
Reviews of Evidence Regarding Interventions to Reduce Tobacco Use and Exposure to Environmental Tobacco Smoke

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Overview: This report presents the results of systematic reviews of effectiveness, applicability, other effects, economic evaluations, and barriers to use of selected population-based interventions intended to reduce tobacco use and exposure to environmental tobacco smoke. The related systematic reviews are linked by a common conceptual approach. These reviews form the basis of recommendations by the Task Force on Community Preventive Services (TFCPS) regarding the use of these selected interventions. The TFCPS recommendations are presented on page 67 of this supplement.

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Introduction

Tobacco use is the largest cause of preventable morbidity and mortality in the United States.^{1–3} Recognized as a cause of multiple cancers, heart disease, stroke, complications of pregnancy, and chronic obstructive pulmonary disease,⁴ tobacco use is responsible for 430,000 deaths per year among adults, and direct medical costs are in the range of \$50 billion to \$73 billion per year.^{5,6}

Exposure of nonsmokers to environmental tobacco smoke (ETS) is another entirely preventable cause of significant morbidity and mortality associated with tobacco use.^{7–9} Exposure to ETS is a recognized cause of heart disease and accounts for an estimated 3000 lung cancer deaths per year in adults.⁸ In infants and children, exposure to ETS causes middle ear infections and

effusions, exacerbates 400,000 to 1 million cases of asthma annually, and causes 150,000 to 300,000 cases of lower respiratory tract infections each year.^{5,7}

Cigarette consumption, the dominant form of tobacco use, peaked in the United States in 1963, and the prevalence of tobacco use among adults in 1964 was 40.3%.⁴ The beginning of a steady but slow decline in tobacco use by adults followed the release and dissemination of the 1964 report of the advisory committee to the Surgeon General on smoking and health, which summarized more than a decade of research on the adverse health effects of tobacco use.¹⁰ The effect of subsequent education and tobacco control efforts (led at various times by government, public and private groups, and individuals) has been considerable, with an estimate of 200,000 premature deaths avoided in the period from 1964 to 1978 alone.¹¹

Despite 36 years of policies, regulations, educational efforts, the increasing information on the negative health effects of tobacco use, and the positive health benefits of cessation, tobacco use remains unacceptably high. In 1998, there were 47.2 million adult smokers in the United States. Smoking prevalence among adults aged 18 years and older was 24.1% (men 26.4%; women 22.0%).¹² There are regional, educational, socioeconomic, racial, and ethnic variations in tobacco use and disparities in tobacco-related morbidity and mortality.^{4,13} Individuals below the poverty line, for example, are more likely to smoke than individuals at or above

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the poverty line (32.3% compared with 23.5%). People with 16 or more years of education are less likely to smoke than people with 9 to 11 years of education (11.3% compared with 36.8%).¹² The prevalence of smoking among American Indians and Alaska natives (40%) is higher than in other racial and ethnic groups.¹²

Tobacco use results in true drug dependence in most users, making attempts to quit difficult and relapses common.¹⁴ Many users make multiple attempts to quit.¹⁵ In 1998, an estimated 15.2 million current smokers (39.2%) had stopped smoking for at least 1 day during the preceding 12 months because they were trying to stop smoking entirely.¹² Although cessation significantly reduces the immediate and subsequent risks of tobacco-related morbidity and mortality,^{3,16} most tobacco users do not receive assistance in quitting.¹⁴

Rather than treating tobacco use cessation as a single event, recent reviews of cessation strategies have stressed recognition of tobacco use as a chronic disease in implementing and maintaining programs to support users in their extended efforts to quit.^{14,15} Despite knowledge of the health benefits of tobacco use cessation and the availability of effective treatments and therapies, many health care providers and health care systems fail to assess and to treat tobacco use consistently and effectively.¹⁴

Preventing the acquisition of this costly, chronic dependence is clearly desirable. However, tobacco use initiation and the transition from experimentation to addiction are not easy to prevent because they occur primarily in adolescence, when individuals are more susceptible to influences from family, friends, peers, society, and the tobacco industry, which encourage tobacco use.¹⁷ Among high school students in the United States, current smoking prevalence rose significantly between 1991 and 1999, from 27.5% to 34.8%.¹⁸ Recent increases in smoking prevalence among young adults aged 18 to 24 years (27.9% in 1998), in addition to reflecting the aging of the cohort of high school students among whom current smoking rates were high during the 1990s, may also indicate an increase in tobacco use initiation in this segment of the population.¹²

The health effects of exposure to ETS have prompted the increasing implementation of public and private policies restricting smoking.⁴ Although ETS exposures in some settings, such as hospitals and transportation systems in the United States, have been reduced or eliminated, nearly 9 of 10 nonsmokers still have some exposure to ETS.⁵ ETS exposure continues to occur in workplaces and public areas without smoking bans or effective restrictions as well as in households in which smoking is allowed.

Interventions to reduce tobacco use and ETS exposure implemented and evaluated over the past 35 years

provide considerable evidence on the effectiveness of clinical and community strategies. Given the massive burden of current addiction, premature death, and disability, as well as the implications for the future, efforts to identify, implement, and maintain or expand effective tobacco prevention and control efforts should be a priority at the national, state, local, and individual levels.

The Guide to Community Preventive Services

The systematic reviews in this report represent the work of the independent, nonfederal Task Force on Community Preventive Services (TFCPS). The TFCPS is developing the *Guide to Community Preventive Services* (the *Community Guide*) with the support of the U.S. Department of Health and Human Services (DHHS) in collaboration with public and private partners. The Centers for Disease Control and Prevention (CDC) provides staff support to the TFCPS for development of the *Community Guide*. A special supplement to the *American Journal of Preventive Medicine*, "Introducing the *Guide to Community Preventive Services: Methods, First Recommendations and Expert Commentary*," published in January 2000 (18(suppl 1):1-142), presents the background and the methods used in developing the *Community Guide*.

Conceptual Approach

The methods used to conduct the systematic reviews and arrive at the evidence-based recommendations contained in this report are explained in Appendix A. Tables and figures that summarize effectiveness findings and tables that support our economic analyses are available at the website (www.thecommunityguide.org).

An illustration of the logic framework depicts our conceptual approach to the subject of tobacco use prevention and control (Figure 1). This figure portrays the relationships among the population, the key tobacco use behaviors, categories of interventions, and important outcomes. The key prevention and control outcomes depicted in the logic framework are (1) reducing exposure to ETS, (2) reducing tobacco use initiation, and (3) increasing tobacco use cessation. The effectiveness of interventions reviewed in this report is measured by the evidence of an effect on one or more of these categories of outcomes. We also organized the selected interventions based on these categories.

As indicated in the logic framework, these outcomes are not independent. Increasing tobacco use cessation, for example, will also reduce exposure to ETS. Conversely, efforts to reduce exposure to ETS may increase tobacco use cessation. The interactions illustrate the potential for synergistic progress in reducing tobacco use and ETS exposure.

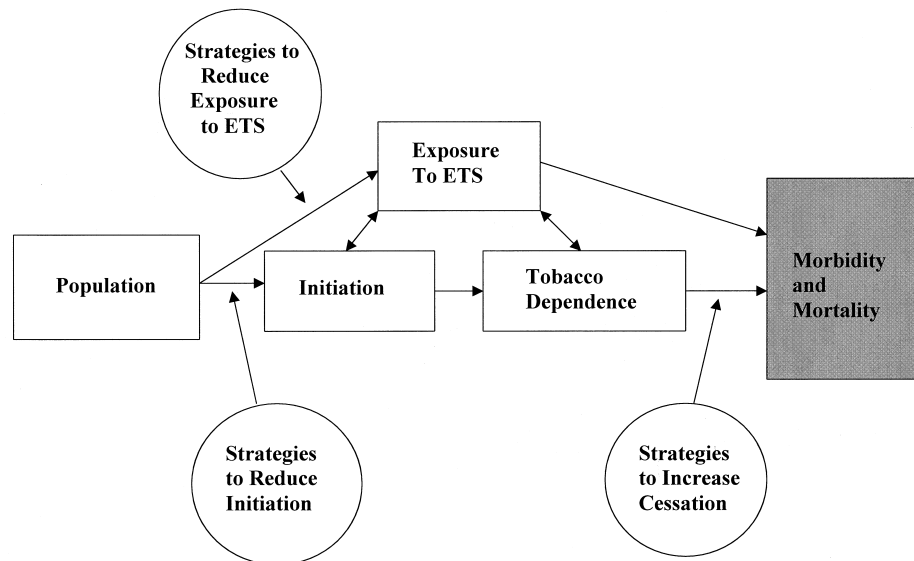


Figure 1. Logic framework, depicting the conceptual approach used in these reviews

We focused on interventions intended to achieve tobacco use prevention and control in the general population, which includes tobacco product users, people at risk for tobacco product use, and people exposed or at risk of exposure to ETS. With one exception, we did not evaluate interventions that targeted only high-risk people (e.g., cessation interventions for smokers with coronary artery disease, cessation programs conducted entirely in hospital settings, or interventions to reduce ETS exposure in homes with asthmatic children). Studies conducted in these populations were not considered in the body of evidence on which the TFCPS based its evaluations. Studies that evaluated health care system and community interventions to reduce tobacco use among populations of pregnant women were included in this review.

This review did not examine the evidence of effectiveness of clinical cessation programs (including provider counseling) or therapies for tobacco use and dependence. In general, the *Community Guide* does not review clinical interventions (i.e., interventions provided face to face by individual health care providers to individual clients in clinical settings), although it does review population-based interventions to increase the use of effective clinical interventions in communities and health care systems. On the basis of these criteria, we did examine the evidence of effectiveness of interventions implemented to increase patient use of effective tobacco use treatments as well as interventions to increase provider delivery of effective treatments and therapies to their patients. The evaluations in the *Community Guide* complement the recently updated *Treating Tobacco Use and Dependence: Clinical Practice Guideline*,¹⁴ which provides an extensive, evidence-based review of both provider and health care system strategies for helping patients to quit. Taken together,

these reviews present a range of options for increasing and improving patient tobacco use cessation. (See also “Evidence Reviews and Recommendations on Interventions to Reduce Tobacco Use and Exposure to Environmental Tobacco Smoke: A Summary of Selected Guidelines,” in this supplement.)

In selecting the interventions evaluated in this report, we first generated a comprehensive list of interventions (a total of 92 interventions in 20 categories). Time and resource constraints prohibited us from evaluating all of the identified interventions (the comprehensive list included, for example, community-wide risk factor screening and counseling, worksite-specific smoking cessation programs, and patient cessation support conducted by mail). Interventions were selected for review by a team of tobacco prevention and control expert consultants,^a based on their professional judgment and subjective assessment of the degree of importance and perceived extent of practice. Selected interventions were identified by (1) the nature and components of the activities involved; (2) the manner of delivery of the activities; (3) the target population

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(e.g., general populations, groups of tobacco product users, patients, and health care providers); and (4) the setting in which the intervention was applied (e.g., health care setting, local area, state, or nation).

We reviewed interventions that were either single component (using only one activity) or multicomponent (using more than one activity together) to achieve desired outcomes. We assessed the effectiveness of multicomponent interventions in improving the outcomes of interest whether or not the relative contribution of individual components could be ascribed. For several interventions reviewed in this report, most or all of the studies evaluated described multicomponent strategies. An effort was made to distinguish between an intervention when implemented alone and when implemented as part of a multicomponent strategy. As noted before, in some cases this was not possible.

We grouped studies together on the basis of their similarity. Sometimes we found that our classification or nomenclature was different from that used in the original studies being reviewed. To achieve comparability in the review process, we grouped such studies according to our definitions of the interventions.

This report contains evidence reviews of 14 interventions organized into three sections: (1) strategies to reduce exposure to ETS, (2) strategies to reduce tobacco use initiation, and (3) strategies to increase tobacco use cessation. Reviews for three additional interventions (restricting youth access to tobacco products, school-based education, and tobacco industry and product restrictions) are still in progress; these evaluations will be published once they are completed (the expected completion date is Spring 2001).

Healthy People 2010 Goals and Objectives

The interventions reviewed in this report can be useful in reaching many of the tobacco control objectives in *Healthy People 2010*,¹⁹ a prevention agenda for the United States. These objectives identify the significant preventable threats to health and focus the efforts of the public and private sectors for addressing those threats. Many of the proposed *Healthy People* objectives in chapter 27, "Tobacco Use," relate directly to goals for increasing cessation, for reducing initiation, and for reducing exposure to ETS (Table 1). This report, in combination with the accompanying recommendations, provides information on interventions that can help communities and health care systems reach *Healthy People 2010* objectives.

Part I: Strategies to Reduce Exposure to ETS

Interventions to reduce exposure to ETS require or encourage the establishment of smoke-free areas in workplaces, in public areas, and in the home. Smoke-free workplaces, public areas, and homes can be effective

in reducing tobacco-related morbidity and mortality in several ways. First, these policies can reduce exposure to ETS, contributing to a reduction in ETS-related morbidity and mortality.⁷⁻⁹ Second, smoke-free policies could change attitudes and behaviors of smokers and increase both the number of people who attempt to quit and the number of attempts per person. By reducing opportunities for relapse, smoke-free policies might also improve the success rate for each quit attempt.²⁰ Third, smoke-free policies challenge the perception of smoking as a normative adult behavior.²¹ By changing this perception, these policies could change the attitudes and behaviors of adolescents, resulting in a reduction in tobacco use initiation.²² Increasing the number of smokers who quit and/or reducing the number of new users will result in fewer tobacco users and a reduction in tobacco-related morbidity and mortality (and further reduce exposure to ETS).³

This section covers evaluations of the evidence of effectiveness of two interventions to reduce exposure to ETS. The interventions reviewed are smoking bans and restrictions to address exposure in the workplace and in public areas, and community education to reduce exposure to ETS, especially among children, in the home environment.

Smoking Bans and Restrictions

Definition. Smoking bans and restrictions are private, non-government, and government policies, regulations, and laws that limit smoking in workplaces and public areas. Smoking bans entirely prohibit smoking in geographically defined areas; smoking restrictions limit smoking to designated areas. Smoking bans and restrictions can be implemented with additional interventions, such as education and tobacco use treatment programs.

Background. Businesses establish smoking policies to protect employees and customers from exposure to ETS in the workplace. Accrediting agencies set regulations to protect employees and patrons within their organizations (e.g., Joint Commission on Accreditation of Healthcare Organizations). Federal, state, or local laws are implemented to protect people from ETS exposure in public areas and to establish minimum standards for both public and private workplaces. For regulations and laws establishing smoking restrictions, standards often include the size, location, and ventilation requirements for designated smoking areas.

Review of evidence: effectiveness. Our search identified a total of 54 studies regarding the effectiveness of smoking bans or restrictions.²³⁻⁷⁶ Of these studies, 17 evaluated the effect of the intervention on exposure to ETS.^{23,27,28,30,31,35,36,38,40,42,47,48,53,55,57,61,72} Thirty-nine studies evaluated only the effect of smoking bans and restrictions on tobacco use behaviors, and these studies

Table 1. Selected *Healthy People 2010*¹⁹ objectives related to tobacco use and exposure to environmental tobacco smoke

Tobacco Use in Population Groups

- 27-1 Adult tobacco use: reduce cigarette smoking prevalence from 24% to 12%
- 27-2 Adolescent tobacco use: reduce tobacco use (past month) from 43% to 21%
- 27-3 Reduce initiation of tobacco use among children and adolescents (developmental)
- 27-4 Age at first tobacco use: increase (delay) the average age of first tobacco use from 12 years to 14 years

Cessation and Treatment

- 27-5 Smoking cessation by adults: increase the percentage of adult smokers stopping smoking for a day or longer from 43% to 75%
- 27-6 Smoking cessation during pregnancy: increase smoking cessation in pregnant women in the first trimester of pregnancy from 12% to 30%
- 27-7 Smoking cessation by adolescents: increase the percentage of adolescent ever-daily smokers who try to quit from 73% to 84%
- 27-8 Insurance coverage of cessation treatment: increase total coverage of pharmacotherapies and behavioral therapies approved by the Food and Drug Administration in:
Managed care organizations from 75% to 100%
Medicaid programs in states and the District of Columbia from 24 states to 51 states

Exposure to Secondhand Smoke (ETS)

- 27-9 Exposure to tobacco smoke at home among children: reduce the proportion of children who are regularly exposed to tobacco smoke at home from 27% to 10%
- 27-10 Exposure to environmental tobacco smoke: reduce the proportion of nonsmokers exposed to ETS from 65% to 45%
- 27-11 Smoke-free and tobacco-free schools: increase the proportion of smoke-free and tobacco-free middle, junior high, and senior high schools from 37% to 100%
- 27-12 Worksite smoking policies: increase the proportion of worksites with formal smoking policies that prohibit smoking or limit it to separately ventilated areas from 79% to 100%
- 27-13 Smoke-free indoor air laws: establish smoke-free indoor air laws that prohibit smoking or limit it to separately ventilated areas in public places and worksites in every state and the District of Columbia (for a total of 51 states). Baseline data, 1998, shows the number of states with laws in effect as follows: private workplaces, 1; public workplaces, 13; restaurants, 3; public transportation, 16; day-care centers, 22; retail stores, 4

Social and Environmental Changes

- 27-14 Enforcement of laws prohibiting the sale of tobacco products to minors: increase from 0 to 51 the number of states (including the District of Columbia) that prevent the sale of tobacco products to minors (an illegal purchase rate of 5% or less for minors)
- 27-15 Retail license suspension for sales to minors: increase from 34 to 51 the number of states (including the District of Columbia) that suspend or revoke state licenses for violation of laws that prohibit the sale of tobacco to minors
- 27-16 Eliminate tobacco advertising and promotion that target adolescents and young adults (developmental)
- 27-17 Adolescent disapproval of smoking: increase the proportion of adolescents who disapprove of smoking from 80% to 95% of 8th grade students; from 75% to 95% of 10th grade students; and from 69% to 95% of 12th grade students
- 27-18 Tobacco control programs: increase the number of tribes, territories, states, and the District of Columbia with comprehensive, evidence-based tobacco control programs (developmental)
- 27-19 Preemptive tobacco control laws: reduce the number of states that have laws that preempt stronger tobacco control laws from 30 to 0
- 27-20 Tobacco product regulation: establish a regulatory structure to monitor toxicity (developmental)
- 27-21 Tobacco tax: increase the average federal and state tax on tobacco products; increase the average tax on cigarettes from \$0.63 to \$2 per pack; increase the average tax on spit tobacco from \$0.27 to \$2 per unit

are considered below. Five reports provided additional information regarding an already-included study.⁷⁷⁻⁸¹ Of the 17 studies, 7 were not included in the review of effectiveness because of least-suitable study designs and fair or limited execution quality.^{23,27,30,38,40,48,53} Details of the 10 qualifying studies^{28,31,35,36,42,47,55,57,61,72} are provided in Appendix B-1 and at the website (www.thecommunityguide.org).

The 10 qualifying studies provided a total of 12 measurements of the effect of smoking bans and restrictions on exposure to ETS (Figure 2). Overall, 9 of the 10 studies^{28,31,35,36,47,55,57,61,72} observed reductions or differences in ETS exposure in workplaces that had smoking bans or restrictions. In four studies, environ-

mental measurements of components of ETS (such as nicotine vapor) were collected before and after implementation of the smoking ban or restriction.^{28,35,55,72} Environmental measurements of ETS components decreased by a median relative percentage difference of -72% (range, -44% to -97%) in assessments conducted between 6 months and 12 months after implementation of the ban or restriction. Six studies provided a total of eight measurements of differences in self-reported exposure to ETS.^{31,36,42,47,57,61} In assessments conducted between 4 and 18 months after implementation, the median relative percentage difference in self-reported ETS exposure was -60% (range, +4% to -94%).

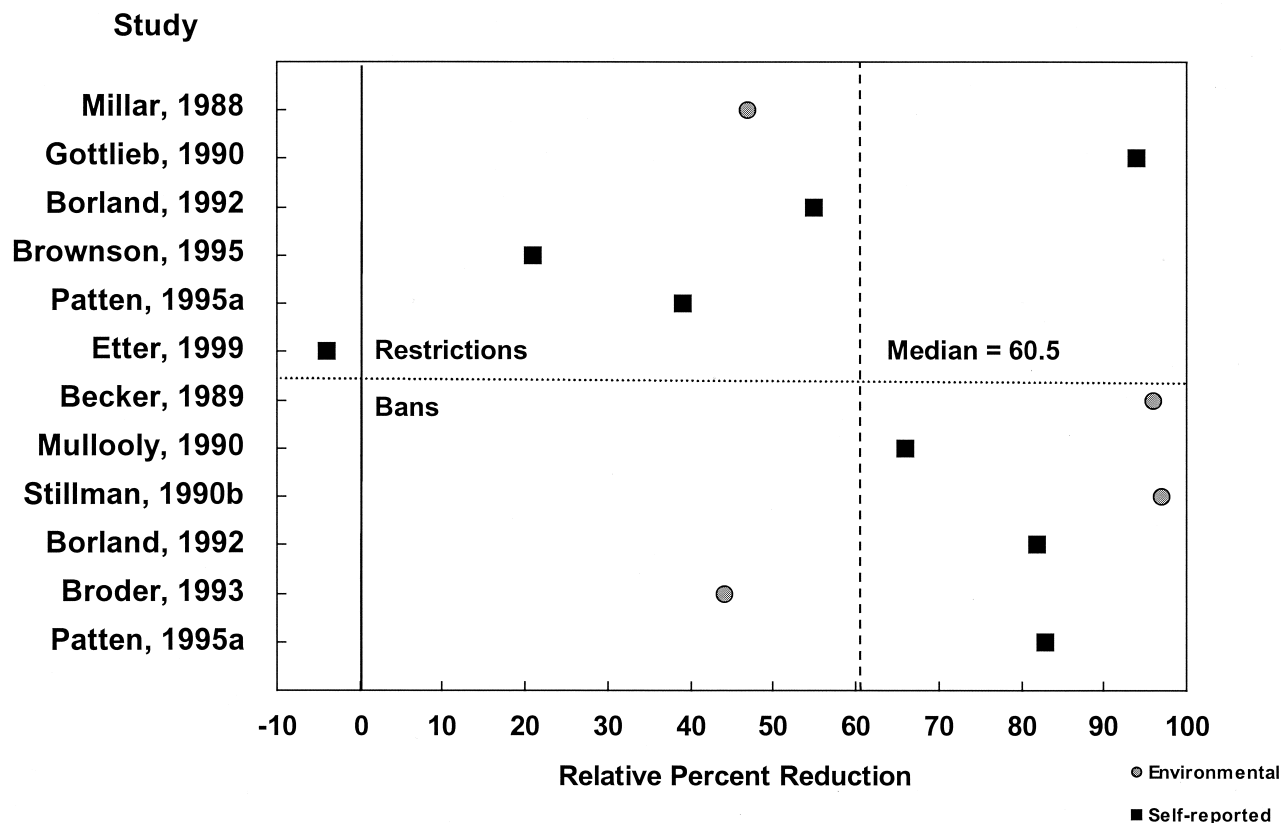


Figure 2. Relative percentage changes in exposure to environmental tobacco smoke attributable to workplace smoking bans and restrictions from studies that qualified for inclusion in this review (“a” and “b” in Study names refer to first or second study by the same author in that year, included in this review)

Four studies evaluated the effect of smoking restrictions,^{36,42,47,55} four studies measured the effect of smoking bans,^{28,35,57,72} and two studies measured differences in workplace exposure to ETS for both.^{31,61} In general, reductions in ETS exposure were greater in workplaces that had smoking bans than in those with only smoking restrictions (Figure 2).

Review of evidence: applicability. The same body of evidence used to assess effectiveness was used to assess the applicability of smoking bans and restrictions to different settings and populations. Smoking bans and restrictions were evaluated in a variety of settings, including hospitals and medical centers,^{28,57,72} offices of health care providers,⁵⁷ workplaces in the government or public sector,^{35,47,55} and a university.⁴² Studies on representative samples of employed people in California^{31,61,79,80} and in Missouri³⁶ demonstrated that smoking bans and restrictions reduced self-reported exposure to ETS in workplaces community-wide. Studies included representative samples of indoor workers in the states of California^{31,61,79,80} and Missouri,³⁶ large, diverse samples of government employees in Texas,⁴⁷ and health maintenance organization (HMO) employees in Oregon.⁵⁷ The evidence of effectiveness in these studies should extend to most indoor workers in the United States.

In four studies, smoking bans or restrictions were implemented and evaluated in response to a government law.^{35,36,47,55} In four studies, the bans or restrictions were the result of private-sector policies.^{28,42,57,72} Two studies measured the effect of smoking bans or restrictions created through workplace policies or local ordinances.^{31,61}

No studies were found that evaluated the effect of smoking bans or restrictions in public settings outside of the workplace, such as public transportation systems or sports and entertainment venues.

Review of evidence: other positive or negative effects. Of the 54 studies in the body of evidence, 50 measured the effectiveness of smoking bans or restrictions on one or more tobacco use behaviors, including consumption (cigarettes per shift or per day), cessation attempts, cessation, or smoking prevalence.^{24–30,32–35,37–47,49–52,54–60,62–77,80} However, 41 of these studies^{24–28,30,32,33,35,37–41,43–46,49,51,54–56,58–60,63–69,71–77,80} were not included in the review of effectiveness because of least-suitable study designs. Details of the nine qualifying studies^{29,34,42,47,50,52,57,62,70} are provided in Appendix B-2, and at the website (www.thecommunityguide.org).

All nine qualifying studies measured self-reported cigarette consumption, and eight of the nine stud-

ies^{29,34,42,47,50,52,62,70} observed either reductions or lower levels of reported cigarette consumption in the group or population exposed to smoking bans or restrictions. Overall, the median absolute change was -1.2 cigarettes per day (range, no change in consumption to -4.3) with follow-up periods of up to 2 years.

Four studies of smoking bans^{34,52,62,70} measured self-reported smoking cessation in sampled smokers over follow-up periods of 4 weeks to 18 months. In one small study,³⁴ none of the smokers quit in the 4 weeks of follow-up. In each of three studies with study periods of 12 to 18 months,^{52,62,70} a larger proportion of smokers subject to a workplace smoking ban quit compared with smokers subject to lesser or no workplace smoking restrictions. In two of these studies,^{62,70} the absolute percentage changes were +7.9 and +9.6 percentage points, respectively. The third study⁵² reported an adjusted relative risk of 1.7 (95% confidence interval [CI], 1.2, 2.4).

Six studies^{29,42,47,50,57,62} measured changes or differences in tobacco use prevalence. Three studies^{29,47,62} observed reductions in prevalence following implementation or exposure to smoking bans or restrictions (absolute percentage changes of -1.4, -3.4, and -11.4 percentage points). Three studies^{42,50,57} observed small increases in tobacco use prevalence (absolute percentage changes of +0.4, +0.8, +1.0 percentage points).

This body of evidence led the TFCPS to the conclusion that smoking restrictions and bans appear to have an effect on tobacco consumption and cessation, but the evidence of an effect on tobacco use prevalence is less consistent.

Additional benefits of smoking bans or restrictions include reduced workplace cleaning costs and reduced risk for fires.⁸² Seven reports describing six studies provided evidence that smoking ordinances do not have an adverse economic effect on businesses (including bars and restaurants) or on tourism.⁸³⁻⁸⁹

Review of evidence: economic. One study conducted in the United States modeled the costs and benefits of a proposed national smoke-free environment act to restrict or to ban smoking inside all nonresidential buildings regularly entered by 10 or more people per week.⁸² Costs included implementation of the restriction or ban by the establishment, construction, and maintenance of smoking lounges, and enforcement. Benefits included savings on medical costs by averting heart disease, value of lives saved obtained by willingness-to-pay methods, costs averted by reduced smoking-related fires, and productivity improvements. The net present benefit to society adjusted to the *Community Guide* reference case was in the range of \$42 billion to \$78 billion. This range was based on high and low estimates of benefits and costs. This study was classified as very good, based on the criteria for quality assess-

ment of economic data used in the *Community Guide*.⁹⁰ (See Appendix C, Interpreting the Economic Data.)

Barriers to intervention implementation. A major barrier to efforts by local governments to adopt smoking bans is pre-emption, which is the passage or presence of a state law with weaker smoking restrictions that prevents implementation and enforcement of stronger local laws.^{91,92} Eliminating pre-emption statutes is one of the tobacco objectives of *Healthy People 2010*.¹⁹ Another major barrier to the adoption of local, state, and national smoking bans is political opposition by smokers, businesses concerned about potential changes in revenue, and tobacco industry-sponsored groups.⁹³

Conclusion. According to the *Community Guide's* rules of evidence, there is strong scientific evidence that smoking bans and restrictions reduce exposure to ETS in the workplace.

Community Education to Reduce Exposure to ETS in the Home

Definition. Community education includes all efforts to increase knowledge and to change attitudes about the health effects of exposure to ETS. Techniques include mass media messages, small media messages (including educational materials), and counseling provided outside of health care settings.

Background. Community education provides information to parents, other occupants, and visitors to the home about the health risks of ETS for nonsmoking adults and for children. For infants and children, most ETS exposure occurs in the home.⁹⁴ Information could change the knowledge and attitudes of smokers, prompting them to reduce or eliminate smoking indoors, reduce consumption, or quit entirely. Nonsmokers might increase their support and encouragement to smoking household members to quit, or they might create and enforce home smoking bans or restrictions. The combination of reduced indoor smoking and increased cessation would result in a reduction in indoor ETS exposure, with a consequent reduction in morbidity and mortality.

Review of evidence: effectiveness. Our search identified a total of three studies that evaluated effectiveness of education in the adoption of home smoking policies, in reducing ETS exposure in the home, or in changing tobacco use behaviors.^{44,95,96} Two studies were excluded because of limitations in execution⁹⁶ or a least-suitable study design.⁴⁴ Details of the qualifying study⁹⁵ are available at the website (www.thecommunityguide.org).

The single qualifying study evaluated a randomized trial of home nurse visits to assist families in reducing infant exposure to ETS. The nurse visits provided a variety of home education aids and an opportunity to discuss options for home smoking policies. At a 12-

month follow-up, the absolute percentage difference in reported infant exposure to ETS was -4 percentage points (relative decrease of 12%). However, households in the intervention group reported an increase in infant exposure to ETS over the period of the study from 33% at baseline to 49% at the 12-month follow-up.

Review of evidence: applicability. The only qualifying study evaluated home nurse visits to families in central North Carolina.⁹⁵

Review of evidence: other positive or negative effects. Potential benefits of education to reduce ETS exposure in the home include changes in tobacco use behaviors such as an increase in cessation attempts and successful cessation. No harms of community education to reduce ETS exposure in the home were identified in the literature or by the chapter development team.

Review of evidence: economic. Economic evaluation information was not reviewed because there was insufficient evidence of effectiveness of the intervention.

Barriers to intervention implementation. No barriers were identified to the implementation of community education strategies focused on reducing ETS exposure in the home.

Conclusion. According to the *Community Guide's* rules of evidence, the evidence of effectiveness of education strategies in reducing exposure to ETS in the home environment is insufficient because of the small number of available studies and limitations in the design and execution of available studies.

Research Issues for Reducing Exposure to ETS

Effectiveness. The effectiveness of smoking bans and restrictions in reducing exposure to ETS in the workplace is established. Research issues, which have been identified by others,²⁰ overlap with questions generated as a result of this review.

- What are the relative effects of smoking bans and restrictions on tobacco use behaviors? What is the full range of effects on tobacco use behaviors that occurs in response to smoking bans and to smoking restrictions? In addition to reducing exposure to ETS, what are the effects on tobacco use cessation and tobacco use prevalence?
- What are the extended effects (beyond 1 to 2 years after implementation) of smoking bans and restrictions on the tobacco use behaviors of workers? Do these effects increase over time?
- What is the full range of effects that occurs in communities in response to different types of local ordinances?
- How does the effectiveness of smoking policies vary by the specific requirements of the legislation and vigorousness of enforcement?

- How is the effect of workplace smoking policies affected by the size and composition of the workforce?
- What is the full range of health benefits that results from reducing or eliminating exposure to ETS in workers and customers currently exposed to ETS on a regular basis (e.g., in restaurants, bars, and casinos)?
- How do cultural characteristics of businesses and workers contribute to increased or decreased effectiveness of smoking bans and restrictions?

The effectiveness of community education interventions in reducing exposure to ETS in the home has not been established. Basic research questions proposed by others^{94,97} overlap the questions generated from this review.

- How effective are educational methods in reducing exposure to ETS in the home?
- What are the relative contributions to reducing home ETS exposures of (1) adherence to policies that ban or restrict smoking in the home and (2) smoking cessation?
- Do policies in the home that ban or restrict smoking reduce exposure to ETS? In adults? In children? Are households with children more likely to adopt policies that ban or restrict smoking in the home?
- Are home smoking bans more effective than smoking restrictions?
- What information or message is effective in prompting and maintaining practices in the home?
- What channels are effective for dissemination of information to reduce home ETS?

Applicability. Workplace smoking bans and restrictions should be applicable in most workplace settings and populations. However, possible differences in the effectiveness of each intervention for specific subgroups of the population could not be determined. Several questions regarding applicability of these interventions in settings and populations other than those studied remain.

- Are smoking bans effective in high schools in reducing exposure to ETS and/or tobacco use?
- Are smoking bans and restrictions effective in universities in reducing exposure to ETS and/or tobacco use?
- Are smoking bans effective in child-care settings in reducing exposure to ETS?
- Do meaningful differences exist in effectiveness of smoking bans and restrictions relative to the level or scale of implementation (private, local, state, national)?

Other positive or negative effects. Smoking bans and restrictions may have important effects on such tobacco use behaviors as consumption, cessation attempts, and

cessation. Assessing the full range of effects of smoking bans and restrictions is important and was addressed in the section on Effectiveness. In addition, research on the following issues would be useful:

- How effective are workplace smoking bans and restrictions in reducing relapses?
- Do smoking bans and restrictions divert tobacco consumption from cigarettes to smokeless tobacco?
- To what extent, if any, do workplace smoking bans and restrictions increase consumption and ETS exposures in the home?
- What effects do workplace smoking bans and restrictions have on productivity?

Economic evaluations. The available economic information consisted of a single evaluation. Considerable research is, therefore, warranted regarding the following questions:

- What are the costs of these interventions?
- What is the cost-effectiveness, net cost, or net benefit of smoking bans and restrictions when the cost-effectiveness analysis includes cost of illness averted?

Barriers. Research issues important to communities and local governments identified in this evaluation include the following:

- What aspects of efforts to prevent or to overturn state pre-emption laws are effective?
- What aspects of efforts to pass local smoking bans are effective in addressing local concerns and industry-organized opposition? What arguments for smoking bans are most persuasive to voters? To local legislative bodies?

Published reports of community and state efforts to pass smoking bans in California are informative,⁹³ and continued investigation is warranted to identify and to disseminate information to counter the evolving strategies of the tobacco industry.

Part II. Strategies to Reduce Tobacco Use Initiation

Interventions that reduce tobacco use initiation are designed to change knowledge, attitudes, and tobacco use behaviors in children, adolescents, and young adults. Most smokers initiate tobacco use during adolescence, and nicotine addiction begins during the first few years of use.⁹⁸ Major risk factors for tobacco initiation among children and adolescents are perceptions that tobacco use is a common and normative peer and adult behavior as well as the availability and accessibility of tobacco products.¹⁷ Preventing or delaying experimentation with tobacco products or preventing the transition from experimentation to regular use and tobacco dependence are the major goals of interventions reviewed in this section. Two interventions are

evaluated in this section: increasing the unit price for tobacco products and mass media campaigns.

Increasing the Unit Price for Tobacco Products

Definition. Interventions to increase the unit price for tobacco products include legislation at the state or national level to raise the product excise tax. Although other factors affect tobacco product pricing, increases in the excise tax have historically resulted in an equivalent or larger increase in tobacco product price.⁹⁹

Background. Excise taxes on tobacco products make the use of tobacco products less attractive to adolescents and young adults who have limited resources and a variety of options for spending available money. Increases in the excise tax have primarily occurred in individual states, as most attempts at the federal level have been unsuccessful. Increases in state excise taxes have occurred as a result of legislative action and, in some states, as a result of statewide referendum. Referenda passed in California, Massachusetts, Oregon, and Arizona provided various proportions of excise tax funds by mandate or recommendation to support statewide education programs and mass media campaigns.¹⁰⁰

Review of evidence: effectiveness. Our search identified eight studies regarding the effectiveness of increasing the price for tobacco products on changing the tobacco use behaviors of adolescents, young adults, or both.^{101–108} Three additional reports provided more information on an already included study.^{109–111} All of the studies were conducted in the United States. Five studies examined the effect of product price on tobacco use in adolescents (aged 13 to 18 years),^{103–106,108} and three studies examined the effect of product price on tobacco use in young adults (aged 18 to 24 years, or <25 years).^{101,102,107} All of the identified studies were of moderate or greatest suitability of study design and fair or good quality of execution. Details of these eight qualifying studies are provided at the website (www.thecommunityguide.org).

All eight studies employed econometric methods in analysis of single or sequential cross-sectional surveys of populations of students, young adults, or both. Local tobacco product price and price changes or differences over the period of study were combined with the survey responses on tobacco use and consumption to calculate price elasticity of demand estimates (the percentage change in quantity demanded resulting from a 1% change in price). Price elasticity of demand estimates provided in these studies included participation (i.e., tobacco use prevalence), tobacco product consumption (such as cigarettes smoked per day), and an overall estimate (participation and consumption). A negative price elasticity of demand estimate reflects a decrease in tobacco use in response to an increase in tobacco product price. All of the studies attempted to control

for concurrent tobacco prevention and control efforts, including differences in smoking restrictions, youth tobacco access laws, school tobacco education programs, and exposure to anti-tobacco media.

The study periods differed for each qualifying study, with some overlap. Five studies evaluated the effect of price on tobacco use for study periods that included the 1990s,^{101-104,106} whereas three studies reported the effect of price on tobacco use for periods before 1990.^{105,107,108}

Price elasticity of demand estimates from seven studies¹⁰¹⁻¹⁰⁷ demonstrated that higher tobacco product prices are associated with lower levels of tobacco use by adolescents and young adults. One study¹⁰⁸ did not find a statistically significant effect of price on adolescent tobacco use, after controlling for such tobacco use regulations as smoking restrictions. For tobacco use prevalence, the price elasticity estimates ranged from no statistically significant effect to -1.19 with a median of -0.37 (suggesting that a 10% increase in product price would result in a 3.7% decrease in the prevalence of tobacco use among adolescents). For tobacco consumption (6 studies provided measurements), the price elasticity estimates ranged from 0 to -0.68 with a median of -0.23 (suggesting that a 10% increase in product price would result in 2.3% decrease in the quantity of product consumed by adolescent users).

The subset of five studies conducted on surveys from adolescents (13 to 18 years)^{103-106,108} determined price elasticity of demand estimates for participation (prevalence) that ranged from no statistically significant effect to -1.19 with a median of -0.38 . Four of these studies also reported estimates for tobacco consumption, ranging from 0 to -0.47 with a median of -0.27 .

In the subset of three studies that evaluated populations of young adults (18 to 24 years),^{101,102,107} the price elasticity measurements were similar to those observed in studies on adolescents. Price elasticity of demand for tobacco use participation ranged from -0.07 to -0.52 with a median of -0.37 . For the effect on consumption, two studies reported estimates of -0.21 and -0.68 .

Overall, the price elasticity of demand estimates in seven of eight studies demonstrate that increases in tobacco product price result in decreases in both the overall prevalence of tobacco product use and the quantity consumed. Increases in product price resulted in reductions in tobacco use in both adolescents and young adults.

Review of evidence: applicability. The same body of evidence used to assess effectiveness was used to assess the applicability of these interventions to different tobacco products, settings, and populations. All of the qualifying studies measured differences in tobacco product price across jurisdictions such as states. Differ-

ences in tobacco product prices included, but were not limited to, differences in state excise taxes.

Studies have evaluated the effect of product price on use and consumption of cigarettes¹⁰¹⁻¹⁰⁸ and of smokeless tobacco products.^{107,110}

All of the studies were conducted in the United States, and most of the studies used national data sets. The study samples are representative of populations of adolescents and young adults. In addition, some studies reported stratified analyses, demonstrating evidence of effectiveness of price on tobacco use and consumption among whites,^{101,103,104} blacks,^{101,103} and Hispanics.¹⁰¹ Two studies observed that both black adolescents and young adults were more responsive to differences in product price than were white adolescents and young adults, respectively.^{101,103} Studies that provided analysis by gender found that increases in the tobacco product price had a greater effect among males than among females.^{101,103,104,106}

Studies conducted on nationally representative population samples suggest that the evidence of effectiveness should apply to most adolescents and young adults in the United States.

Review of evidence: other positive or negative effects.

Increases in the price of tobacco products also reduce tobacco use in adults. A review of this body of evidence and additional positive and negative effects are presented in the section Part III: Strategies to Increase Tobacco Use Cessation. No information about other positive or negative effects, relevant to reducing initiation in adolescents, was identified.

Review of evidence: economic. Econometric analyses were used to evaluate the effectiveness of this economic intervention. The results were reported previously in the section Review of evidence: effectiveness.

Barriers to intervention implementation. Increases in the excise tax require passage of legislation or statewide referendum. Political opposition is well organized and funded at both the federal and state levels. Published reports^{100,112,113} provide information on the components and experiences of both successful and unsuccessful state initiatives that proposed an increase in the excise tax on tobacco products.

Conclusion. According to the *Community Guide's* rules of evidence, strong scientific evidence demonstrates the effectiveness of increasing the price of tobacco products on reducing tobacco use prevalence and consumption among both adolescents and young adults.

Mass Media Campaigns

Definition. Campaigns are mass media interventions of an extended duration that use brief, recurring messages to inform and motivate individuals to remain

tobacco free. Message content is developed through formative research, and message dissemination includes the use of paid broadcast time and print space, donated time and space (as public service announcements), or a combination of paid and donated time and print space. Mass media campaigns can be combined with other interventions, such as increases in the excise tax on tobacco products, school-based education, or other community programs.

Background. Mass media techniques primarily include broadcast messages on television and radio, although other formats, such as billboards, print media, and movies, have been used. Campaigns can focus on messages that target children and adolescents or can include such messages as part of an overall anti-tobacco effort (e.g., including messages targeting tobacco users to increase cessation and messages about reducing exposure to ETS). The content of mass media campaigns designed to educate and motivate children and adolescents to remain tobacco free can vary, but a recent review identified two primary strategies: agenda setting and demand reduction education.¹¹⁴ Agenda-setting messages increase awareness of strategies used by the tobacco industry to promote tobacco use and attempt to facilitate changes in both tobacco use behaviors and public policies concerning tobacco. Demand reduction education messages provide information and support to young people to help individuals decide to remain tobacco free.

Review of evidence: effectiveness. Our search identified 14 studies regarding the effectiveness of mass media campaigns in reducing tobacco use in adolescents.^{115–128} Two studies were excluded from the analysis of effectiveness because of least-suitable study designs.^{123,126} Details regarding the 12 qualifying studies are provided at the website (www.thecommunityguide.org). Twenty-eight reports provided additional information on an already-included study.^{129–156}

The qualifying studies evaluated a variety of mass media campaigns. Nine studies evaluated interventions in which the mass media component focused on youth.^{115–122,124} In three studies,^{125,127,128} the mass media effort included youth-targeted messages within a larger anti-tobacco campaign. Only one study¹²⁰ employed mass media alone (through a variety of outlets). In 11 studies, the mass media campaign occurred in coordination or concurrently with other interventions including contests,^{115,122} school-based education programs,^{116–119,121,122,124,125,128} and community education programs.^{116,121,124,125,127,128} Two studies^{124,127} were conducted in settings with recognized excise tax increases on tobacco products.

The duration of the intervention differed significantly among the studies. Two of the mass media efforts were less than 3 weeks in duration,^{117,118} three interventions were less than 2 years in duration,^{115,121,122}

and seven campaigns were 2 or more years in duration.^{119,120,124,125,127,128,133}

The 12 qualifying studies provided 12 measurements of tobacco use. Five studies reported differences in rates of self-reported tobacco use between intervention and comparison groups.^{115,116,122,124,125} In follow-up periods that ranged from 2 to 5 years, the reported absolute percentage differences ranged from +0.02 to –9.5 percentage points with a median of –2.4 percentage points. Six studies reported intervention and comparison group outcomes expressed as an odds ratio for tobacco use at follow-up.^{117–121,127} Two studies did not find any effect on tobacco use behaviors from exposure to the intervention.^{117,118} In four studies, the follow-up periods ranged from 2 to 4 years, and the adjusted odds ratios were similar in magnitude and direction (range, 0.49 to 0.74; median, 0.60).^{119–121,127} Finally, one study observed an absolute percentage difference of –11 percentage points in group mean tobacco use prevalence at 15-year follow-up for students who received a school education program and were exposed to community and mass media education interventions to reduce cardiovascular disease risk factors.¹²⁸

All seven of the studies that evaluated mass media campaigns of 2 or more years' duration observed a reduction in tobacco use prevalence in the intervention group when compared to the control group.^{119,120,124,125,127,128,133} The observed differences were more consistent and slightly greater in magnitude of effect for both tobacco use prevalence (range, –2.4 to –11; median, –8.0 percentage points) and in the odds ratios (range of outcomes, 0.49 to 0.74, median result, 0.74).

The contributions of individual components to the overall effectiveness of the interventions cannot be attributed.

Review of evidence: applicability. The same body of evidence used to assess effectiveness was used to assess the applicability of these interventions to different settings and populations. Interventions were performed in the United States,^{115–119,121,122,124,125,127} Norway,¹²⁰ and Finland.¹²⁸ Interventions included statewide campaigns in Florida,¹¹⁶ Massachusetts,¹²⁷ and Minnesota.^{124,125} Community and regional interventions were conducted in the Southeast,¹¹⁵ Northeast,¹¹⁹ Midwest,^{121,122} and in Montana¹¹⁹ and Southern California.^{117,118} Interventions were initiated in the 1990s,^{116,120,127} in the 1980s,^{115,117–119,121,122,124,125} and in the 1970s.¹²⁸ Outcomes were evaluated in representative samples of adolescents identified in the general population^{115,127} and in representative or selected samples of schools.^{116–122,124,125,128} Outcomes were evaluated in student populations recruited or surveyed before grade 6,¹¹⁹ grades 6 and 7,^{116–118,121,122,125,128} or after grade 7.^{116,120,124,125} Outcomes from the two most recent studies demonstrate a greater benefit among

younger adolescents.^{116,127} Evaluation of the Florida campaign provides evidence of effectiveness of mass media campaigns among girls, boys, whites, blacks, and Hispanics.^{116,133}

Review of evidence: other positive or negative effects.

Mass media campaigns are effective in reducing population consumption of tobacco products and in increasing cessation in adult tobacco users (see Part III: Strategies to Increase Tobacco Use Cessation). Messages and broadcast times that are effective for children and adolescents, however, may have less or no effect on adult tobacco use. No other positive or negative effects were identified in this review.

Review of evidence: economic. One 4-year study¹⁴⁸ conducted in Montana, New York, and Vermont compared the effect of a mass media campaign combined with a school smoking prevention program to a school smoking prevention program alone on students from grades 5 to 7 through grades 8 to 10. Students were followed for 2 years after conclusion of the intervention. Costs included personnel, travel, data entry, message research and development, and television and radio advertising. The absolute percentage point change was -5.5 percentage points in smoking initiation (tobacco use prevalence was 25% in the comparison groups at follow-up). Adjusted program cost per smoker averted was \$6069, and the adjusted program cost per quality-adjusted life year (QALY) was \$333. On the basis of the explicit quality assessment criteria used in developing the *Community Guide*, this study was classified as very good.⁹⁰ Study details, adjusted results, and quality scoring are listed online in the economic summary table provided at the website (www.thecommunityguide.org). (See Appendix C, Interpreting the Economic Data.)

Barriers to intervention implementation. The main barrier to implementation of mass media campaigns is the cost of purchasing broadcast time. The costs of developing and test marketing messages can be offset by cooperation between tobacco prevention and control programs. Programs can lower message development costs, for example, by using existing television, radio, print, and outdoor ads from CDC's Media Campaign Resource Center, a clearinghouse of high-quality materials produced by states and other organizations.⁵

Conclusion. According to the *Community Guide's* rules of evidence, strong scientific evidence exists that mass media campaigns are effective in reducing tobacco use prevalence in adolescents when combined with other interventions. The contribution of individual components to the overall effectiveness of these interventions cannot be attributed.

Research Issues for Strategies to Reduce Tobacco Use Initiation

Effectiveness. The effectiveness of increasing the unit price for tobacco products and mass media campaigns in reducing tobacco use by adolescents is established. Important questions remain regarding the composition and content of effective campaigns and the effectiveness in different settings and populations. Some issues raised by others^{4,157} overlap with questions generated as a result of this review.

- What interventions are most effective in combination with mass media campaigns? What interventions are least effective?
- What are the relative effects of these interventions on adolescent initiation, consumption, access to tobacco products, and cessation?
- What is the required intensity (frequency of spots and the broadcast exposure) of media messages for an effective campaign?
- What are the independent contributions of particular intervention features (e.g., components, content, intensity, and duration) to overall intervention effectiveness?
- What are the most effective ways to maintain reductions in youth tobacco use into young adulthood?
- Does tobacco use in adults respond to mass media campaigns that are youth-focused?

Applicability. The effectiveness of these interventions should be applicable in most settings and populations. However, there could be differences in the effectiveness of these interventions for specific subgroups of the population. The following questions remain about the applicability of these interventions in various settings and populations:

- Are there differences in the responses of adolescents to tobacco product price increases by age, race, and ethnicity?
- Are the effects of mass media campaigns on adolescents by gender, race, and ethnicity similar to or different from those observed in Florida?

Other positive or negative effects. The studies in these reviews did not provide information on other positive or negative effects. Research questions pertinent to interventions to increase the price of tobacco products are presented in the section Part III: Strategies to Increase Tobacco Use Cessation.

Some issues generated by the review of mass media campaigns are the following:

- Do mass media campaigns that target children and adolescents result in increases in tobacco initiation among young adults by delaying the age of initiation?
- What are the most effective ways to maintain reductions in youth tobacco use into young adulthood?

Economic evaluations. Available economic information was limited to a single study of mass media campaigns. Therefore, considerable research is warranted regarding the following questions:

- Are the costs and cost-effectiveness, net cost, or net benefit of mass media campaigns similar to or substantially different from those that have been previously reported?
- How do the costs per tobacco user averted compare with other tobacco prevention strategies?
- How do specific characteristics of mass media campaigns contribute to economic efficiency?
- What combinations of components in multicomponent interventions are most cost-effective?

Barriers. The strategies evaluated in this section require political action and support. Research questions generated in this review include the following:

- What characteristics are effective in successful legislative and referendum campaigns?
- How can adequate funding levels be maintained for mass media campaigns?

Methods of intervention research. Evaluations of mass media campaigns should provide information on the costs, scale, duration, and content of the campaign. Researchers should identify concurrent tobacco control efforts, especially excise taxes or changes in the price of tobacco products, and should attempt to control for these changes in their analyses.

Additional Interventions Under Evaluation

The TFCPS is currently reviewing the evidence of effectiveness of three additional interventions that may affect the use of tobacco products among adolescents. Youth access restrictions include laws that regulate and enforce bans on the sale of tobacco products to, or their purchase or consumption by, children and adolescents. School-based education includes all efforts in school settings to educate and motivate young people to remain tobacco free. Tobacco-industry restrictions focus on laws that regulate the content, labeling, promotion, and advertising of tobacco products. The TFCPS evaluations and conclusions on these strategies will be released later this year.

Part III. Strategies to Increase Tobacco Use Cessation

Interventions to increase tobacco use cessation include strategies to increase the number of tobacco users who attempt to quit, strategies to improve the success rate of individual cessation attempts, and strategies to achieve both of these goals. Two interventions reviewed in this report are appropriate for communities: increasing the unit price for tobacco products and mass media educa-

tion. The TFCPS also reviewed the following interventions appropriate for implementation in health care systems, which are included in this report: (1) provider reminder systems when implemented alone; (2) provider education programs when implemented alone; (3) provider reminder systems and provider education programs when implemented together, with or without patient education materials; (4) provider feedback systems; and (5) reducing patient out-of-pocket costs for effective cessation therapies. The TFCPS also reviewed one intervention, patient telephone cessation support, that is appropriate for both communities and health care systems.

Increasing the Unit Price for Tobacco Products

Definition. Interventions to increase the unit price for tobacco products include municipal, state, and federal legislation that raises the excise tax on these products. Although other factors also affect the pricing of tobacco products, increases in the excise tax historically have resulted in an equivalent or larger increase in the price for tobacco products.⁹⁹

Background. Excise taxes on tobacco products make the continued use of tobacco products less attractive to users. In the United States, increases in the excise tax have primarily occurred in individual states, as most legislative attempts at the federal level have been unsuccessful. Increases in state excise taxes have occurred as a result of legislative action and, in some states, as a result of statewide referendums. Referenda passed in California, Massachusetts, Oregon, and Arizona provided various proportions of excise tax funds by mandate or recommendation to support statewide education programs and mass media campaigns.¹⁰⁰

Review of evidence: effectiveness. Our search identified 56 reports regarding the effectiveness of increasing the price for tobacco products on tobacco use behaviors among individual smokers and general populations.^{101,107,108,111,158–209} A number of reports, however, conducted analyses on the same data sets for similar, identical, or overlapping periods of time. For the purposes of this evaluation, the TFCPS consolidated reports into aggregate studies, based on similarities in location, the period of study, and the data set employed (details available at www.thecommunityguide.org). For example, we considered all of the identified reports that evaluated activities in California in the period from 1989 to 1994 a single aggregate study.^{158–164} After consolidating overlapping reports, the body of evidence consisted of 22 aggregate studies. Five studies were excluded because of limitations in execution quality.^{204–208} Details of the 17 qualifying studies, including the selection of representative outcome measurements, are available at the website (www.thecommunityguide.org).

The 17 qualifying studies include consolidated evaluations of the effect of tobacco product price on tobacco use in the states of California,¹⁵⁸⁻¹⁶⁴ Massachusetts,¹⁶⁵ Oregon,¹⁶⁶ 11 western states,¹⁶⁷ national evaluations conducted in the 1990s,^{101,168,169} national evaluations conducted in the 1980s,^{107,108,111,170-184} national evaluations conducted in the 1970s,¹⁸⁵⁻¹⁹³ three studies conducted in Canada,¹⁹⁴⁻¹⁹⁶ three studies conducted in the United Kingdom,¹⁹⁷⁻¹⁹⁹ and single studies conducted in Austria,²⁰⁰ Finland,²⁰¹ Switzerland,^{202,203} and New Zealand.²⁰⁹

The most common measurement described in the body of evidence to estimate the effect of tobacco product price increases was the price elasticity of demand (the percentage change in consumption that results from a 1% change in price). In econometric analysis of tobacco product price increases (resulting from an excise tax increase, a tobacco industry price increase, or both), a negative price elasticity of demand estimate indicates a decrease in consumption. In studies that measure changes in tobacco product consumption (typically estimated from national or regional tobacco sales figures), observed changes capture the combined effect of increases in cessation, decreases in initiation, and reduced consumption by continuing users. In studies that use data from individuals to measure tobacco use prevalence and quantity consumed, the price elasticity of demand calculations include distinct estimates for participation (i.e., tobacco use prevalence) and tobacco product consumption (e.g., cigarettes smoked per day), and overall estimates (participation and consumption).

Thirteen of the seventeen consolidated studies included measurements of price elasticity of demand.^{101,107,108,111,158-164,167-194,197-203,209} Ten aggregate studies provided measurements based on cigarette sales data, with a range of price elasticity estimates of -0.27 to -0.76 and a median estimate of -0.41 (suggesting that a 10% increase in product price would result in a 4.1% decrease in population consumption).^{101,107,108,111,158-164,167-194,200-203,209} Seven studies^{101,107,108,111,158-164,168-193,197-199} provided measurements based on individual responses, although one study provided only an overall price elasticity of demand estimate.¹⁹⁹ For the overall price elasticity estimate, the values ranged from $+0.5$ to -0.84 with a median of -0.42 . For the price elasticity of participation, the range was -0.08 to -0.26 with a median of -0.15 . For the estimate of quantity consumed, the values ranged from -0.09 to -0.61 with a median of -0.19 .

Overall, this body of evidence documented consistent effects of increases in tobacco product price on reducing tobacco use, regardless of the measurements reported or calculated, the setting or period of time evaluated, or differences in the control of potential confounders. Three aggregate studies, which used in-

formation collected in the 1990s, provide more recent price elasticity of demand estimates of the effect of tobacco product price increases on reducing tobacco use.^{101,158-164,168,169,194} Price elasticity estimates from tobacco sales figures provided in these studies range from -0.30 (state tax elasticity in California) to -0.42 (U.S. national estimate) with a median of -0.40 . Results from two studies within the U.S. national set^{101,169} based on individual responses in two national surveys were very similar, with estimates of -0.29 and -0.25 overall, -0.14 and -0.15 for participation, and -0.15 and -0.10 for quantity consumed.

Four studies provided measurements other than price elasticity of demand in assessing the effect of tobacco product price changes on tobacco use.^{165,166,195,196} One study reported the effect of federal and provincial excise tax increases on tax paid sales of cigarettes in Alberta, Canada.¹⁹⁶ In the period from 1985 to 1995, the price index for cigarettes increased from 1.00 (1985-1986 baseline) to 1.78, while the consumption index decreased from 1.00 to 0.58. A second study from Canada in 1994 to 1995, following a reduction in the federal excise tax, compared tobacco use in survey samples in provinces that reduced excise taxes on cigarettes with provinces that did not.¹⁹⁵ Although tobacco use declined in all of the provinces over the study period, the rate of decline slowed significantly in provinces that reduced the excise tax on cigarettes. Finally, the states of Massachusetts and Oregon reported reductions in population consumption of tobacco after increases in the excise tax for tobacco products and after the implementation of multicomponent tobacco control programs that included a mass media campaign.^{165,166} In comparison to the rest of the United States, the relative percent decreases in tobacco consumption were -12.8% and -9.8% over periods of 4 years and 2 years, respectively. The independent effect of the excise tax change on tobacco consumption could not be determined in these studies.

Review of evidence: applicability. The individual reports included in the qualifying studies were used to provide information on the applicability of this intervention to different products, settings, and populations. All of the qualifying studies evaluated the effect of price on the consumption of cigarettes. In addition, studies evaluated the effect of price increases on consumption of smokeless tobacco,^{107,111} cigars,²⁰¹ and pipe tobacco.²⁰¹ Studies demonstrated the effectiveness of increases in the state excise tax^{159,161,162,165,168,177} and increases in the federal excise tax.^{160,168} Most studies that used individual data employed representative samples of state or national populations. Studies have demonstrated effectiveness in stratified analyses for whites,¹⁰¹ blacks,^{101,162} Hispanics,^{101,162} men,^{101,162,187,191,198} and women.^{101,187,191,198,199} Studies also demonstrated effectiveness in people with in-

comes below median,^{101,169} less than a high school education,¹⁸⁸ and across most social classes.^{198,199}

Review of evidence: other positive or negative effects. Increasing the unit price for tobacco products will decrease tobacco use in adolescents and young adults (see Part II: Strategies to Reduce Tobacco Use Initiation). Increases in illegal cross-border transport and sale of untaxed tobacco products (smuggling) are potential negative effects of increases in excise taxes on tobacco products. No recent studies of the effects of organized smuggling in the United States were identified in this review, and an analysis in 1985 reported a significant reduction in activity following federal legislation in 1978.²¹⁰

This review identified several additional effects of tobacco product price increases that might reduce (but would not eliminate) the potential health benefits caused by increases in cessation and reductions in consumption. These effects include (1) legal, individual cross-border purchases of tobacco products; (2) substitution of tobacco products (e.g., smokeless tobacco for cigarettes) created by unequal taxation on different kinds of tobacco products¹¹¹; and (3) modification of individual tobacco use behaviors, such as smoking cigarettes longer or changing to a higher-tar, higher-nicotine brand.¹⁷⁴

Review of evidence: economic. Econometric analyses were used to evaluate the effectiveness of this economic intervention. The results are reported in the section Review of evidence: effectiveness.

Barriers to intervention implementation. Increases in the excise tax require passage of legislation or statewide referendum. Efforts to increase the federal excise tax have largely been unsuccessful. Political opposition is well organized and funded at both the federal and state levels. Reports of state tobacco tax initiatives, successful and unsuccessful, have been published.^{17,100,112,113}

Conclusion. According to the *Community Guide's* rules of evidence, strong scientific evidence demonstrates that increasing the unit price for tobacco products is effective in increasing tobacco use cessation and in reducing consumption.

Mass Media Education

Mass media education consists of dissemination, through broadcast and print media, of cessation information to motivate tobacco product users to quit. This evidence review distinguished among three subtypes of mass media interventions (campaigns, cessation series, and cessation contests) that differ in the duration, intent, and intensity of the media messages. Each intervention is addressed separately.

Mass Media Education: Campaigns

Definition. Campaigns are mass media interventions of an extended duration that use brief, recurring messages to inform and to motivate tobacco product users to quit. Message content is developed through formative research, and message dissemination includes the use of paid airtime and print space (advertisements), donated time and space (public service announcements), or a combination of the two. Campaigns can be combined with other interventions, such as an increase in the excise tax, or additional community education efforts.

Background. The historical foundation for mass media education to reduce tobacco use is the national experience from 1966 through 1970 of a long-duration, high-intensity anti-smoking broadcast campaign that resulted from a complaint to the Federal Communications Commission (FCC). The complaint requested application of the Fairness Doctrine to mandate reply time to counter cigarette advertising on television and radio. In June 1967, the FCC initiated a mandate (upheld on appeal) that required broadcasters to provide broadcast time free of charge for anti-smoking messages. At the peak, anti-smoking messages were broadcast (often in prime time) at a rate of one message for every three cigarette commercials. This policy lasted until 1971, when a ban on cigarette broadcast advertising went into effect. Cigarette consumption declined each year during the campaign and rose again after the cigarette advertising ban ended free access to broadcast time for anti-smoking messages.^{211–213}

Review of evidence: effectiveness. Our search identified 24 studies regarding the effectiveness of mass media campaigns in reducing tobacco use.^{164–166,214–234} An additional 14 reports provided more information on an already-included study.^{152,161,235–246} Four reports with limited quality of execution^{214,219,227,233} and two reports with least-suitable study designs^{216,232} were not included in the body of evidence. Three studies measured the effect of a mass media campaign in increasing use of a telephone cessation information service,^{215,229,231} and these results are described later in this section in the review of multicomponent interventions including patient telephone support. Details of the remaining 15 qualifying studies are provided at the website (www.thecommunityguide.org).

All of the qualifying studies evaluated the effectiveness of a mass media campaign either coordinated with or concurrent with other interventions. These other interventions included an excise tax increase (6 studies),^{164–166,220,223,225} community education programs such as the distribution of self-help cessation information (12 studies),^{164–166,217,218,220,223–225,228,230,234} individual or group counseling for cardiovascular disease risk

factor reduction or for smoking cessation (7 studies),^{218,221–224,226,228} and other mass media efforts (2 studies).^{218,234}

The 15 qualifying studies provided 15 measurements of changes in tobacco use, consisting of 5 measurements of changes in individual tobacco use cessation, 3 measurements of changes in population consumption (measured by statewide sales of cigarettes), and 7 measurements of changes in the prevalence of tobacco use in the study population. Two studies^{164,165} provided both measurements of population consumption and tobacco use prevalence. For these studies, the measurements of population consumption are reported.

Five studies evaluated the effectiveness of mass media campaigns combined with additional interventions in increasing tobacco use cessation in groups of recruited tobacco users.^{217,221,224,226,228} The duration of the interventions ranged from less than 1 year to 5 years. Cessation rates in the intervention group ranged from 3.9% (confirmed) to 50% (self-reported), with a median of 7% in follow-up periods of 6 months to 5 years (median, 14 months). The absolute percentage differences in cessation between intervention group participants and comparison group participants (who were potentially exposed to the media component in 3 studies) ranged from –2 percentage points to +35 percentage points, with a median difference of +2.2 percentage points.

Three studies evaluated the effectiveness of mass media campaigns in reducing tobacco consumption (as measured by statewide sales of cigarettes) in a state population.^{164–166} These studies evaluated the effect of ongoing state-funded mass media campaigns coordinated with excise tax increases and funding for community and school-based education programs. All three studies, with follow-up periods of 2 to 8 years, observed decreases in state per capita consumption of cigarettes compared to per capita consumption in the rest of the United States. The observed differences ranged from –9 cigarette packs per capita per year (–9.8% relative decrease) to –20.4 packs per capita per year (–17.5% relative decrease), with a median of –15 packs per capita per year (–12.8% relative decrease).

Seven studies evaluated the effectiveness of mass media campaigns in reducing the prevalence of tobacco use in study populations.^{218,220,222,223,225,230,234} These studies include investigations conducted in California (including targeted campaigns for Vietnamese and Hispanic populations as part of the larger California media campaign previously described),^{218,220,223,225} Minnesota,²²² Australia,²³⁰ and Finland.²³⁴ Five studies reported differences in tobacco use prevalence compared with a concurrent population,^{218,220,222,225,234} and two studies reported before–after changes in a single study population.^{223,230}

Six of the seven studies observed decreases in tobacco use prevalence,^{220,222,223,225,230,234} over study pe-

riods that ranged from 6 months to 20 years (median, 6 years). In the five studies with concurrent comparison populations, absolute percentage differences in tobacco use prevalence reported ranged from +0.2 to –7 percentage points (median, –3.4).^{218,220,222,225,234} In the two studies without a concurrent comparison population, the absolute percentage changes observed over time were –2.5²³⁰ and –4.7 percentage points.²²³

Review of evidence: applicability. The same body of evidence used to assess effectiveness was used to assess the applicability of these interventions to different settings and populations. All of the qualifying studies focused on differences or changes in the consumption and use of cigarettes. Studies included campaigns conducted nationwide in Scotland,²²¹ statewide in the United States,^{164–166} region-wide in the United States²¹⁷ and Finland,²³⁴ in large cities,²³⁰ and in smaller communities and localized populations.^{218,220,222–226,228}

Evidence of effectiveness from the state campaigns should be generally applicable to the U.S. population. Studies have been performed among specific U.S. populations, including Hispanics^{223,224} and Vietnamese men.^{220,225}

Review of evidence: other positive or negative effects. Several studies^{215,217,229,231} observed significant increases in the use of telephone cessation information or support services when the mass media messages directed viewers to call for further information or support. The mass media campaigns in California, Oregon, and Massachusetts included messages that targeted children and adolescents as well as messages about the health effects of exposure to ETS.

Review of evidence: economic. Two studies were included for review, one conducted in the Netherlands²⁴⁷ and the other in Scotland.²⁴⁸ Both studies evaluated community-wide interventions to increase cessation among adult tobacco users. Both studies reported program costs per quitter. In addition, one study²⁴⁸ reported program cost per life-years saved, which was converted to dollars per QALY, based on preference weights provided by Fiscella and Franks.²⁴⁹

The intervention conducted in the Netherlands²⁴⁷ evaluated the effect of a mass media campaign, self-help manual, hotline, and a nine-session group cessation program. Self-reported 7-day abstinence was determined at 6-month follow-up. Costs included wages, overhead, calls to the hotline, participant time, transportation, and charges for the group session. The effect size was estimated as the difference in smoking prevalence before and after the intervention. The self-reported cessation rate was 11% for participants that used the self-help manual alone and 22% for participants that used the self-help manual combined with the cessation program. On the basis of this effect size, adjusted program cost per quitter ranged from \$796 to

\$1593. On the basis of the explicit quality assessment criteria used in developing the *Community Guide*, this study was classified as satisfactory.⁹⁰

The study conducted in Scotland²⁴⁸ consisted of a mass media campaign, telephone helpline, and information booklet. At the 12-month follow-up, 9.8% of program participants reported having quit smoking for at least 6 months. Costs included research, production, design fees, printing, dissemination, staff salaries, and overhead. The adjusted program costs per quitter in this study ranged from \$298 to \$655. Adjusted program costs per QALY ranged from \$151 to \$328. The range was based on lower and upper bound estimates of adult participants. On the basis of the explicit quality assessment criteria used in developing the *Community Guide*, this study was classified as satisfactory.⁹⁰ Study details, adjusted results, and quality scoring are provided at the website (www.thecommunityguide.org). (See also Appendix C.)

Barriers to intervention implementation. The primary barriers to the implementation of mass media campaigns are obtaining and preserving the funding needed to develop and to maintain an extended-duration, high-intensity campaign that uses paid and targeted broadcast times for messages that resonate with target audiences. The barriers encountered by the tobacco control program in the state of California provide important lessons both on the need for public and political support and for vigilance in maintaining an effective campaign.^{250,251}

Cooperation between tobacco control programs can reduce program development costs. Programs can lower message development costs, for example, by using existing television, radio, print, and outdoor ads from CDC's Media Campaign Resource Center, a clearinghouse of high-quality materials produced by states and other organizations.⁵

Conclusion. According to the *Community Guide's* rules of evidence, strong scientific evidence exists that mass media campaigns combined with other interventions are effective in increasing tobacco use cessation and in reducing consumption of tobacco products.

Mass Media Education: Cessation Series

Definition. Cessation series are mass media interventions that use recurring instructional segments to recruit, inform, and motivate tobacco product users to initiate and to maintain cessation efforts. Cessation series can be coordinated with pre-series broadcast or print promotion, community education such as distribution of self-help cessation materials, and organization of cessation groups in the community. The series can extend for a period of several weeks to several months, and techniques include nightly or weekly segments on news or informational broadcasts that

provide expert advice or peer-group experiences on a variety of cessation issues (e.g., dealing with the symptoms of withdrawal).

Background. The goals of smoking cessation series are to increase the number of tobacco users who attempt to quit and to increase the number of quitters who succeed. The series can provide motivation to tobacco product users to join in a community-wide targeted quit effort. Over the course of the broadcasts, viewers can receive ongoing support and assistance from cessation experts and recruited peers.

Review of evidence: effectiveness. Our search identified 20 studies regarding the effectiveness of cessation series in increasing tobacco use cessation.^{244,252–270} Ten additional reports provide information on an already-included study.^{271–280} Ten studies with limited execution^{244,252,254,257,258,261,263,265,266,268} and one study with a least-suitable study design²⁵⁵ were not included in the body of evidence. Details of the nine qualifying studies^{253,256,259,260,262,264,267,269,270} are provided at the website (www.thecommunityguide.org).

All of the qualifying studies evaluated the effectiveness of cessation series combined with other interventions, such as community education (typically access to or distribution of self-help cessation manuals),^{253,256,259,260,262,267,269,270} organized cessation groups or programs,^{256,260,262,264,267,269,270} or telephone cessation support.^{256,260} Eight studies evaluated televised cessation series broadcast over periods that extended from 20 days to 3 months,^{256,259,260,262,264,267,269,270} and one study evaluated a week-long newspaper cessation series.²⁵³

Five of the nine qualifying studies present evaluations of broadcast cessation series conducted in the Chicago metropolitan area (in one of three waves) between 1985 and 1987.^{256,262,267,269,270} These studies were evaluated separately because of differences in the study populations or settings.

Of the nine qualifying studies, only one investigation compared exposed and unexposed groups of recruited participants.²⁵⁹ That study observed no significant difference in self-reported cessation rates at the 6-month follow-up. One study compared self-reported cessation based on recalled exposure to various campaign interventions.²⁶⁰ People who recalled watching the cessation series were more likely to report sustained cessation at interview (odds ratio, 1.36; 95% CI, 1.13, 1.65). In five studies, smokers in both the intervention and comparison groups were exposed to the cessation series, with participants in the intervention group receiving additional interventions, such as small group sessions.^{256,262,264,267,270} These studies reported absolute percentage differences in cessation that ranged from +4 to +8 percentage points (median, +5) with follow-up periods of 4 to 24 months (median, 12). However, these studies share a potential limitation in com-

paring smokers motivated to quit (enrolled or offered cessation group support) with smokers potentially less motivated to quit. Of the two remaining studies, one reported differences in cessation by intervention setting, with all of the participants receiving a similar intervention.²⁶⁹ The other study reported an increase in cessation attempts in people who recalled exposure to a week-long newspaper cessation series.²⁵³

The qualifying studies provided insufficient evidence of effectiveness of the broadcast series in increasing tobacco use cessation. The differences in cessation observed in these studies might be the result of (1) baseline differences in motivation to quit between intervention and comparison smokers and (2) the small-group cessation sessions provided to the intervention group participants.

Review of evidence: other positive or negative effects. No additional information regarding other positive or negative effects was identified in this review.

Conclusion. According to the *Community Guide's* rules of evidence, the available studies provide insufficient evidence to assess the effectiveness of cessation series in reducing tobacco use. Evidence is insufficient because of (1) inconsistent results and (2) inadequate comparison populations or groups.

Mass Media Education: Cessation Contests

Definition. Cessation contests are short-duration, community-wide events that use mass media for the promotion, recruitment, and motivation of tobacco product users to participate in a targeted cessation date or period. This evaluation included contests that offered additional incentives for participation and successful cessation, as well as targeted quit events conducted without additional incentives.

Background. Cessation contests are included in this section because this intervention uses mass media (as well as small media such as posters and flyers) as the primary tool for promotion and recruitment of tobacco product users in the community. Contests can work to increase cessation in the community by changing attitudes of tobacco product users about cessation, recruiting tobacco product users to initiate a quit attempt, and motivating those who attempt to quit to remain abstinent (through incentives or by mobilizing support from family, friends, and other participants).

Review of evidence: effectiveness. Our search identified 17 studies regarding the effectiveness of tobacco cessation contests.^{257,281–296} Three additional reports provided information on an already-included study.^{297–299} Eleven studies that measured tobacco use cessation in contest participants in the absence of a comparison group were excluded from further evaluation.^{281–284,286–288,290,293,294,296} Five studies with limitations in

quality of execution were not included in the evaluation of effectiveness.^{257,285,289,291,292} Details of the one qualifying study²⁹⁵ are provided at the website (www.thecommunityguide.org).

The single qualifying study evaluated a multicomponent smoking cessation program in New York City. Interventions included a cessation manual and video, telephone cessation support, and the opportunity to participate in smoking cessation contests. The contest participation rate was 13%, and entering the contest was significantly associated with self-reported cessation at the 6-month follow-up (odds ratio, 3.0; 95% CI, 1.7, 5.4). Overall, the absolute percentage difference in self-reported cessation at the 6-month follow-up was +3.3 percentage points compared with smokers who received only general health education materials.

Review of evidence: other positive or negative effects. No information on other positive or negative effects was identified in this review.

Conclusion. According to the *Community Guide's* rules of evidence, the available studies provide insufficient evidence to assess the effectiveness of cessation contests in increasing tobacco use cessation. Evidence is insufficient because of the small number of qualifying studies.

Strategies Appropriate for Health Care Systems and Providers

The TFCPS reviewed a variety of interventions that can be implemented by health care systems and providers to increase or to improve cessation of tobacco use by patients. This report does not include an evaluation of the effectiveness of provider counseling to tobacco-using patients or the effectiveness of specific clinical therapies, which have been thoroughly reviewed by others.^{4,14,15,300}

Health Care Systems and Providers: Provider Reminder Systems

Definition. Provider reminder systems include efforts to identify patients who use tobacco products and efforts to prompt providers to discuss and/or to advise patients about cessation. Techniques by which reminders are delivered include chart stickers, vital sign stamps, medical record flow sheets, and checklists. The content of provider reminders can vary, and provider reminder systems are often combined with other interventions, such as provider education and patient education. Multicomponent interventions that include provider reminders are considered in the section Provider Reminder Plus Provider Education With or Without Patient Education.

Background. Reminder systems prompt providers to interact with patients about tobacco use at every encounter. Reminders aim to increase recognition of the

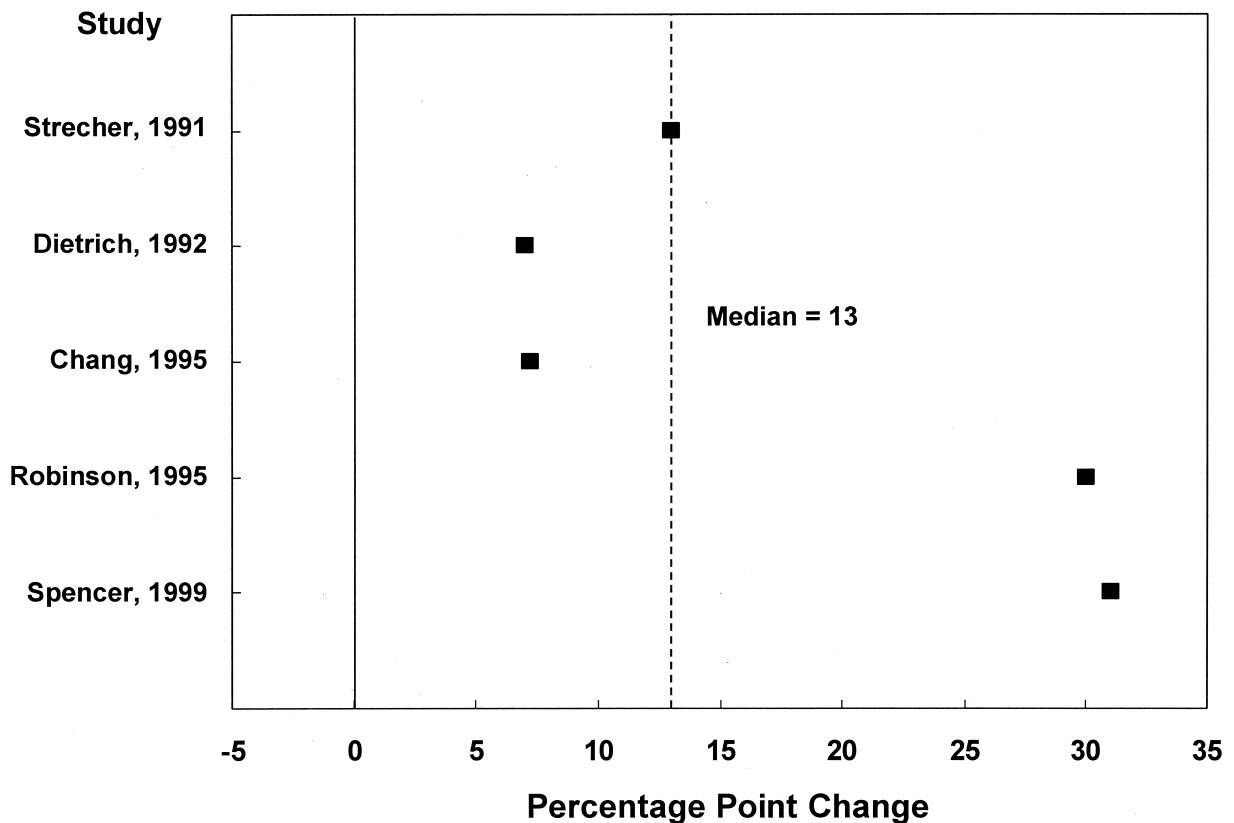


Figure 3. Percentage point change in patient receipt of advice to quit tobacco use from providers attributable to provider reminders from studies that qualified for inclusion in this review

status of patient tobacco use, resulting in an increase in provider delivery of advice to quit. Because even brief provider advice to quit has a demonstrated effect on patient tobacco use cessation,^{14,300} increasing the delivery of advice by providers will increase the number of patients who quit.

Review of evidence: effectiveness. Our search identified eight studies that evaluated the effectiveness of provider reminder systems when used alone.^{301–308} One study with a least-suitable study design was not included in the body of evidence.³⁰³ Details of the seven qualifying studies are provided at the website (www.thecommunityguide.org). The evaluated techniques for prompting providers were chart prompts or stickers,^{301,306–308} “expanded vital signs” that include status of tobacco use,³⁰⁵ and flow sheets.^{304,307} In one qualifying study, the intervention sites received an office consultation that encouraged implementation of a provider reminder system. Analysis was based on receipt of the consultation, not on actual implementation of the reminder system.³⁰²

The seven qualifying studies reported four measurements of differences in documentation of patient smoking status,^{301,304,306,308} five measurements of chart-documented or patient-reported provider delivery of

advice to quit to tobacco-using patients,^{301,302,305,307,308} and one measurement of patient smoking cessation.³⁰⁷ For determination of patient smoking status, four studies^{301,304,306,308} measured absolute percentage differences of +26 to +57.6 percentage points (median, +32.5) in periods that extended from 8 to 24 months after implementation (median, 15). For provider delivery of advice to quit (Figure 3), five studies^{301,302,305,307,308} observed differences that ranged from +7 to +31 percentage points (median, +13) in assessments that extended 2 to 24 months after implementation (median, 8). One study reported an absolute percentage difference in biochemically confirmed smoking cessation of +4 percentage points 6 months after the clinic visit.³⁰⁷

Review of evidence: applicability. The same body of evidence used to assess effectiveness was used to assess the applicability of these interventions to different tobacco products, settings, and populations. Studies were conducted in the United States^{301,302,304,305,307,308} and in Canada.³⁰⁶ Studies were conducted in primary care clinics,^{302,307} family practice clinics,^{304–306,308} and in pulmonary clinics.³⁰¹ Most studies did not provide demographic information on the patient populations.

Review of evidence: other positive or negative effects. Two studies, in which provider reminders included other preventive services, observed increases in some or all of the prompted activities.^{304,306} Other positive or negative effects were not identified in this review.

Review of evidence: economic. We did not identify any economic evaluations reporting on cost, cost-effectiveness, cost-benefit, or cost utility in this review.

Barriers to intervention implementation. One potential barrier to the implementation of a provider reminder system is the administrative burden. Administrative burden was not identified as a problem in any of the qualifying studies, and most of the reminder systems (e.g., “expanded vital signs”) were easily implemented.

Conclusion. According to the *Community Guide’s* rules of evidence, sufficient scientific evidence documents that provider reminder systems when implemented alone are effective in increasing provider delivery of advice to quit to tobacco-using patients.

Health Care Systems and Providers: Provider Education Only

Definition. Provider education involves giving information about tobacco and tobacco use cessation to providers to increase their knowledge and to change their attitudes and practices. Techniques by which information is delivered include lectures, written materials, videos, and continuing medical education seminars. Provider populations include physicians, nurses, physician assistants, health care students, and other office staff.

Provider education efforts are frequently combined with other interventions, such as provider reminders and patient education efforts. Multicomponent interventions that include provider reminders are considered in the section Provider Reminder Plus Provider Education With or Without Patient Education.

Background. Provider education attempts to increase or to improve providers’ interactions with tobacco-using patients. Changes in provider performance could include increases in the identification of tobacco-using patients, increases in the delivery of advice to quit, improvement in the quality of providers’ advice to quit, and both an increase and an improvement in providers’ efforts to assist tobacco users’ attempts to quit and to maintain abstinence.

Review of evidence: effectiveness. Our search identified 25 studies regarding the effectiveness of provider education interventions when implemented alone.^{302,307,309–331} Two additional reports provided information on an already-included study.^{332,333} Five studies with limited quality of execution^{310,312,315,319,328} and four studies

with least-suitable study designs^{317,321,323,331} were not included in the body of evidence. Details on the 16 qualifying studies are provided at the website (www.thecommunityguide.org).

Provider education techniques evaluated in the qualifying studies include day-long seminars,^{302,311} lectures for practitioners,^{311,314,327} lectures for resident physicians,^{307,316,318,320,326} lectures and office visits or contacts,^{322,329} small-group tutorial sessions,^{309,324} mock interviews with feedback,^{325,330} and education materials.³¹³ The total duration of the provider education sessions ranged from 2 hours to 3 days (median, 2.5 hours) in the 11 studies that provided this information.

The 16 qualifying studies reported a total of 19 measurements of changes in provider counseling skills or behaviors and 2 measurements of patient tobacco use behaviors. Four studies measured changes or differences in cessation counseling skills or in the use of patient education materials,^{309,313,324,325} which were not considered in the evidence of effectiveness. Five studies measured differences in provider determination of patient smoking status,^{311,318,322,326,330} with absolute percentage differences that ranged from +0.1 to +35 percentage points (median, +8). Ten studies reported differences in provider delivery of advice to quit (see Figure 4),^{302,307,311,314,316,318,320,322,329,330} with absolute percentage differences that ranged from –5 to +73 percentage points (median, +2.2). Four of these 10 studies observed either no effect or a negative effect on provider delivery of advice to quit.^{302,316,329,330} Two studies reported differences in patient tobacco use cessation.^{307,316} Absolute percentage differences in cessation were +5.2 and +1.7 percentage points in follow-up periods of 3.5 months and 6 months, respectively.

Review of evidence: applicability. The same body of evidence used to assess effectiveness was used to assess the applicability of these interventions to different settings, provider populations, and patient populations. Settings have included HMOs,³¹⁴ academic centers,^{307,316,318,320} and private practices.^{302,311,329} Studies have included such providers as medical and nursing students,^{309,325,327} resident physicians,^{307,316,318,320,324,326,330} physician practitioners,^{302,311,313,314,326,329} and non-physician practitioners.³²⁹ Physician specialties included internal medicine,^{307,311,324} family practice,^{307,311,316,320,324} and pediatrics.^{307,318} Four studies evaluated interventions that targeted providers community-wide.^{311,313,322,329} Few studies provided information on the patient populations.

Review of evidence: other positive or negative effects. No information regarding other positive or negative effects was identified in this review.

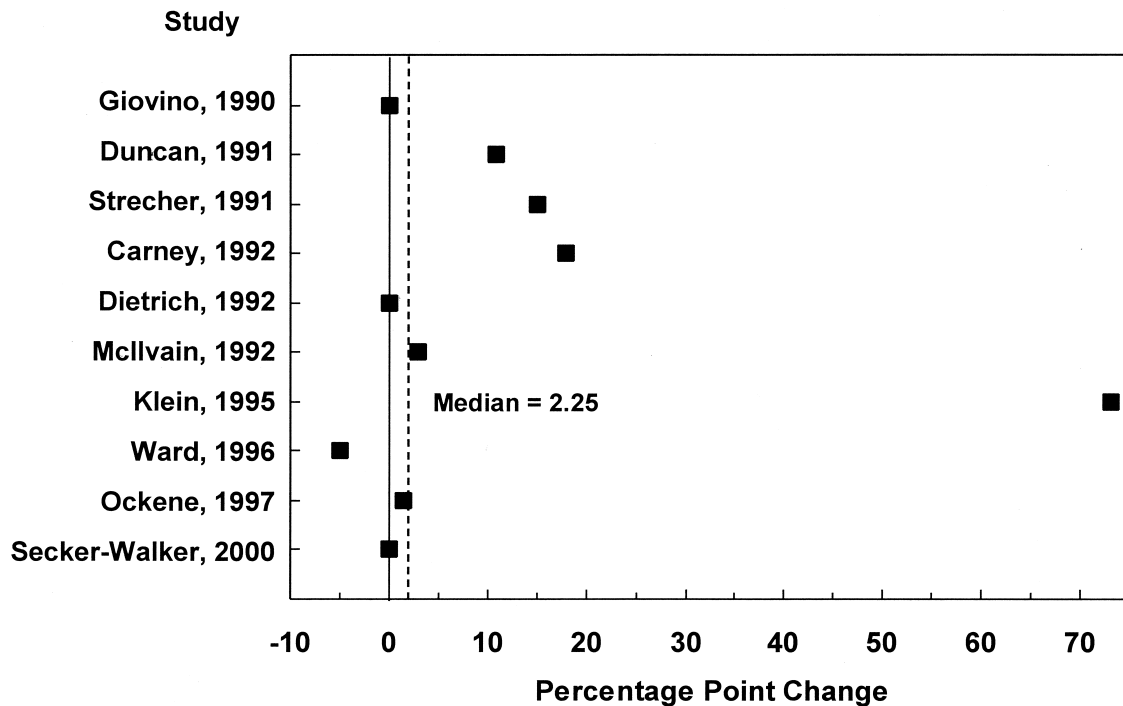


Figure 4. Percentage point change in patient receipt of advice to quit tobacco use from providers attributable to provider education from studies that qualified for inclusion in this review

Conclusion. According to the *Community Guide's* rules of evidence, available studies provide insufficient evidence to assess the effectiveness of provider education interventions when implemented alone. Evidence is insufficient because (1) few studies evaluated the effect on patient tobacco use cessation and (2) studies that evaluated provider delivery of advice to quit demonstrated inconsistent results.

Health Care Systems and Providers: Provider Reminder Plus Provider Education With or Without Patient Education

Definition. Multicomponent strategies to increase tobacco use cessation include efforts to educate and to prompt providers to identify and to intervene with tobacco-using patients, as well as to provide supplementary educational materials when indicated. The components of this intervention are a provider reminder system and a provider education program with or without patient education materials such as self-help cessation manuals.

Background. A multicomponent intervention can provide an integrated strategy to increase and to improve tobacco use cessation by patients. These strategies can educate, motivate, and prompt providers to increase and to improve their interaction with tobacco-using patients. These strategies can also improve patient cessation by increasing knowledge and motivation to quit and to remain abstinent. The multicomponent

interventions evaluated in this section include at least one component directed at providers.

Review of evidence: effectiveness. Our search identified a total of 37 studies regarding the effectiveness of multicomponent health care system interventions in reducing tobacco use among patients.^{302,307,314,320,326,328,329,334–363} Fifteen additional reports provided information on an already-included study.^{364–378} Two studies with limited quality of execution^{328,334} and four studies with least-suitable study designs^{345,350,355,360} were not included in the body of evidence. Details of the 31 qualifying studies are available at the website (www.thecommunityguide.org).

Twenty-one studies included at minimum the combination of a provider reminder system and a provider education program.^{302,307,314,320,326,329,335–339,343,344,347–349,352,356–358,361} An additional component, patient education materials, was provided in 14 of these studies.^{314,337–339,343,344,347–349,352,356–358,361} One study measured changes in adolescent tobacco use initiation and is not considered further in this section.³⁴⁴ Three studies evaluated a provider reminder system combined with other interventions without a provider education program.^{354,359,363} Seven studies evaluated a provider education component combined with a patient education program without a provider reminder system.^{340–342,346,351,353,362}

The 20 qualifying studies that evaluated the effectiveness of a multicomponent intervention containing a

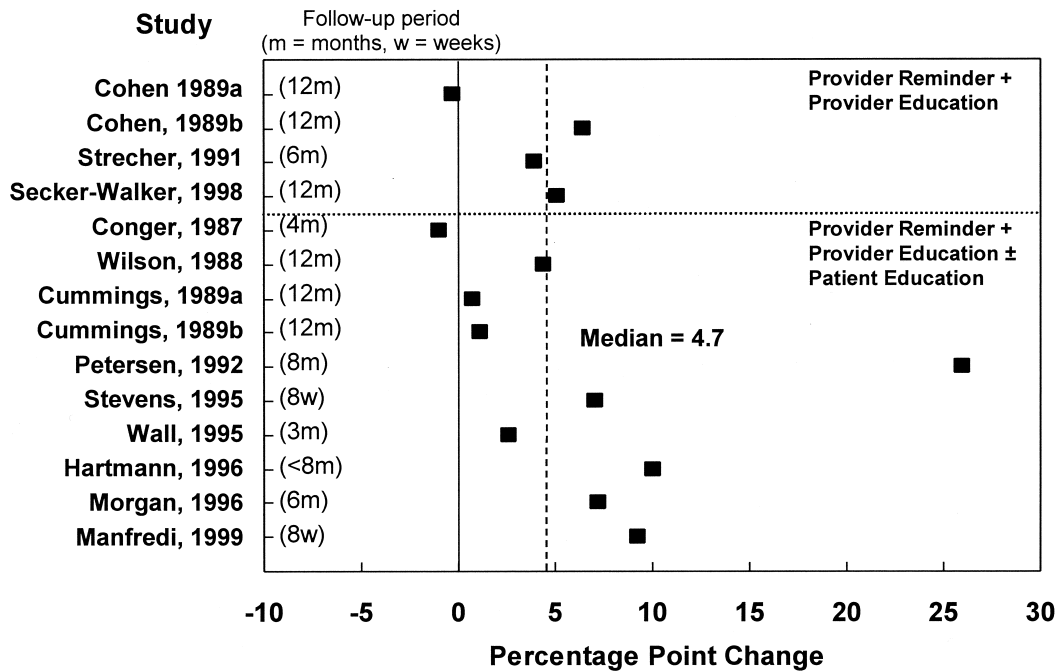


Figure 5. Percentage point change in tobacco use cessation attributable to multicomponent interventions (minimum of a provider reminder and provider education components) from studies that qualified for inclusion in this review

minimum of a provider reminder system and a provider education program, reported 15 measurements regarding provider advice to quit and 14 measurements regarding patient tobacco use cessation (Figure 5). Overall, the absolute percentage differences in patient receipt of provider advice to quit ranged from +5.2 to +60 percentage points (median, +20). In follow-up periods that ranged from 5 weeks to 12 months (median, 10 months), the absolute percentage differences in patient tobacco use cessation ranged from -1.0 to +25.9 percentage points (median, +4.7).

A subset of seven studies evaluated the minimum combination of a provider reminder system and a provider education program.^{302,307,320,326,329,335,336} These studies provided six measurements of differences in provider advice to quit and four measurements of patient tobacco use cessation. The absolute percentage differences reported ranged from +6 to +39 percentage points (median, +12.5) for provider advice to quit and -0.3 to +6.4 percentage points (median, +4.5) for patient tobacco use cessation.

A subset of 13 studies evaluated interventions that included patient education materials combined with a provider reminder system and a provider education program.^{314,337-339,343,347-349,352,356-358,361} These studies provided nine measurements of provider advice to quit and ten measurements of patient tobacco use cessation. The absolute percentage differences reported ranged from +5.2 to +60 percentage points (median, +22) for provider advice to quit and from -1 to +25.9 percentage points (median, +5.7) for patient cessation.

Of the remaining studies, three included provider reminders and patient education without a provider education program.^{354,359,363} These studies reported three measurements of differences in patient tobacco use cessation. The absolute percentage differences ranged from -0.6 to +5.2 percentage points (median, +1.2) in follow-up periods of 6 to 12 months.

Seven studies evaluated combinations that included a provider education program without a provider reminder system.^{340-342,346,351,353,362} These studies reported five measurements of differences in patient tobacco use cessation. Absolute percentage differences in cessation ranged from -1.5 to +4.6 percentage points (median, +0.5) in follow-up periods of 6 to 12 months.^{340-342,346,362} Only three studies measured changes in receipt of provider advice to quit (absolute percentage changes of +14.6,³⁴⁶ -9,³⁴² and +22.7³⁶² percentage points).

Review of evidence: applicability. The same body of evidence used in the assessment of effectiveness was used to assess the applicability of these interventions to different settings, populations, and forms of tobacco. The 21 studies of multicomponent interventions that included at least a provider education program and a provider reminder system were conducted in a variety of health care settings, including HMOs,^{314,339,352,356} private practices,^{302,337,338,347-349,357,358} academic health care centers,^{307,329,348,351} physician training programs,^{307,320,326,335,343} and public health clinics.³⁶¹ Studies were implemented in a variety of provider populations, including primary care,^{307,337,347-349} inter-

nal medicine,^{302,314,338,339} family medicine,^{302,320,326,358} obstetric care,^{329,343,352} pediatricians,³⁵⁷ and dental care.^{336,344,356} One study focused on reducing use of smokeless tobacco.³⁵⁶

Review of evidence: other positive or negative effects. Provider reminder systems have included prompts for other important preventive services. No other positive or negative effects were identified in this review.

Review of evidence: economic. No economic evaluations reporting on cost, cost-effectiveness, cost-benefit, or cost utility were identified in this review.

Barriers to intervention implementation. Administrative burden is a potential barrier to the implementation of provider reminder systems.

Conclusion. According to the *Community Guide's* rules of evidence, strong scientific evidence demonstrates that multicomponent health care system interventions that include a minimum of a provider reminder system and a provider education program are effective in increasing both provider delivery of advice to quit and patient tobacco use cessation. Additional effectiveness was demonstrated by studies that also included patient education, such as self-help cessation materials.

Health Care Systems and Providers: Provider Feedback

Definition. Feedback interventions use retrospective assessment of provider performance in the identification of patient tobacco use status, the delivery of advice to quit, or a combination of both to inform and to motivate providers. Techniques of assessment include chart reviews or the use of computerized records. Assessment and feedback interventions can be combined with other activities, such as provider reminders and provider education, and these combinations are considered in this section.

Background. Provider assessment and feedback can motivate providers to increase and to improve their delivery of effective provider interactions with patients, such as advice to quit. Evaluation of provider assessment and feedback is timely because (1) clinical information systems are improving and are increasingly common; (2) effective cessation therapies are available and increasing provider interactions with tobacco-using patients could increase the use of these therapies; and (3) quality assurance approaches such as the Health Plan Employer Data and Information Set (HEDIS) are being used more often.

Review of evidence: effectiveness. Our search identified five studies that evaluated the effectiveness of provider assessment and feedback interventions on provider behaviors with tobacco-using patients.^{379–383} One study with limited quality of execution³⁷⁹ and one

study with a least-suitable study design³⁸⁰ were not included in the evaluation of effectiveness. Details of the three qualifying studies are provided at the website (www.thecommunityguide.org).

A provider assessment and feedback program was evaluated alone in one study³⁸¹ and in combination with other components in two studies including a provider education program^{382,383} and a provider reminder flow sheet.³⁸² In all three studies, provider documentation or recognition of a patient's tobacco use status was only one of several preventive care practices for which assessment and feedback were provided (range, 3 to 26 items). Only one study used a computer system to collect information and to enable providers to obtain feedback information.³⁸³

None of the qualifying studies attempted to measure changes in provider delivery of advice to quit or patient tobacco use behaviors. The three qualifying studies provided three measurements of effectiveness in increasing provider recognition of patient tobacco use status. In study periods that ranged from 3 months to 6 years, the absolute percentage improvements in provider recognition of patient tobacco use status ranged from +13 to +39 percentage points (median, +21).

Review of evidence: other positive or negative effects. Implementation of a provider assessment and feedback program increased provider delivery of other preventive care practices in these studies.^{381,382} No other positive or negative effects were identified in this review.

Conclusion. According to the *Community Guide's* rules of evidence, the available studies provided insufficient evidence to assess the effectiveness of provider assessment and feedback interventions in increasing either provider delivery of advice to quit or patient tobacco use cessation. Evidence is insufficient because the small number of available studies did not provide measurements on the outcomes required for an evaluation of effectiveness in this review (such as increasing provider delivery of advice to quit or patient tobacco use cessation).

Health Care Systems and Providers: Reducing Patient Out-of-Pocket Costs for Effective Cessation Therapies

Definition. This intervention includes efforts to reduce the financial barriers to patient use of effective cessation therapies such as nicotine replacement,¹⁴ other pharmacologic therapy,¹⁴ or behavioral therapies such as cessation groups.¹⁴

Background. The objectives for reducing out-of-pocket costs for effective cessation therapies are as follows: (1) to increase the use of effective therapies, (2) to

increase the number of people who attempt to quit, and (3) to increase the number of people who make successful cessation efforts.

Review of evidence: effectiveness. Our search identified five studies regarding the effectiveness of reducing patient out-of-pocket costs for effective tobacco cessation therapies.^{384–388} All five studies were of fair quality of execution and greatest or moderate suitability of study design and were included in the evaluation of effectiveness. Details of the qualifying studies are available at the website (www.thecommunityguide.org).

All five studies evaluated interventions that reduced or eliminated patient costs for nicotine gum^{384,386,387} or nicotine replacement.^{385,388} In two studies, nicotine gum or replacement was provided as part of,³⁸⁴ or in addition to,³⁸⁵ a behavioral program. Access to a behavioral program was provided but rarely used in a third study.³⁸⁸ In three studies, nicotine gum or nicotine replacement was provided free of charge to participants in the intervention group.^{384,386,388} In one study, the out-of-pocket costs of the combination of behavioral program and nicotine replacement were \$52.50 for comparison group patients and \$10 for intervention group patients.³⁸⁵

One study conducted in an HMO setting reported significant differences in the use of nicotine gum (measured in pieces of gum per user) by the level of drug co-payment, but the results could not be meaningfully expressed as a percentage-point difference.³⁸⁷ The remaining four studies^{384–86,388} provided four measurements of differences in the use of cessation therapies and four measurements of differences in tobacco use cessation among study populations of recruited smokers^{384,386,388} or among a general patient population.³⁸⁵

All four studies observed increases in the use of cessation therapies. In three studies, the absolute percentage difference reported ranged from +6.5 to +28 percentage points (median, +7).^{384–386} In one study, the difference in use was reported as an adjusted odds ratio of 2.26 (95% CI, 1.60, 3.19).³⁸⁸

All four studies also observed increases in tobacco use cessation, either measured as differences in the observed cessation rates^{384,386,388} or as differences in the overall rates of cessation calculated for the study population.³⁸⁵ In follow-up periods that ranged from 6 to 12 months (median, 9), absolute percentage differences in cessation ranged from +2.1 to +11 percentage points (median, +7.8). In addition, one study reported an adjusted odds ratio for cessation of 1.63 (95% CI, 1.14, 2.35).³⁸⁸

Review of evidence: applicability. The same body of evidence used to assess effectiveness was used to assess the applicability of these interventions to different settings and populations. All of these studies were conducted in the United States. Studies were con-

ducted in several settings, including HMOs,^{385,387,388} private practices,³⁸⁶ and a Department of Defense hospital.³⁸⁴ Studies were conducted in rural³⁸⁶ and mixed rural–urban settings.^{385,388} One study was conducted among a low-income population.³⁸⁶

Review of evidence: other positive or negative effects. One study observed an increase in the extended use of nicotine gum beyond the recommended duration (4 months).³⁸⁶ No other potential benefits or harms were identified in this review.

Review of evidence: economic. Of two studies reviewed,^{385,386} one was conducted in Washington State and reported program cost per quitter.³⁸⁵ This study was conducted in a health care setting for employees enrolled in a health plan. The intervention consisted of insurance coverage for patients in a behavioral program that included nicotine replacement, with a 12-month follow-up. There were four types of insurance coverage, which differed according to the user's out-of-pocket-costs: (1) a 50% copayment for the behavioral program and the usual \$5 copayment per prescription for nicotine-replacement therapy (standard coverage); (2) a 50% copayment for both the behavioral program and nicotine-replacement therapy (reduced coverage); (3) no copayment for the behavioral program but a 50% copayment for nicotine-replacement therapy (flipped coverage); and (4) no copayment for the behavioral program and the usual \$5 copayment per prescription for nicotine-replacement therapy (full coverage). Costs that were measured included drugs, personnel, and cost of the behavioral program. Development, marketing, and implementation of the coverage plan were not included in the analysis. The adjusted program costs per quitter were \$135, \$141, \$149, and \$195 for standard, reduced, flipped, and full coverage, respectively. This study was classified as good, based on the quality assessment criteria used in the *Community Guide*.⁹⁰

The second study was a cost-benefit analysis conducted in Vermont,³⁸⁶ reporting net benefit. This study was conducted at a rural family practice clinic with low-income patients. The intervention consisted of brief physician advice and a prescription for free nicotine gum, with a 6-month follow-up. Costs that were measured included physician time, nicotine gum, smoking cessation booklets, and patient time. Development, promotion, and evaluation costs were not included. The adjusted quit rate for the intervention group was 9.4%. When costs and benefits from averted illness were compared, the intervention was shown to be cost-saving. This study was classified as satisfactory, based on the quality assessment criteria used in the *Community Guide*.⁹⁰ (See also Appendix C, Interpreting the Economic Data.)

Barriers to intervention implementation. Potential barriers to increased use of effective cessation therapies are coverage requirements that tie pharmacotherapy to behavioral therapy interventions. Recent reviews have identified each strategy as effective alone.¹⁴ These combinations demonstrate a higher cost-effectiveness³⁸⁹ but also limit the use of effective therapies for smokers who are unwilling to participate in the behavioral program. These barriers might be reduced by including proactive telephone counseling as a behavioral therapy option.³⁹⁰

Conclusion. According to the *Community Guide's* rules of evidence, sufficient scientific evidence demonstrates that reducing out-of-pocket costs for effective cessation therapies increases both use of the effective therapy and patient tobacco use cessation.

Multicomponent Interventions That Include Patient Telephone Support

Definition. Telephone support interventions provide tobacco product users with cessation counseling or assistance in initiating abstinence, in maintaining abstinence, or both. Telephone support can be reactive (tobacco user initiates contact) or proactive (provider initiates contact or user initiates contact with provider follow-up). Techniques for delivery of telephone support include the use of trained counselors, health care providers, or taped messages in single or multiple sessions. Telephone support sessions usually follow a standardized protocol for providing advice and counseling. The telephone support component is usually combined with other interventions, such as patient education materials, individual or group cessation counseling, or nicotine-replacement therapies.

Background. Telephone contact can increase motivation to tobacco users to attempt to quit and can provide support and assistance to recent quitters to reduce relapses. When implemented in a community setting, the telephone component typically provides access to cessation information, such as self-help materials and available local resources (such as group sessions), and may provide counseling and motivation sessions. When implemented in a clinical setting, telephone follow-up calls usually support other clinical cessation interventions such as provider counseling, group cessation sessions, or nicotine-replacement or other therapies.

Review of evidence: effectiveness. Our search identified 39 studies regarding the effectiveness of telephone cessation support.^{24,232,277,314,343,351,354–356,361,363,391–418} Sixteen additional reports provided information on an already-included study.^{365–367,370–372,376–378,419–425} Four studies with limited quality of execution^{391,394,396,411} and three studies with least-suitable study designs^{24,232,355} were not included in the body of

evidence. Details of the 32 qualifying studies are available at the website (www.thecommunityguide.org).

In all of the qualifying studies, telephone support was coordinated with additional interventions including patient education (29 studies),^{277,343,354,356,361,363,392,393,395,397–399,401–410,412–418} provider-delivered counseling (17 studies),^{314,351,354,356,361,363,392,395,397,398,402,405,410,412–414,416} nicotine replacement (4 studies),^{401,405,413,417} a smoking cessation clinic (1 study),⁴⁰⁰ and a televised cessation series (1 study).²⁷⁷ The qualifying studies included evaluations of telephone support interventions that were proactive (27 studies)^{314,343,351,354,356,361,363,392,395,397–406,409,410,412–414,416–418} or reactive (5 studies).^{277,393,407,408,415}

Of the 32 qualifying studies, 30 reported a total of 31 measurements of differences in patient tobacco use cessation (Figure 6).^{277,343,351,354,356,361,363,392,393,395,397–410,412–416,418} In follow-up periods of 5 weeks to 34 months (median, 12 months), these studies reported absolute percentage differences in cessation, ranging from -3.4 to $+23$ percentage points (median, $+2.6$). Seven measurements from six studies that compared telephone support and patient education to patient education alone^{399,403,404,406,408,418} provided similar results with absolute percentage differences in continuous tobacco use cessation, ranging from $+0.9$ to $+6.3$ percentage points (median, $+2.4$). Five of these six studies evaluated proactive telephone support systems. The median relative percentage difference in tobacco use cessation in these studies was $+41\%$.

Review of evidence: applicability. The same body of evidence used to assess effectiveness was used to assess the applicability of these interventions to different settings and populations. Telephone cessation support interventions have been implemented nationwide,⁴⁰⁷ statewide,⁴¹⁸ and in regions and cities.^{277,399,408,409,415} Studies were conducted in a variety of health care settings, including HMOs,^{314,356,363,392,401,403–406,414,415} private practices,⁴¹² public health clinics,³⁶¹ medical centers and hospitals,^{351,354,398,402,410,412} and resident training programs.^{343,351} Provider specialties included dentistry³⁵⁶; obstetrics, gynecology, and family planning^{343,361,395,397,403,404,412}; primary care^{314,363,392,406}; family practice^{351,363}; and internal medicine.^{351,363} Patient populations included hospitalized smokers,^{354,398,402,405,413,414} veterans,^{413,416} pregnant women,^{343,361,395,403,412} African Americans,⁴⁰⁷ and older (60+ years) smokers.⁴⁰⁹ One study focused on changing smokeless tobacco use.³⁵⁶

Review of evidence: other positive or negative effects. No positive or negative effects of telephone cessation support interventions were identified in this review.

Review of evidence: economic. Five studies were reviewed.^{423,426–429} Two studies reported program costs per quitter,^{427,429} and three studies^{423,426,428} reported

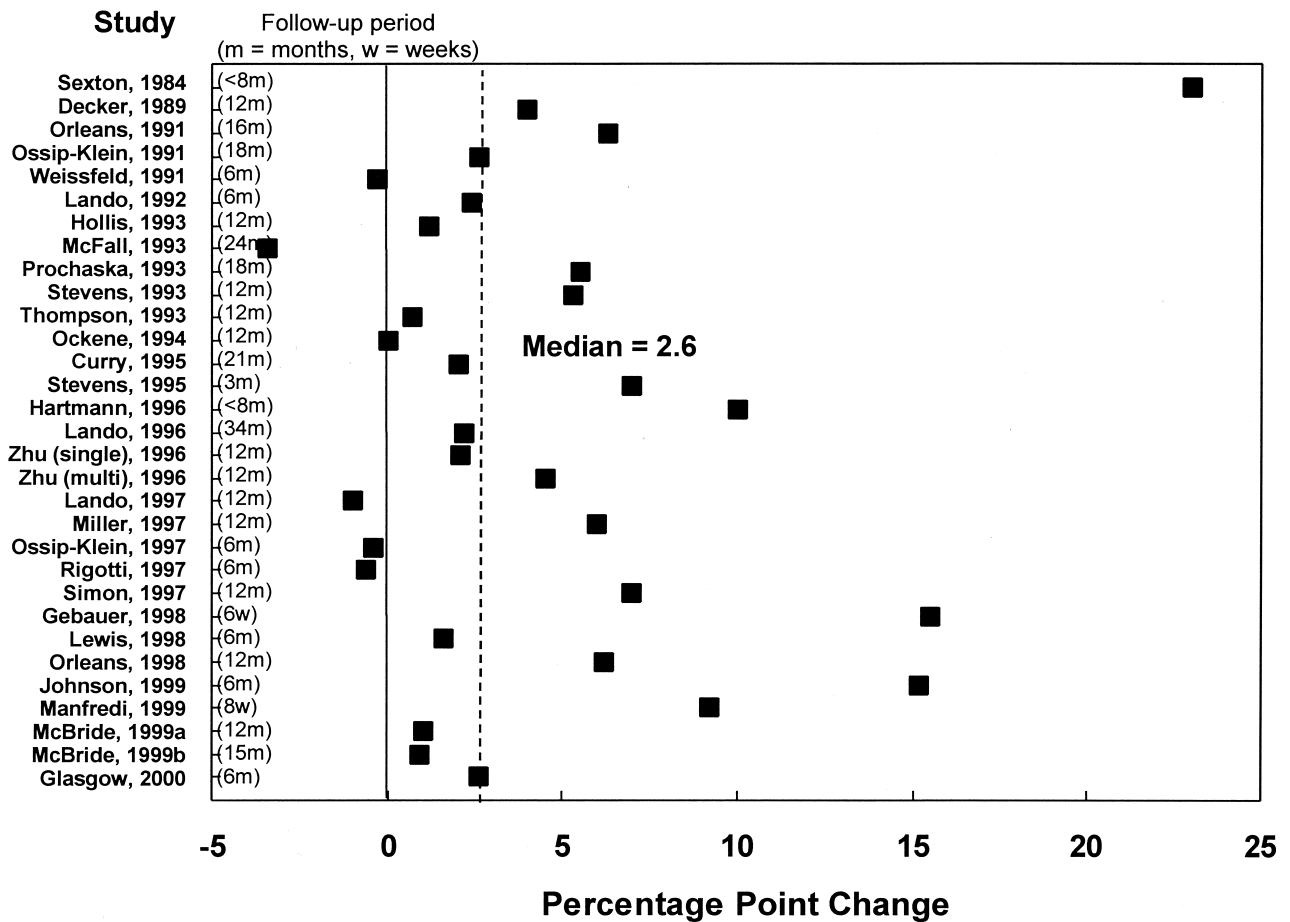


Figure 6. Percentage point change in tobacco use cessation attributable to multicomponent interventions that included telephone cessation support from studies that qualified for inclusion in this review

program costs per life-year saved ratios, which were converted to cost per QALY by using preference weights reported by Fiscella and Franks.²⁴⁹

Both studies reporting program costs per quitter evaluated interventions to increase tobacco use cessation among pregnant women.^{427,429} The first study was conducted in Southern California in an HMO setting.⁴²⁷ The intervention consisted of a combined prenatal nutrition counseling and smoking cessation program aimed at reducing the incidence of low birth-weight infants. The smoking cessation program consisted of an eight-week home correspondence program that included weekly telephone calls to an automated answering service. The absolute percentage change in smoking cessation was +12 percentage points, with a comparison group cessation rate of 38%. Costs included salaries, overhead, supplies, printing, phone, and postage. Adjusted program cost per quitter was \$677. This study was classified as good, based on the quality assessment criteria used in the *Community Guide*.⁹⁰

The second study was a nationwide, modeled intervention in the United States.⁴²⁹ It consisted of a single 15-minute counseling session conducted by a nonmed-

ical counselor, instructional material, and two follow-up telephone calls. The absolute percentage change in cessation was +15 percentage points, modeled from earlier randomized trials of smoking cessation among pregnant women. Costs included instructional materials, staff time, overhead, and training. Adjusted program cost per quitter was \$292. The difference in program cost between the two studies can be explained by the fact that the first study looked at a comprehensive intervention that used more resources. This study was classified as good, based on the quality assessment criteria used in the *Community Guide*.⁹⁰

Of the three studies reporting program costs in terms of life-years saved, two studies^{423,426} looked at interventions conducted in hospital settings with adult patients who smoked. One study was conducted at the Mayo Clinic in Minnesota,⁴²⁶ and the second was conducted at HMO hospitals in Oregon and Washington.⁴²³ The comparison group quit rates for the studies were 10.7% and 9.2%, respectively. The absolute percentage changes were +12 percentage points and +4 percentage points, respectively. The Mayo Clinic intervention consisted of two programs: an individual nicotine-dependency treatment program and a relapse preven-

tion program. The relapse prevention program included telephone follow-up calls, letters, and a mailed survey. The comparison was a group of patients with no program. Costs included personnel, supplies, telephone, drugs, and capital equipment. Adjusted program cost per QALY was \$2532. The HMO hospital intervention consisted of a 20-minute bedside counseling session, a video, self-help materials, and follow-up calls. Costs included program development, personnel, communications, and overhead. Adjusted program cost per QALY of this intervention was \$1248. In comparing the two studies, the Mayo Clinic intervention had a higher program cost per QALY in spite of showing a higher net effect size. This difference occurred because program costs of the Mayo Clinic intervention included letters, surveys, and treatment for nicotine dependency in addition to counseling and telephone calls. These studies were classified as good, based on the quality assessment criteria used in the *Community Guide*.⁹⁰

The third study⁴²⁸ was conducted at a Boston hospital with patients who had had an acute myocardial infarction. The modeled intervention consisted of nurse-managed smoking-cessation counseling, including telephone support after discharge. The comparison group consisted of patients exposed to standard smoking cessation counseling designed for survivors of acute myocardial infarction. The comparison group had a quit rate of 45%. The absolute percentage change was +26 percentage points. Costs included personnel and instructional materials. Time spent on the phone, follow-up time, program development, and training costs were not included. The adjusted program costs per QALY was \$73. This study was classified as good, based on the quality assessment criteria used in the *Community Guide*.⁹⁰ (See also Appendix C, Interpreting the Economic Data.)

Barriers to intervention implementation. One study identified in this review⁴²⁰ reported extremely low utilization of a reactive telephone support line implemented in an HMO setting. Several studies identified in the evaluation of mass media campaigns^{215,229,231,253} observed significant increases in use of telephone cessation services when the mass media messages directed viewers to call for further information or support.

Conclusion. According to the *Community Guide's* rules of evidence, strong scientific evidence exists that telephone cessation support is effective in increasing tobacco use cessation when implemented with other interventions (e.g., other educational approaches, clinical therapies, or a combination) in both clinical and community settings. The minimum intervention with sufficient evidence of effectiveness identified in this evaluation was proactive telephone support combined with patient cessation materials.

Research Issues for Increasing Tobacco Use Cessation: Community-wide Strategies

Effectiveness. The effectiveness of increasing the unit price for tobacco products and mass media campaigns (when implemented with other interventions) is established. However, research issues regarding the effectiveness of these interventions remain.

- What intervention components contribute most to effectiveness of multicomponent interventions? What components contribute the least?
- What are the minimum and optimal requirements for the duration and intensity of mass media campaigns?
- What are the most effective combinations of messages for mass media campaigns?
- Do tobacco users respond differently to changes in product price that result from excise tax increases than to industry-induced increases?
- How long do the effects of a single excise tax increase last?

Because the effectiveness of mass media cessation series and smoking cessation contests has not been established, basic research questions remain.

- Are these interventions effective in increasing tobacco use cessation in the population?
- Do recruited tobacco users exposed to these interventions quit at a greater rate than recruited tobacco users not exposed to these interventions?
- What are the rates of participation in these interventions?

Applicability. The effectiveness of increasing the unit price and of mass media campaigns in reducing tobacco use in the population is established. However, identifying differences in the effectiveness of each intervention for specific subgroups of the population remains important.

- Do significant differences exist regarding the effectiveness of these interventions, based on the level of scale (i.e., national, state, local) at which they are delivered?
- What are the effects of mass media campaigns among populations that differ by race and ethnicity?

Other positive or negative effects. Several potential negative effects of tobacco product price increases were reviewed in this evaluation. Although further research on the potential negative effects is warranted, evaluating the effect of potential positive effects of reductions in tobacco use should also be investigated to provide a complete picture of the effects of increases in state and federal excise taxes.

- What are the effects of these interventions on reducing smoking-related fires? What are the effects on ETS exposure?
- What proportion of smokers substitute tobacco products, modify their smoking habits, or both in response to an increase in the price of tobacco products? How much of the potential health benefit of a price increase is reduced by these behaviors? How can these potential problems be reduced?
- Do mass media campaigns that focus on tobacco have additional effects on other drug use?

Economic evaluations. The available economic information on mass media campaigns was limited. Considerable research is, therefore, warranted regarding the following questions:

- What are the costs of mass media campaigns, especially campaigns that achieve an effective intensity over an extended duration?
- How do the costs per additional quitter compare with other interventions intended to reduce tobacco use?
- What is the cost-benefit, cost-utility, or cost per illness averted of these interventions?

Barriers. Implementation of these interventions requires political action and support. Research issues generated in this review include the following:

- What components of successful legislative and referendum campaigns are most effective? What components are least effective?
- What information is most important in gaining public support for these interventions? In gaining legislative support?
- What are the most effective ways to maintain adequate funding levels for mass media campaigns?

Research Issues for Increasing Tobacco Use Cessation: Health Care System-Level Strategies

Effectiveness. The effectiveness of recommended and strongly recommended interventions in this section (i.e., multicomponent provider reminder plus provider education with or without patient education materials; provider reminder systems alone; multicomponent interventions that include telephone cessation support; and reduction of patient out-of-pocket costs for cessation) is established. However, research issues regarding the effectiveness of these interventions remain.

- Which characteristics of provider-based interventions contribute to increased or decreased effectiveness?
- What are the least and most effective combinations of services in multicomponent interventions?
- What is the effect of provider reminder systems on patient tobacco use cessation when implemented alone?

- What is the relative effectiveness of provider reminders that focus on determination of patient tobacco use status versus reminders that prompt for delivery of advice to quit?
- How do content and method of delivery of provider reminders relate to effectiveness?
- Can reducing patient costs for effective cessation services increase the effectiveness of provider-based interventions?
- What is the most effective level of implementation for telephone cessation support services?
- Is the use and effectiveness of telephone cessation support increased when community and clinical cessation support programs are coordinated?

Because the effectiveness of two interventions (provider education when used alone and provider feedback systems) has not been established, basic research questions remain. This is especially true for provider assessment and feedback systems for which the number of available studies was small.

- What are the effects of provider assessment and feedback interventions on provider delivery of advice to quit to tobacco-using patients? On patient tobacco use cessation?
- What is the effectiveness of HEDIS, as a form of assessment, feedback, and benchmarking, in improving patient receipt of advice to quit and patient tobacco use cessation? Does effectiveness vary by practice setting?
- What frequency, duration, and format of provider education efforts are required to obtain consistent improvements in provider performance and patient response?

Applicability. Each recommended and strongly recommended provider-based intervention should be applicable in most relevant target populations and settings. However, possible differences in the effectiveness of each intervention for specific subgroups of patient and provider populations could not be determined. Several questions regarding the applicability of these interventions in settings and populations other than those studied remain.

- Do provider-based interventions differ in effectiveness in different patient populations?
- Are provider-based interventions effective in increasing cessation or in reducing initiation in adolescent populations?
- Do significant differences exist regarding the effectiveness of these interventions, based on the level of scale at which they are delivered?

Other positive or negative effects. With the exception of the use of provider reminder systems to prompt action on other preventive services, studies in this review did not report on other positive and negative

effects of these interventions. Research on the following questions would be useful:

- Do provider-based interventions for tobacco use cessation interfere with office flow or efficiency? If so, how can this effect be minimized?
- Do provider-based interventions increase or decrease the delivery of other preventive services?

Economic evaluation. Available economic information was limited in this section. Considerable research is warranted regarding the following questions:

- What are the costs for provider-based interventions?
- What are the costs for patient-based interventions?
- How do the costs per additional quitter compare with other interventions intended to reduce tobacco use?
- What is the cost-benefit, cost-utility, or the cost per illness averted of these interventions?
- What is the cost-effectiveness for provider interventions that target tobacco alone compared with provider interventions that target multiple preventive services?

Barriers. Research questions regarding the potential barriers identified for the interventions evaluated in this section include the following:

- How can provider-based interventions that place minimal administrative burden on providers or systems be implemented?
- What information is needed to overcome potential barriers to the implementation of provider assessment and feedback interventions?
- What information is needed to overcome potential barriers to reducing patient out-of-pocket costs for effective cessation therapies?
- What is the effect on use of combining effective pharmacologic therapies and behavioral programs as a criterion for reimbursement? What is the effect on use and effectiveness if these cessation options are provided independently?

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Appendix A Methods

In the *Guide to Community Preventive Services: Systematic Reviews and Evidence-Based Recommendations* (the *Community Guide*), evidence is summarized regarding (1) the effectiveness of interventions; (2) the applicability of evidence data (i.e., the extent to which available effectiveness data might apply to other populations and settings); (3) other positive or negative effects of the intervention, including positive or negative health and nonhealth outcomes; (4) economic effect; and (5) barriers to implementation of interventions. The process that was used to systematically review evidence and then translate that evidence into the conclusions made in this review involved the following:

- forming an evidence review and chapter development team;
- developing a conceptual approach to organizing, grouping, and selecting interventions;
- selecting interventions to evaluate;
- searching for and retrieving evidence;
- assessing the quality of and abstracting information from each study;
- assessing the quality of and drawing conclusions about the body of evidence of effectiveness;
- translating the evidence of effectiveness into recommendations;
- considering data regarding applicability, other effects, economic effect, and barriers to implementation; and
- identifying and summarizing research gaps.

This appendix summarizes how these methods were used in developing the reviews of selected interventions to reduce tobacco use and exposure to environmental tobacco smoke (ETS). The *Community Guide's* methods for systematic reviews and linking evidence to recommendations have been published elsewhere.¹

The reviews of strategies to reduce tobacco use and ETS exposure were produced by a multidisciplinary team of national and regional experts that represent a variety of perspectives on tobacco prevention and control (see authorship and acknowledgment lists). The chapter development team drafted the conceptual approach to the chapter (see text).

Selecting Interventions for Evaluation

The intervention reviews included in this review were selected for evaluation by the chapter development team. An initial, comprehensive list of interventions in the areas included in the conceptual approach (i.e., strategies to reduce ETS exposures, strategies to reduce tobacco use initiation, and strategies to increase cessation) was generated and then reviewed. By consensus, the members of the consultation team then established

a priority list of interventions to include in the review. Instructions to the consultants were to consider interventions that are widely practiced (whether considered effective or not) and interventions they considered important (even if not widely recognized, evaluated, or implemented).

The priority list that resulted contained 10 intervention categories. Subsequent work resulted in an expansion of some categories to include more than one distinct intervention (e.g., we eventually identified several subtypes of mass media education). Some interventions could be applied to more than one goal and were eventually evaluated for all applicable goals (e.g., increasing the unit price for tobacco products was evaluated both for reducing initiation and for increasing cessation). The initial priority strategies and the expanded list of interventions are presented in Table A-1.

Interventions Not Reviewed

Time and resource constraints precluded the review of all of the proposed interventions, including some interventions identified within priority strategies, such as the following:

- Patient cessation support conducted by mail (including computer-generated messages)
- Worksite tobacco cessation interventions (such as group cessation meetings)
- Community-wide risk factor screening and counseling
- Community-wide distribution of self-help cessation materials

Some of these interventions were components of multicomponent strategies that were evaluated for this review.

Search for Evidence

Electronic searches for literature were conducted in Medline, EconLit, and the database of the Office on Smoking and Health (OSH). The OSH database, a focused database of tobacco prevention and control articles, was so complete that we did not conduct searches of additional electronic databases. We also reviewed the references listed in all retrieved articles and consulted with experts on the chapter development team. With very few exceptions (e.g., one final report to the Robert Wood Johnson Foundation), included studies were published in journals. To be included in the review, a study had to

- have a publication date of 1980 to May 2000;
- address at least one area in our conceptual framework (ETS, initiation, cessation);
- be a primary study rather than, for example, a guideline or review;
- take place in an industrialized country or countries;

Table A-1. Priority interventions selected for review

Priority strategy selected for review	Interventions
Increasing the unit price for tobacco products	Increasing the unit price, reducing initiation Increasing the unit price, increasing cessation
Health care system-level interventions	Provider reminder + education ± patient education Provider reminder Provider education Provider feedback Patient telephone cessation support (multicomponent) Reducing patient out-of-pocket costs
Mass media education	Mass media campaigns, reducing initiation Mass media campaigns, increasing cessation Mass media cessation series Cessation contests
Tobacco industry restrictions	Evaluations in progress ^a
Product use restrictions	Smoking bans and restrictions
Youth access restrictions	Evaluations in progress ^a
School-based education	Evaluations in progress ^a
Site-specific interventions	Smoking bans and restrictions are applicable Other strategies were not evaluated in this review ^b
Community education	Education to reduce ETS exposures in the home Other strategies were not evaluated in this review ^b
Personal and home education	Not evaluated in this review ^b

^aEvaluations of these interventions will be published separately but included in the full chapter.

^bSee the discussion.

ETS indicates environmental tobacco smoke.

- be written in English;
- meet the evidence review and the *Community Guide* chapter development team's definition of the interventions;
- provide information on one or more outcomes related to the analytic frameworks; and
- compare a group of people who had been exposed to the intervention with a group of people who had not been exposed or who had been less exposed. (The comparisons could be concurrent or in the same group over a period of time.)

Our initial database searches were conducted in January 1998. A second database search was conducted in August 1999. Any study added after August 1999 was referred by members of the chapter development team or identified in the reference lists of retrieved articles.

Abstraction and Evaluation of Studies

Each study that met the inclusion criteria was read by two reviewers, who used a standardized abstraction form to record information from the study. Any disagreements between the reviewers were reconciled by consensus among the development team members. In

addition, to ensure a consistent application of assessments of study design suitability and limitations in execution quality within the body of evidence for each intervention, every evaluated study was presented and discussed in meetings of the chapter development team.

Assessing the Suitability of Study Design

Design suitability was assessed for every identified study (Table A-2). Our study design classifications, chosen to assure consistency in the review process, sometimes differ from the classification or nomenclature used in the original studies. Non-comparative studies were excluded from further evaluation. With two exceptions, studies with least-suitable designs were also excluded from further evaluations. These two exceptions occurred (1) in our assessment of smoking bans and restrictions in which before–after studies that used environmental measurements of ETS were included in the body of evidence and (2) in our assessment of the effectiveness of increasing the unit price for tobacco products in which national or regional cross-sectional and before–after studies that compared tobacco use

Table A-2. Suitability of study design for assessing effectiveness in the *Guide to Community Preventive Services*

Suitability	Attributes
Greatest	Concurrent comparison groups <i>and</i> prospective measurement of exposure and outcome
Moderate	All retrospective designs <i>or</i> multiple before or after measurements but no concurrent comparison group
Least	Single before and after measurements and no concurrent comparison group <i>or</i> exposure and outcome measured in a single group at the same point in time

Table A-3. Intervention strategies and outcomes of interest

Strategy	Outcomes of Interest
Reduce exposure to ETS	Self-reported exposure to ETS Environmental measurements of ETS components Self-reported tobacco use behaviors Other outcomes (e.g., knowledge or attitudes) if available and relevant
Reduce tobacco use initiation	Self-reported tobacco use behaviors (e.g., use, quantity consumed) Other outcomes (e.g., knowledge or attitudes) if available and relevant
Increase tobacco use cessation	Self-reported tobacco use behaviors (i.e., cessation, use) Population measurements of tobacco product consumption (e.g., state tax-paid sales of cigarettes, usually calculated as cigarette packs per capita) Other outcomes (e.g., knowledge or attitudes) if available and relevant
Health care system cessation interventions	Measurements of provider identification of patient smoking status (chart documented, patient self-reported receipt) Measurements of provider delivery of advice to quit to tobacco-using patients (chart documented, patient self-reported receipt) Measurements of patient use of cessation therapies (such as nicotine replacement)

ETS indicates environmental tobacco smoke.

prevalence and price by jurisdiction were included in the body of evidence.

Assessing the Quality and Summarizing the Body of Evidence of Effectiveness

Quality of study execution was systematically assessed following the published *Community Guide* methods and abstraction form.^{1,2} The abstraction form organizes potential limitations in execution into the following eight categories:

- definition and selection of study and comparison population(s);
- definition and measurement of exposure and intervention;
- assessment of outcomes;
- follow-up and completion rates;
- bias;
- data analysis;
- confounding; and
- miscellaneous criteria (e.g., lack of statistical power).

Execution of each study was characterized as good, fair, or limited, based on the total number of categories with limitations. Good studies had none or one assessed limitation; fair studies, two to four; and limited studies, five or more. Studies with limited execution were excluded from analysis.

We abstracted information from the studies regarding the outcomes of interest specific to the intervention under evaluation. Within each strategy, however, the outcomes of interest were similar in most cases (Table A-3).

Unless otherwise noted, we represented results of each study as point estimates for the change in the tobacco use behavior (or provider behavior) attributable to the interventions. We then calculated percentage-point changes (absolute percentage change) and baselines by using the following formulas:

- For studies with before and after measurements and concurrent comparison groups:

$$(I_{\text{post}} - I_{\text{pre}}) - (C_{\text{post}} - C_{\text{pre}}); \text{baseline} = I_{\text{pre}}, \text{ where:}$$

I_{post} = last reported tobacco behavior or status in the intervention group after the intervention;

I_{pre} = reported tobacco behavior or status in the intervention group immediately before the intervention;

C_{post} = last reported tobacco behavior or status in the comparison group after the intervention;

C_{pre} = reported tobacco behavior or status in the comparison group immediately before the intervention.

- For studies with post measurements only and concurrent comparison groups (common in cessation studies performed on recruited tobacco users):

$$I_{\text{post}} - C_{\text{post}}; \text{baseline} = C_{\text{post}}$$

- For studies with before and after measurements but no concurrent comparison:

$$I_{\text{post}} - I_{\text{pre}}; \text{baseline} = I_{\text{pre}}$$

When effect measures reported by the authors could not be converted into percentage-point changes (e.g., adjusted odds ratios for tobacco use cessation), the reported findings were described in the text. We rep-

resented data on the effect of smoking bans and restrictions on ETS exposure as relative percentage changes ($(I_{\text{post}} - I_{\text{pre}})/I_{\text{pre}} * 100$). For the interventions that were multicomponent mass media campaigns, a subset of studies reported changes in terms of cigarette packs per capita per month or per year. We converted those differences into relative percentage changes $(I_{\text{post}} - I_{\text{pre}}) - (C_{\text{post}} - C_{\text{pre}})/I_{\text{pre}} * 100$ to facilitate comparisons. As noted in the main text, effects of interventions to increase the unit price for tobacco products were expressed as price elasticity of demand measures.

We often had to select among several possible effect measures for inclusion in our summary measures of effectiveness. When available, we used measures adjusted for potential confounders in multivariate analysis in preference to crude effect measures. In studies of tobacco use cessation, where possible, we selected effect measures of verified rather than self-reported cessation, and continuous cessation (duration usually of 3 or more months) over cessation of less than 3 months' duration. No studies were excluded from evaluation strictly on the basis of an insufficient follow-up period. In one study, cessation duration of 1 week was recorded instead as a measure of cessation attempts.

To summarize the findings regarding the effectiveness of an intervention across the studies in a body of evidence, we displayed results of individual studies in tables and figures and reported median and range of effect measures. We summarized the strength of the body of evidence based on numbers of available studies, strength of their design and execution, and size and consistency of reported effects as described in detail elsewhere.¹

Several assumptions were made in the assessment of the evidence of effectiveness.

- Changes in prevalence of tobacco use among populations of adolescents represent both changes in tobacco use initiation and any changes in adolescent cessation. In our review, changes in prevalence of tobacco use in adolescents were attributed to changes in initiation.
- Changes in population consumption of tobacco products (as measured in tax-paid sales of cigarettes) include changes in tobacco use cessation. Population changes represent the combined effect of changes in cessation, changes in initiation, and changes in consumption by continuing tobacco users. In our review, changes in population consumption were attributed to changes in cessation. Because the effect of new users on population tobacco consumption is significantly smaller, we did not consider changes in population consumption of tobacco products as evidence of effectiveness in reducing tobacco use initiation.

Other Effects

The *Community Guide* reviews of interventions to reduce tobacco use and ETS exposure routinely sought information on other effects (i.e., positive and negative health or nonhealth "side effects"). We sought evidence of potential harms of these population-based interventions if they were mentioned in the effectiveness literature or thought to be of importance by the chapter development team. In almost all cases, additional outcomes were not specifically addressed in the reports that we reviewed.

One exception deserves mention here. We evaluated the evidence of effectiveness of smoking bans and restrictions on tobacco use behaviors, such as daily consumption, cessation attempts, and successful cessation. Although several studies demonstrated an effect of smoking bans on increasing tobacco use cessation, other studies did not observe an effect. In addition, recent studies that measured an effect in analyses of cross-sectional survey data did not meet our study-design criteria for evaluation of effectiveness. For now, the potential effects on consumption and cessation are presented as an additional positive benefit of smoking bans and restrictions. Additional evidence of effectiveness from longitudinal studies could eventually result in a determination that smoking bans increase cessation in addition to reducing exposure to ETS.

Economic Evaluations

Methods for the economic evaluations in the *Community Guide* have been previously published.³ Reviews of economic evaluation studies were performed if the intervention was found to be effective. To be included in the reviews, a study had to

- evaluate interventions found to be effective in the systematic reviews;
- use cost, cost-effectiveness, cost-benefit, or cost-utility analysis;
- provide sufficient detail to enable use and adjustment of results;
- itemize costs or refer to a source of cost data;
- be a primary study rather than a guideline or review;
- be conducted in one or more Established Market Economies^a;
- have a publication date of 1976 to 1999; and
- be written in English.

^aEstablished Market Economies as defined by the World Bank include Andorra, Australia, Austria, Belgium, Bermuda, Canada, Channel Islands, Denmark, Faeroe Islands, Finland, France, Former Federal Republic of Germany, Germany, Gibraltar, Greece, Greenland, Holy See, Iceland, Ireland, Isle of Man, Italy, Japan, Liechtenstein, Luxembourg, Monaco, The Netherlands, New Zealand, Norway, Portugal, San Marino, Spain, St. Pierre and Miquelon, Sweden, Switzerland, the United Kingdom, and the United States.

Of 50 studies screened, 11 were included in the body of evidence. Of the 39 studies excluded, 13 looked at clinical interventions, 8 looked at interventions with insufficient evidence of effectiveness, 6 looked at other community interventions not covered within the scope of this review, and 12 failed other inclusion criteria. The 11 included studies did not conduct true cost-effectiveness analyses, because they included only program costs but not costs of illness averted (and, thus, overstated the net costs of the intervention). Because of this limitation, and regardless of the titles given by the authors, these studies were reclassified as cost analysis and, therefore, a cost per unit outcome ratio was calculated. A standardized abstraction form (available at www.thecommunityguide.org, on the tab for The Guide, select Methods, then select Economic Abstraction form) was used for abstracting and adjusting data to meet the reference case suggested by the Panel on Cost-Effectiveness in Health and Medicine.⁴ Costs were adjusted to 1997 U.S. dollars. An example of the summary table of results is available at the website (www.thecommunityguide.org).

Summarizing Barriers to Implementation of Interventions

Information regarding barriers to implementation of the interventions was abstracted from reviewed studies, evaluated on the suggestion of the chapter development team, or both. In some cases, additional information was obtained. For several reviews, we included references to more detailed descriptions. Information on barriers did not affect recommendations of the TFCPS.

Summarizing Research Gaps

Systematic reviews in the *Community Guide* identify existing information on which to base public health conclusions. An important additional benefit of these reviews is identification of areas where information is lacking or of poor quality. To develop these sections, we used the following process:

- We identified remaining research questions for each intervention evaluated.
- In cases of interventions for which evidence of effectiveness was sufficient or strong, we summarized remaining questions regarding effectiveness, applicability, other effects, economic consequences, and barriers.

- In cases of interventions for which evidence of effectiveness was insufficient, we summarized remaining questions regarding effectiveness and other effects. We summarized applicability issues only if they affected the assessment of effectiveness. We decided that it would be premature to identify research gaps in barriers or economic evaluations before effectiveness was demonstrated.
- For each category of evidence, we identified issues that had emerged from the review, based on the informed judgment of the intervention review team. Several factors influenced that judgment. In general,
 - If no information or inadequate information existed to draw a conclusion regarding effectiveness, applicability, other effects, or economic evaluations, we listed these as evidence gaps.
 - When a conclusion was drawn regarding evidence, we applied team judgment to decide if additional issues remained.

In terms of effectiveness,

- If effectiveness was demonstrated by using some but not all outcomes, we did not necessarily list all other possible outcomes as evidence gaps.

In terms of applicability,

- If the available evidence was thought to generalize, we did not necessarily identify as evidence gaps all subpopulations or settings where studies had not been done.

And in terms of methods,

- Within each body of evidence, the intervention review team considered whether overriding methodologic issues existed.

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Appendix B

Appendix B-1: Studies Measuring the Effect of Smoking Bans and Restrictions on Reducing Exposure to Environmental Tobacco Smoke (ETS)

Author & year (study period) Design suitability: design Quality of execution (# of Limitations) Evaluation setting	Intervention and comparison elements	Study population description	Effect measure	Results			
				Reported baseline	Reported effect	Value used in summary	Follow-up time
Becker 1989b ¹ (1987) Least: Before-After Good (1) Hospital	Location: USA; Baltimore, MD Components: Smoking ban implemented in the Medical Center + employee education Comparison: Before-After	n=9 randomly selected locations within the Medical Center (several locations were tested; results here for lounge areas)	1) Average nicotine vapor concentrations in tested lounge areas (7 day collections) $\mu\text{g}/\text{m}^3$	13.01	0.48	-12.53 $\mu\text{g}/\text{m}^3$ p=0.03 (-96%)	6 mo
Borland 1992 ² (1990) Least: Cross-sectional Survey Good (1) Workplace	Location: USA, California Components: Workplace smoking policies (smoke-free; work area ban only; other; none) Comparison: Worksites without smoking policies/restrictions	Employed, non-smoking, adult respondents to the 1990 California Tobacco Survey n=7002 (analysis)	1) Self-reported work area ETS exposure Note: Logistic regression analysis for nonsmokers' work area exposure to ETS	51.4% (no policy)	9.3% (smoke-free) 23.2% (work area ban only) Smoke-free vs Area ban only	-42.1 pct pt(-82%) Adj OR =8.46 95%CI(5.51,12.9) -28.2 pct pt(-55%) -13.9 pct pt(-60%) Adj OR =2.81 95%CI(1.92, 4.12)	NA NA NA
Broder 1993b ³ (1989-1990) Least: Before-After Good (1) Workplace (public sector)	Location: Canada; Toronto Components: Workplace smoking ban Comparison: Before-After	Study buildings n=3, 8-12 sampled worksite sectors of each floor	1) Mean measurements of environmental air samples (units differ) Volatiles (V) Carbon dioxide(CD) Carbon monoxide(CM) Particulates (Pa)	V=1.6 CD=491 CM=0.003 Pa=0.023	V=0.9 CD=481 CM=0.004 Pa=0.014	-0.7 (-44%) p=0.0007 -10 (-2%) p=0.03 +0.001(+33%) NS -0.009 (-39%) NS	12 mo
Brownson 1995 ⁴ (1992-1993) Moderate: Time Series Fair (2) Workplace; Community	Location: USA, Missouri Components: Smoking restrictions and community education Comparison: Before-After	BRFSS sample n=6052 (resp rate 73%) Adult, employed, never or former smokers n=(not reported)	1) Self-reporting exposure to environmental tobacco smoke in the workplace	44.2 % (\pm 2.6)	Post 1: 33.2 % (\pm 6.3) Post 2: 34.7 % (\pm 4.1)	-11 pct pt (-24.9%) p=0.01 -9.5 pct pt (-21.5%) p<0.001	1-4 mo 5-16 mo

Appendix B-1 Continued

Author & year (study period) Design suitability: design Quality of execution (# of Limitations) Evaluation setting	Intervention and comparison elements	Study population description Sample size	Effect measure	Results			Follow-up time
				Reported baseline	Reported effect	Value used in summary	
Elter 1999 ⁵ (1995-1996) Greatest: Other design with a concurrent comparison group Fair (4) School; Workplace (University of Geneva)	Location: Switzerland; Geneva Components: University smoke free program; Smoking restrictions + smoking cessation services Comparison: Participants less exposed to smoking restrictions	Probability sample of University students, faculty, and staff; n=2908 eligible Baseline n= 2237 (77%) I=833 C=1023 4m f/u (cohort) n=1856 (64%)	1) Scale response of self-reporting exposure to environmental tobacco smoke on campus ("Never"=0; "Very often"=100)	I=53.3 C=51.2	I=49.3 C=45.1	overall +2.1 pts (+3.9%) p=0.13	4 mo
Gottlieb 1990 ⁶ (1987-1988) Moderate: Time Series Fair (3) Workplace	Location: USA; Texas, Components: Worksite smoking restriction (Texas Dept of Human Services) Comparison: Before-After	Survey sample of employees Pre: n=2158 82.2% resp rate Post 6m: n=2205 52.7% resp rate	1) Self-reported exposure to coworkers' smoke ("never bothered by")	41.3%	80.1% (p<0.001)	+38.8pct pt (94%)	6 mo
Millar 1988b ⁷ (1986-1987) Least: Before-After Good (1) Workplace	Location: Canada, Ontario Components: Workplace smoking restrictions Comparison: Before-After	Workplace locations n=12	1) Mean respirable suspended particulate levels ($\mu\text{g}/\text{m}^3$) at each location; (By location) 1) A-7th floor, 2) A-9th floor 3) B-3rd floor 4) B-15th floor	1)30 $\mu\text{g}/\text{m}^3$ 2)28 $\mu\text{g}/\text{m}^3$ 3)35 $\mu\text{g}/\text{m}^3$ 4)47 $\mu\text{g}/\text{m}^3$	22 $\mu\text{g}/\text{m}^3$ 22 $\mu\text{g}/\text{m}^3$ 18 $\mu\text{g}/\text{m}^3$ 25 $\mu\text{g}/\text{m}^3$	-8 $\mu\text{g}/\text{m}^3$ (-27%) p<0.001 -6 $\mu\text{g}/\text{m}^3$ (-21%) p<0.05 -17 $\mu\text{g}/\text{m}^3$ (-48%) p<0.01 -22 $\mu\text{g}/\text{m}^3$ (-47%) p<0.001	1 year
Mullooly 1990 ⁸ (1985-1987) Moderate: Time Series Fair (2) Workplace; HMO	Location: USA, Oregon Components: Worksite smoking ban (some facilities in 1985 and the rest in 1986) Comparison: Before-After (including a comparison with expected outcomes based on projected trends 1976-1984)	Employees n=13,736 overall; 1985 facilities ban n=5590 (resp rate 70%) 1986 facilities ban n=8146 (resp rate 70%)	1) Self-reported presence of smoke in the workplace: Overall = (Obs post-Obs pre) - (Exp pre-Exp post)	1985 : observed 31% expected 30% 1986: observed 53% expected 43%	1985: obs 10% exp 20% 1986: obs 18% exp 42% NR	Overall: -11 pct pt (-35%) (p<0.05) Overall: -34 pct pt (-64%) (p<0.05) No significant change observed	2 years 1 year

Appendix B-1 Continued

Author & year (study period) Design suitability: design Quality of execution (# of Limitations) Evaluation setting	Intervention and comparison elements	Study population description Sample size	Effect measure Follow	Results			-up time
				Reported baseline	Reported effect	Value used in summary	
Patten 1995a ⁹ (1990-1993) Moderate: Time Series Fair (3) Workplaces (statewide)	Location: USA, California Components: Smoke-free workplace Comparison: Lesser or no work area restrictions; Work area ban only (restriction)	Nonsmoking, adult indoor workers responding to the California Tobacco Surveys of 1990, 92, 93. Yr Resp #nonsm 90 (75%) 8580 92 (73%) 2177 93 (70%) 12,946	1) % nonsmokers self-reported exposure to environmental tobacco smoke in the work area by workplace smoking policy	1993 67.5 (±7.3)% No work area ban 41.1(±6.8)% Work area ban	1993 11.2 (±2.1)% Smoke-free worksite	-56.3 pct pt (-83%) Adj OR=15.09 95%CI (9.8,23.2) Smoke-free vs work area ban (restriction) -29.9 pct pt (-73%) NR	3 years
Stillman 1990b ¹⁰ (1988) Least: Before-After Good (1) Hospital	Location: USA, Baltimore, MD Components: Medical center smoking ban; Smoking cessation program offered to employees Comparison: Before-After	7-day nicotine vapor measures (environmental sampling) Randomly selected locations within the Medical Center; lounge areas n=4, cafeterias n=2 of 3	1) Av. 7-day nicotine vapor concentrations (µg/m ³) in sampled locations Cafeteria Waiting area Staff lounges Restrooms Corridors/elevators	7.06 µg/m ³ 3.88 µg/m ³ 2.43 µg/m ³ 17.71 µg/m ³ 2.28 µg/m ³	0.22 µg/m ³ 0.28 µg/m ³ 0.12 µg/m ³ 10.0 µg/m ³ 0.20 µg/m ³	-6.84 µg/m ³ (-97%) p=0.0007 -3.6 µg/m ³ (-93%) p=0.0003 -2.31 µg/m ³ (-95%) p=0.003 -7.71 µg/m ³ (-44%) NS -2.08 µg/m ³ (91%) p=0.02	8 mo

BRFSS indicates Behavioral Risk Factor Surveillance System; C, comparison group; CI, confidence interval; Exp, expected; f/u, follow-up; I, intervention group; NS, not significant; Obs, observed; OR, odds ratio; pct pt, percentage point.

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Appendix B-2: Studies Measuring the Effect of Smoking Bans and Restrictions on Tobacco Use Behaviors

Author & Year (study period) Design suitability: design Quality of execution (# of Limitations) Evaluation setting	Intervention and comparison elements	Study population description Sample size	Effect measure	Results			Follow -up time
				Reported baseline	Reported effect	Value used in summary	
Biener 1989 ¹ (1985-1986) Greatest: Other design with a concurrent comparison group Fair (2) Hospital	Location: USA, Rhode Island Components: Hospital smoking restriction Comparison: Hospital with fewer smoking restrictions	Hospital Employees Int: n=82 Post: n=110 Comp: n=83 Post: n=104	1) Self-reported consumption of cigarettes (cigs/day): ^a At work At home 2) Self-reported smoking cessation attempt in the 6 months prior to interview ^b 3) Self-reported smoking prevalence ^c	Int: 8.4±2.5 Comp: 7.6±2.6 Int: 12.8±2.5 Comp: 13.3±4.1 Int: 4% Comp: 30% Int: 34.1% Comp: 27.7%	Int: 4.5±1.4 Comp: 6.9±2.0 Int: 10.6±3.1 Comp: 9.2±2.6 Int: 0% Comp: 19% Int: 20.0% Comp: 25.0%	Work: -3.2 cigs/dy Home: +1.9cigs/dy Overall: -1.3cigs/dy +7 pct pt NS (+175%) -11.4 pct pt (-33%)	12 mo
Brigham 1994 ² (1989) Greatest: Group non- randomized trial Fair (4) Hospital	Location: USA; Baltimore, MD Components: Hospital smoking ban Comparison: Hospitals without smoking restrictions	Recruited smoking employees n=92 n=67 (73%) completed Int=34 Comp=33	1) Self-reported consumption during working hours: cigs/shift (SD) ^a 2) Self-reported cessation ^d	Inter: 7.57(±4.7) cigs/shift Comp: 10.02(±2.9) cigs/shift 0%	I: 3.64 (4.9) c/s C: 9.53 (4.8) c/s 0%	-3.44 cigs/shift F(1,65)=15.9 p<0.0001 0 pct pt (0%) NS	4 wks 4 wks
Etter 1999 ³ (1995-1996) Greatest: Other design with a concurrent comparison group Fair (4) School; Workplace (University of Geneva)	Location: Switzerland; Geneva Components: University smoke free program; Smoking restrictions + smoking cessation services Comparison: Participants less exposed to smoking restrictions	Probability sample of University students, faculty, and staff, n=2908 eligible Baseline n= 2237 (77%) I=833 C=1023 4m f/u (cohort) n=1856 (64%)	1) Self-reported consumption (cigs/day) by smokers ^a 2) Self-reported smoking cessation attempts in the last 4 months ^b 3) Self-reported current smoker status ^d	I=11.4 cigs/day C=11.4 cigs/day I=2.0% C=3.5% I=24.8% C=27.2%	I=11.7 cigs/day C=12.0 cigs/day I=3.8% C=3.5% I=25.1% C=26.7%	overall -0.3 cigs/dy (-2.6%) p=0.53 overall +1.8 pct pt (+90%) p=0.048 overall +0.8 pct pt (+3.2%) p=0.47	4 mo 4 mo 4 mo

Appendix B-2 Continued

Author & year (study period) Design suitability: design Quality of execution (# of Limitations) Evaluation setting	Intervention and comparison elements	Study population description Sample size	Effect measure	Results			Follow-up time
				Reported baseline	Reported effect	Value used in summary	
Gotlib 1990 ⁴ (1987-1988) Moderate: Time Series Fair (3) Workplace	Location: USA; Texas Components: Worksite smoking restriction (Texas Dept of Human Services)	Survey sample of employees Pre: n=2158 82.2% resp rate Post 6m: n=2205 52.7% resp rate	1) Self-reported cigarette consumption of 25+ cigarettes/day ^a 2) Self-reported smoking cessation attempts by current smokers in the last 6 months ^b 3) Self-reported current smoker ^c	19.4% 30.7% 22.9%	16.7% (p<0.001) 30.0% NS 19.5% NS	-2.7 pct pt (-14%) -0.7pct pt (-2.3%) -3.4 pct pt (-15%)	6 mo 6 mo 6 mo
Jeffery 1994 ⁵ (1987-1990) Greatest: Prospective Cohort Fair (4) Workplace	Comparison: Before-After Location: USA; Minneapolis-St. Paul Components: Worksite smoking restrictions (Companies that implemented restrictions in the study period) Comparison: No worksite smoking restrictions (Companies without restrictions at baseline and at f/u)	Recruited companies (n=32) Random samples of employees (n=200 at each company)	1) Mean cigarette consumption self-reported by smoking employees (cigs/day) ^a 2) Mean proportion of employees self-reporting cessation attempt(s) in the last 3 months ^b 3) Mean smoking prevalence (self-reported) ^c	I=20.6 C=20.4 I=26.6% C=25.8% I=26.1% C=26.1%	I=18.3 C=20.2 I=21.3% C=21.4% I=23.9% C=23.5%	-2.1 cigs/day (-11.5%) (p=0.01) -0.9 pct pt (-4%) (p=0.91) +0.4 pct pt (+1.5%) (p=0.97)	2 years 2 years 2 years
Longo 1996 ⁶ (1994) Greatest: Other design with a concurrent comparison group Fair (4) Hospitals; Workplace	Location: USA; Communities in 21 states Components: Mandated hospital smoking ban Comparison: Worksites in the community without a smoke-free policy	Communities containing a study hospital, n=26 Random survey samples of employed adult current+former smokers (response rate) Inter: 1469 (84%) Comp: 920 (64%)	1) Self-reported average daily cigarette consumption ^a 2) 1 year post-ban quit ratio ^d quit ratio = #former smokers / #current + #former	NR 0.038 95%CI (0.025, 0.052)	-1.1 cigs/day p=0.01 0.066 95%CI (0.05, 0.082)	-1.1 cigs/day (NA) Adjusted relative risk 1.7 (1.2, 2.4)	1 year 1 year
Mullooly 1990 ⁷ (1985-1987) Moderate: Time Series Fair (2) Workplace; HMO	Location: USA, Oregon Components: Worksite smoking ban (some facilities in 1985 and the rest in 1986) Comparison: Before-After (including a comparison with expected outcomes based on projected trends 1976-1984)	Employees n=13,736 overall; 1985 facilities ban n=5590 (resp rate 70%) 1986 facilities ban n=8146 (resp rate 70%)	1) Self-reported total daily consumption of cigarettes (cigs/day) ^a 2) % self-reporting current smoker status (prevalence) ^c	NR 1985: obs 23.5% exp 23% 1986 obs 19% exp 22%	NR 1985: obs 22% exp 19% 1986: obs 20% exp 22%	No significant change observed Overall +2.5 pct pt (+10.6%) NS Overall +1 pct pt (+5.2%) NS	1 and 2 years 2 years 1 year

Author & year (study period) Design suitability: design Quality of execution (# of Limitations) Evaluation setting	Intervention and comparison elements	Study population description Sample size	Effect measure	Results			
				Reported baseline	Reported effect	Value used in summary	Follow -up time
Patten 1995b ⁸ (1990-1992) Greatest: Other design with a concurrent comparison Fair (4) Workplaces (statewide)	Location: USA, California Components: Workplace smoking policy (smoke-free) Comparisons: Workplace smoking policy not smoke-free Workplace policy changes 1990+1992 Group 1990 1992 Intervention NSF SF Comparison NSF NSF Note: 2 additional study groups not reported here	Respondents to the California Tobacco Survey, analysis on a subset n=1844 indoor workers employed in 1990 and 1992 Intervention n=157 smokers at baseline (1990) Comparison n=217 smokers at baseline (1990)	1) Self-reported mean cigarette consumption (cigs/day) by smokers (Quitters = 0 cigs) ^a 2) % Self-reporting smoking cessation at 1992 interview (95% CI) ^d 3) % Self-reporting smoking relapse at 1992 interview (95% CI) 4) Self-reported smoking prevalence, 1990 and 1992 ^c	Int 14.51 cigs/day Comp 14.86 cigs/day Comparison: 9.2 (±4.9)% Comparison: 3.5 (±3.3)% Int: 20.3% Comp: 26.7%	13.11 cigs/day 14.41 cigs/day Int: -18.8(±8.8)% Int: 3.3 (±4.0)% Int: 19.1% Comp: 26.7%	-1.41 (±2.16) c/dy NS -0.45 (±1.42) c/dy NS Overall difference -0.96 cigs/day (-6.6%) NR (NS) +9.6 pct pt (+104%) NS -0.2 pct pt NS -1.4 pct pt (-6.9%) NS	2 years 2 years 2 years 2 years
Stave 1991 ⁹ (1988-1989) Greatest: Other design with a concurrent comparison group Fair (4) Workplace; Hospital clinics	Location: USA; North Carolina; Duke University Medical Center Components: Medical Center smoking ban Comparison: University employees not subject to the Medical Center smoking ban	Random samples of employees, Medical center n=400; University n=400; (resp rate 91.2%)	1) Self-reported cigarette consumption (cigarettes/day) I=inter; C=Comp ^a 2) % self-reported smoking cessation attempts at 15m f/u ^b 3) % smoking cessation (validated) at 15m f/u ^d 4) % self-reported smoking cessation at 15m f/u ^d	I=18.7 (±13.9) cigs/day C=18.7 (±12.2) cigs/day (retrospective) 45.8% 2.9% (v) 6.9%	I=14.2 (±8.0) C=18.5 (±10.6) 50% 10.8% (v) 22.5%	Overall: -4.3 cigs/day (-23%) (p<0.03) +4.2 pct points (+9.2%) NR +7.9 (v) pct pt (+272%) p<0.03 +15.6 pct pt (+226%) p<0.01	15 mo 15 mo 15 mo 15 mo

C, or Comp indicates comparison group; c/s, cigarettes per shift; CI, confidence interval; exp, expected; F, *f*-test; f/u, follow-up; I, Int, or Inter, intervention group; NR, not reported; NS, not significant; NSF, not smoke-free; obs, observed; pct pt, percentage point; resp, response; SF, smoke-free.

Footnotes:

^aMeasurements of cigarette consumption by smokers.

^bMeasurements of smoking cessation attempts by smokers.

^cMeasurements of tobacco use prevalence in the study populations.

^dMeasurements of smoking cessation.

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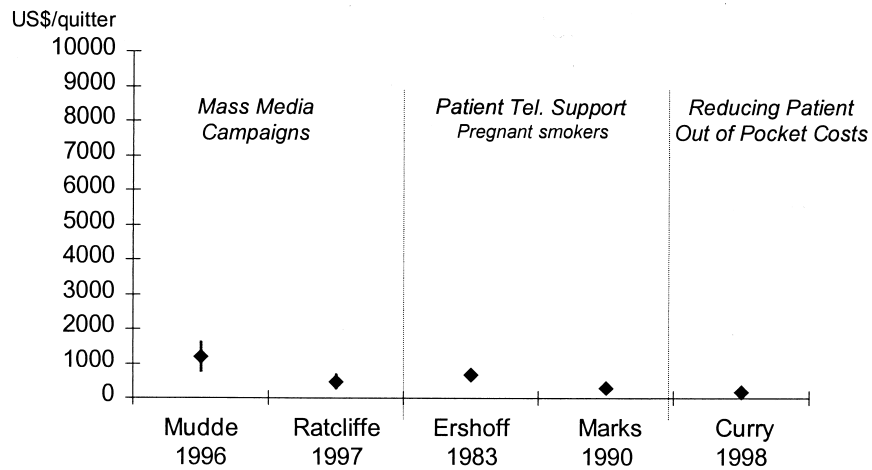


Figure C-1. Adjusted program cost per quitter of three interventions for tobacco use prevention, by author.

Interpreting the Economic Data

Choosing among community-based preventive interventions entails considering such factors as community needs and goals, effectiveness, cost-effectiveness, equity, feasibility, and other social concerns. However, cost-effectiveness is a useful tool for allocating resources among competing preventive services. Thus, bowing to budgetary constraints, selecting options that are more, rather than less, cost-effective could actually result in greater improvements in health.

In general, the economic data reported in the *Community Guide* are most appropriate for comparing interventions aimed at achieving the same goals, such as reducing tobacco-related illnesses. For example, adjusted program costs per quitter (Figure C-1) are relatively close for the three interventions for which we

have data and, although mass media campaigns are relatively more costly than reducing patient out-of-pockets costs, the difference is small.

Comparing the cost-effectiveness of interventions in the *Community Guide* to other preventive interventions requires caution because cost-utility analysis is limited in addressing the efficiency of the allocation of resources from a societal point of view. To paraphrase Gerard and Mooney,¹ if a health care decision maker wishes to take a societal view, then the opportunity cost associated with alternative preventive interventions can no longer be restricted to quality-adjusted life years (QALYs), and the relevant form of analysis ceases to be cost-utility and becomes cost-benefit analysis. With that caveat in mind, three interventions for which we have data (Figure C-2)—tobacco use initiation mass media

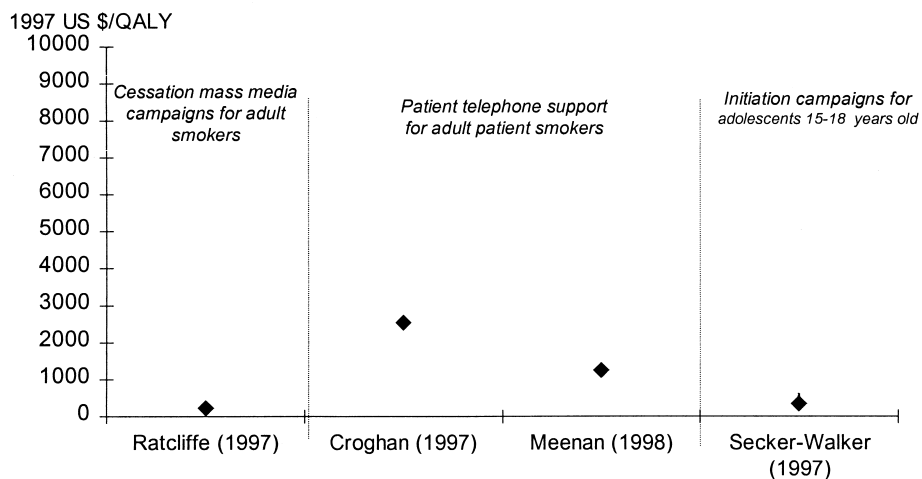


Figure C-2. Adjusted program costs per quality-adjusted life year (QALY) for tobacco use prevention interventions, by author.

campaigns, cessation mass media campaigns, and patient telephone support for adult smokers—were all in the lower end of the range of cost-saving-to-\$1,024,000/QALY reported for other preventive services.² However, the estimation of the ratios reported in the *Community Guide* did not include the offsetting costs (i.e., benefits) from averting disease caused by tobacco smoke. Had the estimation of the ratios included those benefits, and by using Oster's³ range of cost of illness (updated to 1997 values, range from \$155,466 for a male smoker aged 35 to 39 who smoked more than two packs per day to \$2,652 for a female smoker aged 75 to 79 who smoked less than one pack per day), all three interventions would have been shown to be cost-saving.

There are also limitations to both the studies and our adjustment processes. Even generally similar interventions will vary in the exact activities that are included. For example, the two studies we included in our mass media review both had a mass media campaign, but only one had a nine-session group cessation program. Also, type of costs included varied by study, as do resource requirements for similar interventions in different contexts. Changes in the cost per outcome ratio can generally be predicted from changes in the type of costs included in the analysis or changes in the effectiveness of the intervention. The more complex or

intensive an intervention, the larger the amount of resources used. The more comprehensive the list of resources, the higher the cost per outcome ratio. The higher the proportion of labor costs or the higher the level of skill of the personnel involved, the more costly the intervention. The more effective the intervention, the lower the cost per outcome achieved even if the program is more expensive. Furthermore, economic evidence was not available for all the interventions.

In spite of the difficulties presented by the limited number of studies, quality limitations, and challenges of standardization, we believe this information will be useful to the *Community Guide* audience. As the availability and quality of economic data improve, economic information will be increasingly useful for decision making under budgetary constraints.

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