smoking among youth or smoking cessation in adults also had to contend with secular trends.

## Methodological Issues

Besides the presence of secular trends, a number of methodological problems may explain in part why some controlled field experiments conducted to determine intervention efficacy have failed to show overall significant intervention effects. These studies are outlined below.

Although some controlled field experiments described in this section used a randomized controlled trial,<sup>25,28–30</sup> others did not. A sufficient number of primary sampling units randomly assigned generally produce comparable study groups. However, in most cases, logistic constraints ruled out a randomized design. In the absence of randomization, most studies attempted to control for baseline differences by matching communities according to demographic characteristics and known or hypothesized correlates of smoking behavior. However, matching communities on the basis of variables that may be only moderately (or weakly) associated with smoking behavior can reduce the statistical power and make it difficult to find a difference that exists, which would constitute a type II error. In addition, precision would not necessarily increase, and the degrees of freedom to estimate the model are also reduced in a matched-pair design.<sup>31</sup> Adjusting for factors that are not comparable between the communities in a statistical analysis also reduces the degrees of freedom that would be available to test for the interaction effect.

Further complicating the issue of statistical power is that appropriate analyses of field experiments should base the analysis on the primary study units receiving the intervention (e.g., communities, schools). In most experimental studies, cost considerations dictate that the number of such study units is not large.

A related issue is the practice of analyzing individuals rather than the primary study unit. If all individuals in the primary sampling units receiving the intervention simply are compared to all those in the primary sampling units not receiving the intervention, the study sample size is artificially inflated, increasing the chance of inferring that a small difference is significant (inflating the type I error).<sup>32</sup> The underlying principle of experimental design is that the units of randomization (or assignment) to the experimental condition and the units of analysis should be the same.

To better understand the necessity to consider variability within primary study units, consider a set of communities assigned randomly to receive, or not receive, a media intervention. Within each community, a random survey of residents is conducted to measure outcomes. By nature of their shared experience within the community, there will be a shared component to their response. Thus, differences in average response between a control community and an intervention community will in part be due to community-level differences unrelated to the study. The randomization of many communities to each study condition will average out these community-level differences. If the community-level source of variation is not included in the analysis, differences between communities may be mistakenly ascribed to an intervention-control difference, inflating the chance of a type I error. Of course, if the variation of average response from community to

community is small, the effect on the type I error also will be small. Studies that use only one community per intervention condition cannot estimate this effect at all; any difference found may simply be due to differences between the two communities.

To further understand the need to account for community-level effects, suppose it were possible to randomize individuals within communities to receive, or not receive, the intervention. In this case, individuals from both the intervention and control groups would be living in each community, and community-level differences would affect both groups similarly, effectively subtracting out the community-level effect.

Although some experimental studies of the use of media to change health behavior have used analytical techniques that account for the hierarchical nature of the design and take into account the variability between the sampling units at each level, others have not. Most analytical techniques to handle these designs are based on mixed-effect models, with careful attention paid to specification of the model terms so that these effects can be properly estimated. Such models, including those now termed hierarchical linear models, can also handle multiple covariates, as is often necessary, for the reasons given above. Describing the specifications of these models is beyond the scope of this section, but these analytical techniques are well presented elsewhere.<sup>32,33</sup> It should be noted that these analytic methods did not become fully developed with available software until the early 1990s. Many researchers understood this problem and dealt with it to the extent possible by considering the intraclass correlation or other measures of nonhomogeneity within and between their primary sampling units. Designs that account for variability between the primary sampling units will be more precise but at the cost of a reduction in statistical power.<sup>32,34</sup>

When there are a sufficient number of primary sampling units, true matching, appropriate and multiple measures obtained pre- and postintervention, and analyses that account for the nesting of individuals within the primary sampling units, the quasi-experimental design is considered ideal for the evaluation of field experiments such as the ones described below.<sup>32</sup> In reality, the design and conduct of such ideal studies are not possible. As Hornik<sup>10</sup> acknowledged, designs and analyses appropriate to the laboratory are not necessarily applicable to the field, and new approaches to reflect the realities of such research are needed.

Generally, the controlled field experiments used surveys (cross-sectional, longitudinal, or both) to measure outcomes. Multiple cross-sectional surveys often were used to measure trends over time, at preintervention to establish previous secular trends, and during and after intervention, to assess differential change over time. Such a study design can strengthen the basis for causal inference when matching is deficient because each community serves as its own historical control. As long as the samples obtained are representative, and the primary sampling units are not changing their demographics or other characteristics differentially over time, repeated cross-sectional evaluations are appropriate evaluation tools. Even if the population composition changes, standardized estimates can be computed.

Longitudinal or cohort samples of individuals surveyed repeatedly are also appropriate and can establish that the extent of change over time for individuals differs within the type of intervention. However, many longitudinal studies suffer from sample attrition, and the individuals lost may be atypical of the group as a whole. If loss to follow-up differs among the primary sampling units or intervention groups, and is not accounted for in the analysis, interpretation of the results can be complicated. Thus, if the rates of

follow-up differ among groups, such as smokers and nonsmokers, an intervention may appear more or less effective than it really was, depending on which group showed the greatest attrition. For example, if the intervention group experienced less attrition, it would likely contain more smokers at follow-up, making it less probable to detect a difference. Even if the attrition rates are comparable, there may be differences in characteristics among those lost and those successfully followed within their intervention groups. Many of the longitudinal studies reviewed below attempted to establish whether differential attrition might be a problem.

To avoid repetition in the sections below that describe the controlled field experiments involving youth and adults, the studies did not specifically account for individual-level variability within primary sampling units, unless otherwise indicated. All studies that used longitudinal assessment of outcomes suffered attrition to a lesser or greater degree. No comment is given unless there was evidence of differential attrition or if no attrition analysis was reported. Furthermore, the analyses performed generally adjusted for at least demographic or other characteristics that were related to baseline inequalities or differential attrition. Only if studies did not use such methods is it noted. Studies using cross-sectional assessment generally used population-based random household surveys. These are simply referred to as population surveys in the tables and text. The text comments mainly on other important features of the study design, intervention, analysis, and results.

### Effects on Youth

Table 12.1 summarizes the controlled field experiments involving youth. The columns of table 12.1 highlight the intervention and methodological characteristics of the various studies discussed below (see last paragraph of previous section). The two



studies that did not allow for assessment of a media effect, either separate from or in addition to other intervention components, are discussed first (North Karelia, Minnesota Heart Health). The remaining studies are presented in more or less chronological order. Three of the youth studies were embedded within efforts primarily aimed at adults to improve cardiovascular health; these include the North Karelia Project, the Minnesota Heart Health Program, and the Stanford Five-City Project. Of the controlled field experiments assessing a media effect on youth, seven found evidence for an effect, and three found no evidence.

The two-year-long North Karelia Project in Finland began in 1978 and included interventions aimed at both adults and youth.<sup>22-24</sup> The youth prevention components were school based, and the two intervention arms differed in the nature of the school social influence program: either peer or teacher led. North Karelia received both an adult mass media intervention (see “Effects on Adults” for more information on media intervention) and other community-based activities aimed at adult smoking cessation. The control province received no interventions.

Three groups of students (peer-led, teacher-led, and control) in the North Karelia Youth Project were assessed longitudinally multiple times up to four years after the program began; at least 80% of those surveyed at baseline participated again at each point. Some differences in attrition rates occurred among intervention groups, but differential attrition was not analyzed. The results of this study provided some of the earliest evidence that a combined school and communitywide campaign with a significant media component can reduce youth smoking. Both immediately after the intervention and at four years after the program began, smoking rates were lower in the intervention schools.<sup>22</sup> At the four-year follow-up, when students were about

17 years of age, 34% (peer-led) and 27% (teacher-led) of the boys in the intervention schools reported smoking at least once or twice a month, compared with 42% of those in the control schools. For girls, these percentages were 21% (peer-led) and 25% (teacher-led) in the intervention schools and 33% in the control schools. Lower smoking rates in the intervention communities persisted at 8-year follow-up and 15-year follow-up, but only for baseline nonsmokers. At the 15-year follow-up, there was no evidence that youth smokers quit at higher rates in the intervention communities than in the control communities.<sup>23,24</sup>

The Minnesota Heart Health Program was another study that evaluated youth outcomes in a study aimed at reducing cardiovascular risk factors, including smoking, among adults.<sup>35</sup> School-based health and smoking prevention programs to influence social and psychological factors were instituted in schools in one intervention community with its matched community serving as the control. The intervention community received the mass media campaign and the community-based, adult-focused activities. The control community received neither. Thus, only the combined intervention could be compared to no intervention. All students in all schools in the two youth study communities were surveyed in 1983 when they were 6th graders and then annually until they were seniors in high school. Results from both longitudinal and cross-sectional surveys showed a marked reduction (about 40% for cross-sectional surveys) in weekly smoking prevalence for high school seniors in the intervention community compared with the control community.

Like the North Karelia Project and the Minnesota Heart Health Program, the Stanford Five-City Project also aimed its mass media primarily at adults (see “Effects on Adults”). However, no intervention was specifically for youth; the study

**Table 12.1 Summary of Reviewed Controlled Field Experiments: Youth**

Study	Intervention description	Target group	Study design	Assessment mode/outcomes/analysis	Main results
North Karelia (Youth) Vartiainen et al. 1986, <sup>22</sup> Vartiainen et al. 1990, <sup>23</sup> Vartiainen et al. 1998 <sup>24</sup> Started in 1978. Finland	C = no intervention. I = peer-led social influence school program plus adult-focused mass media campaign plus community activities aimed at promoting cessation among adults. I = teacher-led social influence school program plus adult-focused mass media campaign plus community activities aimed at promoting cessation among adults. Lasted 2 years.	7th graders (12- to 13-year-olds) received school program for 2 years.	Quasi-experimental: 4 schools in North Karelia (intervention province) received school program and were compared with 2 schools in a control province that did not receive it, starting in 1978. Schools selected to match for various characteristics.	Smoking at least once or twice a month was assessed in the same cohort pre- and postintervention, with additional follow-ups later. Some differences in follow-up rates, not analyzed. Analysis of simple proportions of smoking at each follow-up.	At 4-year follow-up, smoking prevalence was significantly lower in both intervention groups, relative to the comparison group. At 8- and 15-year follow-ups, smoking initiation rates were still lower for baseline nonsmokers in the intervention groups, with no difference in quit rates for baseline smokers.
Minnesota Heart Health Program (MHHP) (Youth) Perry et al. 1992 <sup>35</sup> Started in 1983.	C = no intervention. I = health behavior and smoking prevention school program plus mass media focused on heart health, including smoking cessation. Lasted 6 years.	6th graders in all 13 grade schools in MHHP study; community and matched control community.	Quasi-experimental: 1 community participating in the MHHP with its 1 matched control community in South Dakota.	Weekly smoking prevalence and smoking intensity among students in all schools in each community assessed annually (longitudinally and cross-sectionally) until their senior year in high school. Intraclass correlation considered in analyses. Attrition analysis showed bias in favor of finding no effect.	Both longitudinal and cross-sectional results showed significantly less weekly smoking and lower smoking intensity for the students in the intervention community compared with the control community. Results were present early and maintained through the senior year.
Stanford Five-City Project (Youth) Fortmann et al. 1995, <sup>43</sup> Winkleby et al. 1993 <sup>36</sup> Started in 1979.	C = no intervention. I = media advocacy and (primarily) adult-focused antismoking advertising. Lasted 6 years.	12- to 24-year-olds	Quasi-experimental: 2 pairs of matched communities in each condition.	Cross-sectional population surveys assessed daily smoking prevalence before, during, and following the intervention.	At no time (1979-90) was there a difference in daily smoking prevalence between intervention and control communities. Strong secular trend present.



Study	Intervention description	Target group	Study design	Assessment mode/outcomes/analysis	Main results
<p>Flynn et al. 1992,<sup>38</sup>                      Flynn et al. 1994,<sup>39</sup>                      Flynn et al. 1995<sup>40</sup>                      Flynn et al. 1997,<sup>42</sup>                      Worden et al. 1988,<sup>37</sup>                      Worden et al. 1996<sup>41</sup>                      Started in 1985.</p>	<p>C = school-only antismoking educational program.                      I = school-based education (same as C) plus television and radio antismoking media campaign.                      Lasted 4 years.</p>	<p>4th, 5th, and 6th graders</p>	<p>Quasi-experimental:                      2 pairs of matched study communities assigned to intervention on the basis of available media markets.</p>	<p>Smoking behavior index, which can be interpreted as the number of cigarettes smoked per week, any smoking in the past week, or smoking yesterday.                      Longitudinal cohort of youth randomly selected from metropolitan statistical areas (MSAs) was surveyed at baseline and annually until 2 years postintervention.                      Analyzed both on an individual and community basis. Unclear whether community-level analysis accounted for individual-level variability.</p>	<p>At 2 years postintervention, students receiving the full intervention were significantly lower on the smoking index (41%), or smoking last week (35%), or smoking yesterday (34%) reports than those receiving only the school curriculum. The combined program appeared particularly effective in high-risk youth.</p>
<p>Bauman et al. 1988,<sup>44</sup>                      Bauman et al. 1991<sup>28</sup>                      Started in 1985.</p>	<p>C = no intervention. I<sup>1</sup> = radio antismoking messages.                      I<sup>2</sup> = same as I<sup>1</sup> plus radio advertisement of a nonsmoking sweepstakes (encouraging communication with peers to discourage smoking).                      I<sup>3</sup> = same as I<sup>2</sup> plus television advertisement of the sweepstakes.                      Lasted 15 months.</p>	<p>12- to 14-year-olds</p>	<p>Prescreened standard MSAs were randomly allocated (2 each) to intervention and control conditions.</p>	<p>Longitudinal sample of adolescents in probability sample of households in MSAs assessed for a number of attitudinal and smoking behavior variables at baseline and 11 and 17 months postintervention. Individual-level variation taken into account in analysis of MSAs.</p>	<p>No differences in smoking behavior detected at 11 and 17 months postintervention. Moderate effect of the radio campaign (I<sup>1</sup> and I<sup>2</sup>) on expected consequences of smoking.</p>

**Table 12.1 Summary of Reviewed Controlled Field Experiments: Youth (continued)**

Study	Intervention description	Target group	Study design	Assessment mode/outcomes/analysis	Main results
<p>Television, School, and Family Smoking Prevention and Cessation Project Brannon et al. 1989,<sup>47</sup> Flay et al. 1988,<sup>45</sup> Flay et al. 1995,<sup>29</sup> Sussman et al. 1989<sup>46</sup> Started in 1986.</p>	<p>Los Angeles: C<sup>1</sup> = no treatment. C<sup>2</sup> = basic health information curriculum only. I<sup>1</sup> = school-based (social-resistance) education. I<sup>2</sup> = television media intervention. I<sup>3</sup> = school-based education plus television media intervention. San Diego: C = no treatment. I = school-based (social-resistance) education only (no television). Lasted 4 years.</p>	<p>12- to 14-year-olds</p>	<p>Schools in Los Angeles (35; 7 per condition) and San Diego (12; 6 per condition) randomly assigned to treatment conditions.</p>	<p>Students assessed longitudinally twice in the 7th grade and once in each of grades 8 and 9. Smoking in the past week and ever smoking analyzed. Analysis accounted for individual variability within classrooms within schools.</p>	<p>No significant effects on smoking behavior (at 2-year follow-up). Strong, significant effects on knowledge of smoking consequences, perceived smoking prevalence, and efforts to resist trying cigarettes.</p>
<p>Project Sixteen Biglan et al. 2000<sup>30</sup> Started in 1990.</p>	<p>C = school intervention only. I = school intervention plus community intervention with paid antismoking media on radio. Lasted 3 years.</p>	<p>7th and 9th graders</p>	<p>8 matched pairs of small Oregon communities were randomly assigned to 1 of the 2 conditions.</p>	<p>All 7th and 9th graders in all schools in each community surveyed annually and cross-sectionally (before, 3 during, after). A composite measure of weekly smoking was evaluated. Analyses nested students within communities.</p>	<p>At both project completion and 1-year follow-up, students in the school plus community intervention had significantly lower rates of past-week smoking.</p>
<p>Hafstad and Aaro 1997,<sup>48</sup> Hafstad et al. 1996,<sup>48</sup> Hafstad et al. 1997,<sup>30</sup> Hafstad et al. 1997<sup>51</sup> Started in 1992. Norway</p>	<p>C = no intervention. I = three consecutive waves of mass media campaigns designed to prevent adolescent smoking (newspaper advertisements, poster, television spot, and cinema spot). Each of 3 waves of media had a different message focus and was broadcast for 3 weeks once a year. Lasted 3 years.</p>	<p>14- to 15-year-old students. Both males and females, but females were targeted.</p>	<p>Quasi-experimental: 1 pair matched counties. Unknown basis for assignment to I or C.</p>	<p>Daily, weekly, less than weekly, occasional, or nonsmoker status analyzed with longitudinal assessment at 6–12 months and at 3 years (1 year after 3rd campaign). Main analyses examined any current smoking with interaction effects of baseline status and gender. Attrition slightly higher in C, but differential attrition not analyzed.</p>	<p>3-year follow-up: significant reduction in overall odds of being a smoker for I group compared with C group for males and females. Reduction in odds of smoking for baseline male and female smokers. Reduction in odds of smoking for baseline nonsmokers evident only for the females.</p>

Study	Intervention description	Target group	Study design	Assessment mode/outcomes/analysis	Main results
<p>Texas Tobacco Prevention Pilot Initiative                      Meshack et al. 2004<sup>52</sup>                      Started in 2000.</p>	<p>C = no intervention.                      I<sup>1</sup> = no program/no media.                      I<sup>2</sup> = no program/low media.                      I<sup>3</sup> = no program/intensive media.                      I<sup>4</sup> = enhanced school/no media.                      I<sup>5</sup> = enhanced school/low media.                      I<sup>6</sup> = enhanced school/intensive media.                      I<sup>7</sup> = multicomponent/low media.                      I<sup>8</sup> = multicomponent/intensive media.                      Lasted 6 months.</p>	<p>6th graders</p>	<p>8 sites selected for maximum ethnic diversity. Random assignment of intervention level to communities contingent on having a unique media market. The largest and most ethnically diverse school in each community was selected for evaluation. In some cases, 2 schools were selected; 11 schools evaluated altogether.</p>	<p>Before-and-after cross-sectional school surveys evaluated student attitudes and tobacco use (any in the last 30 days), and susceptibility to smoking.*                      Preintervention survey conducted in spring 2000. Various interventions took place during the summer and fall of 2000, with the postintervention survey of a new 6th-grade cohort taking place in late fall 2000.                      Analyses considered intraclass correlation within schools.</p>	<p>Combining the intensive or low-media campaign with the multicomponent community program (I<sup>7</sup> or I<sup>8</sup>) was most effective in suppressing positive attitudes toward smoking. Combining the intensive media campaign with the multicomponent community program (condition I<sup>6</sup>) consistently reduced tobacco use, susceptibility to smoking, and prosmoking attitudes.                      Smoking was reduced more in I<sup>2</sup> than in I<sup>3</sup>, but neither tested against C.</p>
<p>Slater et al. 2006<sup>53</sup>                      Started in 1999.</p>	<p>I<sup>1</sup> = no intervention. I<sup>2</sup> = no community media, no in-school curricula, in-school media only. I<sup>3</sup> = community media, no in-school media, curricula.                      I<sup>4</sup> = community media, in-school media, curricula.                      Communities selected from all regions of the U.S.                      2-year media period staggered for communities.                      Study ended in 2003.</p>	<p>Middle and junior high school students, mean age 12.2 years.</p>	<p>2 schools in 8 no-media communities randomly assigned to I<sup>1</sup> and I<sup>2</sup>, and 2 schools in 8 media communities randomly assigned to I<sup>3</sup> and I<sup>4</sup>.                      Randomization constrained.</p>	<p>Longitudinal sample measured at preprogram, following curriculum, and twice thereafter.                      Four-level model included time, student, school, and community.</p>	<p>Study evaluated marijuana, alcohol, and smoking uptake. The community-media interventions (I<sup>3</sup> and I<sup>4</sup>) significantly reduced uptake rates for all substances. Lowest uptake rates by 4th survey observed for condition I<sup>4</sup>.</p>

\*Never smokers who do not rule out trying a cigarette or taking one from a friend, if offered, are susceptible to smoking. See chapter 7 for further discussion.

measured youth (aged 12–24 years) smoking prevalence in addition to adult health outcomes.<sup>36</sup> In this study, two sets of matched communities received the media intervention and the others did not, making a direct assessment of mass media effects possible. The program began in 1977 and lasted for six years. Cross-sectional surveys before, during, and after the intervention did not detect a difference in youths' daily smoking prevalence between the control and intervention communities.

Students in two matched pairs of communities in Vermont and Montana received either a combination of media (television and radio) and school interventions, or the school intervention alone, over a four-year period. The school intervention, based on social influence theories, conveyed refusal skills, accurate social norms, positive views of nonsmoking, and negative views of smoking.<sup>37–42</sup> The paid media intervention consisted of 15 television and 8 radio spots broadcast at intervals over the intervention period. Within each matched pair of communities, one was assigned to receive each condition. Thus, the media effect above and beyond the school intervention could be evaluated. Students who completed the baseline assessment were assessed annually over the four-year campaign period, with an additional follow-up occurring two years after completion of the campaign. This sustained campaign was associated with a reduction in youth smoking. Smoking rates after campaign completion were 34% to 41% lower among students exposed to both the antitobacco advertising campaign and the school programs compared with those exposed to the school programs alone.<sup>38</sup> These effects persisted at the two-year postcampaign follow-up.<sup>39</sup> Notably, these results were even more pronounced for high-risk students, particularly high-risk girls.<sup>41</sup>

Overall, this study provides strong evidence that a program using both mass media and

school-based programming is more effective than one using school-based programming alone.<sup>42</sup> The added value of the media campaign may be most pronounced for high-risk youth in the study; they were found to watch more television and listen to more radio.

In a study conducted in the southeastern United States, Bauman and colleagues<sup>28</sup> compared three different strategies of mass media with a control group who did not receive any intervention. This study was designed to evaluate the effectiveness of a radio campaign about the expected negative consequences of smoking, along with television and print-media messages delivered by mail. These campaign messages were designed to provide personal encouragement not to smoke. The study occurred over a 15-month period beginning in 1985, with follow-up conducted two years after baseline, 11–17 months after the broadcast, and two to eight months after the mailed intervention.<sup>28</sup> The media messages used in this campaign were rigorously developed on the basis of a number of behavioral theories and were tested during an extensive formative period.<sup>44</sup>

Bauman and colleagues<sup>28</sup> used a cluster sampling procedure to identify a probability sample of households within standard metropolitan statistical areas (MSAs). They selected regionally matched communities. Nonetheless, baseline smoking rates varied substantially among the standardized MSAs. Analyses accounted for interindividual variability within MSAs. No significant difference in the change in smoking prevalence over time between the groups was detected. However, there was some evidence of a positive effect on expected consequences of smoking and peer approval of smoking. The media campaign was of short duration and may not have been sufficient to produce changes in smoking behavior. A further analysis<sup>54</sup> indicated that the differences between

communities that persisted, even after controlling for a wide range of demographic and personality covariates, limited the power of the study to detect change.

The Television, School, and Family Smoking Prevention and Cessation Project<sup>29,45-47</sup> randomly assigned schools in Los Angeles and San Diego, California, to intervention groups. The design for Los Angeles was more complex than for San Diego, which was restricted to a school program versus a no-intervention group. In Los Angeles, there were two control groups (no intervention and an attention placebo) and three intervention groups: school program, television, and both. Both the school program and the television spots were designed to foster social resistance to smoking. A cohort of students in 340 classes in 35 Los Angeles and 12 San Diego schools were assessed at baseline (January 1986), immediately postintervention (April 1986), and at one and two years later. The program lasted four years. Changes in scores at each assessment were analyzed separately in a hierarchical linear model that accounted for students within classrooms within schools. Randomization produced very comparable groups at baseline. No treatment condition was associated with smoking in the past week at any follow-up. However, both intervention types had some favorable effects on knowledge and on students' estimates of smoking prevalence among youth and among adults. The authors attribute the lack of any intervention effect on smoking behavior to poorly executed television programming and significant variability in the integrity of classroom program delivery. Also, the program was of relatively short duration.

Biglan and colleagues<sup>30</sup> matched 16 small Oregon communities (8 pairs) and randomly assigned them to receive either (1) a school-based prevention program, or (2) the school-based program in addition to

a community program that included media advocacy, youth antitobacco activities, family communication about tobacco use, and policies aimed at reducing youth access to tobacco. The media advocacy involved paid advertisements and radio PSAs, newspaper articles, presentations to local civic groups, and posters. The program lasted three years at each site. The school curriculum used a social influences approach and was designed for students in grades 6-12. Cross-sectional surveys of students from 7th grade and 9th grade were conducted five times from baseline until one year after the end of the intervention. The combined school and community intervention was associated with a significant reduction in prevalence one year after the intervention was completed, compared with the school-only condition.<sup>30</sup> This study supports the findings of Flynn and colleagues<sup>40</sup> and provides additional evidence that a mass media campaign (when combined with other components) can reduce smoking rates.

A three-wave mass media campaign from Norway was designed to assess the effect of mass media alone.<sup>48-51</sup> Three distinct media campaigns of three weeks' duration were directed at adolescents in one county over a three-year period (1992-95). The campaign, designed to be provocative, was intended to elicit negative affective reactions and to stimulate communication among peers. It used newspaper advertisements, posters, and television and cinema spots. Two campaigns were specifically designed to engage girls, while the third was directed toward both girls and boys. A baseline survey of all eligible youth aged 14 and 15 years (longitudinal cohort) was conducted in both the intervention county and the control county before the first of three media campaigns. Attrition was slightly higher for the no-intervention group, but possible effects were not analyzed. At the completion of the final media campaign, nonsmoking youth at baseline were less likely to smoke at follow-up in the intervention county

compared with youth in the control county. The overall increase in the percentage of daily smokers was significantly lower among girls in the intervention county than in the control county. Findings were not significant for boys, although the results appeared to be in the same direction. The campaign was primarily aimed at girls, so this finding was expected.

A relatively short-term (six months) intervention study in Texas evaluated the effect of antitobacco media, enhanced school programs, and community-based programs on middle-school students' smoking.<sup>52</sup> Sites were identified on the basis of ethnic diversity and then randomly assigned to the various levels of intervention: media (none, low, and intensive); programs (none, enhanced school program based on social influence theory); and multicomponent (both school- and community-based programs). Two schools were selected for some intervention levels. Surveys were administered to 6th graders in spring 2000 before the intervention at 11 schools—selected to be the most ethnically diverse schools possible—and repeated on a new sample of 6th graders in the fall. Schools were the primary unit of analysis, and intraclass correlation within schools was considered in the analysis. Smoking and positive beliefs about smoking declined the most between the pre- and postintervention evaluations among the students at the sites with the highest levels of intervention. These schools also had the highest baseline smoking rates. The media-alone results were not consistent: the low-media condition showed a greater reduction in smoking than did intensive or no media exposure.

Another study aimed to discern the effect of a communitywide media campaign on the initiation of marijuana, alcohol, and cigarette use among middle and junior high school students in all regions of the United States.<sup>53</sup> Eight communities received the media program (brochures,

press releases, advertised special events, posters, and radio PSAs), and eight did not. Within the set of eight communities that received media, schools were randomly assigned either to receive or not to receive an in-school media campaign consisting of posters, book covers, tray liners, T-shirts, water bottles, rulers, and lanyards. Schools in the no-media communities were randomly assigned either to no treatment or to the in-school media condition. Schools in each set of communities also were randomly assigned either to receive or not to receive an anti-substance-use curriculum based on social influence theory. The randomization process was constrained by using a group-matching strategy to reduce the potential for confounding from community differences. The media interventions lasted for two years but were staggered over a four-year period among communities. A hierarchical model was used to assess the uptake endpoints: measurement time within student, student within school, school within community, and community within media condition. The results showed reduced (at least 50% less) substance uptake over time for students exposed to both community and in-school media compared with those not exposed to any media. Marijuana and alcohol uptake appeared more reduced than was cigarette initiation, but the media emphasized the other substances more than cigarettes. The media effect was similar regardless of whether or not students participated in the anti-substance-use curriculum. The study did not examine the community media effect separately from the in-school media effect but concluded that these types of media together could reduce substance uptake.

### Effects on Adults

Many of the controlled field experiments described below were aimed at improving cardiovascular health, and these projects included intervention components to promote healthy eating and to increase



exercise as well as to reduce smoking. Other projects were specifically designed to reduce smoking. As in the youth studies, some studies of adults allowed for the evaluation of media alone in influencing smoking behavior and others for evaluating only media in combination with other intervention components. Of the 10 studies reviewed concerning the promotion of cardiovascular health, only two allowed for the media component to be evaluated separately from all other components: the Stanford Three Community Study<sup>25</sup> and the Coronary Risk Factor Study (CORIS).<sup>55</sup> However, six of the eight studies specifically concerned with smoking cessation allowed for a separate evaluation of the media component. Table 12.2 summarizes the details of these studies and is organized into sections for general cardiovascular health promotion and smoking cessation, with results described more or less chronologically. Of the ten controlled field experiments concerning cardiovascular health, seven showed at least some evidence for an effect on reducing smoking behavior; of the nine field experiments promoting reduced smoking, eight showed some reduction.

### ***Cardiovascular Health***

The Stanford Three Community Study,<sup>25</sup> the Australian North Coast's "Quit for Life" program,<sup>56</sup> and the CORIS<sup>55</sup> used very similar study designs that allowed a media component to be evaluated separately. These studies are described first, followed by studies for which a media component could not be evaluated separately.

The Stanford Three Community Study<sup>25</sup> began in 1972 and was one of the earliest community-based field experiments. It used a quasi-experimental design in which three communities were randomly assigned to receive (1) a mass media campaign (radio and television programming and spots, weekly newspaper columns,

newspaper advertisements, and printed material), (2) a mass media campaign and intensive face-to-face intervention, (3) or no intervention (control). With the use of a population-based longitudinal sample, reductions in self-reported cigarette consumption were examined, presumably among all cohort participants, with nonsmokers defined as smoking zero cigarettes per day. Thus, this measure does not distinguish between smokers quitting by follow-up or simply decreasing their daily consumption. Change in smoking prevalence within the cohort would have provided stronger evidence. The analyses were based on comparisons of unadjusted mean changes in consumption, and differential attrition was not examined. After two years, lower self-reported cigarette consumption occurred in the mass media and intensive face-to-face intervention than in the control condition (a net reduction of 24.1% and 2.5%, respectively). The group that received the mass media intervention alone also experienced a significant reduction in cigarette consumption, but the difference was not as large (7.3%). The high-risk cohort showed even greater reductions at two years: 13.8% for the media-only intervention and 42.3% for the media and intensive face-to-face program versus 17.2% in the control community. It is likely that a portion of these reductions is from smokers' quitting.

The Australian North Coast Healthy Lifestyle Programme included a strong component directed at smoking cessation: "Quit for Life."<sup>56</sup> This program was also patterned after the Stanford Three Community Study and was instituted in three small communities in New South Wales, Australia. The "Quit for Life" campaign began in 1978 and used a social marketing approach with an aim of reducing the prevalence of smoking. The quasi-experimental design was used to evaluate the effects of a mass media campaign alone (TV, radio, newspapers, posters, etc.) in one community compared

Table 12.2 Summary of Reviewed Controlled Field Experiments: Adults

Study	Intervention description	Target group	Study design	Assessment mode/outcomes/analysis	Main results
Stanford Three Community Study Maccoby et al. 1977 <sup>25</sup> Started in 1972.	C = no intervention (Tracy). I <sup>1</sup> = extensive mass media campaign (Gilroy). I <sup>2</sup> = same as above plus individual risk-reduction counseling for high-risk subjects (Watsonville). Lasted 2 years.	35- to 59-year-olds. Individuals at high risk for cardiovascular disease were identified and analyzed separately.	Quasi-experimental: 2 cities as intervention sites and 1 city as the comparison. <b>Cardiovascular Health Promotion Trials</b>	Longitudinal assessment with baseline data collected in 1972, immediately preceding the intervention and at follow-up at 1 and 2 years after the intervention began. Subjects reported the number of cigarettes smoked per day; presumably, nonsmokers were analyzed as smoking zero cigarettes per day. Unadjusted analysis of change. Differential attrition not analyzed.	After 2 years, the I <sup>2</sup> city (Watsonville) had a significantly lower self-reported cigarette consumption than the C city (Tracy). The reduction was not as great, but still significant for the I <sup>1</sup> city (Gilroy). Results were similar for high-risk subjects, but with even higher net reductions in consumption, suggesting substantial quitting.
North Coast "Quit for Life" Programme Egger et al. 1983 <sup>56</sup> Started in 1978. Australia	C = no intervention (Tamworth). I <sup>1</sup> = mass media program (Coffs Harbour). I <sup>2</sup> = mass media program and community program (Lismore). Media and other programs aimed to alter coronary risk factors. Lasted 2 years.	18 years and older	Quasi-experimental: 2 intervention towns and a comparison town. Intervention applied to 2 towns that shared common media market. Towns not well matched.	Cross-sectional random population surveys at baseline and year 1 and year 2 were used to assess current smoking status, knowledge, and attitudinal factors.	After 2 years, compared with C, there was a greater reduction in smoking prevalence among both men and women in I <sup>1</sup> and I <sup>2</sup> . The reduction was better sustained (year 2) in Lismore (I <sup>2</sup> ). There were no significant changes in knowledge or attitudes.

Study	Intervention description	Target group	Study design	Assessment mode/outcomes/analysis	Main results
<p>Coronary Risk Factor Study (CORIS)</p> <p>Rosouw et al. 1993,<sup>55</sup></p> <p>Steenkamp et al. 1993,<sup>57</sup> Steyn et al. 1997<sup>58</sup></p> <p>Started in 1979.</p> <p>South Africa</p>	<p>C = no intervention (Riversdale). I<sup>1</sup> = mass media (Swellenden). I<sup>2</sup> = mass media and community based (Robertson). Lasted 4 years.</p>	<p>White persons 15–64 years of age.</p>	<p>Quasi-experimental: 3 matched communities assigned to intervention groups. Intervention areas shared common boundary; control community was remote.</p>	<p>Cross-sectional surveys of entire white population conducted at baseline (1979) and follow-up (end of intervention and 12 years). Those surveyed both times were used in a cohort analysis. Surveys assessed self-reported risk factors, including current regular smoking and consumption level.</p>	<p>At the 4-year follow-up, the cohort analysis showed the overall change in smoking prevalence and cigarette consumption were similar in I<sup>1</sup> and I<sup>2</sup> and greater than in C. Effect greater for women. At the 12-year follow-up, smoking prevalence and cigarette consumption were lower in I<sup>1</sup> but not in I<sup>2</sup>, compared to C.</p>
<p>North Karelia Project (Adults)</p> <p>Jousilahti et al. 1994,<sup>62</sup></p> <p>Puska et al. 1983,<sup>21</sup></p> <p>Puska et al. 1985,<sup>63</sup></p> <p>Puska et al. 1985,<sup>64</sup></p> <p>Puska et al. 1989,<sup>65</sup></p> <p>Vartiainen et al. 1991,<sup>59</sup></p> <p>Vartiainen et al. 1994,<sup>60</sup></p> <p>1998<sup>24,61</sup></p> <p>Started in 1972.</p>	<p>C = no intervention. I = changes in community organizations, involvement of many sectors of the community, the use of mass media, screening, appropriate practical skills training, provision of social support for behavior change, environmental modifications, special training of public health nurses to provide smoking cessation advice and counseling. Lasted 5 years.</p>	<p>25- to 64-year-olds</p>	<p>Quasi-experimental: 2 matched communities. Compared cardiovascular risk factor changes in North Karelia (I) and Kuopio (C).</p>	<p>Cross-sectional population surveys assessed daily smoking prevalence at baseline, before the intervention, and at the end of the intervention. Changes in prevalence of regular smoking.</p>	<p>After 5 years, compared with Kuopio, smoking prevalence had declined significantly more among men in North Karelia, but not among women. The difference was even greater for men at 10 years, but changes thereafter were small.</p>

Table 12.2 Summary of Reviewed Controlled Field Experiments: Adults (*continued*)

Study	Intervention description	Target group	Study design	Assessment mode/outcomes/analysis	Main results
Stanford Five-City Project (Adults) Farquhar et al. 1990; <sup>68</sup> Fortmann et al. 1993; <sup>26</sup> Fortmann et al. 1995; <sup>43</sup> Fortmann & Varady 2000; <sup>66</sup> Winkleby et al. 1996 <sup>97</sup> Started in 1980.	C = no intervention. I = multicomponent community media campaign with mass media campaign aimed at improving cardiovascular disease risk factors. Lasted 6 years.	25- to 74-year-olds	Quasi-experimental: 2 pairs of matched communities, assigned to intervention on the basis of shared mass media market. Another city was observed for cardiovascular morbidity and mortality.	Cross-sectional population surveys assessed smoking status, knowledge, and quitting behavior at baseline 2 years before the intervention, at alternate year intervals during the intervention, and at 2 years after the intervention. A cohort sample was embedded within the multiple cross-sectional surveys.	Cross-sectional analysis: smoking prevalence fell to a comparable extent in both intervention and comparison cities.  Cohort follow-up analysis: the 2 intervention cities showed greater declines in smoking prevalence than the 2 comparison cities. There were no differences in knowledge of the risks of smoking, "confident could quit," or negative attitudes to smoking. "Intent to quit" was significantly higher in the intervention cities.
Minnesota Heart Health Program (Adults) Lando et al. 1995; <sup>34</sup> Luepker et al. 1994 <sup>27</sup> Started in 1980.	C = no intervention. I = multicomponent community program (including mass media). Lasted 5 years.	25- to 74-year-olds	Quasi-experimental: 3 sets of matched cities, assigned to intervention on the basis of shared media market.	Cross-sectional and cohort population surveys were conducted for 4 years before the interventions, annually during the intervention, and 2 years after to gain health information, including current smoking status.	Cross-sectional analysis: compared with control, women in the intervention cities showed a greater decline in smoking prevalence, while men showed no difference.  Cohort follow-up analysis: neither men nor women showed any differences between intervention cities and comparison cities.

<b>Study</b>	<b>Intervention description</b>	<b>Target group</b>	<b>Study design</b>	<b>Assessment mode/outcomes/analysis</b>	<b>Main results</b>
Heartbeat Wales Tudor-Smith et al. 1998 <sup>66</sup> Started in 1985. Wales	C = no planned activities to promote cardiovascular health. I = planned activities related to smoking, including TV series on BBC, quit and win program, promotion of nonsmoking areas in restaurants, and worksite programs. Lasted 5 years.	18- to 64-year-olds	Quasi-experimental: 9 districts in Wales (I) compared with 4 districts in Northern England (C), chosen for similar health profiles.	Cross-sectional population surveys pre- and postintervention (stratified by age), obtained smoking status and cigarette consumption. Individual- and community-level analyses conducted of net changes between intervention and reference communities.	Smoking prevalence and consumption declined in both intervention and control communities, and the declines were not significantly different.
Kilkenny Health Project Shelley et al. 1995 <sup>70</sup> Started in 1986. Ireland	C = no intervention. I = variety of health promotion projects and events, "supported by coverage in local media" (apparently the local newspapers and a radio station). Lasted 7 years.	35- to 64-year-olds	Quasi-experimental: Kilkenny (willing to cooperate) matched to remote control community (County Offaly).	Independent cross-sectional selections of persons from voter roles, stratified by age and sex. Visits conducted by nurses (pre- and postintervention) to obtain measures and administer questionnaire that included questions on smoking (at least 1 cigarette per day). Samples small. Net change compared between communities within gender.	Males apparently reduced their smoking more in the reference community and females more in the intervention community, but neither of these differences was significant.
Hoffmeister et al. 1996 <sup>71</sup> Started in 1987. Germany	C = no intervention. I = special programs targeted to each cardiovascular risk factor. For smoking, these included cessation courses, local media campaigns including an intensive poster campaign, and designation of nonsmoking areas in public places. Lasted 4 years.	25- to 69-year-olds	Quasi-experimental: 6 intervention regions were compared with a national sample (excluding the intervention regions) of areas, chosen to be representative of the former West Germany.	Representative cross-sectional samples pre- and postintervention. Persons invited for a physical exam and filled out a questionnaire about smoking and other health behaviors. Samples in C and I weighted to make them comparable. Analyses accounted for intraregion variability.	From 1985 to 1991, the prevalence of smoking declined significantly more in the intervention regions than in the rest of the country.

**Table 12.2 Summary of Reviewed Controlled Field Experiments: Adults (continued)**

<b>Study</b>	<b>Intervention description</b>	<b>Target group</b>	<b>Study design</b>	<b>Assessment mode/outcomes/analysis</b>	<b>Main results</b>
O'Loughlin et al. 1999 <sup>72</sup> Started in 1992. Canada	C = no intervention (St. Henri). I = multicomponent intervention, including videos broadcast on local TV and distributed to community groups (Centre-Sud). Lasted 4 years.	18- to 65-year-olds	Quasi-experimental: 1 pair of matched communities of low socioeconomic status, selected and assigned to condition for logistical considerations. Communities adjacent.	Cross-sectional (before and 3 years after beginning of intervention), and longitudinal surveys (baseline and 5 years).	No difference in change in smoking prevalence detected pre- and postintervention with either cross-sectional or longitudinal data. However, the percent of heavy smokers ( $\geq 25$ cigarettes/day) showed a marginally greater decline in the intervention community.
<b>Smoking Cessation or Reduction Trials</b>					
Sydney "Quit for Life" Program Dwyer et al. 1986; <sup>74</sup> Pierce et al. 1986; <sup>73</sup> Pierce et al. 1990; <sup>75</sup> Started in 1983. Australia	C = no intervention. I = antismoking media campaign (mostly TV, but radio and newspapers as well) with some of the ads promoting a quiltline and quit centre at Sydney Hospital. Lasted 7 years, but evaluated at 1 year, before program implementation in Melbourne.	16 years and older	Sydney (I) compared with Melbourne (C).	Early results for smoking status, cigarette consumption and quitting behavior assessed longitudinally in a panel identified from a random household survey. Persons moving between cities excluded from analysis of proportions. Long-term results assessed with repeated cross-sectional surveys and a model of trends.	Before the intervention was implemented in Melbourne, significantly more smokers in Sydney either quit or cut their cigarette consumption compared with Melbourne. Relapse and initiation rates were similar. After implementation in Melbourne, this city as well as Sydney showed declines in smoking.
Community Intervention Trial for Smoking Cessation (COMMIT) The COMMIT Research Group 1995; <sup>76</sup> The COMMIT Research Group 1995; <sup>77</sup> Started in 1989.	C = no intervention. I = 4 components: (1) public education through media and communitywide events, (2) health care providers, (3) workites and other organizations, (4) cessation resources. Lasted 4 years.	25- to 64-year-olds	Quasi-experimental: 11 matched pairs of communities, randomly assigned to C and I.	Cross-sectional population surveys pre- and postintervention, with embedded longitudinal cohort of heavy smokers ( $\geq 25$ cigarettes/day). Cohort sample weighted for attrition.	Cohort analysis: no significant difference in quit rate observed by study end among heavy smokers in C and I communities. Effect was observed in light-to-moderate smokers. Cross-sectional analysis: no significant difference in changes in smoking prevalence, heavy smoking prevalence, daily cigarette consumption, or quit rates.



Study	Intervention description	Target group	Study design	Assessment mode/outcomes/analysis	Main results
<p>American Stop Smoking Intervention Study (ASSIST) NCI 2005;<sup>78</sup> NCI 2006;<sup>79</sup> Stillman et al. 2003<sup>80</sup> Started in 1993.</p>	<p>C = no seed money. I = seed money to build tobacco control capacity, some of which likely was spent on promoting media advocacy. Intervention phase lasted 6 years, prior to evaluation.</p>	<p>18 years and older</p>	<p>17 states selected by application to receive seed money. Others did not receive money.</p>	<p>Population surveys (1992–93, before intervention) and (1998–99) and cigarette sales data. State was the unit of analysis, with individual variability accounted for in a 2-stage analysis.</p>	<p>Smoking prevalence declined nationwide by 2.4% over evaluation period, but significantly greater in ASSIST states (3.0% vs. 2.1%). The decline in per capita cigarette consumption was not statistically different.</p>
<p>A Su Salud McAlister et al. 1992<sup>81</sup> Started in 1986.</p>	<p>C = no intervention (Del Rio). I = mass media and volunteer network (Eagle Pass). I<sup>2</sup> = mass media and intensive contact smoking cessation program (Eagle Pass). I<sup>3</sup> = mass media and brief contact (Piedras Negras). Lasted 4 years.</p>	<p>16- to 60-year-olds</p>	<p>Quasi-experimental: 3 matched Texas border communities. Division of intervention in Eagle Pass randomly determined. Otherwise, communities assigned to intervention conditions for logistical reasons.</p>	<p>Population surveys identified smokers (&gt;9 cigarettes/day) who formed a cohort followed 1 and 2 years postintervention to assess smoking status. Data from I<sup>1</sup> and I<sup>2</sup> pooled for analysis. Sample sizes relatively small (&lt;200). Simple proportions of quit rates at follow-up compared.</p>	<p>At 2 years, cessation rates were higher in Eagle Pass (I<sup>1</sup> and I<sup>2</sup>) than in Del Rio, but Piedras Negras (I<sup>3</sup>) was similar to C.</p>
<p>Mudde et al. 1995<sup>82</sup> Started in 1990. Netherlands</p>	<p>C = no intervention. I = local television and posters; and health providers promoted a quitline and other community-based cessation efforts. Lasted 1 year.</p>	<p>25- to 65-year-olds</p>	<p>Quasi-experimental: 1 pair of matched communities randomly assigned to C and I.</p>	<p>Longitudinal panel of smokers identified from population survey, followed up during and after the intervention.</p>	<p>Midpoint results showed a trend for more cessation for I, but final results showed no difference.</p>
<p>Breathe Easy Secker-Walker et al. 2000<sup>83</sup> Started in 1989.</p>	<p>C = no intervention. I = community efforts, cessation assistance, videotape distributed widely through health provider offices. Lasted 4 years.</p>	<p>Women 18 to 64 years old</p>	<p>Quasi-experimental: 2 pairs of matched counties in Vermont and New Hampshire. Adjacent state border counties received interventions, and remote ones did not.</p>	<p>Cross-sectional population surveys conducted pre- and postintervention assessed smoking status and cigarette consumption. No differences at baseline. Simple change analyzed.</p>	<p>Change in smoking prevalence at postevaluation was not different between C and I; however, smokers in I reduced their consumption significantly more than those in C.</p>

**Table 12.2 Summary of Reviewed Controlled Field Experiments: Adults (continued)**

<b>Study</b>	<b>Intervention description</b>	<b>Target group</b>	<b>Study design</b>	<b>Assessment mode/outcomes/analysis</b>	<b>Main results</b>
<p>Vietnamese-American Men                      Jenkins et al. 1997,<sup>85</sup>                      McPhee et al. 1995<sup>84</sup>                      Started in 1990.</p>	<p>C = no intervention (Houston, Texas). I<sup>1</sup> = multimedia and community interventions (San Francisco/Alameda Counties) 39 months. I<sup>2</sup> = similar but not identical intervention (Santa Clara County) 24 months.</p>	<p>Vietnamese-American men, aged 18 years and older</p>	<p>Two studies: Houston vs. San Francisco/Alameda and Houston vs. Santa Clara.</p>	<p>Cross-sectional population surveys assessed smoking prevalence and recent quitting.</p>	<p>Prevalence remained the same in C and I<sup>2</sup>, but in I<sup>1</sup>, it was significantly lower at follow-up. Quitting in the past 2 years also increased in I<sup>1</sup> compared with C.</p>
<p>Health Education Authority for England's Anti-Smoking TV Campaign                      McVey and Stapleton 2000<sup>86</sup>                      Started in 1992.                      England</p>	<p>C = no intervention. I<sup>1</sup> = television antismoking campaign. I<sup>2</sup> = television campaign and locally organized antismoking campaign (Long-Term Care Network). Lasted 18 months.</p>	<p>16 years and older</p>	<p>Four TV regions in central and northern England: One assigned to C, two to I<sup>1</sup> and one to I<sup>2</sup>.                      Assigned on the basis of need for intervention, resulting in marked baseline differences in smoking rates.</p>	<p>Cohort of smokers and former smokers identified from population survey and followed at 6 and 18 months after program initiation.</p>	<p>The odds ratios for I<sup>1</sup> and I<sup>2</sup>, respectively, 1.53 and 1.67, suggest an increase in nonsmokers. However, I<sup>1</sup> and I<sup>2</sup> are not significantly different from each other.</p>
<p>Texas Regional Study                      McAlister et al. 2004<sup>87</sup>                      Started in 2000.</p>	<p>C = no intervention. I<sup>1</sup> = low-level media, no community-level cessation activities. I<sup>2</sup> = high-level media, no community-level cessation activities. I<sup>3</sup> = I<sup>1</sup> plus community activities. I<sup>4</sup> = I<sup>2</sup> plus community activities. Lasted 6 months.</p>	<p>18 years and older</p>	<p>Quasi-experimental: 19 regions in Texas assigned on the basis of media markets and other logistical considerations to interventions classified as described in left column.</p>	<p>Population surveys conducted at pre- and postintervention. Cohort of daily smokers identified from baseline survey and followed for cessation. Cessation of daily smoking was analyzed. Media exposures also measured.</p>	<p>In both cross-sectional and cohort analyses, intensity of intervention was significantly related to cessation of daily smoking. I<sup>4</sup> showed highest cessation rates. No separate test of media-only group(s) vs. C presented. Higher level of exposures related to increased cessation in cohort sample.</p>

with the same mass media campaign combined with a variety of community-based programs, including programs for smoking cessation, in a second community. The commercial media campaign was oriented toward changing several coronary risk factors. A third community received no intervention and served as the control. Cross-sectional population surveys showed that, after two years of intervention, both intervention communities experienced a reduction in smoking prevalence greater than that in the control community. Similar to results from the Stanford Three Community Study, these reductions were better sustained in the community that received both mass media and community programming.

CORIS, another cardiovascular risk-reduction program patterned after the Stanford Three Community Study, began in South Africa in 1979 and also produced positive results.<sup>55</sup> Like the Stanford Three Community Study, CORIS included three towns. One town received a media campaign, one received the media campaign and community-based interventions, and a control town received no intervention. The media campaign involved posters, billboards, mailings, and items in the local newspapers. Cross-sectional surveys of the entire White population of all three towns at baseline and at the end of the intervention allowed for both a cross-sectional assessment and a cohort assessment. The cohort assessment indicated that at the end of the four-year intervention, cigarette consumption and smoking prevalence in the two intervention communities were reduced by a similar amount overall with respect to the comparison community, and the effect was greater for women than for men. At a long-term (12 years) cross-sectional evaluation, overall smoking prevalence rates still were lower in the media-only community but not in the media and community-programming town, which had rates similar to the control community.<sup>58</sup>

The North Karelia Project,<sup>21,24,59-65</sup> like the Stanford Three Community Study, was one of the earliest community-based intervention studies. It began in 1972 and lasted for five years. In this study, the intervention consisted of both community-based interventions and mass media; therefore, these interventions could not be evaluated separately. The media activities involved liaison with local newspapers and radio and production of printed materials to aid other program components and to publicize program activities. Population surveys assessed smoking prevalence (and other risk factors) at five-year intervals. After five years, the prevalence of regular smoking among men, but not women, had declined significantly more in the intervention community (North Karelia) compared with a control community (Kuopio). A second media program dealing specifically with smoking was aired nationally in 1978 and again a year later.<sup>88</sup> It consisted of seven weekly programs depicting smokers going through the cessation process. At 10 years, the difference for men in North Karelia had become even more marked; prevalence had declined from 52% to 36% in North Karelia and from 50% to 42% in Kuopio. However, very little change occurred between 10 and 15 years.<sup>59</sup> Women showed increased prevalence over the 15-year period, likely because diffusion of smoking was still occurring among women in Finland in this era. North Karelia had specifically requested the intervention, and some differences between the intervention and control communities were not accounted for in the analyses.

The Stanford Five-City Project<sup>26,43,67,68,89</sup> began in 1980 and lasted six years. In this quasi-experimental design to reduce cardiovascular risk factors, two communities received the interventions, two served as the controls, and a fifth community was used to monitor trends in cardiovascular disease data. The interventions used both multicomponent community programs

and mass media interventions that included smoking cessation programs on television and radio as well as PSAs on television. Both cross-sectional and cohort analyses of the Stanford Five-City Project were conducted. Individual and community variability were accounted for in the analyses. Two years after the completion of the intervention, a significant decrease of 13% occurred in smoking prevalence in the cohort that received the intervention compared with the control cohort. Although smoking prevalence also decreased in the cross-sectional analyses, the difference between the intervention and control communities was inconsistent. The authors suggest that with the cross-sectional design and a transient California population, people moving into intervention communities may not have experienced the full intervention. Both the cohort and cross-sectional analyses demonstrated a positive effect on quit rates, with intervention communities experiencing greater quit rates than did the control communities.<sup>26,89</sup>

The Minnesota Heart Health Program<sup>27,34</sup> began the same year (1980) as the Stanford Five-City Project and used a similar approach. Three matched pairs of cities were selected. One city from each pair received the intervention, while the other served as the control. The sites were not randomly assigned to these conditions. With respect to smoking, intervention efforts included smoking cessation programs, “quit and win” contests, classes, self-help materials, and in-home telephone and correspondence programs. Media messages were created that sought to aid the audience in understanding the importance of each risk factor and prevention strategies with respect to cardiovascular disease. Both cross-sectional and cohort population surveys were used for evaluation. Results of cross-sectional and cohort analyses indicate that while smoking prevalence fell among men, no significant difference was found

between the intervention and control sites. For women, cross-sectional results pointed to a significant intervention effect. However, results from the cohort analyses showed no significant difference in smoking prevalence in women between intervention and control sites.

Several other trials in countries other than the United States have been patterned after the above cardiovascular-health projects and included some form of mass media as part of a multicomponent intervention.<sup>69–72</sup> Table 12.2 provides details regarding these studies, initiated between 1985 and 1992 and lasting between four and six years. In general, the media components of the interventions were not substantial. Only one study—with perhaps the largest media component—showed a change in smoking prevalence more pronounced for the intervention condition compared to the control.<sup>71</sup>

### ***Smoking Cessation***

With evidence for an effect on smoking from the earlier studies designed to promote cardiovascular health, a number of projects were launched specifically to alter smoking behavior. Some of these were targeted toward specific populations, such as women<sup>83</sup> or minorities.<sup>81,84</sup>

Because smoking prevalence nationwide in Australia remained constant from the mid-1970s to the mid-1980s, the state health departments in New South Wales and Victoria decided to build on the success of the earlier “Quit for Life” program that was part of the North Coast Healthy Lifestyle Programme.<sup>73,74</sup> The new “Quit. For Life” program would be much larger and serve as a demonstration project for possible future nationwide interventions. The new campaign, launched in Sydney in 1983 and in Melbourne in 1984, continued throughout the remainder of the 1980s. Television was the primary medium, accounting

### Do “Quit and Win” Programs Work?

Chapter 11 describes media-based smoking cessation contests in which smokers abstinent for a required length of time are eligible to win cash or other prizes. Some studies described in this chapter have included “quit and win” contests as part of their community-based intervention efforts (e.g., Minnesota Heart Health Program, Stanford Five-City Project, Community Intervention Trial for Smoking Cessation [COMMIT], Heartbeat Wales). Furthermore, communities have mounted their own contests, either as part of state or national events (e.g., the American Cancer Society’s Great American Smokeout or World No-Tobacco Day sponsored by the World Health Organization) or as stand-alone programs. In some cases, these contests have been targeted to special populations such as adolescents, young adults, college students, pregnant women, mothers of young children, or the economically disadvantaged.

Program evaluations using controlled field studies or comparisons of quit rates to those in the same (previous) or other locales (concurrent) used biochemical and/or third-party verification of quit status at entry, at the time of eligibility, and at subsequent follow-ups. However, in most programs, either the word of the smoker or a sponsor was sufficient, and only the winners undergo biochemical validation. The length of time smokers need to be abstinent to be eligible for prizes has varied, and various lengths of longer-term follow-up have shown considerable relapse following the contest. A review of 10 such programs found a follow-up quit rate ranging from 7% to 45%.<sup>a</sup> This review questioned whether the number of quitters from such contests was sufficient to detect an increase in quit rate; the authors used actual contest data from Australia to estimate that only 0.34% of adult smokers in the targeted population quit due to the contest.

A 2005 review<sup>b</sup> found that in three<sup>c,d,e</sup> of four studies<sup>c,d,e,f</sup> meeting rigorous criteria (followed quitters for at least six months and used biochemical validation at each step), longer-term quit rates for program participants were significantly higher than in the comparison group.

The population effectiveness of “quit and win” programs depends on the participation rate and how many participants quit smoking. Participation rates can vary according to the resources devoted to publicizing and promoting the event. Further, it is possible that smokers more motivated to quit use the opportunity offered by these programs to take action, but they might have taken action soon anyway.<sup>a,b</sup> On the other hand, some participants might be motivated simply by the prize and be prone to relapse following the contest.<sup>a,b</sup> Estimates of participation rates vary from <0.01% to 5% of adult smokers.<sup>b</sup> With one-year of abstinence at follow-up as a criterion for successful cessation, the pooled quit rate for the three successful “quit and win” contests was 17.2%.<sup>b</sup> Multiplying the participation rates above by the quit rate yields an estimate of the percentage of the population of smokers quitting because of the contest. This result ranged from 0.2% to 0.9% of the population of smokers, bracketing the estimate provided earlier.<sup>a</sup> Despite these low rates, the cost per successful quit due to “quit and win” programs is probably less or roughly equivalent compared with other cessation programs.<sup>b</sup>

<sup>a</sup>Chapman, S., W. Smith, G. Mowbray, C. Hugo, and G. Egger. 1993. Quit and win smoking cessation contests: How should effectiveness be evaluated? *Preventive Medicine* 2 (3): 423–32.

<sup>b</sup>Hey, K., and R. Perera. 2005. Quit and Win contests for smoking cessation. *Cochrane Database of Systematic Reviews*. DOI: 10.1002/14651858. (no. 2) CD004986. <http://www.cochrane.org/reviews/en/ab004986.html>.

<sup>c</sup>Bains, N., W. Pickett, B. Laundry, and D. McCreedy. 2000. Predictors of smoking cessation in an incentive-based community intervention. *Chronic Diseases in Canada* 21 (2): 54–61.

<sup>d</sup>Lando, H. A., P. L. Pirie, P. G. McGovern, T. F. Pechacek, J. Swim, and B. Loken. 1991. A comparison of self-help approaches to smoking cessation. *Addictive Behaviors* 16 (5): 183–93.

<sup>e</sup>McAlister, A. L., T. Gumina, E.-L. Urjanheimo, T. Laatikainen, M. Uhanov, R. Oganov, and P. Puska. 2000. Promoting smoking cessation in Russian Karelia: A 1-year community-based program with quasi-experimental evaluation. *Health Promotion International* 15 (2): 109–12.

<sup>f</sup>Hahn, E. J., M. K. Rayens, C. Chirila, C. A. Riker, T. P. Paul, and T. A. Warnick. 2004. Effectiveness of a quit and win contest with a low-income population. *Preventive Medicine* 39 (3): 543–50.

for two-thirds of the media budget. Each advertisement also promoted a telephone quitline. A longitudinal cohort identified from a population cross-sectional survey was used to assess the immediate impact of the campaign.<sup>73</sup> Proportions of smokers who quit, who initiated smoking, and who reduced their cigarette consumption (by  $\geq 5$  cigarettes/day) were compared for Sydney and Melbourne before the initiation of the campaign in each city. In Sydney, 35% of smokers either quit or reduced

their consumption compared to 18% in Melbourne. There were no differences in relapse rates or initiation rates.

Pierce and colleagues<sup>75</sup> used cross-sectional data to assess the long-term impact of the program between 1981 and 1987 in each of the two cities. Their data consisted of multiple pre- and postcampaign years of population data for each city. A pre- and posttrend analysis estimated the prevalence of smoking as a function of the onset of

### Televised Smoking-Cessation Clinics

In a number of cities, mainly in the 1980s, volunteer organizations (e.g., the American Lung Association) worked with local television stations to provide viewers with information, tips, and support for smoking cessation. The rationale for these mass media projects was the reluctance of many smokers to attend actual smoking-cessation clinics or counseling programs. Furthermore, television stations were agreeable to broadcasting short messages (usually under two minutes) daily for 20 days (some up to six weeks) as a public service in conjunction with news programs, in some cases on both the early and late news. Thus, program cost was low, and potential reach was wide. Coordinated printed self-help materials were generally made available to anyone willing to obtain them.

The evaluation of the effect of such programs presented a number of challenges. The percentage of smokers potentially reached by a single local station and who quit as a result may not be high enough to detect with a reasonably sized population survey. Thus, it would be too costly to compare prevalence or recent quitting in communities with such a program to those in matched communities without any program. In reports describing these projects, smokers were asked to register (via the TV spots, flyers, or newspaper advertisements) and to agree to follow-up contacts for up to two years. Most of the reports simply present the cessation outcomes for this sample; some validated quit rates biochemically. However, a few studies compared registrants to random samples of smokers within the city.<sup>a,b,c</sup> Often, the registrants were heavier smokers and showed signs of being more motivated to quit (more previous attempts, poorer general health, etc.) than smokers in the general population. Higher motivation likely overcame the greater addiction, leading to cessation rates generally better for registrants than for smokers in the general population.

Flay<sup>d</sup> reviewed a number of these televised self-help clinics and concluded that they were probably more cost-effective than face-to-face counseling clinics in producing sustained cessation, but the issues regarding participant characteristics mentioned above were noted. The literature review failed to identify any further reports on televised smoking-cessation clinics after 1992.<sup>c</sup> Apparently, focus shifted to other media efforts such as promoting telephone quitlines, discussed later in this chapter.

<sup>a</sup>Danaher, B. G., E. Berkanovic, and B. Gerber. 1984. Mass media based health behavior change: Televised smoking cessation program. *Addictive Behaviors* 9 (3): 245–53.

<sup>b</sup>Wewers, M. E., K. Ahijevych, and J. A. Page. 1991. Evaluation of a mass media community smoking cessation campaign. *Addictive Behaviors* 16 (5): 289–94.

<sup>c</sup>Warnecke, R. B., P. Langenberg, S. C. Wong, B. R. Flay, and T. D. Cook. 1992. The second Chicago televised smoking cessation program: A 24-month follow-up. *American Journal of Public Health* 82 (6): 835–40.

<sup>d</sup>Flay, B. R. 1987. Mass media and smoking cessation: A critical review. *American Journal of Public Health* 77 (2): 153–60.



the campaign. Within this model, this onset variable yielded estimates of the change in the underlying trend in smoking prevalence associated with the onset of the campaigns in Sydney and Melbourne. Results indicate that in the six months following the launch of the antismoking media campaigns in Sydney and Melbourne, smoking prevalence declined significantly for all people in Sydney and for men in Melbourne. The size of these declines was estimated to be 2.6 percentage points for all people in Sydney and 2.9 percentage points for men in Melbourne. In separate analyses by sex, the authors also found that for men in both cities, the campaigns were associated with a continued decline in smoking prevalence of 1.5 percentage points per year, but women did not show a decline.

The Community Intervention Trial for Smoking Cessation (COMMIT) was a large demonstration project focusing on smoking cessation among heavy smokers ( $\geq 25$  cigarettes/day).<sup>76,77</sup> COMMIT selected 22 matched communities (20 in the United States and 2 in Canada) and randomly assigned one of each pair to receive the multicomponent intervention and the other to serve as a control. The communities were matched on the basis of geographic location, size, and socioeconomic factors. For four years (1989–92), intervention communities received the intervention, which may or may not have included some mass media elements. Community board members were provided media advocacy training that included building a press strategy, identifying and training spokespeople, analyzing available media resources, learning about smoking prevention and cessation campaign design, planning strategies for countering tobacco industry promotions, and using role models. The objectives of the media effort were to implement and publicize events (e.g., “quit and win” contests), publicize local action plans and activities, and enhance local

coverage of national and regional tobacco-related news. Communities could optionally elect to mount antitobacco media campaigns with donated or purchased time or space.<sup>90</sup> Some states where the COMMIT communities were located (e.g., California) initiated antitobacco media campaigns during this time. COMMIT was evaluated both longitudinally and cross-sectionally. Analyses adjusted for individual variability within community but did not show a greater cessation rate for heavy smokers in the intervention communities compared with the controls.<sup>77</sup> Cross-sectional analyses also did not find a difference in changes in smoking behavior for the two groups.<sup>76</sup> However, an increase in cessation was found among light to moderate smokers.<sup>77</sup>

The American Stop Smoking Intervention Study (ASSIST) was a large-scale demonstration project for which the National Cancer Institute provided seed money of about \$1 million per year to selected states to build tobacco control capacity.<sup>78–80</sup> Chapter 9 gives more information on the media efforts promoted by this project. The ASSIST intervention involved much more than media. Its net effect was evaluated by population surveys before (1992–93) and during (1998–99) the project as well as tobacco sales data before and during the intervention period. The analysis used the state as the unit of evaluation; for smoking prevalence, individual variation within each state was taken into account with a two-stage analytical approach.<sup>79,80</sup> The decline in prevalence over the evaluation period was significantly greater in ASSIST states compared to non-ASSIST states, even after controlling for tobacco control efforts funded by states in either group. However, no significant difference was found for per capita cigarette consumption according to cigarette sales data. In contrast to the Sydney “Quit for Life” study, women in ASSIST states appeared to account for much of the reduced smoking prevalence.

### Analyses of Media Effects in COMMIT Communities

Two analyses relying on population data from the COMMIT communities are relevant to the role of media in influencing smoking behavior<sup>a,b</sup> These analyses could have been presented in the following section on “Population-Based Studies” because they do not compare intervention and control conditions; however, they involve communities rather than nations, regions, or states.

The first study analyzed data from school surveys of 9th graders in 21 of the 22 COMMIT communities.<sup>a</sup> The goal of this analysis was to examine the role of tobacco media exposures and tobacco control policies on smoking (any in the last 30 days) and susceptibility to smoking among nonsmokers. Cigarette price, strength of youth access laws, and recall of school-based tobacco education were negatively associated with both smoking and susceptibility to smoking. Smoke-free policies for public places and schools appeared to be unrelated to either. Frequency of reported exposure to protobacco advertisements was marginally positively associated with smoking and susceptibility to smoking. Perhaps due to selective recall bias, a positive relationship was also observed for frequency of exposure to antitobacco advertisements.

Although mass media were not a major component of the COMMIT study design, a 2006 follow-up study permitted an assessment of the influence of mass media on smoking cessation.<sup>b</sup> In 2001, smokers in the evaluation cohort were surveyed again (53% follow-up rate). An analysis was conducted of smokers living in 15 of the U.S. communities located in a major television media market who were smokers at the time of the 1993 evaluation and still lived in the same community ( $n = 2,061$ ).<sup>b</sup> Nielsen gross-rating-point data for state-sponsored antitobacco media aired in these communities from 1999 to 2000 were correlated with the observed quit rates for participants in the 15 communities, with significant results ( $p = 0.047$ ). Higher rating points correlated with a higher quit rate. The effect was greater when the analysis was restricted to individuals who believed that media information had increased significantly between 1999 and 2000. It was estimated that quitting increased 10% for every 5,000 additional rating points (or about two additional exposures per month). Media messages may or may not have emphasized smoking cessation. Some of the communities were in states with other tobacco control initiatives (increased excise taxes, clean indoor air laws) in place during this period. The group who believed media had increased significantly may have been those more disposed to quit smoking and thus more likely to remember the messages.

<sup>a</sup>Lewit, E. M., A. Hyland, N. Kerrebrock, and K. M. Cummings. 1997. Price, public policy, and smoking in young people. *Tobacco Control* 6 Suppl 2: S17–S24.

<sup>b</sup>Hyland, A., M. Wakefield, C. Higbee, G. Szczypka, and K. M. Cummings. 2006. Anti-tobacco television advertising and indicators of smoking cessation in adults: A cohort study. *Health Education Research* 21 (2): 296–302.

A study of smokers in three Texas border towns used television programming in Spanish and English to promote general health, with smoking cessation as the main focus.<sup>87</sup> The study began in 1986, lasted four years, and involved three matched towns. One served as a control (Del Rio), sections of another (Eagle Pass) were randomly assigned by residential block to receive either volunteer network activities or an intensive cessation intervention, and the third community (Piedras Negras)

received a media intervention and a brief smoking-cessation intervention. By means of a population survey, a cohort of smokers consuming at least 10 cigarettes per day was identified and followed up during and at the end of the program. The cohort sample sizes were small (<200 people) per group. While the groups appeared comparable at baseline, no attrition analysis was presented. An analysis of the proportion who quit at each follow-up showed little difference within the

two groups of Eagle Pass residents, but together, the quit rate for this community was significantly higher than for Del Rio, the control community. Piedras Negras smokers showed quit rates similar to the control community.

A study from the Netherlands involved two matched communities in which local mass media and health providers promoted a quitline.<sup>82</sup> A longitudinal panel of smokers identified from a population survey were evaluated again at mid- and postcampaign. No differences were found, although somewhat more quitting occurred in the intervention communities at the midpoint evaluation. The authors note that a national media campaign mandating and reinforcing smoking bans in public buildings was introduced about midway through the intervention period and could have contaminated the results.

A study initiated in 1989 and lasting four years focused on smoking cessation among women in rural communities.<sup>83</sup> Two pairs of matched communities were identified in rural Vermont and New Hampshire. The two communities close in proximity received the intervention; their remote matches served as comparisons. The intervention consisted of community efforts, cessation assistance, and the distribution through the offices of health professionals of a videotape that showed four women going through the smoking-cessation process. Analyses of data from cross-sectional population surveys showed good baseline comparability, so simple change analyses were performed. These analyses failed to find a difference in the change in prevalence between the groups, but smokers in the intervention communities appeared to reduce their cigarette consumption to a significantly greater extent than did those in the control group.

Two related projects concerned male Vietnamese Americans and used a mass

media intervention that focused on changing smoking behavior. One project targeted Vietnamese-American men living in San Francisco and Alameda Counties in California.<sup>85</sup> The other targeted Vietnamese-American men living in Santa Clara County, California.<sup>84</sup> A single comparison community, Vietnamese-American men living in Houston, Texas, was used for both projects. In the San Francisco and Alameda project, an antitobacco media campaign lasting more than one year immediately preceded the community-based intervention, including cessation assistance, which lasted an additional 24 months. The total intervention time was 39 months for San Francisco and Alameda and 24 months for Santa Clara. The San Francisco and Alameda project had an additional component that targeted students and their families. The media campaign extensively used Vietnamese-language messages in newspapers, billboards, posters, other materials, and a video shown twice on local Vietnamese-language television. Cross-sectional population surveys pre- and postintervention were used to evaluate the projects. At the completion of the intervention, the odds of being a smoker were lower, and the odds of quitting smoking sometime in the past two years were higher in San Francisco and Alameda Counties than in Houston. The Santa Clara project did not demonstrate any significant reduction in smoking prevalence compared with Houston. The antismoking media campaign conducted before the intervention in San Francisco and Alameda Counties may have primed the target audience for the intervention messages, thus improving the efficacy of the community-based interventions.

McVey and Stapleton<sup>86</sup> evaluated the effectiveness of an antismoking television campaign conducted in England. Two regions in England received an intensive television-based mass media campaign to provide motivation, support,

and confidence for quitting, as well as an understanding of the difficulties associated with it. All spots were tagged with a telephone number for a quitline. Another region received the television campaign and a locally organized antitobacco program encompassing a wide array of antismoking activities, including policy advocacy. A fourth region served as the control (no intervention). These regions were selected to receive their respective treatments because of practical issues, including the need for intervention, as expressed by higher smoking rates, and the existence of a strong, preexisting antitobacco infrastructure. The regions were therefore, by design, significantly different at baseline. After 18 months, the odds of not smoking in the intervention regions were significantly higher than in the control region. No evidence indicated that adding community-based antismoking programming significantly increased the effectiveness of the mass media campaign in reducing smoking prevalence.

In 2000, McAlister and colleagues<sup>87</sup> used a mass media campaign (including television, radio, newspaper, and billboard advertisements) and community-based efforts to provide cessation assistance in Texas. Spots were tagged with the telephone number for the American Cancer Society quitline. A cohort was identified from a cross-sectional population survey at baseline. The cohort was resurveyed six months later, along with another cross-sectional survey. The authors found in both the cross-sectional and longitudinal analyses that treatment areas receiving both high-level (high-exposure) mass media campaigns along with cessation activities (including both clinical and community-based cessation programs) had the highest rate of reduction in daily smoking, with a significant dose-response effect over the various levels of intervention. The media-alone interventions were not analyzed separately against the no-intervention condition.

### Summary of Experimental Studies

The studies discussed above mainly used quasi-experimental designs to assess the effects of mass media campaigns on youth and adult smoking behavior. The media intervention studies had wide variability in scope, duration, and quality. Some studies considered the effect of media alone; in others, media were only one part of a multicomponent intervention.

The majority (seven of ten) of the youth studies provided evidence that media can play an important role in affecting smoking behavior. Although one of the studies that evaluated the effect of media alone (versus no intervention) found evidence for an effect,<sup>50</sup> three did not,<sup>29,44,68</sup> and one did not test the effect.<sup>52</sup> In studies comparing media combined with a school-based intervention to a school-based intervention alone,<sup>30,40</sup> or to no intervention,<sup>22,29,35</sup> all but one<sup>29</sup> found evidence for an effect. These findings suggest that for maximal effect on youth smoking, media need to be combined with other smoking prevention efforts. Supporting this is another controlled field experiment, the Midwestern Prevention Project, not reviewed above because media were present in both the intervention and control communities. This project compared media alone (control condition) with media together with school and other programs (intervention condition) by using longitudinal cohorts.<sup>91</sup> The study found that the intervention condition was more effective in curbing youth smoking uptake than was the media-alone condition.

The results for the role of media in influencing adult smoking behavior are also mixed. Among studies concerned with promoting cardiovascular health, which had many other media messages besides those related to smoking cessation, seven of ten found at least some evidence of an effect on adult smoking prevalence

or quitting.<sup>24,27,55,56,66,71,72</sup> Among those concerned with smoking cessation, eight of nine found such evidence.<sup>75,76,80,81,83,85–87</sup> However, if strong and consistent evidence of an effect is the criterion (uniformly decreased smoking prevalence or increased quitting), only five of the studies concerning cardiovascular health and six of those for smoking cessation would meet this standard.

Whether media alone are as effective as media combined with other program components in promoting quitting is difficult to discern. Of the six studies<sup>25,55,56,75,86,87</sup> with designs allowing for a comparison of media alone versus no intervention, one did not make the comparison (only analyzed dose-response of intervention intensity<sup>87</sup>), and all of the others showed at least some evidence for an effect. Of those studies with a media-alone condition, five also included a condition for media combined with other program components. Often, there appeared to be a greater effect for the combined intervention, but only one study<sup>86</sup> provided a direct comparison of these two conditions, and that study did not find them to be significantly different. Although results are less clear than for youth, it is likely that multicomponent interventions that include media will have a greater chance of having an impact than will media-only or other-modes-only interventions.

Each of the studies reviewed had unique strengths and weaknesses. However, some limitations deserve mention as consistent across a number of these studies. Most notably, many studies focused on the individual as the unit of analysis, despite allocating intervention treatments at the community (or regional) level. As discussed earlier, this approach can lead to biased results because it fails to account for the between-community differences associated with hierarchical or nested designs. Preexisting differences between communities, aside from those

explicitly measured and controlled for in the analyses, can obscure or be mistaken for intervention effects. Differential attrition in longitudinal studies can also be a problem if not examined closely for potential effects on the results. Furthermore, few of these studies included measures of prior secular trends, which might have obscured intervention effects.

## Population-Based Studies

### Overview

The first study of a media campaign aimed at influencing populations' smoking behavior was the natural experiment provided by the Federal Communications Commission's (FCC's) Fairness Doctrine. This campaign and its consequences are described in more detail later in this section. Here it is important to note that it preceded all of the controlled field experiments described above and all of the other population studies described in this section. The campaign may have provided impetus to investigators to undertake controlled studies using media to influence health behaviors, including smoking. Evidence of efficacy from the controlled field experiments and demonstration projects in turn paved the way for governmental agencies charged with improving public health to take action. One example is Australia's National Tobacco Campaign of 1997–2003, which built on the success of the earlier experimental ("Quit for Life")<sup>56</sup> and demonstration "Quit. For Life" media campaigns.<sup>73</sup> The effectiveness of such efforts is discussed below. In some cases, funding for population interventions was obtained from existing public health budgets, and in other cases, public health advocates worked to pass ballot measures to increase tobacco excise taxes (chapter 14) to pay for tobacco control efforts that included

media campaigns. Some U.S. states have also used funds from the 1998 Master Settlement Agreement to fund or augment funding for tobacco control programs.

Many of these U.S. state-sponsored campaigns in California, Florida, Massachusetts, Minnesota, and elsewhere described later in this chapter have included media campaigns as part of a multicomponent tobacco control program to reduce tobacco use. Other components of these programs have included school- and community-based programs, telephone quitlines and other smoking-cessation efforts, efforts to manage the chronic disease burden of smoking, the implementation of new laws restricting smoking in public places and workplaces, increased enforcement of laws restricting youth access to tobacco, and increases in tobacco excise taxes. A comprehensive program includes all of these components as well as provision for program administration and evaluation.<sup>92</sup> Because many of these program components are often initiated simultaneously, isolating the effects that can be attributed to a mass media campaign is generally not possible. However, this isolation of effect was also not possible in some of the controlled field experiments described in the previous section for the same reason.

### Typical Study Designs and Methodological Issues

Researchers have used a variety of analytic approaches to evaluate the results of population-based studies. Typically, studies

- Relate individual recall of mass media campaigns to changes in tobacco use outcomes by using pre-post cohort designs.
- Compare pre-post changes in tobacco use outcomes in a state with a tobacco control program with states without one and use cross-sectional data.

- Correlate levels of aggregate exposure across geographic areas with changes in tobacco use outcomes for the same areas.

The first type of design described above falls under the general heading of longitudinal designs. The other two are considered cross-sectional designs. Some of the advantages and shortcomings of these types of evaluation strategies have already been touched upon in the section “Methodological Issues” for the controlled field experiments, and this section provides more relevant details. Separate sections on “Longitudinal Designs: State and National Mass Media Campaigns” and “Cross-Sectional Evaluations” describe individual studies. However, some studies used both types of designs and are, therefore, mentioned more than once.

#### Longitudinal Designs

Population-based longitudinal designs can attribute effects to a campaign by relating self-reported exposure at baseline to changes in behavior in subsequent measurements. However, the strength of the observed association is influenced by the extent of control variables available to assess confounding and issues related to sample attrition. Careful attention to potential confounding is critical in such designs to account for the possibility that study participants who recall campaign messages may differ from those who do not. For example, if youth who are susceptible to smoking are more likely to recall campaign messages than are nonsusceptible youth (selective attention bias), then failure to control for baseline susceptibility to smoking could bias the results. For instance, because youth who are susceptible to smoking are more likely to become smokers in the future, failure to account for this in the analysis could lead to a positive correlation between message recall and smoking initiation.

A second potential limitation of longitudinal designs relates to the extent of sample



attrition over time. Invariably, some study participants are lost at follow-up. Random attrition hinders the power of the study to detect an effect but does not bias the observed effects. However, if sample attrition is systematic (nonrandom), it can lead to bias. For example, if at-risk youth who are susceptible to smoking are more likely to move and be lost to follow-up, they will not be adequately represented, possibly resulting in fewer transitions to smoking, which will bias the results. For population samples, this effect can be accounted for with sampling weights that make the sample followed look more like the original representative sample.

### Post-Only Cross-Sectional Design

With this design, a single measurement is obtained following an intervention for groups exposed and unexposed to the intervention. The following example illustrates the problems that can arise. It is possible that the level of smoking among individuals more likely to be exposed to an antismoking media campaign (e.g., urban dwellers)<sup>93,94</sup> is lower than among those unexposed (e.g., rural people) simply because of where they live and the differing smoking prevalence in those areas (typically higher in rural areas). Thus, any difference or lack of difference in smoking rates between intervention conditions (which may have different distributions of urban and rural residents) may be due to underlying smoking rates and not to the intervention. Selective attention can also cloud interpretation from cross-sectional studies; for example, if youth nonsmokers recall a specific antitobacco advertisement more than do smokers, the association of recall and smoking status may only mean that the advertisement was more salient to nonsmokers, not that it prevented them from smoking. Hornik<sup>10</sup> outlines a number of questions that, if answered appropriately, provide some confidence that a campaign evaluated with a post-only design had an effect:

- Does a substantial proportion of the target audience report a high level of exposure to the campaign?
- Is the targeted outcome of campaign exposure negatively associated with smoking?
- Does this relationship continue to hold after statistically controlling for known predictors of smoking?
- Is there a dose-response relationship between exposure and smoking? As exposure increases, does the rate of smoking decrease accordingly?
- Do the attitudes targeted by the campaign change in the expected direction?

### Pre-Post Cross-Sectional Design

With measurements before and after a media campaign, change can be measured, and the analysis can control for the preexisting level of the outcome being measured (likely different for different geographical areas, see example above). Again, adjusting for other pre-campaign covariates would be important. However, if there are no comparison areas not receiving the media, it still would be unknown whether the change observed was part of a secular trend, or because of other events, or because of the program. There also is the potential that some of the intervention will “leak” into comparison areas, again making it more difficult to establish that the program was responsible for a desired outcome.

A more rigorous methodology would provide for two (or more) precampaign measures to establish the secular trend and take a postcampaign measurement and perhaps some measurements during the campaign as well. Assuming all else in the environment remained constant (not always the case), it would be expected that comparison areas would continue on the same trajectory as observed during the precampaign period. This method would ensure that any change during the program period in the areas



receiving the intervention would be due to the campaign. If other factors were operative during the campaign period, the multiple precampaign measures would at least enable some estimation of this unplanned effect.

An advantage of cross-sectional measures is that they often are obtained from random samples of the population, and population estimates can be made with appropriate weighting. However, if the demographic composition of the population has changed over time, it would be desirable to standardize these estimates to the composition of the population at a fixed time. Some longitudinal baseline samples are selected from a random population study as well; to the extent that they are appropriately weighted for nonparticipation at baseline and for attrition, the samples can provide population estimates.

Various population-based studies are discussed below under the general headings of longitudinal and cross-sectional designs. However, a number of the population-based studies were evaluated by means of both longitudinal and cross-sectional studies reported separately. Therefore, the individual studies are mentioned under each of the main headings below. Again, to the extent possible, results for youth and adults are presented separately.

### Longitudinal Designs

#### ***State Mass Media Campaigns***

Three population-based longitudinal studies have assessed the effectiveness of two statewide mass media campaigns (Massachusetts and Florida). These studies examined the association between youth smoking and individual recall of media campaign advertisements in the context of statewide tobacco control programs. Additionally, an oral cancer prevention campaign in India and Australia's

National Tobacco Campaign were assessed longitudinally in adults.

#### **Massachusetts, Youth**

Siegel and Biener<sup>95</sup> assessed the impact of Massachusetts's statewide mass media campaign on smoking initiation among youth aged 12–15 years. A baseline population survey was conducted in October 1993 to March 1994 to identify a cohort of youth to follow and to obtain baseline measures. A four-year follow-up survey assessed whether youth initiated smoking, defined as smoking 100 or more cigarettes in their lifetimes. A cigarette excise tax increase went into effect in January 1993. The media campaign, begun in October 1993, consisted of television and radio spots and billboards for the youth-focused media. Approximately 80% of the media expenditures were for television. The campaign primarily focused on reaching a general audience, not youth specifically. This study found that youth aged 12–13 years who recalled campaign messages at baseline were less likely (odds ratio = 0.49; 95% confidence interval, 0.26–0.93) to become smokers than were those who did not recall messages. No statistically significant effects were found for youth 14–15 years old. Among all youth, there was no association between recall of media on seven of the eight knowledge and attitude outcomes.

The observed association between media recall and smoking among 12- and 13-year-old youth is strengthened by the extensive set of baseline control variables included in the analysis. One of the key controls was a measure of baseline smoking status defined as susceptible nonsmokers, nonsusceptible nonsmokers, and experimenters. The researchers also demonstrated that recall of media messages at baseline was not associated with smoking status. The primary limitation of this study is that the authors did not adjust for nonresponse at the follow-up

### Typical Measures of Media Exposure

For studies that rely on individual measures of exposure to mass media campaigns, researchers have used a number of methods to operationalize exposure. For clarity, commonly used measures are described and labeled below. Many studies described below used more than one of these measures.

- **Unaided Recall of Campaign Messages.** Reports of campaign messages overall and/or by medium (e.g., television, radio, billboard, print) that respondents recall seeing without prompting for specific message content.
- **Aided Recall of Campaign Messages.** Reports of campaign messages overall and/or by medium (e.g., television, radio, billboard, print) that respondents recall seeing after being provided a brief description of the advertisement. Some studies confirm the accuracy of recall with follow-up questions about the message content.<sup>a,b</sup>
- **Aided and Unaided Campaign or Brand Awareness.** The ability to recall the campaign slogan or brand (with or without prompting). In some studies, recall is confirmed with follow-up questions regarding details or meaning of a specific advertisement.
- **Message Receptivity.** Several studies measure audience reaction to campaign messages with a series of questions (e.g., did the advertisement grab your attention? did you talk to friends about the advertisement?).
- **Aggregate Measures of Campaign Exposure.** In addition to individual-level measures of campaign awareness, several studies have estimated exposure to campaigns by using aggregate data on campaign advertising such as gross rating points (defined as the percentage of the target population reached by a campaign [reach] multiplied by the frequency at which the target population is exposed). Therefore, if a campaign advertisement reaches 50% of the target audience three times in a week, the gross rating points equal 150. Aided recall appears to correlate well with gross rating points.<sup>c</sup>

<sup>a</sup>Sly, D. F., G. R. Heald, and S. Ray. 2001. The Florida “truth” anti-tobacco media evaluation: Design, first year results, and implications for planning future state media evaluations. *Tobacco Control* 10 (1): 9–15.

<sup>b</sup>Farrelly M. C., C. G. Heaton, K. C. Davis, P. Messeri, J. C. Hersey, and M. L. Haviland. 2002. Getting to the truth: Evaluating national countermarketing campaigns. *American Journal of Public Health* 92 (6): 901–7.

<sup>c</sup>Niederdeppe, J., M. C. Farrelly, and M. L. Haviland. 2004. Confirming “truth”: More evidence of a successful tobacco countermarketing campaign in Florida. *American Journal of Public Health* 94 (2): 255–57.

survey either with appropriate weights or analytic techniques.

#### Florida, Youth

Two other studies with longitudinal designs involve the evaluation of the Florida “truth” campaign. Florida’s campaign, begun in April 1998, targeted youth aged 12–17 years with messages that “attacked the [tobacco] industry and portrayed its executives as predatory, profit hungry, and manipulative.”<sup>96(p.333)</sup>

The first longitudinal study to examine the effectiveness of the Florida “truth”

campaign surveyed youth in February 1999, 5–10 months after a stratified, representative baseline survey (vendor provided sampling frame) conducted within 6 months of the campaign launch. This survey included 1,820 youths, but the study limited the sample to 1,480 who were nonsmokers at baseline. The study examined two measures of smoking initiation: (1) whether a youth smoked at all in the past 30 days at follow-up, and (2) whether a youth was an “established” smoker at follow-up, defined as smoking on six or more days in the past month and more than five cigarettes per day. Campaign exposure was measured

with a complex index that combined three different measures: (1) recall of up to two campaign advertisements, (2) cognitive reactions to these advertisements, and (3) agreement with a campaign-related belief—"you feel tobacco companies are just trying to use you." The index equaled zero if the youth could not confirm awareness of any advertisements. It equaled two if the respondent confirmed awareness of two advertisements, said that both advertisements made him or her "stop and think about whether or not they should smoke," and responded "some" or "a lot" in response to the belief described above. It equaled one for all other respondents. These values were determined from the follow-up survey measures.

The analysis consisted of two separate logistic regressions of smoking initiation (to either smoking or established smoking) as a function of the exposure index. It controlled for month of the baseline survey, age, gender, whether the respondent had at least one friend who smoked, and whether the youth had a parent who smoked. These analyses indicated that those who scored higher on the exposure index were less likely to become smokers and established smokers.

A limitation of this study is that the measure of campaign exposure relied on recall at follow-up. This process can bias the observed findings in favor of finding an effect if nonsmokers at follow-up are more likely to recall or process campaign messages. In addition, the combination of campaign recall with an intermediate outcome (i.e., agreement with a key belief question) that is on the causal pathway between campaign exposure and smoking initiation is a questionable measure of campaign exposure. If nonsmokers are more likely to hold this belief compared with smokers, then combining recall with agreement with this belief will bias the analysis in favor of finding an effect.

A second longitudinal study of the effectiveness of the Florida "truth" campaign, by Sly and colleagues,<sup>97</sup> takes a somewhat different approach from the study described above.<sup>96</sup> In the later study, another follow-up survey was conducted of adolescents who responded to the earlier surveys. Those who were nonsmokers (1,805) at their baseline interview were included in this analysis. The outcome measures are identical to those of Sly and colleagues<sup>96</sup> for current smoking and established smoking. The measure of campaign exposure is constructed differently from the measure in the earlier study. Youth were asked at the new follow-up survey if they had seen any of the 11 advertisements that had aired since the inception of the campaign.

Youth were given a short description of the beginning of each advertisement and then asked to confirm their awareness by describing what happened in the advertisement. Exposure to these advertisements was categorized into three levels: zero, one to three, and four or more advertisements. A separate measure was constructed to capture the influence of the campaign message theme on smoking initiation on the basis of agreement with a key campaign belief ("You feel tobacco companies are just trying to use you"). Responses to this statement were grouped into "a lot," "some or a little," and "not at all." A third measure was summed across nine attitude and belief statements to test the influence of tobacco industry attitudes and beliefs on smoking initiation. The authors estimated two logistic regressions of initiating smoking and established smoking as a function of number of advertisements recalled, agreement with a key campaign message theme, and the index of industry attitudes. The latter three constructs were tested individually and jointly. Other controls included age, gender, and how many of the respondent's best friends smoked at baseline. Unlike the previous study, there was no

control for parental smoking or the timing of the baseline survey.

The results indicated that the number of advertisements recalled, agreement with the key campaign message, and the industry attitude index all were associated with decreased smoking initiation. The analyses also suggested that exposure to the campaign works indirectly through changing attitudes and beliefs, which in turn influence smoking uptake. This finding is consistent with the theory of planned behavior.<sup>98</sup>

### ***National Mass Media Campaigns***

#### **India, Adults**

To determine whether the rate of oral cancer in India could potentially be reduced, an intensive, ongoing, media-based educational program (films, posters, folk theater, radio broadcasts, and newspaper articles) to discourage all forms of tobacco use was undertaken in three districts of the country. The intervention period began in 1979 and lasted at least five years.<sup>99,100</sup> A cohort of tobacco users (identified from all adults screened in randomly selected villages in each district) was interviewed in their homes by dentists and followed annually for five years. The dentists advised participants of any precancerous conditions discovered; these individuals were not included in the analyses. These and all other tobacco users were advised of the dangers and encouraged to quit at each follow-up. A comparison cohort was obtained from a similar in-home surveillance effort that took place a decade earlier in the same districts, with the baseline interview in 1966–67. This earlier cohort was not exposed to the media campaign. Cessation of all forms of tobacco use was increased in the intervention cohort in two of the three districts; in the third district, the increase was slight and not significant. Chewing tobacco cessation rates were higher than for other forms of tobacco (bidis and clay pipes; cigarette smoking was rare). Many more in the intervention

cohort also reported reducing consumption. Whether or not tobacco use was declining in other districts during the media intervention phase was not reported.

Five-year follow-up examinations by the dentist interviewers showed the age-adjusted rate of occurrence of precancerous conditions to be reduced to nearly one-quarter of that observed in the earlier control cohort in two of the regions, but it increased in the third (the same region with no significant reduction in prevalence). A 10-year evaluation of one of the districts that the authors considered most representative of India showed that tobacco users in the intervention cohort continued to quit, but quit rates in the control cohort remained stable.<sup>100</sup> At 10 years, the incidence of precancerous lesions in the intervention cohort was 40% of the incidence in the control cohort. Because oral cancer is usually preceded by precancerous conditions, the authors concluded the media program likely would reduce the incidence of oral cancer.

#### **Australia, Adults**

Smoking rates declined steadily in Australia during the 1980s and early 1990s. However, these declines stalled during the mid-1990s, raising concerns in the public health community.<sup>101</sup> Encouraged by the earlier “Quit for Life” campaigns,<sup>56,73</sup> the federal government of Australia subsequently committed an initial A\$7 million to an additional cessation-focused campaign to target adult smokers aged 18–40 years.

Launched in June 1997, the National Tobacco Campaign (NTC) was the largest and most intense antismoking media campaign ever implemented in Australia. The central communications element of the campaign consisted of television advertisements designed to convey information about the relatively certain effects of smoking. The campaign slogan was “every cigarette is doing you damage” and focused on the continuing damage

that results from smoking, rather than on long-term health risks. The campaign used three television advertisements—*Artery*, *Lung*, and *Tumor*—to launch the campaign. These advertisements used highly realistic and graphic images to portray the deadly pathology of what happens inside the arteries, lungs, and brain as cigarette smoke enters the body. These advertisements were supplemented by a series of similar radio advertisements that reinforced the campaign's messages, and in later years, by television ads about the effects of smoking on damage to the brain and eyes and a further ad on damage to the lungs. For a full description of the NTC and its implementation, see Hill and Carroll.<sup>101</sup>

Borland and Balmford<sup>102</sup> conducted a longitudinal analysis to explore the short-term impact of Australia's NTC on thoughts about quitting smoking and progression toward cessation. A random sample of the electronic white pages identified 1,000 current smokers, aged 18–40 years, who lived in Sydney, Melbourne, Brisbane, and Adelaide. A total of 250 baseline interviews were conducted in each of the four cities, with 119 of the original 1,000 interviewees lost to follow-up for the survey two weeks after baseline (88% retention). Primary outcome measures included the frequency of various thoughts about smoking and the tobacco industry, concerns about passive smoking, and the prequitting stage of change. They also included a measure of self-reported quitting activity that was based on a survey question to assess whether participants had changed or thought about changing their smoking behavior in the past two weeks. This study also included measures of exposure to the NTC on the basis of survey questions that assessed unprompted and prompted recall of NTC advertisements from the “every cigarette is doing you damage” campaign.

Between the baseline and follow-up surveys, 33% of smokers progressed toward cessation

after the onset of the campaign. Recall of the NTC also was found to be significantly associated with greater self-reported quitting activity and an increase in negative thoughts about smoking. These results suggest that the NTC may have had a short-term impact on smokers' preparedness to quit smoking. Study limitations noted by the authors included lack of a control and selective attention. Also, the analysis did not adjust for the potentially confounding factors in a multivariable model.

### **Cross-Sectional Evaluations**

A number of studies have assessed the effectiveness of state and national mass media campaigns in preventing youths' smoking and in promoting smoking cessation in the United States and abroad. The next two subsections review studies concerning national campaigns and discuss the evidence from state-based media campaigns in the United States. The last subsection discusses the efficacy of media advertisements for quitlines.

#### ***National Antitobacco Media Campaigns***

##### **United States Fairness Doctrine, Adults and Youth**

The earliest opportunity for evaluation of antismoking media campaigns occurred with the 1967 FCC ruling that the Fairness Doctrine applied to cigarette commercials, requiring broadcasters to air antismoking commercials in proportion to cigarette commercials. This balance was defined as a ratio of one free antismoking advertisement on television or radio for every three cigarette commercials.<sup>103</sup> The first evaluations of the natural experiment provided by the Fairness Doctrine were simple models of cigarette demand, using time-series data on annual per capita cigarette consumption.<sup>103–105</sup> These studies provided convincing evidence that the Fairness Doctrine had a significant impact on

smoking during the late 1960s. Antismoking advertisements aired from 1967 through early 1971 when cigarette advertising was banned in the broadcast media.

Studies by Lewit and colleagues<sup>106</sup> and Warner and Murt<sup>107</sup> add to the evidence base on the effectiveness of the Fairness Doctrine. Warner and Murt<sup>107</sup> evaluated the Fairness Doctrine by using a time series of cross-sectional data from the 1978 National Health Interview Survey (NHIS). These surveys contain self-reported smoking rates in the United States for each year from 1901 through 1978 for six 10-year birth cohorts of males and females. The 1901–10 cohort is the eldest, and the 1951–60 cohort is the youngest. To assess the effect of the campaign on smoking rates, the authors estimated what smoking rates would have been between 1964 and 1978 in the absence of the campaign. They then compared those estimates with the actual self-reported smoking rates in NHIS data.

In estimating the rates of smoking that would have occurred for each cohort, in each year of the antismoking campaign, Warner and Murt used assumptions that, without the campaign, secular trends in smoking would have persisted through the 1960s and 1970s. To estimate these rates, the authors added or subtracted the earlier cohorts' average percentage point changes for the relevant ages to the 1963 base smoking rate for the cohort in question. This process was repeated for the 1964–78 estimates.

Warner and Murt's<sup>107</sup> time-series analysis indicated that self-reported smoking rates in NHIS data would have been significantly higher through 1978 in the absence of the antismoking campaign. This analysis suggests that the campaign had a measurable effect on U.S. smoking rates. More specifically, these researchers found that the campaign may have been more effective at encouraging males to quit smoking or not to start. Males in the youngest cohort were projected to have

a 61% smoking prevalence by 1978 without the campaign, a difference of 22 percentage points from that cohort's actual reported rate of 39%. Although the largest effects appeared to be within male cohorts, the campaign had a significant impact on most female cohorts as well.

The primary limitation of Warner and Murt's<sup>107</sup> analysis is that it used a number of unverifiable assumptions to calculate estimated smoking rates in the absence of the campaign and did not control for possible confounding influences, such as cigarette prices, that may have affected smoking rates during the campaign. Also, these estimated rates were not based on model predictions that could have accounted for a number of influences. Nonetheless, to check the overall validity of their assumptions, Warner and Murt converted the cohort estimates of smoking prevalence into estimates of cigarette consumption and compared them with consumption estimates produced by Warner<sup>104,105</sup> from cigarette production and sales data. The similarity of these estimates, they argued, provided reasonable support for the validity of their assumptions.

Lewit and colleagues<sup>106</sup> conducted a more traditional analysis of the effects of the antismoking campaign that aired under the Fairness Doctrine. They used a cross-sectional sample from Cycle III of the National Health Examination Survey to estimate demand functions for cigarette smoking by adolescents. Their analysis used a large sample of youth ( $N = 6,768$ ), aged 12–17 years and data collected between March 1966 and March 1970. These researchers estimated self-reported smoking behavior as a function of various measures of exposure to antismoking advertisements. Unlike previous studies, the analysis by Lewit and colleagues controlled for an extensive set of potential confounding influences that included cigarette prices, family income, family size, employment status, family structure,



parents' education, age, gender, race, and exposure to prosmoking messages.

The analysis by Lewit and colleagues<sup>106</sup> used two measures of smoking behavior as the dependent variables in regression models: (1) whether the youth was a current smoker and (2) the number of packs of cigarettes smoked per day. Youth exposure to the antismoking commercials aired under the Fairness Doctrine was captured with a series of dichotomous and interaction variables. The simplest measure was a dichotomous variable that distinguished youth who were interviewed during the Fairness Doctrine period. Alternative measures were used to capture the possibility that youth who watch more television would be more likely to see antismoking campaign commercials. To do so, the authors used two variables consisting of youths' daily hours of television and an interaction between daily television and an indicator for Fairness Doctrine periods. The final specification of campaign exposure by Lewit and colleagues consisted of a proxy for the number of antismoking commercials that youth viewed. This proxy was defined as the product of the number of antismoking commercials that aired in a given year and the number of hours per day that each youth spent watching television. The study by Lewit and colleagues also included a squared term for this variable to capture the possibility that the impact of antismoking commercials is subject to diminishing returns.

The regression analyses by Lewit and colleagues<sup>106</sup> indicated that smoking prevalence among youth was between 3.0 and 3.4 percentage points lower during the Fairness Doctrine than during the previous 16 months. Consistent with their hypotheses, they also found that the interaction between television watching and the Fairness Doctrine periods had a negative and statistically significant impact on the probability of smoking, suggesting that youth who watched more television during the Fairness Doctrine

era of antismoking commercials were less likely to smoke cigarettes. Lewit and colleagues further found that their proxy for the number of advertisements youths saw was negatively and statistically associated with a lower probability of smoking. However, the squared term for this proxy had a positive and significant effect on smoking. These results suggest that the Fairness Doctrine had a significant negative impact on smoking by youth and that this impact was subject to diminishing returns. None of the specifications estimated by the Lewit study found a significant impact of the campaign on the number of cigarettes smoked per day. This finding is not surprising, as many youth are not yet regular or addicted smokers.

Lewit and colleagues<sup>106</sup> made significant improvements in estimating the effects of Fairness Doctrine antismoking commercials. They did so by estimating youth smoking behaviors as a function of proxies for exposure to the antismoking campaign while controlling for a broad set of potentially confounding influences. This study made significant strides in using more complex measures of exposure to the campaign. As in other studies that rely on aggregate rather than self-reported individual exposure, the measures were of potential rather than actual exposure.

Despite their limitations, these cross-sectional studies provided fairly convincing evidence of the impact of the Fairness Doctrine and were consistent with previous time-series analyses of cigarette sales and consumption data.<sup>103,104</sup> As noted by Flay,<sup>1</sup> these findings were further validated by other analyses and studies showing that cigarette consumption increased after antismoking commercials were no longer broadcast, following a ban of cigarette advertising on television and radio. Thus, the Fairness Doctrine advertisements appeared to be more effective in deterring cigarette consumption than were the cigarette commercials in encouraging consumption,



even though the latter outnumbered the former. The Fairness Doctrine and ensuing evaluations showed that antismoking advertising on television and radio, when implemented with sufficient intensity and reach, could produce behavioral changes in smoking. As such, these studies laid groundwork for further investigation and eventually for antismoking media campaigns to become one of the preeminent tools used by governments and private health organizations for curbing youth and adult smoking in the United States.

### **Australia's NTC, Adults**

The details of this campaign were described above in "Longitudinal Designs, National Mass Media Campaigns." In addition, Wakefield and colleagues<sup>8</sup> used a national cross-sectional population telephone survey method, involving a baseline survey of adults and cross-sectional follow-up surveys in subsequent years. The surveys measured unprompted recall of the NTC, recognition of advertising, campaign-attributed encouragement to become or remain a quitter, and beliefs and attitudes about smoking and health. Overall, 88% of Australian adults had confirmed recall of the NTC in 2000. In addition, roughly one-half of the smokers who had seen the NTC believed that it made them more likely to quit smoking cigarettes. Specific changes between surveys—in unprompted awareness of health effects caused by smoking, and new learning about smoking and health—were observed in relation to the main messages of the advertisements, which were time sensitive, according to the year of launch of each of the ads. This analysis relied on a basic descriptive analytic strategy and specifically did not link self-reported measures of awareness of the NTC to outcomes of interest because of the problem of selective recall bias.

### **Australia's NTC, Youth**

Other studies have used cross-sectional data to assess whether the NTC, which focused on

adults, had an impact on youth in Australia. White and colleagues<sup>108</sup> used two cross-sectional surveys of youth (one telephone and one school based; both postintervention only) to examine youth awareness of the "every cigarette is doing you damage" campaign and whether the campaign had any measurable impact on tobacco-related attitudes and behaviors among youth. The national telephone survey targeted youths aged 14–17 years. The school survey included secondary school students aged 12–17 years in Victoria. The telephone survey assessed youth awareness of campaign messages, attitudes about smoking, intentions to smoke, and quitting behaviors. The school survey also assessed youth awareness of campaign messages and whether the students took any actions as a result of seeing the campaign advertisements.

Again, the primary analytic strategy of White and colleagues<sup>108</sup> consisted of simple descriptive analyses rather than multivariate analyses that adjusted for potential confounding factors. Analyses were conducted separately for smokers and nonsmokers and summarized youth awareness of the campaign and responses to various questions about tobacco-related attitudes and quitting behaviors. Results from both the telephone and school surveys show that recognition of the NTC's tagline was extremely high (90% or greater) among Australian youth. Analyses from the telephone survey indicate that a high proportion of smoking and nonsmoking youth agreed with statements about campaign-related beliefs. A high proportion of youth also indicated beliefs that the campaign was relevant to primary students, secondary students, and young smokers.

Students in the Victoria school survey were asked questions about whether they took any action in response to the campaign. Students were allowed to indicate any one of a number of possible actions, such as quitting smoking, reducing their cigarette

consumption, and telling someone else to quit smoking. Compared with never smokers, a significantly higher proportion of youth who had smoked at least once in their lifetime indicated taking at least one action in response to the campaign. Among current established smokers, for example, 27% said they cut down the number of cigarettes they smoked in response to the campaign, 26% indicated they thought about quitting, and 18% said the campaign made them try to quit smoking. However, 42% did nothing in response to the campaign.

These data suggest that, although the NTC was aimed at adult smokers and had a strong cessation message, the campaign had at least some impact on youth in Australia. Awareness of NTC advertisements was assessed in both surveys used in this study, but the authors did not estimate the direct statistical relationships between self-reported awareness of the campaign and the attitudinal and behavioral outcomes assessed in the study.

### **American Legacy Foundation's National "truth" Campaign Aimed at Youth**

Cross-sectional studies also have been used extensively to evaluate high-profile, national antismoking campaigns aimed at curbing youth smoking in the United States, such as the American Legacy Foundation's (Legacy's) national "truth" campaign. When launched in 2000, the "truth" campaign differed from other national smoking prevention campaigns in being marketed as a popular youth brand and delivering blunt facts and messages about the tobacco industry (such as industry efforts to obscure the health effects of tobacco). The campaign's messages were delivered in a variety of television advertisements that featured risk-taking adolescents and were designed to avoid making directive statements that tell youth not to smoke.

The Legacy "truth" campaign strategy is generally consistent with modern theories

of persuasion. These theories hold that, for a message to have an effect on desired outcomes, it must not only be viewed and remembered but also must be understood and perceived as credible and relevant. The Legacy "truth" campaign's general approach contrasts with other national campaigns, such as Philip Morris's "Think. Don't Smoke" campaign, the second-largest national antismoking campaign to air during the early years of the Legacy "truth" campaign. The "Think. Don't Smoke" campaign, which aired between 1998 and 2002, featured role models displaying firm decisions not to smoke and explaining their reasons for not smoking.

The first cross-sectional studies on the effectiveness of the Legacy "truth" campaign provide fairly convincing evidence that the campaign had a significant impact on tobacco industry-related attitudes, beliefs, and other behavioral precursors, as well as a significant impact on youth smoking prevalence in the United States. Farrelly and colleagues<sup>109</sup> used a nationally representative sample of 12- to 17-year-olds from the Legacy Media Tracking Survey. Data were from two waves: a baseline period during the months before the campaign's launch, and approximately 10 months afterward. This study included self-reported measures of confirmed recall of Legacy "truth" advertisements, multiple measures of campaign-related attitudes and beliefs, and a comprehensive set of individual background characteristics.

The study indicated that 10 months subsequent to the campaign's launch, a high percentage of youth (75%) had seen at least one specific campaign advertisement. Using multivariable logistic regressions, the authors also showed that awareness of specific campaign advertisements was significantly associated with greater anti-tobacco-industry attitudes and with beliefs that were targeted by the campaign.<sup>109</sup> A subsequent study, using six waves of

the same survey, examined antitobacco attitudes over time in groups of states: (1) tobacco-producing states, (2) non-tobacco-producing states with low tobacco control funding, (3) non-tobacco-producing states with relatively high tobacco control funding, and (4) non-tobacco-producing states with well-funded media programs. The authors found no significant difference in how antitobacco attitudes changed over time among the state groups and concluded that response to the Legacy “truth” campaign was not influenced by residence in a tobacco-producing state.<sup>110</sup>

For the earlier study,<sup>109</sup> findings also showed that the Legacy “truth” campaign was associated with a significant reduction in youths’ intentions to smoke in the future. Interestingly, this study also found that youth awareness of Philip Morris’s “Think. Don’t Smoke” campaign was associated with a lower level of several anti-tobacco-industry attitudes as well as increased intentions to smoke. As with all cross-sectional studies, the primary limitation of this study is the potential for bias in selective attention, which precludes strong causal inferences.

A subsequent cross-sectional study, published in 2005, examined effects of the Legacy “truth” campaign on smoking behavior of youth.<sup>93</sup> This study used a large national sample of 8th-, 10th-, and 12th-grade students from the Monitoring the Future survey. Multivariable logistic regression models estimated youth smoking prevalence as a function of the Legacy “truth” campaign’s intensity measured at the media market level. The media market measure of “truth” campaign exposure was based on gross-ratings-point data provided by the campaign’s media contractor. These data captured the relative reach of and frequency of exposure to the campaign among its target audience of 12- to 17-year-olds within each of 210 media markets in the United States. Because gross rating points varied greatly across U.S. media markets, these data allowed

the formation of multiple natural comparison groups and provided an alternative analysis approach in the absence of true experimental implementation of the campaign. This study also controlled for a wide range of individual demographic characteristics as well as preexisting levels of smoking in each of the 210 U.S. media markets.

Findings from this study associate the Legacy “truth” campaign with a significant decline in youth smoking, resulting in approximately 300,000 fewer youth smokers in the United States. The authors showed that smoking prevalence among students in 8th, 10th, and 12th grades combined declined from 25.8% to 18.0% between 2000 and 2002. The Legacy “truth” campaign accounted for approximately 22% of this decline. Although the Legacy “truth” campaign had no effect on youth smoking after only a few months of the campaign in 2000, the effects were statistically significant in 2001 and 2002. These findings suggest that the association between the Legacy “truth” campaign and youth smoking strengthened over time and, as expected, had little effect in the early months after the campaign’s launch. Furthermore, Thrasher and colleagues<sup>110</sup> found that the effect on smoking was similar among high- and low-risk adolescents, when high risk was defined in multiple ways.

The above studies, like all other population studies, relied on self-reported measures of youth smoking. These measures may be subject to social desirability bias; that is, youth are less likely to report smoking in media markets that received high levels of exposure to the campaign. This would lead to an overstatement of the campaign’s effects. However, in a study published in 2007,<sup>111</sup> biochemically validated smoking status in a school-setting survey (5,511 students from 48 high schools) showed that only 1.3% of respondents underreported smoking via self-report, and recall of “truth” advertisements was not

related to underreporting. The campaign's effects could have resulted from other youth-focused prevention programs, such as the national antidrug campaign by the Office of National Drug Control Policy.<sup>20</sup> However, in similar models, the authors found no associations between Legacy "truth" gross rating points and heavy drinking among youth, which may be influenced by the Office of National Drug Control Policy campaign and other drug and alcohol prevention initiatives. These findings help rule out the possibility that the correlation between Legacy "truth" gross rating points and youth smoking was spurious.

### **Tobacco Industry-Sponsored Media Campaigns Aimed at Youth and Parents**

In contrast to the Legacy "truth" campaign, Philip Morris's "Think. Don't Smoke" campaign was associated with lower levels of antitobacco attitudes and higher intentions to smoke.<sup>109</sup> Another analysis of this campaign by Wakefield and colleagues examined its association with smoking behavior as well as attitudes and intentions.<sup>112</sup> This study also included Lorillard's "Tobacco Is Whacko if You're a Teen" and a Philip Morris media campaign aimed at parents, "Talk. They'll Listen." The study used Monitoring the Future school survey data (8th, 10th, and 12th graders) from tens of thousands of students and related the data to gross-rating-point data for the four months preceding the surveys in the media markets where the schools were located. Models for the variables associated with behavior, attitude, and intention controlled for demographic and other personal data, region, the real price of cigarettes, a smoke-free air index, and exposure to state tobacco control program media. Additional models for smoking behavior also controlled for frequency of television watching, with consistent outcomes.

The analyses discerned no association between smoking in the past month with

the youth-directed media campaigns as measured by gross rating points. However, exposure to the tobacco industry's youth-directed campaign advertising was associated with an intent to smoke in the next five years for 8th graders. In contrast, greater exposure to the rating point variable for media directed toward parents was associated with a higher likelihood of smoking in the past month for 10th and 12th graders, increased intent to smoke for all grades, and lower levels of a few antitobacco attitudes. Wakefield and colleagues<sup>112</sup> cite theories in developmental psychology to explain these findings. As adolescents mature, they consider themselves more independent and less reliant on their parents. Thus, messages aimed at parents as authority figures invite rejection by older adolescents. The nature of the media buy for the campaign directed toward parents was unlikely to result in more rating points in areas with higher adolescent smoking rates. Sensitivity analyses explored the effect of removing some of the key control variables (cigarette price, smoke-free air index, exposure to public health-sponsored antitobacco campaigns) from the model; however, the results were basically unchanged.

### **Cross-Sectional Results from Other Countries for Adults**

In addition to the studies described above, several national antismoking media campaigns in other countries have been evaluated with cross-sectional data and have shown similar results. In March through May 1977, Norway conducted a mass media campaign to inform its population about the health consequences of smoking, with no other tobacco control measures mentioned.<sup>113</sup> The publicly controlled media ran six large advertisements in 170 newspapers and magazines, and the state-owned television station twice aired the British documentary film *Dying for a Fag*. The first showing was followed by a call-in radio program for viewers to discuss

their reactions to the film. An in-home population survey, conducted in June 1977 to evaluate the effect of this campaign, found that 86% of the population had seen a newspaper advertisement, 62% had seen a magazine advertisement, and 66% had seen one of the showings of the film on television. Compared with surveys conducted before the campaign, daily smoking prevalence among men dropped from 53% to 45%. It had been close to 53% since 1971, after declining from the mid-1950s. Daily smoking prevalence among women had been steadily increasing from the mid-1950s through 1973, declined through 1976, but remained even between 1976 and 1977. Per capita cigarette consumption declined 4.3% in the 12-month period from July 1976 through July 1977 compared to the preceding 12-month period. Gredler and Kunze,<sup>114</sup> using a pre-post design, suggested that a large-scale antismoking campaign that aired in Austria for eight weeks at the end of 1980 and the beginning of 1981 was responsible for a significant reduction in the prevalence of smoking in Austria between 1979 and 1981. Using multiple cross-sectional surveys, Doxiadis and colleagues<sup>115</sup> found that an intensive antismoking campaign in Greece that consisted of radio and television advertisements virtually eliminated annual percentage increases in smoking between 1979 and 1980. Doxiadis and colleagues also found that when this campaign ceased, cigarette consumption again rose to precampaign rates. These findings suggest that a media campaign that reaches a high proportion of the population can influence smoking behavior, even without other tobacco control efforts in place.

### ***Statewide Antitobacco Media Campaigns***

#### **Comparative Cross-Sectional Evaluation Among States of Effects on Youth**

A study by Emery and colleagues<sup>116</sup> published in 2005 provides compelling evidence

from a correlational analysis that youth exposure to state-sponsored antismoking commercials within the United States is associated with stronger intentions not to smoke in the future and with a lower probability of being a smoker. This study used cross-sectional data for two years (1999 and 2000) on 8th-, 10th-, and 12th-grade students from the Monitoring the Future survey to link exposure to state antismoking commercials to youth smoking outcomes. Their analysis was similar to that of Farrelly and colleagues,<sup>93</sup> using commercial ratings data from Nielsen Media Research to calculate a measure of audience exposure to antismoking advertising across the 75 largest media markets for the years 1999 through 2000. These data enabled Emery and colleagues to measure exposure to state antismoking advertisements across the 75 media markets separately from exposure to antismoking advertisements sponsored by the tobacco industry and advertisements for smoking-cessation aids sponsored by the pharmaceutical industry. These measures were incorporated as independent variables in a series of multivariable logistic regressions that estimated outcomes related to smoking as a function of exposure to advertising. This study was the first to examine the impact of state-funded antismoking campaigns on youth smoking while controlling for other tobacco-related advertisements. The analyses controlled for a comprehensive set of potential confounding influences—such as demographics, family structure, parents' education, average state cigarette prices, clean indoor air laws, and secular trends—to account for potential influences they were unable to model (e.g., such as Legacy's "truth" campaign).

The results from these analyses indicate that exposure to at least one state-funded antismoking advertisement in the prior four months is associated with lower perceived rates of friends' smoking, greater perceived harm of smoking, stronger intentions not to smoke in the future, and lower likelihood

of being a smoker. These findings are particularly compelling because the models consistently yield significant associations between exposure to state antismoking campaigns and youth smoking-related outcomes. This association occurred even though state campaigns, as captured by the awareness measures used by Emery and colleagues, varied dramatically in the number and frequency of advertisements aired.

A limitation of this study was that the authors could not control for preexisting correlations between levels of smoking in the media markets and the number and frequency of advertisements aired in each market. As Farrelly and colleagues<sup>93</sup> noted, markets with low media exposure tend to have populations that are more rural, white, and less educated, and lower in income than do markets with high exposure. These factors are all associated with higher levels of smoking. Thus, failing to control for these potential preexisting correlations could lead to a spurious negative correlation between antismoking advertising and youth smoking rates. In subsequent analysis, the same methods applied to five years of advertising exposure and youth smoking outcome data, and controlling for preexisting youth smoking rates in 1995–96, found the same pattern of results, linking greater advertising exposure to reductions in youth smoking.<sup>117</sup>

### **Minnesota, Youth**

In 1985, Minnesota was the first state to mount a statewide antismoking campaign aimed at youth. The campaign used paid and donated spots on television and radio as well as newspaper and billboard ads, particularly in connection with sports and other events attracting large adolescent audiences. Murray and colleagues<sup>118</sup> evaluated the effects of this campaign during 1986–90 on youth attitudes toward tobacco and smoking by contrasting change over time among Minnesota youth relative to youth in Wisconsin. They demonstrated a

small but statistically significant increase in exposure to antismoking messages but no changes in attitudes or smoking behavior. Given the relatively low level of spending for the campaign and only a small increase in exposure to antismoking messages, it is possible that the campaign's reach was not sufficient to lead to change in smoking behaviors.

Another cross-sectional study examined the effects of Minnesota's Target Market youth media campaign. This campaign, launched in the spring of 2000 and continued for three years, was phased out after state budget cuts. To evaluate the campaign, four cross-sectional surveys of approximately 1,100 12- to 17-year-olds were conducted between summer 2002 and winter 2003.<sup>119</sup> The last survey was conducted five months after the last advertisement aired. The authors used several measures to test whether or not ending the campaign had a negative impact on outcomes: awareness of Target Market; smoking susceptibility ("if someone you thought was cool offered you a cigarette, would you smoke it?") and "would you wear a shirt, hat, or sunglasses with a tobacco company logo on it?"); intention to smoke in the next year; and three attitudinal scales. One scale measured attitudes toward the tobacco industry (central to the campaign), one included traditional normative attitudes and beliefs, and the third reflected antitobacco empowerment.

The results show that awareness of the advertising dropped from 59% to 50%, and awareness of the Target Market brand dropped from 85% to 57%. By the last survey, the two measures of smoking susceptibility increased, as did intentions to smoke in the next year. Finally, scores on all three attitudinal scales decreased. These results may provide evidence of the effectiveness of Minnesota's media campaign by showing that the absence of the campaign led to adverse changes in key tobacco outcomes. However, without a



comparison sample, it is difficult to know if the trends in Minnesota reflected, in part, a national trend.

### **California, Youth and Adults**

Popham and colleagues<sup>120</sup> conducted a before-and-after cross-sectional design to assess the effectiveness of California's 1990–91 mass media campaign among youth and adult smokers. This assessment occurred before the implementation of most other statewide tobacco control activities and after an increase of 25 cents per pack in the state cigarette excise tax. The pre- and posttest surveys of youth in grades 4–12 were conducted in schools; the adult smoker survey was conducted by telephone. For youth, posttest surveys were conducted 3, 7, and 12 months after baseline and 2, 6, and 11 months after the campaign launch. The authors used *t*-tests to evaluate differences between surveys and in the final survey and differences between those exposed and unexposed (self-report) to the media messages. The results indicate positive changes in tobacco attitudes, intentions, and use. However, these differences appear between the baseline and first posttest survey only after two months of exposure to the campaign. For example, smoking prevalence declined from 12.8% to 10.3% over this period and was 10.9% in the 12-month survey. A similar pattern was found for attitudes and intentions. In addition, the statistically significant differences were of modest magnitude. When authors analyzed outcomes in the 12-month survey for those who reported awareness of the campaign versus those who did not, they found conflicting results: those exposed to the campaign showed significantly more health-enhancing attitudes, but more nonsmokers indicated they were thinking about starting to smoke. The authors suggest that their measure for “thinking about starting” may not have been valid. Selective attention among nonsmokers susceptible to smoking may also explain this result.

The results for the adult smoker surveys show an increase in awareness of campaign messages between the baseline and 12-month surveys, a modest but statistically significant decrease in antitobacco attitudes, and no difference in intentions to quit. No meaningful differences were found in the final survey between those reporting and those not reporting awareness of the campaign. Given the relatively short timeframe for the study and analyses that did not control for potentially confounding influences among those either reporting or not reporting exposure, it is not surprising that this study had mixed results.

One other study attempted to assess indirectly the impact of California's media campaign on tax-paid cigarette sales. Hu and colleagues<sup>121</sup> conducted a regression analysis of quarterly cigarette sales between 1980 and 1992 and mass media campaign expenditures, controlling for cigarette price excluding cigarette excise taxes, the amount of cigarette excise taxes, and time. They found a significant association between expenditures on mass media campaigns and declines in cigarette sales.

### **Florida, Youth**

In addition to the evidence of effectiveness for the Florida “truth” campaign noted earlier in this chapter from longitudinal evaluations,<sup>96,97</sup> Sly and colleagues<sup>96</sup> used a before-and-after design with a comparison group to assess the effectiveness of the Florida “truth” campaign in the first year of the campaign. The central comparisons in this study are between independent cross-sectional samples of 12- to 17-year-olds in Florida and the rest of the United States (excluding Arizona, California, Massachusetts, and Oregon, which had preexisting campaigns) in April 1998 and May 1999. Key outcome measures included campaign-targeted beliefs and attitudes, smoking susceptibility, and behavior. Target sample sizes were



1,800 and 1,000 for the Florida and national population samples, respectively.

One year after the campaign was launched, 89% of Florida youth sampled reported seeing at least one of the Florida “truth” advertisements. At baseline, the level of agreement with beliefs and attitudes was similar between Florida and national youth for 9 of the 11 items. By the May 1999 survey, youth in Florida had more favorable beliefs and attitudes than did the national sample for 9 of the 11 items. Between the baseline and the May 1999 surveys, statistically significant decreases occurred in the percentage of youth who had ever tried a cigarette and the percentage of nonsmoking youth who were open to smoking. In addition, rates of change in ever trying a cigarette, currently smoking, and being open to smoking among nonsmokers over the one-year period compared favorably in Florida with the national sample. For example, current smoking declined by 8.9% in relative terms in Florida and increased by 11.9% nationally. These results are consistent with the longitudinal studies by Sly and colleagues.<sup>96,97</sup> They indicate that the Florida “truth” campaign reached a significant proportion of all Florida youth in its first year and had a positive impact on beliefs, attitudes, and intentions to smoke.

Using an approach similar to that of Sly and colleagues,<sup>96</sup> Niederdeppe and colleagues<sup>122</sup> compared 12- to 17-year-old youths in Florida ( $N = 1,097$ ) and nationally ( $N = 6,381$ , excluding youth in states with large-scale media campaigns in Arizona, California, Massachusetts, Mississippi, and Oregon) with cross-sectional surveys conducted between fall 2000 and spring 2001. Key measures included current and lifetime smoking, smoking intentions, awareness of tobacco control activities, and agreement with four belief items about cigarette companies that are central to the Florida “truth” and the Legacy national

“truth” campaigns as well as eight other beliefs about the social and physical effects of tobacco use.

The results indicate that Florida adolescents were less likely than youth nationally to have smoked in the past 30 days, to have ever tried smoking, and to be open to smoking in the future (among never smokers). Florida adolescents also had higher awareness of “truth” and community antitobacco organizations (e.g., Florida’s Students Working Against Tobacco) but similar levels of exposure to school-based tobacco prevention education. Florida youth had less-favorable beliefs about cigarette companies (all four items were statistically significant) compared with youth nationally, but all other beliefs surveyed were similar.

Another evaluation of Florida’s campaign relied on the cross-sectional Florida Youth Tobacco Surveys (more than 20,000 students in more than 240 middle and high schools each year) conducted in 1998 (preprogram) and in both 1999 and 2000 (postprogram).<sup>123</sup> No comparison group in other states was presented. However, over the two-year period, both experimentation and current smoking declined markedly for both middle school and high school students. Experimentation declined from 21.4% to 16.2% among middle school students and from 32.8% to 28.2% for high school students. The corresponding percentages for current smoking were 18.5% to 11.1% and 27.4% to 22.6% for middle and high school students, respectively. In addition, among never smokers, there were significant increases in the percentages committed to never smoking: 67.4% to 76.9% for middle school students and 73.7% to 79.3% for high school students. Furthermore, the percentage of experimenters who said they would not try smoking again went from 67.4% to 76.8% for middle school students and from 44.4% to 51.0% for high school students. This study documented very

encouraging trends in Florida over the course of the campaign.

### **British Columbia, Canada, Adults**

Gagne<sup>124</sup> described the short-term results of a provincewide media campaign conducted in two waves—four weeks in early 2005 and four weeks in early 2006—but postcampaign data were available only for the 2005 segment. The media campaign consisted of television and radio spots, together with a poster campaign, and focused on the short- and long-term benefits of quitting. Cross-sectional national population surveys conducted before (from 1999) and after (to 2005) the first segment provided trend data on smoking behavior for analysis. Smoking prevalence is lower in British Columbia than in the rest of Canada, so deviations from expected trends for prevalence or self-reported cigarette consumption among smokers for British Columbia and the rest of Canada were computed. Both prevalence and smokers' daily cigarette consumption increased in the rest of Canada, but they continued a downward trend in British Columbia. Low-consumption smokers in British Columbia showed a greater decline in consumption than expected, but those in the rest of Canada continued on trend. Higher consumption smokers in British Columbia remained on trend, but those in the rest of Canada increased consumption beyond that expected from the preexisting trend. These results suggest that the media campaign helped British Columbia residents curb their smoking, while smoking increased in the rest of Canada.

### ***State and National Tobacco Control Programs with Antitobacco Media Components***

As the study by Emery and colleagues<sup>116</sup> described above indicates, a number of statewide mass media campaigns have aimed at curbing youth and/or adult smoking in

the United States. A central challenge in assessing these efforts' effectiveness is that these campaigns often take place within the context of a comprehensive approach to tobacco control that includes tobacco prevention education in schools, community mobilization efforts to change policy and educate the public, smoking cessation telephone quitlines, and policy initiatives (e.g., banning smoking in public places, raising excise taxes, subsidizing smoking cessation therapy, restricting youth access to cigarettes). Reviews of multicomponent tobacco use prevention and control programs have shown them to be effective in reducing both smoking by youth and adults and cigarette sales.<sup>6,7,125–129</sup>

The population studies described earlier in this chapter (national and state programs, evaluated longitudinally and cross-sectionally) mostly concerned the media campaign component of a multicomponent program; in general, other tobacco control measures were also operative. These evaluation studies generally related behavior and attitudes directly to some measure of exposure to the media campaigns. This section looks at programs regarded as multicomponent or even comprehensive tobacco control programs.<sup>92</sup> Although antitobacco media campaigns are an important component of these programs, other components may have played at least as great a role in discouraging smoking. It is difficult to determine the separate effectiveness of campaign components. Furthermore, the programs are generally directed at the entire population, not just youth. The studies described below concern the net effect of all program components together for two national, four statewide, and one citywide campaign. Although other U.S. states have also mounted tobacco control programs, peer-reviewed, published results are insufficient to include them in this summary. Results from state reports and other sources are summarized, however, in a 2005 review.<sup>128</sup>

### **Singapore**

This city-state appeared to be among the first countries to undertake a concerted and coordinated tobacco control program, in 1986, that sought to denormalize tobacco use with its theme, "Towards a Nation of Non-Smokers."<sup>130</sup> The program aimed to prevent youth smoking, encourage smokers to quit, and protect the rights of nonsmokers. Tobacco control measures included restriction of smoking in public places and workplaces, restriction of tobacco advertising, increased excise duties on imported cigarettes, and provision of cessation assistance. Educational programs in schools, clubs, worksites, and within the community also were undertaken, and written materials were part of this effort. Emmanuel and colleagues<sup>130</sup> noted that all these educational programs "were complemented by intensive mass media coverage." It is not known whether these media efforts were paid announcements by the government or provided as news coverage (perhaps requested by the agency running the campaign). Cross-sectional, population-based surveys indicated that smoking prevalence (aged 15 and older) fell from 19.0% in 1984 to 13.6% in 1987, or a 28% decrease. Per capita tobacco consumption decreased 26% over this period, while youth (15–19 years old) smoking prevalence decreased from 5.1% to 2.9%. Declines were observed for both genders and all age and ethnic groups. Smoking prevalence had been declining in Singapore before this tobacco control effort, but the rate of decline increased during the campaign.

### **New Zealand**

From 1985 to 1998, New Zealand undertook an extensive tobacco control program that included restrictions on tobacco advertising and sponsorships, increased taxation of tobacco products, regulation of nicotine and tar yields in manufactured cigarette brands, stronger warnings on cigarette packaging, increased but not total smoking restrictions

in enclosed public places and workplaces, school-based education programs, a ban on the sale of tobacco products to those under age 16, and public education through both paid advertising campaigns and news items.<sup>131</sup> However, the paid advertisements were limited because of cost. The campaign effect was evaluated by annual cross-sectional population surveys (1985 through 1995), and data were compared to available published data from other Organisation for Economic Co-operation and Development (mostly European) countries. Adult smoking prevalence fell from 30% in 1985 to 25% in 1998, and was then the eighth lowest among 21 comparison countries. Youth (15–24 years old) smoking prevalence decreased from 35% to 28% over this period. Among the 17 comparison countries with data for this age group, New Zealand ranked third in the rate of decline. The decline was also observed among the Maori population, which was an important program goal. In general, the declines were greater among those with more education. Between 1975 and 1985, adult per capita tobacco consumption fell 23%; the decline nearly doubled to 45% from 1985 to 1998. The adult per capita consumption level in 1995 was second lowest behind Sweden among the comparison countries.

### **California**

California was the first U.S. state to fund a tobacco control program from the revenues of a voter-approved cigarette excise tax hike, Proposition 99. The initiative passed in 1989, boosting the tax by 25 cents per pack, with 20% of the new revenue to be devoted to a comprehensive tobacco control program. California's program featured an antitobacco media campaign that began in late 1990. Shortly thereafter, community and school programs were initiated. Activists instrumental in the passage of Proposition 99 worked for local and then statewide bans on smoking in workplaces. The state ban became law in 1995 and was extended to bars and clubs in 1998.

Increased efforts began in 1996 to enforce laws banning the sale of cigarettes to minors. In 1998, voters approved a further increase of 50 cents per pack in the cigarette excise tax; the increase took effect in 1999.

Further evaluation efforts documented a decline in per capita cigarette consumption (sales).<sup>121,132,133</sup> Later studies compared both per capita cigarette consumption and adult smoking prevalence in California with similar data for the rest of the United States and found greater declines in California than in any other state.<sup>95,134</sup> Comparisons were from state-specific sales data and national cross-sectional surveys as well as the cross-sectional California Tobacco Surveys, conducted approximately every three years as part of the program evaluation. Pierce and colleagues<sup>134</sup> presented evidence of a halting of favorable downward trends coincident with severely reduced funding for the program, including the media campaign, in 1993–96. Program funding was restored in late 1996.

Evaluations of the California Tobacco Program's effect on cigarette consumption<sup>135,136</sup> and adult smoking cessation<sup>137</sup> provide additional evidence of program success. Between 1988 and 2002, per capita consumption (sales data) declined by 60% in California compared to 40% in the rest of the United States.<sup>135</sup> During the early part of the program, analyses of self-reported consumption (from California Tobacco Surveys) indicated that most of the decline could be attributed to California smokers' smoking less. However, between 1996 and 2002, a significant proportion of the decline was because of smokers' quitting. Self-reported consumption by non-Hispanic, white, daily smokers between the ages of 35 and 64 years responding to national cross-sectional surveys (U.S. Census Bureau Current Population Surveys) declined faster in California, with its comprehensive tobacco control program, than in smokers of similar ages

in (1) New York and New Jersey, with cigarette prices similar to those in California and no program, and (2) in tobacco-growing states (Kentucky, Tennessee, North Carolina, South Carolina, Virginia, and Georgia), with low cigarette prices and no program.<sup>136</sup> Although consumption among daily smokers was lower in California among younger, non-Hispanic, white smokers aged 20–34 years than in the other state groups, all groups showed similar rates of decline. In contrast, successful cessation increased among this younger age group of California smokers faster than in the other state groups.<sup>137</sup> Faster increases in quitting for California smokers were also observed for the age group of 35–49 years, but not for those 50–64 years old. An analysis of trends in the prevalence of daily smoking among African Americans in these state groups (above) showed no program or tax effect,<sup>138</sup> the levels and trends for all state groups were virtually the same. All these analyses adjusted for demographic factors and estimated the trends from general linear models that accounted for variability within state groups.

Youth outcomes have also been investigated.<sup>139–141</sup> Trends in unstandardized measures of several adolescent (12–17 years old) smoking behaviors (ever puffed, ever smoked a whole cigarette, and smoked at least 100 cigarettes in lifetime) from the California Tobacco Surveys showed overall declines from 1990 to 2002.<sup>139</sup> However, while the decline in ever puffing was apparent after 1990 in the youngest age group (12 and 13 years), it became apparent after 1993 for adolescents aged 14 and 15 years, and after 1996 for those aged 16 and 17 years. The declines in the other measures did not begin until after 1996 for all age groups. The prevalence of smoking in the past 30 days for all adolescents remained constant from 1990 to 1992 (approximately 9%), increased to 12% in 1996, declined below 1990 levels to about 7% in 1999, and declined further to about 5% in 2002. The California

Tobacco Surveys also showed a decline (standardized) in prevalence of young adults' (aged 18–24 years) ever smoking over this period, and national survey data (Current Population Surveys, again standardized) indicate that while young adults' smoking prevalence remained level in the rest of the United States, a marked decline occurred between 1998–99 and 2001–02 in California. These results suggest that fewer of California's adolescents are moving to young adulthood as smokers.

Two longitudinal population surveys of adolescents aged 12–17 years were conducted: (1) at baseline in 1993, followed in 1996; and (2) at baseline in 1996, followed in 1999; and transition rates were examined.<sup>140</sup> Adjusted analyses indicate that transitions from being a committed never smoker at baseline to any smoking by follow-up, from being a susceptible never smoker to any smoking, and from being an experimenter to becoming an established smoker were significantly lower in the second survey compared to the first for those aged 12–14 years. Only the first transition was significantly less likely for those aged 15–17 years in the second cohort. Although the other transition rates were lower in the second cohort compared with the first, they were not significantly lower.

An analysis by Chen and colleagues<sup>141</sup> used age-period cohort analyses of the California Tobacco Surveys and California Youth Tobacco Surveys (similar surveys, but the latter are smaller and conducted continually) to examine the prevalence of never smoking from 1990 to 1999. They concluded that the California Tobacco Control Program affected only those born after 1978 who would have been 12 years of age or younger when the California Tobacco Program began.

Taken together, these studies suggest that an environment of tobacco control and the denormalization of tobacco use decrease smoking initiation.

### **Massachusetts**

Koh and colleagues present a thorough review of the history of tobacco control in Massachusetts.<sup>142</sup> Following California's example, Massachusetts voters approved a ballot initiative in 1992 that raised the excise tax on cigarettes by 25 cents per pack, with a portion of the revenues (initially about 30%, but less later) dedicated to funding a tobacco control program. The program was implemented in 1994. It included a mass media campaign, community-based programs to promote change at the local level (including the adoption of smoking restrictions), the passage and enforcement of laws restricting youth access to cigarettes, school-based prevention programs, and efforts to help smokers quit (including a quitline).

First evaluations of the program examined per capita cigarette sales data and adult smoking prevalence.<sup>143</sup> Taking into account cross-border sales, Harris and colleagues<sup>143</sup> found a 17% reduction in sales for Massachusetts from 1992 to 1996, compared to a decline of 6% nationally. Using Behavioral Risk Factor Surveillance System (population survey) data, they found that adult prevalence declined 9.4% from 1990–92 (before the program) to 1993–95 (after the program), but declined only 2.9% during this period in all other 41 states surveyed (excluding California). A subsequent analysis of per capita consumption data indicated an annual decline of 4% for Massachusetts compared to only 1% in the rest of the United States (excluding California) from 1993 to 1999.<sup>144</sup> Unadjusted adult prevalence rates from the Behavioral Risk Factor Surveillance System, together with the random, population-based Massachusetts Tobacco Surveys, showed an annual decline of 0.43 percentage points for Massachusetts compared to no change in the other states from 1992 to 1999. Prevalence trends through 1999 were examined again later by using the Behavioral Risk Factor Surveillance System data,<sup>145</sup> with the addition of regression



models that adjusted for demographics. On the basis of the model estimates, prevalence declined 22% (or 2.4% per year on average for nine years) from 1990 to 1999 in Massachusetts but only 5% nationally (<0.5% per year) during this period.

Surveys of students in secondary schools and colleges have shown a decline in youth tobacco use.<sup>146,147</sup> Triennial school surveys of students in randomly selected classes of randomly selected schools showed a decline from 1996 to 1999 in current smoking (in last 30 days) from 21.0% to 12.6% for students in grades 7 to 9, and from 35.6% to 29.9% for students in grades 9 to 12.<sup>146</sup> Data were weighted to account for any changes in population demographics. The greater relative decline for younger students compared to older students (67% vs. 16%) supports the California results,<sup>139,141</sup> that is, children who grow up in an environment that denormalizes tobacco use may be more likely to remain never smokers. Rigotti and colleagues<sup>147</sup> examined smoking prevalence (last 30 days) among young adult college students, using the 1999 Massachusetts College Alcohol Survey administered to 11 public colleges and universities in Massachusetts. Current smoking was lower among public college students who had attended high school in Massachusetts compared with out-of-state students: 35.5% versus 42.6%, respectively. Adjusting for demographic factors including age, sex, race, parental education, and college residence found the in-state students were only 67% as likely to be smokers as the out-of-state students.

### Arizona

Arizona's comprehensive program began in 1995, following a 1994 voter-approved initiative raising the excise tax on cigarettes by 40 cents per pack, with 23% of this new revenue devoted to tobacco control.<sup>148</sup> The resulting program included all nine components of a comprehensive tobacco control program subsequently recommended by the Centers for Disease

Control and Prevention.<sup>92</sup> Cross-sectional surveys conducted in 1996 and 1999 assessed changes in adult smoking prevalence with standardization to 1996 state demographics for comparability. Although the 1996 survey was not a true preprogram survey, the changes between the two surveys were notable. Overall, adult smoking prevalence decreased from 23.1% to 18.3%, and significant decreases were observed for important population subgroups, including Hispanics, low-income households, and low-education groups. Whether the decline in prevalence was due to national or regional influences rather than to the state tobacco control program could not be established without data from a comparison group of states.

Ross and colleagues<sup>149</sup> report that youth smoking in Tucson, Arizona, declined between 1996 and 2001 coincident with the city's Full Court Press (FCP) project, a comprehensive, community-based program for prevention of adolescent tobacco use. Factoring out the expected decline from increases in cigarette prices during this period, the percentage decline in 30-day smoking prevalence attributable to the FCP was 13.8% for 7th and 8th graders, 10.9% for 9th and 10th graders, and 8.8% for 11th and 12th graders. However, because the FCP supplemented the state's tobacco control program and students were, therefore, exposed to multiple programs, the resultant decline would represent the combined program effects and does not factor in national or regional secular trends.

### Oregon

Voters in Oregon also approved an initiative increasing the excise tax on cigarettes.<sup>150</sup> This increase occurred in 1996, and 10% of the revenue generated was allocated to the development and implementation of a comprehensive tobacco control program that became operational in 1997. Oregon's Tobacco Prevention and Education Program included community-based tobacco use

prevention coalitions in every county, a statewide media-based public awareness and education campaign, comprehensive school-based programs, tribal tobacco use prevention programs, multicultural outreach and education, a quitters' help line providing smoking cessation support, and projects evaluating new approaches to prevent and reduce tobacco use. Cigarette sales data from Oregon were compared with the United States as a whole, excluding California, Massachusetts, and Arizona. In the baseline period before program onset, per capita cigarette sales decreased 2.2% in Oregon compared to 0.6% in the rest of the United States. During the program (1996–98), per capita consumption declined by 11.3% in Oregon compared to 1.0% in the other states. Adult smoking prevalence, as estimated from the cross-sectional Behavioral Risk Factor Surveillance System, indicated a decline of 6.4%. How this decline in prevalence compared with other states was not described.

### **New York City**

Although New York City is not a state, its population is larger than that of many U.S. states. Between 2002 and 2003, the city undertook a number of tobacco control activities, including a large increase (\$1.42 per pack) in the excise tax on cigarettes, an indoor air smoke-free policy that covered all workplaces including restaurants and bars, an emphasis on the treatment of nicotine dependence with distribution of nicotine patches in conjunction with brief telephone counseling for heavy smokers, and educational publications and advertisements in broadcast and print media that emphasized the health risks of secondhand smoke and the benefits of quitting.<sup>151</sup> Cross-sectional population surveys show that adult smoking prevalence remained remarkably stable from 1993 to 2002 (between 21.5% and 21.7%) but dropped 11% (to 19.2%) between 2002 and 2003. Subgroups showing the greatest declines (>15%) were smokers aged

18–24 years, those residing in the Bronx, those with some college, U.S.-born African Americans, and those who smoked more than 10 cigarettes per day. Many smokers, especially those with lower incomes, reported that they had tried to quit or had cut down the number of cigarettes they smoked per day. Furthermore, nearly half the population reported reduced exposure to secondhand smoke. Although the proportion of cigarettes reportedly purchased outside the city increased by nearly one-third, city tax revenue increased by a factor of 10. However, tax avoidance practices such as city residents purchasing outside the city, or nonresidents bringing cigarettes into the city instead of purchasing them while there, meant that the reported average price paid per pack increased just 20% instead of the 32% expected in the absence of such behavior. Although declines may have occurred in other metropolitan areas between 2002 and 2003, the stable prevalence rate leading up to the city's tobacco control program suggests that the program was responsible for at least some of the decline in smoking.

Because the decline in smoking prevalence in New York City appeared to level off by 2005, an intensive mass media campaign was planned to augment a statewide media campaign planned for January through October of 2006.<sup>152</sup> The city campaign aimed to increase smokers' motivation to quit; the statewide campaign had the same theme but also focused on the effects of secondhand smoke on children. No new additional tobacco control efforts were undertaken either by the state or by the city during this period. Adult smoking prevalence declined from 18.9% in 2005 to 17.5% in late 2006, and the decline was observed particularly among males and Hispanics. Unless statewide or nationwide secular trends show a decline of similar magnitude during this period (data not yet available), this study suggests that a well-funded, intensive antitobacco mass media campaign can have an effect in the setting



of an ongoing, multicomponent tobacco control program.

### ***Media and Calls to Cessation Information Centers and Quitlines***

Mass media messages have sometimes been “tagged” with phone numbers for interested viewers to call for information about cessation services or to get cessation help directly. It can be argued that prompting a smoker to make a call for information or help is a behavioral outcome for a media campaign. Quitlines can be an effective mode for the delivery of cessation services for a number of reasons, including accessibility and convenience to the smoker.<sup>153</sup> The studies described below indicate that tagged media can increase call volume to informational services and quitlines.

For five years, from 1985 through 1989, the U.S. Department of Health and Human Services, through its Public Health Service, Centers for Disease Control and Prevention, Office on Smoking and Health, conducted a media campaign through PSAs to encourage smokers to inform themselves about smoking cessation. During three months (August 1983, January 1985, and January 1987), the PSAs were tagged with a telephone number staffed by the Cancer Information Service (CIS) of the National Cancer Institute. The numbers of calls to the information and referral service related to smoking cessation were much higher (approximately 20% of total calls) during the months when the PSAs were tagged (three spots) with the service center number<sup>154</sup> than in months when no cessation-related messages, or cessation-related messages (nine spots) not tagged with the telephone number, were shown (approximately 8% of total calls). This campaign appeared to be effective in prompting smokers who possibly already were motivated to take an action that might help them quit. An estimated 63% of the television-viewing audience saw a tagged announcement, but no

indication of a noticeable change in smoking prevalence was found during this period.<sup>155</sup>

Another study involving the CIS used strategically placed media spots to encourage African Americans to call for help with quitting.<sup>156</sup> Fourteen communities were selected for similar demographic profiles, including race, to form seven matched pairs. One community of each pair was then randomly assigned (to the extent possible, as determined by media markets) to the intervention condition. Within the intervention communities, newly designed radio and television spots were placed on stations with predominantly African-American adult audiences. Copies of these spots were also disseminated through community-based organizations. Call records that obtained demographics, address, smoking status, and how the caller heard about the CIS were the basis for evaluating campaign effectiveness. During the campaign, African Americans made 82% of the calls in the intervention communities but only 26% of the calls in the control communities. Before the campaign, African Americans in all communities averaged only 1.6 calls per week; during the first wave of the campaign, however, the average was 86 calls per week. Call volume for African Americans fell to near baseline levels just before the second wave of the campaign, but during the second wave, call volume for African Americans increased to 40.3 per week. Slightly more of the African Americans said their calls were prompted by radio spots than by television.

One of the first smokers' quitlines was part of the Sydney, Australia, “Quit. For Life” antismoking campaign.<sup>73</sup> Call volume increased markedly during the first week of airing of commercials with the theme: “I’ve had enough.” The commercials depicted social reasons for not smoking and smokers unhappy with their smoking, as well as including the suggestion that smokers call the quitline. Enrollment in Quit Centre programs at Sydney Hospital also was higher

during the part of the media campaign that emphasized the “I’ve had enough” theme.

Other media-promoted quitlines<sup>157–163</sup> also saw increases in call volume coinciding with the airing of tagged messages. Since 1994, the Health Education Authority for England has funded a mass media campaign aimed at getting smokers to quit.<sup>164</sup> The campaign advertisements urge smokers to call a quitline. Although the quitline receives about one-half million calls per year, more than 70% of calls occurred during the three months of the advertising campaign. In 2004, quitline call volume increased fourfold compared with the average, coincident with the media blitz associated with the United Kingdom No Smoking Day.<sup>162</sup>

The California Smokers’ Helpline appears to reach a fairly representative sample of California smokers, as the demographic characteristics of helpline callers are similar to those of the general population.<sup>165</sup> During the first period when media messages were tagged with the helpline phone number, call volume increased more than three times compared with that observed for a period of similar length before the media campaign.<sup>157</sup> Furthermore, a greater proportion of callers during the first and subsequent periods of intense, tagged media messages indicated the spots as the reason they had called. In periods when media use was minimal, a higher proportion of callers cited other sources of referral to the helpline.

As in previous campaigns, some media messages for Australia’s NTC were tagged with a telephone number for the Australian National Quitline Service.<sup>159,166</sup> Quitline call volume was higher when media messages were present. Overall, the NTC quitline call volume was significantly related to television target rating points for the tagged advertisements. However, calls from people making counseling requests occurred more when rating points were lower; counseling was not suggested proactively during times

of high call volume. Some of the callers during lower call-volume periods may have been specifically referred.<sup>159</sup> Carroll and Rock<sup>166</sup> found that certain of the campaign ads, especially those that showed someone calling the quitline, and placement in low involvement programs tended to yield greater quitline activity.

In contrast to the egalitarian reach of the California quitline, a study in Victoria, Australia, found lower response in low socioeconomic areas;<sup>163</sup> however, the increase in quitline call volume<sup>161</sup> coincident with increased media messages was the same regardless of socioeconomic area.<sup>163</sup> Furthermore, the Maori population, a minority group in New Zealand, called a national quitline at higher rates during an intense media campaign.<sup>160</sup>

### Summary of Population-Based Studies

The earliest evidence that mass media could affect smoking behavior was discerned from events surrounding the natural experiment created by the Fairness Doctrine. This evidence provided the impetus to investigate further the effects of well-defined media interventions aimed at national and statewide populations. Often, the evaluation of these media campaigns has taken place within the framework of a multicomponent tobacco control program. In many instances it is not possible to separate the effects of the media component from the other components of the tobacco control program.

When studies have related various measures of exposure to media from these campaigns to behavioral outcomes, the evidence has been very consistent. The findings described above suggest that antismoking media campaigns can influence attitudes toward tobacco within a short period, followed by longer-term effects on smoking behavior. Moreover, these studies highlight the validity of modern health behavior change

theories that predict that health-marketing campaigns bring about behavior changes by first influencing behavior-related attitudes, beliefs, and intentions. This evidence also highlights the importance of identifying in the formative stages of campaign development the attitudinal constructs that health marketing advertisements are likely to influence, and then using those constructs to inform and enhance the evaluation of health marketing campaigns.

As in the controlled experimental studies, methodological issues (similar and unique) related to population studies deserve attention. Particular care to separate program effects from secular trends is essential. Repeated cross-sectional surveys to establish preexisting secular trends and track progress during the program need to take into account changing population demographics. Longitudinal surveys need to investigate the possible effects of differential attrition. Selection of a comparison group for evaluating a state-level program is complicated by spillover of media and other program elements from other states and programs, however modest, within the comparison states.

## Summary

### Controlled Field Experiments

A large number of field experiments have assessed the efficacy of mass media campaigns in the United States and in other countries. Taken as a whole, these experimental studies provide evidence that antismoking media campaigns can affect smoking-related attitudes, smoking initiation, and smoking cessation. However, these findings are not uniformly positive.

Early, longitudinal, community-based studies such as the North Karelia Project and the Stanford Three Community Study used multicomponent approaches,

including mass media, to reduce risk factors, including smoking, for cardiovascular disease. These studies provide some initial evidence of efficacy that such approaches can alter health behaviors.

A second wave of large-scale studies (e.g., the Stanford Five-City Project and the Minnesota Heart Health Program), using approaches similar to those in the North Karelia Project and the Stanford Three Community Study, also documented declines in cardiovascular disease risk factors. However, interpretation of these later studies was complicated by favorable secular trends that occurred simultaneously with the study, possibly obscuring the results in the intervention communities. Overall, these studies provide only modest evidence of intervention effects over time.

Although most of the large-scale cardiovascular disease prevention studies examined outcomes related to adults, several also assessed their effect on youth (North Karelia Project, Stanford Five-City Project, and Minnesota Heart Health Program). A number of controlled field experiments also were aimed specifically at preventing smoking in youth or at encouraging smoking cessation among adults. Several cited studies focused solely on evaluating mass media campaigns, while others, like the seminal community-based cardiovascular disease prevention studies mentioned above, observed the role of media as part of a comprehensive approach. Again, results from the prevention and cessation studies have been mixed. Nevertheless, evidence exists for the potential effectiveness of intensive, well-planned, and coordinated mass media campaigns, together with school- and community-based programs, to reduce youth smoking and support adult smoking cessation.

Intrinsic in controlled field experiments are a number of considerations that may cloud intervention effects or lead to

inaccurate conclusions, possibly explaining some of the variation in findings from the studies reviewed. Common issues, such as insufficient control for baseline community characteristics, smoking-related risk factors, and prior and concurrent secular trends, along with small sample sizes, can result in reduced statistical power. In most studies, only a few communities are included. Appropriate analyses of field experiments should account for the fact that individuals “nested” within schools, organizations, and communities tend to share similar characteristics. Failure to account for the homogeneity among individuals within communities, if present, can result in a type I error (*p*-values that are too small). Analyses that account for these similarities among individuals within communities are more precise but at the cost of significantly reducing statistical power (*p*-values that are too large). Differential attrition in longitudinal samples also can either mask or contribute to observed effects. Differences in how researchers treat these issues likely account for some of the inconsistency in study findings.

### Population Studies

Population research regarding the effect of mass media on smoking behavior began with the evaluation of the Fairness Doctrine. The results of the Fairness Doctrine natural experiment, evaluated by cross-sectional studies, provided impetus for much that followed. Since then, a number of longitudinal and cross-sectional studies evaluated the effectiveness of novel, large-scale national and state-level campaigns aimed at youth and/or the general population in the United States and Australia and smaller-scale campaigns in other countries. In most of these studies, mass media was a major component of a multicomponent tobacco control program.

A number of population-based, cross-sectional studies and a few longitudinal

studies have validated the findings from the controlled field experiments. All of these population studies showed evidence of effectiveness. Three longitudinal studies examined two state campaigns to investigate how mass media campaigns curb smoking initiation among youth. Although both campaigns were conducted in states that implemented other tobacco use prevention and control interventions, all three studies found an association of recall of campaign messages with decreased initiation. None of these studies addressed how attrition from the longitudinal sample may have influenced the findings, but all three studies provide evidence of effectiveness. One longitudinal study of smoking cessation indicated that exposure to mass media messages is associated with increased thoughts about quitting and negative thoughts about smoking. However, the study did not control for potentially confounding influences.

Cross-sectional studies of Legacy’s national “truth” campaign, which featured hard-hitting messages that highlight tobacco industry practices and stark facts about the deadly effects of tobacco (similar to the successful Florida “truth” campaign), found that the campaign was associated with stronger antitobacco attitudes and reduced smoking. Philip Morris’s “Think. Don’t Smoke” campaign, which takes a “just say no” approach and lacks hard-hitting messages and facts about tobacco, has not been shown to be effective, however. In addition, the company’s “Talk. They’ll Listen” campaign directed to parents may encourage prosmoking beliefs and attitudes among older adolescents. On the other hand, evaluations of state tobacco control programs with significant media components have shown encouraging results.

### Conclusions

1. Several evaluations of the antismoking public service announcements required

- under the Fairness Doctrine between 1967 and 1970, the first large-scale U.S. national mass media campaign, indicate that there were discernible reductions in tobacco consumption, smoking prevalence, and smoking initiation. This natural experiment spurred research into the use of media to influence health behaviors.
2. Evidence from controlled field experiments suggests that antitobacco mass media campaigns conducted in conjunction with school- or community-based programming can be effective in curbing smoking initiation in youth and promoting smoking cessation in adults. This evidence has provided the impetus for antitobacco mass media campaigns to become important components of tobacco control programs.
  3. The few population-based studies of antitobacco mass media campaigns, in which the media campaign was the only antitobacco program, demonstrate that the media campaigns were effective in reducing smoking in the youth and adult target populations.
  4. Population-based studies of antitobacco mass media campaigns that were only one component of multicomponent tobacco control programs provide considerable evidence for reduced use of tobacco by youth and adults. The antitobacco mass media campaign and the other program components together may have reduced smoking more than did any single component alone. The relative contributions of various components to program effectiveness are difficult to determine, but some of the controlled field experiments showed a dose-response relationship between reduced smoking and an increased number of program components.
  5. Evidence from controlled field experiments and population studies conducted by many investigators in many countries shows that antitobacco mass media campaigns can reduce tobacco use.

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