Chapter 4. Initial Outcomes Index

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4. Initial Outcomes Index

Some outcomes of a tobacco control program, such as tobacco use prevalence, may become clear only over a period of many years. Therefore, initial and intermediate outcome measures, which in turn can be related to final outcomes such as smoking prevalence, represent an important tool for program evaluation. This chapter discusses criteria for measurement of initial and intermediate outcomes from tobacco control programs, the development of a specific metric (the Initial Outcomes Index; IOI) for the American Stop Smoking Intervention Study (ASSIST) evaluation, and the IOI's association with final outcomes such as tobacco use prevalence and consumption.

The IOI was formed from three initial outcomes, each of which was significantly correlated with reduced prevalence and consumption levels at baseline in 1993: total cigarette price, a rating of local and state clean indoor air policies, and the percentage of workers covered by 100% smoke-free workplaces. The IOI index value was formed from equal weightings of these three factors, normalized at baseline, because the results of a principal components analysis showed very similar loadings.

Over the period of study from 1992 through 1999, 65% of ASSIST states showed an increase in IOI greater than the mean for all states, versus only 32% of non-ASSIST states. In a comparison of IOI results with final outcomes, IOI showed a significant association with prevalence and consumption levels throughout the study period, whereas the only IOI factor that showed a significant association between changes over time and changes in outcomes was a strong relationship between cigarette price and per capita consumption. Nonetheless, the data produced from this evaluation serve as an important baseline for future efforts to track initial outcomes that relate tobacco control program effects to long-term outcomes.

Introduction

This chapter discusses the process of defining initial outcomes for ASSIST and the criteria used to ultimately define the IOI used in the ASSIST evaluation analysis.[1] As discussed in more detail in chapter 9, part of this analysis examined the relationship between these initial outcomes and other evaluation metrics as well as final outcomes such as tobacco prevalence and per capita consumption. This IOI was designed to serve as a near-term measure for the effectiveness of ASSIST interventions.

In an effective tobacco control program, it is reasonable to expect that early, or initial, outcomes of the interventions would relate to later outcomes, usually defined as declines in tobacco use. However, changing the smoking behavior of a population does not necessarily occur immediately subsequent to a tobacco control program. For

example, increased tobacco taxes are associated with decreased experimental and established smoking among youth,[2] but this effect would not be reflected in smoking prevalence rates for several years. Therefore, policy makers need more proximal measures of program effects to protect and advocate for program funding as well as to evaluate program progress. This chapter explains the concept and importance of measuring initial outcomes and presents criteria for evaluators to consider in defining and selecting those outcomes in their evaluations of program effects, followed by a discussion of the specific initial outcomes selected for the ASSIST evaluation.

For ASSIST, the units of observation for these outcomes were the 50 states of the United States and the District of Columbia. Because only 51 units of observation were available for the ASSIST evaluation, for statistical purposes it was necessary to combine the selected initial outcomes into a single measure, the IOI. The methodology for constructing the ASSIST IOI and its relation to the measures describing the ASSIST final outcomes (reduced adult smoking prevalence and lower adult cigarette consumption rates) are described below. Data for each initial outcome are also described and tabulated.

Tobacco Use Outcome Measures

The two most widely used and generally accepted indicators of population tobacco use are smoking prevalence and per capita cigarette consumption.[3] These measures are used in this chapter and in chapter 9, which provides a comprehensive analysis of final outcomes as part of the evaluation of the ASSIST intervention. This section gives a brief description of the data sources for these measures as used in the ASSIST evaluation.

Adult Smoking Prevalence

Adult (18 years old and older) smoking prevalence estimates for each state and for the District of Columbia were obtained from the Tobacco Use Supplement to the Current Population Survey (TUS-CPS).[4] The baseline prevalence estimates were from the September 1992, January 1993, and May 1993 TUS-CPS, and the estimates at the end of the intervention period were from the September 1998, January 1999, and May 1999 TUS-CPS.[4]

The CPS is a nationwide population survey (civilian, noninstitutionalized population, 15 years old and older) conducted continuously by the U.S. Bureau of the Census for labor force monitoring.[5] Briefly, the CPS includes a probability sample based on a stratified sampling scheme of clusters of four neighboring households identified from the most recent decennial census, updated building permits, and other sources. All strata are defined within state boundaries, and the sample is allocated among the states so that state-specific estimates can be computed. National Cancer Institute (NCI) staff developed the TUS, and trained Bureau of Census interviewers pretested it prior to its implementation.

For the TUS-CPS, all household members 15 years old and older are

asked to answer two questions that determine their current smoking status: (1) whether they have smoked at least 100 cigarettes in their entire life and (2) whether they now smoke cigarettes every day, some days, or not at all. To be considered a current smoker, respondents must answer *yes* to the first question and *every day* or *some days* to the second. If one or more household members are not present at the time of the initial household interview, they are called later and administered the TUS-CPS by telephone. Even so, not all household members answer the TUS-CPS. (The response rate is between 75% and 85%.) The answers on smoking status are obtained from a proxy respondent for each household member not present at the time of the household interview and are replaced with self-response data following the administration of the TUS-CPS. For the present analyses, both proxy and self-report data on smoking status were used. Smoking prevalence was computed as the percentage of all adult respondents who were identified as current smokers.

Per Capita Cigarette Consumption

Until late 1998 when it was disbanded, the Tobacco Institute compiled cigarette sales data monthly in each state for federal tax reporting purposes.[6] Since then, individuals from the institute formed a consulting firm, and now they produce the same data as part of the economic consulting firm Orzechowski and Walker, with support from the tobacco industry.[7] These data are reported annually (November 1 to October 31) to the Federal Trade Commission, which publishes the new data each year along with those from past years.

As these data are from wholesale warehouse removals, there is considerable variation from one month to the next—in particular, the levels of removals in the last month of any quarter are strongly correlated with the removals in the first month of the next quarter. This variation has little to do with actual consumption and likely reflects business practice. To remove this source of variability, data were combined into two-month intervals with December/January, February/March, and so on treated as single intervals. To convert the sales data to per capita cigarette consumption, the mean number of packs removed from warehouses in a given interval was divided by the total population of adults aged 18 years old and older in each state at each bimonthly time point. Annual population totals are available from the U.S. Bureau of the Census,[8–10] and these were interpolated to obtain the population at given times (interval midpoints) during the year. For the analyses described in chapter 9, the bimonthly values were analyzed. For this chapter, generally the data were aggregated for the periods August/September through April/May to correspond to the period when adult smoking prevalence estimates were obtained from the TUS-CPS.

Although a decline in smoking prevalence is generally reflected in a decline in per capita cigarette consumption, the opposite may not occur. Current smokers could choose to smoke less instead of quitting, or new, younger smokers could reach adulthood with a lower level of

consumption than the level of consumption of smokers in previous cohorts. In these situations, prevalence would remain constant, but per capita consumption would decline.

Defining and Selecting Initial Outcomes

Once a tobacco control program is under way, early intervention strategies, if effective, should begin to foster societal changes that will ultimately result in lower smoking prevalence and per capita cigarette consumption. These two results are the final outcomes of the program, and they, in turn, will lead to reductions in smoking-related morbidity and mortality, the public health goals of tobacco control. Comprehensive tobacco control programs with appropriate monetary and human resources undertake a variety of efforts aimed at influencing the social environment, such as the following:

- Educating the public
- Advocating for the enactment of new legislation or policies
- Promoting smoking cessation through clinics and telephone helplines
- Advocating for increased enforcement of laws restricting smoking or restricting sales of tobacco products to minors
- Forming coalitions of advocates to conduct tobacco control efforts[11,12]

Although the effects of each of these efforts on smoking prevalence or cigarette consumption may not be known for years, early effects or reactions in the 0- to 2-year aftermath can be defined and tracked. These effects are initial outcomes. For example, an initial outcome may be the passage of a law that prohibits smoking in public buildings or the adoption by businesses of smoke-free workplace policies. These initial policy outcomes might lead directly to the final outcomes. (For example, a smoker in a smoke-free workplace might smoke less or quit altogether.) However, another outcome, an intermediate outcome, such as enforcement of the law or policy, might be necessary for the final outcome to occur. For example, unless clean indoor air policy is enforced, it may not have an effect on smoking behavior. Whether an outcome is initial or intermediate is usually determined from the strategic plan of the tobacco control program, which sets forth the specific tactics and outcomes expected from those tactics.

Initial and Intermediate Outcomes Versus Other Forces of Change

It is not always clear whether an outcome is an initial or an intermediate outcome or whether it is directly attributable to an intervention's specific activities or to a change that is already occurring in society. While it is generally easier to link an initial outcome to a specific intervention, the link for an intermediate outcome may be somewhat more difficult to establish. These points are illustrated in the examples below.

New legislation pertaining to restricting smoking in the workplace is clearly an initial outcome. However, increased levels of workers' reports of workplace smoking restrictions, more of an intermediate outcome, might come about through means other than just legislation.

Examples of Initial Outcomes

Examples of initial outcomes for the types of efforts mentioned in this section include the following:

- *Awareness of media campaigns.* Media campaigns are one tool that tobacco control programs can use to educate the public. Such campaigns have focused on the health risks that cigarette smoke poses both to smokers and to nonsmokers, especially children. Some campaigns have been primarily informational about the dangers of smoking; others have directly attacked the tobacco industry. A measurable initial outcome of such efforts could be the rate of recall that the public has of specific media campaigns, assessed through surveys. Another outcome might be the change in the population's smoking-related knowledge or attitudes.

- *News coverage.* Calling journalists' attention to important issues related to tobacco (e.g., newly documented adverse health effects, the benefits of new policy initiatives) is a strategy for encouraging the public and policy makers to support the enactment of tobacco control policies. A measurable initial outcome of these media advocacy efforts could be the number of published news stories and editorials that present the issue favorably to tobacco control. With resultant increased public support, an intermediate outcome might be passing legislation that has been associated with quitting smoking (e.g., clean indoor air laws) or better enforcement of current legislation.

- *Use of cessation assistance.* Many comprehensive programs offer smoking cessation assistance to smokers through local programs or statewide telephone helplines. A measurable initial outcome of these programs could be the number of individuals attending the cessation programs or calling the helpline.

- *Enforcement of laws forbidding sales to minors.* At the time a tobacco prevention and control program is implemented, a law might already be on the books that prohibits sales of tobacco to minors, but it is not being enforced. A strategy of the program might be to increase enforcement by working with the local agency that has responsibility for enforcement or to increase compliance by educating merchants about the law and the benefits of enforcing the law. A measure of the initial outcome of these efforts could be the results of sales checks in which minors attempt to buy cigarettes.

- *Formation of coalitions.* As soon as possible in the start-up of a community-based program, all members of the community—usually represented by organizations—who would have an interest in preventing and controlling tobacco use should be invited and involved in planning and conducting the strategies. The initial outcome is the formation of a coalition, which can be measured by the number of members and the type of community representation in the coalition.

For instance, some large corporations, subject to smoke-free workplace laws in some states, extend such policies to cover all of their facilities nationwide. Also, smoke-free policies in some locales are a result of health department regulation rather than legislation. Thus, workers' reports of a 100% smoke-free workplace might be a measure of the reach or strength of legislation or regulation, or the reports might reflect prevailing and expanding social norms.

A little further downstream from the initiation of a tobacco control policy, and more clearly an intermediate outcome, is the level of report of smoke-free homes. Increased population knowledge about the dangers of secondhand smoke would be the initial outcome result from a tobacco control program's media campaign (intervention) to educate the public about the dangers of secondhand smoke. Armed with this knowledge, people then may increasingly decide to restrict or

ban smoking altogether in their homes. However, tracking that decision to an intervention is not necessarily straightforward; other program elements, including workplace smoking restrictions, may have influenced or facilitated the decision to have a smoke-free home.

Thus, in selecting outcomes to measure, it is important that program planners and evaluators at least in theory be able to relate the activities of the intervention to the outcome to be measured and recognize that other factors might also bring about the initial or intermediate outcome of interest.

Criteria for Selecting Initial Outcomes in Evaluations of Tobacco Control Efforts

The four criteria for selecting initial outcomes to include in an evaluation are the following:

1. The outcome must be consistently measurable across all units of the evaluation and over time. While states are a logical unit for evaluation, a local government may also want to track its progress over time and institute surveillance systems for this purpose. Evaluating a particular tobacco control program over time, or comparing different tobacco control programs (e.g., states) at a given point in time, requires standardized means of collecting information and constructing the appropriate measures. If the nature of the measure (e.g., how data are gathered or reduced) changes even slightly, it will be impossible to determine whether any changes in the resulting values are from actual changes in the population or are simply an artifact of the new measure. One mechanism for gathering consistent and comprehensive data is a national population survey. With standard sampling plans and methodologies and a standard set of questions, population surveys can serve as a surveillance system for initial, intermediate, and final outcomes expected from a tobacco control program.

2. There must be sufficient variability in the measure across the units of observation and/or over time. If little variability exists, it would not be possible to meaningfully rank the units according to the level of the particular initial outcome. And if all units changed in lockstep, there would be no basis for comparing trends over time.

3. The initial outcome should be a potentially caused result of an intervention undertaken as part of a tobacco control program. For example, cigarette prices will increase if the legislature passes a new excise tax. Sales of cigarettes to minors should decline if enforcement of youth access laws is increased. In these examples, cigarette price and test-buy data are the initial outcomes. It is not always possible a priori to know how the initial outcomes will change over time. Change may occur so slowly that there is little to analyze, or so rapidly and in lockstep that attribution to the intervention is difficult. Evaluators should learn from the experiences of others regarding which initial outcomes might provide the best indicator of an intervention's effect.

4. Either preexisting evidence should indicate an association, or in its

absence there should be at least a potential link between the initial outcome and the ultimate outcomes. As an example, the level of media attention given to tobacco-related issues should raise public awareness and knowledge as well as influence policy makers. This in turn could influence social norms, which ultimately may discourage smoking initiation and increase smoking cessation, leading to reduced per capita cigarette consumption and smoking prevalence. However, the level of media attention may not actually correlate significantly with the level of per capita cigarette consumption or smoking prevalence until a number of years have passed. A lag would be expected between the initial outcome and its effect on smoking behavior.

Initial Outcomes Selected for the ASSIST Evaluation

For the evaluation of ASSIST, three initial outcomes were selected: (1) cigarette price (including tax), (2) rating of local and state clean indoor air policies, and (3) percentage of workers covered by 100% smoke-free workplaces. The discussion in this section focuses on the rationale for selecting the initial outcomes for the ASSIST evaluation, variability of the initial outcomes across the states (the unit of measure for the ASSIST evaluation), and the relation of the initial outcomes to the final outcomes. In addition to the criteria for selecting a useful initial outcome (described in the preceding section), the ASSIST evaluation required that

> **ASSIST Policy Areas**
>
> Following the ASSIST framework, the 17 ASSIST states promoted interventions in four policy areas, expressed as objectives in the "ASSIST Program Guidelines for Tobacco-Free Communities":
>
> Eliminate environmental tobacco smoke in all areas where others may face involuntary exposure and the serious health risks associated with inhalation of other people's tobacco smoke.
>
> Eliminate all tobacco product advertising and promotion, other than point-of-sale and objective product information advertising.
>
> Reduce access to and availability of tobacco products, particularly to persons under the legal age of purchase.
>
> Reduce consumption of cigarettes and other tobacco products through price increases using increased taxes and other costs imposed on tobacco products.
>
> *Source:* ASSIST Coordinating Center. 1991. Overview. ASSIST program guidelines for tobacco-free communities. Internal document, ASSIST Coordinating Center, Rockville, MD (p. 12).

baseline data (just prior to the onset of the program) for each initial outcome measured be available at several points through the end of the program.

A central component of the ASSIST model is the use of policy to change physical environments and influence social norms that in turn help shape health-related behavior. To achieve these objectives, the ASSIST program guidelines required the states to implement interventions in four policy areas: clean indoor air, restricted tobacco advertising and promotion, reduced access to tobacco products by minors, and price

increases of tobacco products. The initial outcomes measured in the evaluation derive from these policy areas and interventions. However, because the actual initial outcomes to be monitored were not selected until after the ASSIST intervention began, appropriate data related to restriction of advertising and promotions and to reduced access to tobacco products were not included as part of the data collection at baseline. Thus, initial outcomes related to these two interventions could not be assessed.

Cigarette Price

The cost of a pack of cigarettes to the consumer reflects the selling price, federal and state excise taxes, and state and local sales taxes. Research has established that smokers are sensitive to the cost of cigarettes; smokers change the amount they purchase in accordance with the price they have to pay. Studies consistently estimate the adult price elasticity of demand[13] to be about –0.4. This means that for every 10% increase in cigarette prices, demand for cigarettes should fall by 4%.[14,15]

While the amount of state excise tax could also be considered an initial outcome, the ASSIST evaluation uses the total price of a pack of cigarettes because the tobacco industry sometimes temporarily changes the price of cigarettes to counteract a tax increase. It is the total cost of cigarettes to the consumer that affects consumption; therefore, price, not tax, was the initial outcome selected for the evaluation.

Because the ASSIST evaluation examined trends over time, the average

cigarette price for each state and for each year was adjusted to the baseline period using the consumer price index. The adjusted prices are referred to as the "real" prices of cigarettes in each year.

Table 4.1 shows the real cigarette prices for each state from baseline to the end of the ASSIST program (as of November of each year). Considerable variability is apparent in the real price of cigarettes among the states in any given year. At baseline (1992–93), the price of cigarettes ranged from $1.53/pack in Kentucky to $2.32/pack in Hawaii. Over the course of ASSIST, many states raised their tobacco excise taxes, and the tobacco industry raised cigarette prices in 1998 after the Master Settlement Agreement was final. Thus, the average price per pack over all states increased from $1.90/pack at baseline to $2.15/pack at the end of the program (1998–99). The pack price decreased slightly over the ASSIST period in Minnesota but increased by $0.80 in Alaska.

The relationship between the real price of cigarettes at baseline and adult smoking prevalence[16] for each state is shown in figure 4.1 ($r = -.39$, $p < .01$). In this figure and in subsequent figures, it should be noted that values at the extremes can influence the magnitude of the correlation coefficients. However, even after omitting extreme values, the weaker correlations were still statistically different from zero ($p < .05$).

Figure 4.2 shows the correlations at baseline between real cigarette price and adult per capita cigarette consumption. The values for per capita cigarette consumption are the average of the

Table 4.1. Real Price of Cigarettes, 1992–99
(Shading indicates ASSIST states.)

State	1992–93	1993	1994	1995	1996	1997	1998	1998–99	Change
AK	2.161	1.963	1.918	1.969	1.929	2.617	2.845	2.963	0.802
AL	1.800	1.570	1.534	1.522	1.569	1.661	1.768	1.898	0.098
AR	1.892	1.731	1.670	1.622	1.703	1.730	1.883	2.002	0.110
AZ	1.887	1.662	1.628	2.019	2.096	2.132	2.284	2.394	0.507
CA	2.183	1.997	1.992	1.963	1.928	1.963	2.092	2.539	0.356
CO	1.661	1.497	1.564	1.571	1.569	1.637	1.773	1.901	0.240
CT	2.162	2.127	2.071	2.023	1.993	2.035	2.175	2.309	0.147
DC	2.233	2.210	2.237	2.281	2.190	2.207	2.330	2.448	0.215
DE	1.812	1.488	1.531	1.567	1.546	1.579	1.722	1.852	0.040
FL	2.018	1.775	1.746	1.768	1.742	1.787	1.985	2.104	0.086
GA	1.693	1.493	1.513	1.493	1.474	1.531	1.684	1.799	0.106
HI	2.318	2.190	2.263	2.224	2.265	2.382	2.724	2.843	0.525
IA	1.963	1.763	1.791	1.786	1.793	1.796	1.945	2.069	0.106
ID	1.767	1.549	1.634	1.719	1.740	1.728	1.916	2.029	0.262
IL	1.962	1.887	1.869	1.859	1.895	1.897	2.218	2.341	0.379
IN	1.646	1.511	1.470	1.443	1.478	1.540	1.728	1.851	0.205
KS	1.813	1.638	1.655	1.628	1.613	1.703	1.884	1.993	0.180
KY	1.526	1.376	1.360	1.369	1.391	1.451	1.651	1.758	0.232
LA	1.843	1.607	1.551	1.596	1.564	1.700	1.876	2.002	0.159
MA	2.053	1.963	2.054	2.016	2.308	2.392	2.572	2.689	0.636
MD	1.998	1.782	1.765	1.731	1.805	1.827	2.001	2.111	0.113
ME	2.025	1.850	1.866	1.834	1.810	2.050	2.456	2.543	0.518
MI	1.886	1.665	2.260	2.254	2.229	2.273	2.408	2.531	0.645
MN	2.263	2.044	2.050	2.053	2.076	2.062	2.105	2.243	–0.020
MO	1.625	1.493	1.489	1.545	1.533	1.593	1.780	1.884	0.259
MS	1.863	1.641	1.571	1.595	1.625	1.655	1.854	1.979	0.116
MT	1.746	1.479	1.480	1.453	1.483	1.546	1.704	1.808	0.062
NC	1.571	1.377	1.413	1.405	1.421	1.539	1.691	1.808	0.237
ND	1.868	1.868	1.815	1.795	1.854	1.914	2.054	2.187	0.319
NE	1.842	1.746	1.712	1.709	1.743	1.803	1.950	2.074	0.232
NH	1.769	1.542	1.561	1.562	1.589	1.736	1.935	2.057	0.288
NJ	2.137	1.905	1.903	1.911	1.858	1.950	2.511	2.624	0.487
NM	1.778	1.626	1.634	1.657	1.664	1.699	1.839	1.977	0.199
NV	2.099	1.987	1.937	1.927	1.903	1.882	2.082	2.222	0.123
NY	2.106	2.108	2.096	2.059	2.082	2.100	2.289	2.411	0.305
OH	1.726	1.556	1.558	1.554	1.572	1.603	1.764	1.886	0.160
OK	1.875	1.665	1.601	1.572	1.619	1.688	1.844	1.963	0.088
OR	1.887	1.744	1.806	1.768	1.778	2.063	2.243	2.346	0.459
PA	1.904	1.643	1.635	1.662	1.687	1.779	1.884	2.021	0.117
RI	2.049	1.768	2.130	2.130	2.087	2.187	2.342	2.462	0.413
SC	1.681	1.428	1.400	1.450	1.456	1.527	1.646	1.772	0.091
SD	1.825	1.568	1.601	1.651	1.697	1.769	1.875	1.989	0.164
TN	1.812	1.606	1.581	1.565	1.566	1.601	1.784	1.908	0.096
TX	2.120	1.864	1.876	1.857	1.815	1.893	2.075	2.189	0.069
UT	1.860	1.656	1.684	1.695	1.756	2.059	2.220	2.333	0.473
VA	1.725	1.598	1.567	1.544	1.499	1.491	1.665	1.784	0.059
VT	1.802	1.638	1.601	1.912	1.906	1.982	2.133	2.245	0.443
WA	2.167	2.285	2.294	2.435	2.538	2.561	2.654	2.780	0.613
WI	2.027	1.834	1.876	1.950	1.895	1.946	2.218	2.331	0.304
WV	1.739	1.555	1.579	1.541	1.537	1.605	1.775	1.874	0.135
WY	1.638	1.441	1.457	1.506	1.476	1.487	1.646	1.775	0.137
Overall									
Mean	1.898	1.725	1.742	1.759	1.771	1.850	2.029	2.155	0.257
SD	0.191	0.227	0.248	0.252	0.260	0.283	0.305	0.309	0.187
ASSIST									
Mean	1.890	1.736	1.803	1.812	1.826	1.891	2.085	2.204	0.313
SD	0.224	0.262	0.306	0.317	0.344	0.340	0.363	0.361	0.206
Non-ASSIST									
Mean	1.902	1.719	1.712	1.733	1.744	1.829	2.001	2.130	0.229
SD	0.176	0.211	0.212	0.214	0.206	0.253	0.273	0.281	0.173

Source: Orzechowski, W., and R. C. Walker. 2000. *The tax burden on tobacco: Historical compilation 1999.* Monthly state cigarette tax reports, Vol. 34. Arlington, VA: Orzechowski & Walker.

Figure 4.1. Real Price of Cigarettes Versus Adult Smoking Prevalence, 1992–93
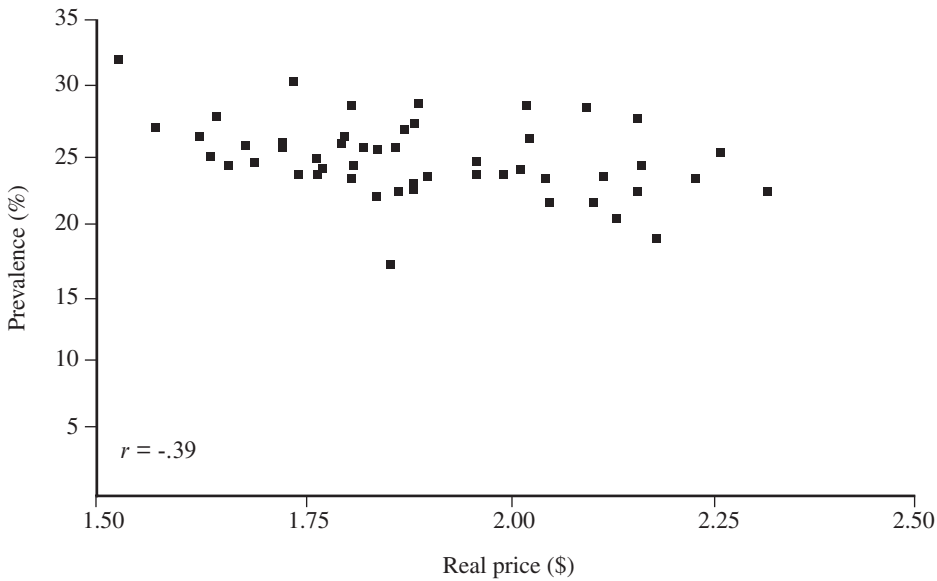
Note: Smoking prevalence data are from U.S. Department of Commerce, Bureau of the Census. September 1992, January 1993, May 1993. *Tobacco Use Supplement to the Current Population Survey.* Washington, DC: U.S. Department of Commerce.

bimonthly values for the 10-month period from August/September 1992 through April/May 1993, which correspond to the same months for which prevalence was computed from the TUS-CPS. The correlation between the real price of cigarettes and per capita cigarette consumption was $-.67$ ($p < .0001$).

Strength of Clean Indoor Air Legislation

Public health concerns about the harmful effects of secondhand smoke and about the right of nonsmokers to breathe clean air have translated into community ordinances and state or local laws to protect nonsmokers.[17–20] Restrictions on smoking protect nonsmokers from secondhand smoke in government and private worksites, schools, childcare facilities, restaurants, retail stores, and recreational and cultural facilities.

The strength of the legislation is a score that reflects both the strictness and the coverage of clean air ordinances within each state and should reflect the success of advocacy efforts within each state. The score includes a preemption penalty and a further adjustment for local ordinance strength. (See chapter 3.) Table 4.2 presents the legislative scores for each state for each year from 1993 to 1998. The maximum possible score for a state with top ratings across the board is 42. (See chapter 3 for a more thorough explanation of how the legislative scores were obtained and adjusted for strength of local laws and preemption.) In 1993,

Figure 4.2. Real Price of Cigarettes Versus per Capita Cigarette Consumption

Note: Per capita cigarette consumption data are from U.S. Department of Commerce, Bureau of the Census. September 1992, January 1993, May 1993. *Tobacco Use Supplement to the Current Population Survey.* Washington, DC: U.S. Department of Commerce.
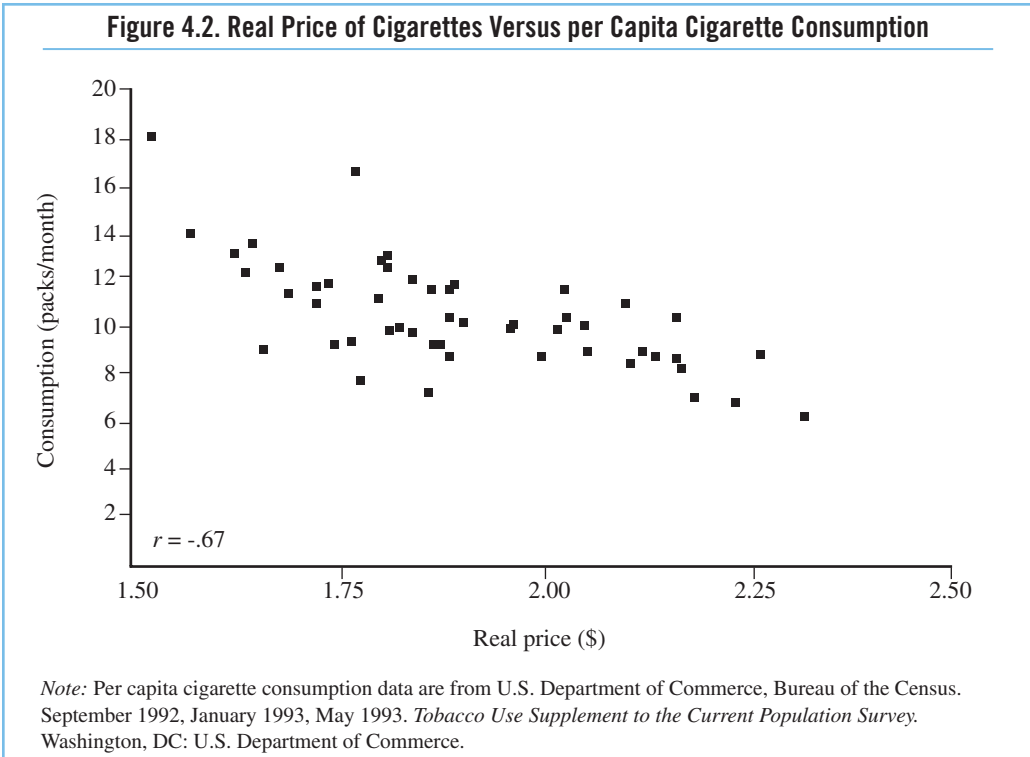
the legislative scores ranged from a low of zero for Iowa, Mississippi, and Oklahoma to a high of 18 for Alaska. Iowa and Mississippi remained at zero through 1998 and were joined by Kentucky in 1994. Because of preemptive laws, some state scores declined over the period, others remained the same because no new legislation was enacted, and some improved. For instance, California declined by more than 8 points after preemption, whereas Maryland increased its score by more than 19 points. The mean clean indoor air legislative score did, however, increase slightly over time, from 7.71 points in 1993 to 8.64 points in 1998.

Figures 4.3 and 4.4 show the correlations of this legislative score with adult smoking prevalence ($r = -.37, p < .01$) and per capita cigarette consumption ($r = -.30, p < .05$), respectively, at baseline in 1993.

Smoke-free Workplaces

Considerable evidence indicates that smoking restrictions lead to smokers modifying their smoking behavior by reducing consumption or quitting altogether.[21–27] The inconveniences that smokers experience in having to leave their work areas to smoke, combined with their awareness of the smoke-free social norm, are incentives for them to reduce or quit smoking. Accordingly, the percentage of indoor workers reporting that their workplace is completely smoke-free is an important early outcome

Table 4.2. Legislative Score Including Preemption and Local Adjustment
(Shading indicates ASSIST states.)

State	1993	1994	1995	1996	1997	1998	Change
AK	18.00	18.00	18.00	18.00	18.00	18.07	0.07
AL	1.48	1.48	1.53	1.53	1.53	1.53	0.05
AR	5.03	5.03	5.03	5.03	5.03	5.03	0.00
AZ	7.67	7.89	7.89	8.35	8.37	8.37	0.70
CA	15.62	6.93	6.93	6.96	6.97	6.98	−8.64
CO	5.28	6.43	6.24	6.24	6.24	6.24	0.96
CT	2.00	2.00	2.00	2.00	2.00	2.00	0.00
DC	12.00	12.00	12.00	12.00	12.00	12.00	0.00
DE	0.83	5.37	5.08	5.08	5.08	5.08	4.25
FL	7.00	7.00	7.00	7.00	7.00	7.00	0.00
GA	2.82	7.04	7.18	7.20	7.20	7.17	4.35
HI	12.42	12.06	12.06	12.06	13.67	14.26	1.84
IA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ID	9.00	9.00	9.00	9.00	9.00	9.00	0.00
IL	3.94	3.94	6.94	6.92	6.92	6.92	2.98
IN	5.12	5.12	5.18	5.18	5.18	9.23	4.11
KS	13.27	14.47	14.47	14.47	14.47	14.47	1.20
KY	3.00	0.00	0.00	0.00	0.00	0.00	−3.00
LA	2.99	7.83	8.11	8.11	8.11	8.11	5.12
MA	11.17	11.89	12.49	12.64	12.82	13.01	1.84
MD	4.91	4.94	24.10	24.10	24.10	24.10	19.19
ME	9.00	9.00	9.00	9.00	9.00	9.10	0.10
MI	16.33	16.33	16.34	16.34	16.35	16.35	0.02
MN	13.01	13.01	13.00	13.00	13.00	13.00	−0.01
MO	14.49	14.49	14.49	14.49	14.49	14.49	0.00
MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MT	12.00	12.00	12.00	12.00	12.00	12.00	0.00
NC	3.41	3.57	3.44	3.44	3.44	3.44	0.03
ND	14.00	14.00	14.00	14.00	14.00	14.00	0.00
NE	9.00	9.00	9.00	9.00	9.00	9.00	0.00
NH	15.00	15.00	15.00	15.00	15.00	15.00	0.00
NJ	11.02	11.02	11.02	11.04	11.05	14.06	3.04
NM	6.49	6.54	6.72	6.72	6.85	6.85	0.36
NV	4.00	4.00	4.00	4.00	4.00	4.00	0.00
NY	16.33	19.98	20.18	20.39	20.47	20.31	3.98
OH	7.29	10.28	10.28	10.28	10.32	10.32	3.03
OK	0.00	1.00	1.00	1.00	1.00	1.00	1.00
OR	9.06	9.06	9.06	9.06	9.26	9.26	0.20
PA	0.13	0.13	0.13	0.13	0.13	0.13	0.00
RI	13.00	13.00	13.00	13.00	13.03	13.05	0.05
SC	9.04	11.04	11.04	3.06	3.06	3.06	−5.98
SD	4.08	5.08	0.31	0.31	0.31	0.31	−3.77
TN	0.47	0.47	0.47	0.47	0.47	0.47	0.00
TX	7.12	7.45	7.47	7.47	7.56	7.58	0.46
UT	17.00	14.00	14.00	14.00	14.00	14.00	−3.00
VA	1.86	3.86	3.86	3.86	3.86	3.86	2.00
VT	9.13	9.13	13.13	13.13	13.13	13.13	4.00
WA	11.16	11.16	11.16	11.16	11.16	11.16	0.00
WI	12.04	15.04	15.04	15.04	15.04	15.04	3.00
WV	3.41	4.00	5.76	6.62	7.10	7.28	3.87
WY	0.84	0.84	0.84	0.84	0.84	0.84	0.00
Overall							
Mean	7.71	8.08	8.55	8.43	8.48	8.64	0.93
SD	5.32	5.19	5.73	5.77	5.80	5.83	3.59
ASSIST							
Mean	9.54	10.32	10.47	10.07	10.13	10.56	1.02
SD	4.58	4.83	4.75	5.07	5.06	4.96	2.40
Non-ASSIST							
Mean	6.80	6.95	7.59	7.60	7.66	7.68	0.88
SD	5.49	5.05	5.99	5.99	6.04	6.06	4.09

Figure 4.3. Legislative Score Versus Adult Smoking Prevalence

Note: Per capita cigarette consumption data are from U.S. Department of Commerce, Bureau of the Census. September 1992, January 1993, May 1993. *Tobacco Use Supplement to the Current Population Survey.* Washington, DC: U.S. Department of Commerce.
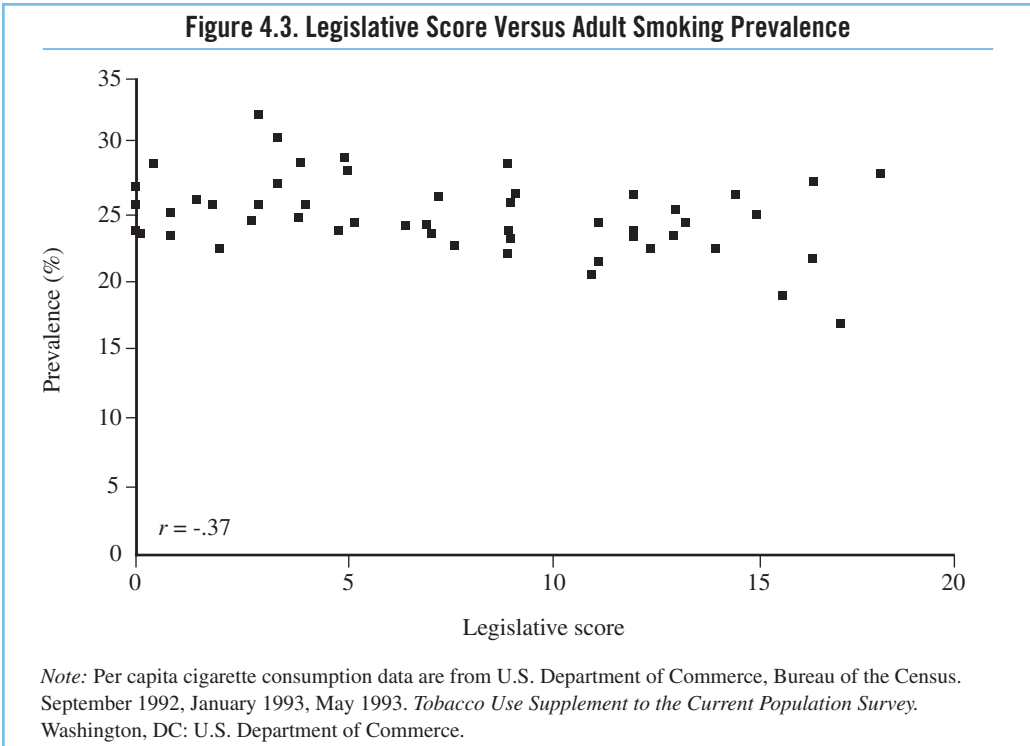
and reflects to some degree the strength and scope of clean indoor air legislation. Because some private workplaces have a smoke-free policy even though there is no law requiring it, and because some workplaces may not comply with state or local laws requiring no-smoking restrictions in public or work areas, workers' reports of the policies provide additional relevant information beyond that captured in the legislative score.

The TUS-CPS included questions to identify indoor workers and to assess the level of smoking restrictions in the workplace. The supplements asked, "Which of these best describes the area in which you work most of the time?"[28(p9-15)] A response indicating that the person worked indoors and outside a

home and was not self-employed led to a further question: "Does your place of work have an official policy that restricts smoking in any way?"[28(p9-16)] Those persons who answered "yes" were then asked, "Which of these best describes your place of work's smoking policy for indoor public or common areas?"[28(p9-16)] and "Which of these best describes your place of work's smoking policy for work areas?"[28(p9-17)] Those persons who reported that smoking was not allowed in any work areas and in any public and common areas were considered to have a smoke-free workplace.

Table 4.3 presents the results for the percentage of indoor workers reporting smoke-free workplaces from baseline to the end of ASSIST. The values in the

Figure 4.4. Legislative Score Versus per Capita Cigarette Consumption

Note: Per capita cigarette consumption data are from U.S. Department of Commerce, Bureau of the Census. September 1992, January 1993, May 1993. *Tobacco Use Supplement to the Current Population Survey.* Washington, DC: U.S.
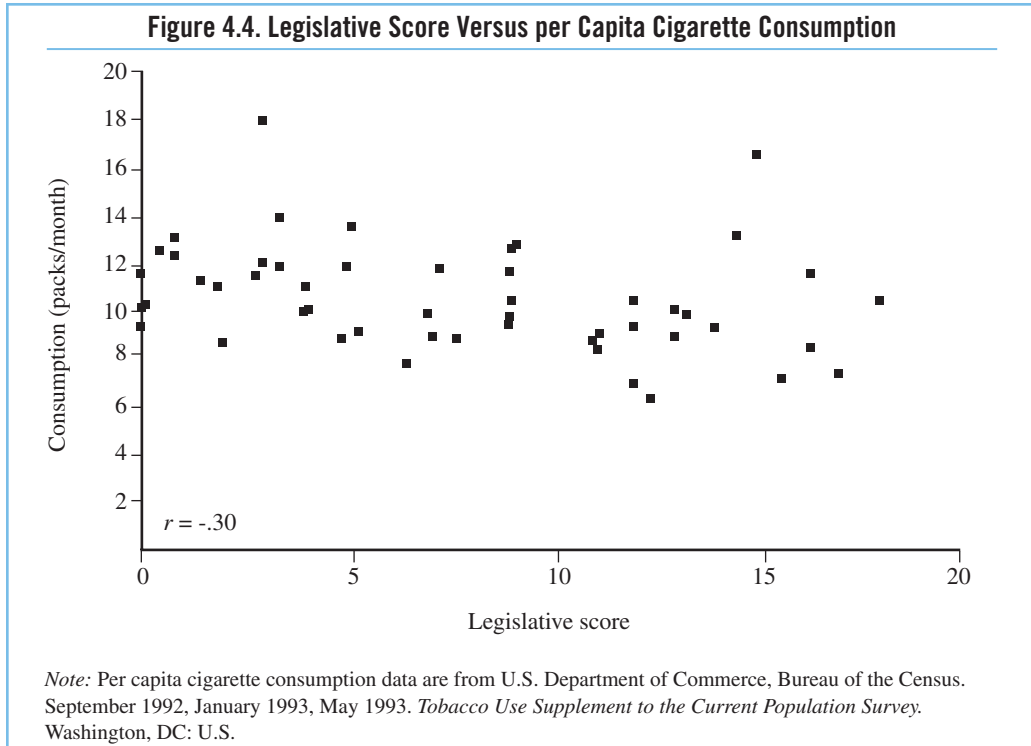
table were interpolated/extrapolated from the results of the 1992–93, 1995–96, and 1998–1999 TUS-CPS. (For example, the slope of the line between the 1992–93 and 1995–96 values was used to determine how much to add to the 1992–93 value to obtain values for 1994 and 1995.) Again, there was considerable variability in this measure among the states at baseline: Kentucky and Washington State were the states with the lowest percentage (29.1%) and highest percentage (66.8%), respectively, of indoor workers covered by smoke-free workplace policies. All states improved over time, with the mean percentage

of indoor workers protected increasing from 46.4% at baseline to 68.5% at the end of ASSIST. The state showing the least improvement was Oregon, which started at a relatively high level in 1993, and the state improving the most was Arkansas, which started at a relatively low level.

The correlations between percentage of workers reporting a smoke-free workplace and smoking prevalence ($r = -.57$, $p < .0001$) and per capita cigarette consumption ($r = -.51$, $p < .0001$) at baseline, respectively, are shown in figures 4.5 and 4.6.

Table 4.3. Percentage of Indoor Workers with Smoke-free Workplaces
(Shading indicates ASSIST states.)

| State	1992–93	1993	1994	1995	1996	1997	1998	1998–99	Change
AK	57.4	60.7	64.7	68.7	70.3	71.5	72.7	72.9	15.5
AL	38.2	43.0	48.8	54.5	57.9	60.9	63.8	64.3	26.1
AR	31.9	36.5	42.0	47.5	52.6	57.6	62.5	63.4	31.5
AZ	56.2	58.4	61.1	63.8	65.4	66.8	68.2	68.5	12.3
CA	57.5	62.4	68.3	74.1	75.6	76.3	77.0	77.1	19.6
CO	53.4	58.3	64.2	70.1	71.6	72.1	72.6	72.6	19.2
CT	47.5	52.8	59.2	65.6	68.6	71.0	73.4	73.8	26.3
DC	51.1	57.5	65.2	72.9	74.1	74.1	74.0	74.0	22.9
DE	50.1	54.4	59.4	64.5	66.9	68.7	70.5	70.8	20.7
FL	52.8	56.5	60.8	65.1	66.7	67.8	68.8	69.0	16.2
GA	47.4	50.1	53.3	56.5	59.8	63.1	66.3	66.9	19.5
HI	46.5	50.6	55.4	60.2	63.9	67.4	70.8	71.4	24.9
IA	45.2	49.8	55.3	60.8	64.0	66.9	69.7	70.2	25.0
ID	59.2	62.3	66.1	69.8	70.7	71.0	71.2	71.3	12.1
IL	39.8	45.5	52.4	59.3	62.4	64.9	67.3	67.7	27.9
IN	34.7	39.4	45.0	50.6	53.5	55.8	58.0	58.4	23.7
KS	49.3	53.1	57.6	62.1	65.8	69.4	73.0	73.6	24.3
KY	29.1	34.9	41.8	48.7	51.5	53.5	55.5	55.9	26.8
LA	39.3	44.0	49.7	55.4	58.5	61.0	63.6	64.0	24.7
MA	48.1	54.3	61.8	69.3	72.3	74.4	76.5	76.9	28.8
MD	52.1	60.5	70.6	80.7	82.2	82.0	81.7	81.7	29.6
ME	54.8	59.7	65.6	71.5	73.3	74.3	75.2	75.4	20.6
MI	39.5	43.3	47.8	52.4	55.4	58.1	60.8	61.3	21.8
MN	54.4	58.2	62.7	67.1	69.6	71.6	73.6	73.9	19.5
MO	38.9	44.3	50.8	57.3	60.3	62.7	65.0	65.4	26.5
MS	39.9	43.7	48.2	52.8	55.9	58.7	61.4	61.9	22.0
MT	42.9	46.9	51.8	56.7	60.6	64.3	68.0	68.6	25.7
NC	31.3	37.9	45.8	53.7	56.7	58.7	60.8	61.1	29.8
ND	47.0	50.9	55.5	60.1	62.5	64.5	66.5	66.8	19.8
NE	44.0	49.3	55.6	62.0	64.3	65.9	67.5	67.7	23.7
NH	52.5	57.9	64.3	70.8	72.6	73.5	74.3	74.5	22.0
NJ	46.8	52.5	59.4	66.3	68.7	70.2	71.7	72.0	25.2
NM	55.4	58.1	61.3	64.5	65.8	66.7	67.6	67.7	12.3
NV	33.5	35.2	37.3	39.4	42.2	45.2	48.2	48.7	15.2
NY	41.8	48.1	55.6	63.1	66.6	69.3	71.9	72.4	30.6
OH	37.8	43.1	49.3	55.6	58.6	60.9	63.2	63.6	25.8
OK	41.5	46.1	51.7	57.2	60.6	63.6	66.6	67.1	25.6
OR	59.3	61.3	63.6	66.0	66.5	66.6	66.6	66.7	7.4
PA	42.2	47.1	52.9	58.7	62.2	65.2	68.3	68.8	26.6
RI	44.8	51.6	59.7	67.9	70.0	70.9	71.8	71.9	27.1
SC	37.5	43.3	50.3	57.3	60.0	61.8	63.6	63.9	26.4
SD	43.5	48.7	54.9	61.0	61.7	61.3	60.9	60.9	17.4
TN	35.3	40.4	46.4	52.5	56.1	59.2	62.3	62.8	27.5
TX	50.6	54.4	59.0	63.5	64.8	65.4	66.0	66.1	15.5
UT	65.0	70.1	76.2	82.3	83.5	83.8	84.0	84.0	19.0
VA	43.2	48.4	54.6	60.8	64.3	67.1	70.0	70.5	27.3
VT	58.0	63.5	70.1	76.8	77.7	77.5	77.3	77.2	19.2
WA	66.8	68.3	70.0	71.7	72.6	73.4	74.1	74.2	7.4
WI	43.9	48.8	54.8	60.8	62.6	63.5	64.5	64.7	20.8
WV	39.1	44.8	51.6	58.5	60.7	62.0	63.4	63.6	24.5
WY	47.6	51.3	55.7	60.1	62.3	64.1	65.8	66.1	18.5
Overall									
Mean	46.4	51.0	56.6	62.1	64.6	66.4	68.2	68.5	22.1
SD	8.71	8.37	8.24	8.42	7.79	7.06	6.48	6.39	5.70
ASSIST									
Mean	45.6	50.5	56.5	62.5	64.9	66.6	68.3	68.6	23.0
SD	9.07	8.17	7.32	6.78	6.38	6.03	5.73	5.69	6.11
Non-ASSIST									
Mean	46.8	51.3	56.6	61.9	64.4	66.3	68.1	68.5	21.7
SD	8.65	8.58	8.77	9.22	8.50	7.63	6.91	6.79	5.52

Source: U.S. Department of Commerce, Bureau of the Census. September 1992, January 1993, May 1993; September 1995, January 1996, May 1996; September 1998, January 1999, and May 1999. *Tobacco Use Supplement to the Current Population Survey.* Washington, DC: U.S. Bureau of the Census.

Figure 4.5. Workplace Smoking Ban Versus Adult Smoking Prevalence
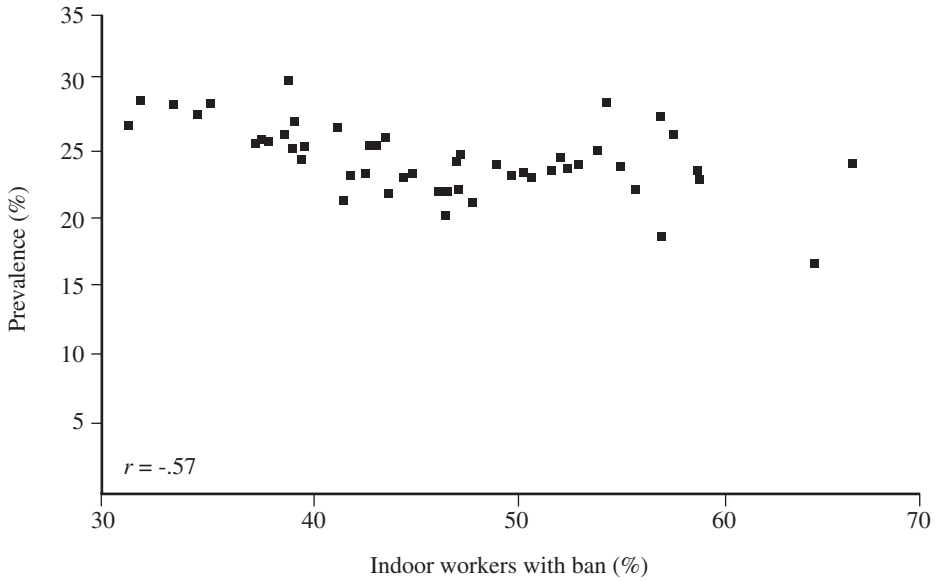
Source: National Cancer Institute. 2005. What is the TUS-CPS? http://riskfactor.cancer.gov/studies/tus-cps.

Figure 4.6. Workplace Smoking Ban Versus per Capita Cigarette Consumption
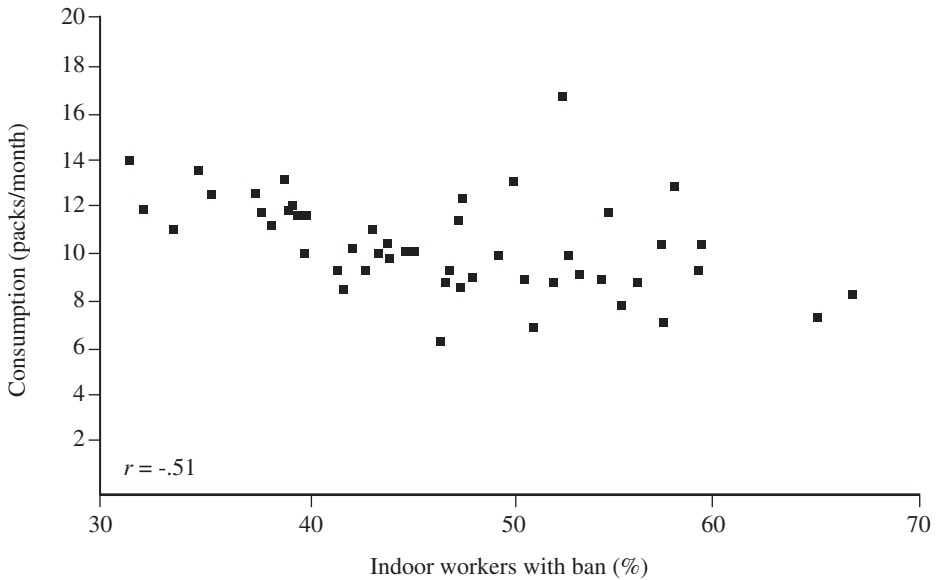
Source: National Cancer Institute. 2005. What is the TUS-CPS? http://riskfactor.cancer.gov/studies/tus-cps.

The IOI for Policy

Construction of the IOI

Each of the three initial outcomes chosen for the ASSIST evaluation was measured consistently among the states and over time, varied considerably among the states, was conceptually related to the program interventions, and was significantly correlated with adult smoking prevalence and per capita cigarette consumption. Because the state is the unit of analysis for the ASSIST evaluation, with only 51 units of observation and a number of other variables to consider (see chapter 9), all three outcomes could not be included separately in the statistical analyses of the final outcomes (smoking prevalence and per capita cigarette consumption). Thus, the individual initial outcomes were combined into an index.

For individual outcomes to be combined into an index, there should be some indication of a consistent relationship or correlation among those outcomes; as one changes, the others should also change. Table 4.4 shows the intercorrelations among the initial outcomes for 1993 and 1998. The correlations were stronger among the initial outcomes in 1998 than they were in 1993.

Although the purpose of constructing the IOI for the ASSIST analysis was to economize on the number of factors that would need to be considered in the final analysis (see chapter 9), another reason to combine factors would be to avoid multicollinearity. A well-constructed IOI could be useful in evaluating total program effect if it comprised initial outcomes related to each program component. The correlations among the initial outcomes in 1998–99 are strong enough that the use of the index for the ASSIST evaluation is warranted.

Creating an index implies combining the individual initial outcomes, either by summing them directly or by weighting them in some way. One way of determining appropriate weighting factors is from a principal components analysis of the standardized variables. Because the first principal component is the linear combination of the variables (initial outcomes), which explains the greatest portion of the variance, it provides an alternative to equal weighting of the three initial outcomes. However, preliminary results indicated that the weights for the three variables (on the first principal component) were very nearly equal. Thus, it was decided to simply sum the individual initial outcomes.

Table 4.4. Correlations among Initial Outcomes in 1992–93 and 1998–99

	Correlation	
Initial outcome	1992–93	1998–99
Cigarette price vs. legislative score	.374[*]	.525[***]
Cigarette price vs. smoke-free workplace	.385[*]	.442[*]
Legislative score vs. smoke-free workplace[a]	.427[*]	.503[**]

[a]1993 and 1998 data.
[*]$p < .01.$ [**]$p < .001.$ [***]$p < .0001.$

Since the unit of measurement for each initial outcome was different, the values for each initial outcome at baseline were standardized (mean = 0, standard deviation = 1), and the resulting z scores were summed to obtain the IOI at baseline. Subsequent values for each year from 1993 through 1998 were obtained by subtracting each state's score in a given year from the baseline mean and dividing by the baseline standard deviation to obtain a normalized difference score with the baseline value as the reference. The normalized z scores for each initial outcome were added to obtain the index values for 1993 through 1998. Table 4.5 shows the IOI value for each of the states in each year. At baseline, the IOI values ranged from a low of –4.81 in Kentucky to a high of 4.57 in Alaska. All states showed an improvement, with Alaska improving the most. Of the ASSIST states, 65% (11/17) showed improvement at or greater than the mean increase from baseline to the end of the intervention period for all states, whereas only 32% (11/34) of the non-ASSIST states showed this degree of improvement.

Simple univariate tests comparing means for ASSIST states with those for non-ASSIST states at baseline and at the end of the intervention period showed no statistically significant differences (two-tailed z tests and $p < .05$) for the IOI or for any of the IOI components. However, the ASSIST states showed marginally significantly higher mean legislative clean indoor air scores at both times ($p < .10$). Without appropriate adjustment for important covariates, these analyses are problematic; a more

appropriate and thorough analysis is presented in chapter 9.

Correlation of the IOI with Final Outcomes

The correlation of the IOI with adult smoking prevalence at baseline ($r = –.57$, $p < .0001$) is shown in figure 4.7. The correlation of the IOI with per capita cigarette consumption ($r = –.64$, $p < .0001$) is shown in figure 4.8.

Table 4.6 presents the correlations of each initial outcome with each final outcome at baseline (1992–93) and at the 1995–96 and 1998–99 time frames. The "change" columns show the correlations of change for each initial outcome with the change in final outcomes over the entire ASSIST intervention period. The correlation of each initial outcome and the overall IOI with adult smoking prevalence and per capita cigarette consumption was statistically significant within each time frame. However, none of the 1993 to 1999 changes in initial outcomes was correlated at all with the change in adult smoking prevalence; all the correlations were less than .11 in magnitude. The correlation of change in the IOI with change in per capita cigarette consumption was significant, but this was due entirely to the highly significant relationship between change in cigarette price and change in per capita consumption. In contrast to cigarette price, the other two initial outcomes—legislative score and percentage of indoor workers with smoke-free workplaces—were not significantly correlated with change in per capita cigarette consumption.

## Table 4.5. Initial Outcomes Index
(Shading indicates ASSIST states.)

State	1992–93	1993	1994	1995	1996	1997	1998	1998–99	Change
AK	4.57	3.91	4.14	4.86	4.84	8.58	9.92	10.55	5.98
AL	−2.62	−3.28	−2.80	−2.20	−1.56	−0.74	0.15	0.89	3.51
AR	−2.20	−2.52	−2.20	−1.82	−0.81	−0.10	1.27	1.99	4.19
AZ	1.06	0.14	0.31	2.66	3.34	3.69	4.65	5.25	4.19
CA	4.25	3.84	2.85	3.37	3.37	3.63	4.38	6.74	2.49
CO	−0.90	−1.19	0.06	0.74	0.89	1.30	2.07	2.75	3.65
CT	0.44	0.86	1.30	1.78	1.98	2.47	3.47	4.22	3.78
DC	3.10	3.71	4.73	5.85	5.51	5.60	6.24	6.85	3.75
DE	−1.31	−2.52	−0.86	−0.15	0.01	0.39	1.35	2.07	3.38
FL	1.23	0.38	0.72	1.34	1.38	1.74	2.89	3.53	2.30
GA	−1.87	−2.61	−1.35	−1.06	−0.78	−0.10	1.07	1.73	3.60
HI	3.10	2.89	3.76	4.11	4.75	6.06	8.36	9.04	5.94
IA	−1.24	−1.77	−0.99	−0.39	0.03	0.37	1.47	2.17	3.41
ID	1.02	0.24	1.12	1.99	2.20	2.17	3.18	3.78	2.76
IL	−1.13	−0.87	−0.17	1.13	1.68	1.97	3.92	4.61	5.74
IN	−3.14	−3.31	−2.88	−2.37	−1.86	−1.28	0.73	1.42	4.56
KS	0.93	0.45	1.28	1.66	2.01	2.89	4.25	4.89	3.96
KY	−4.81	−4.94	−4.79	−3.95	−3.51	−2.97	−1.69	−1.09	3.72
LA	−1.99	−2.68	−1.41	−0.47	−0.29	0.72	1.93	2.64	4.63
MA	1.66	1.90	3.37	4.14	6.04	6.75	7.98	8.63	6.97
MD	0.65	0.49	1.56	6.14	6.70	6.79	7.67	8.24	7.59
ME	1.87	1.52	2.28	2.79	2.87	4.23	6.49	6.96	5.09
MI	0.76	0.04	3.68	4.17	4.39	4.93	5.95	6.64	5.88
MN	3.83	3.11	3.65	4.18	4.58	4.74	5.20	5.96	2.13
MO	−1.01	−1.08	−0.36	0.67	0.96	1.54	2.79	3.38	4.39
MS	−2.37	−3.10	−2.95	−2.30	−1.79	−1.31	0.05	0.76	3.13
MT	−0.40	−1.33	−0.76	−0.34	0.26	1.02	2.27	2.88	3.28
NC	−4.26	−4.51	−3.39	−2.54	−2.12	−1.27	−0.24	0.41	4.67
ND	1.10	1.54	1.79	2.21	2.80	3.34	4.30	5.04	3.94
NE	−0.33	−0.23	0.33	1.04	1.49	1.98	2.93	3.61	3.94
NH	1.39	0.82	1.66	2.41	2.76	3.62	4.77	5.42	4.03
NJ	1.92	1.36	2.14	2.97	2.97	3.63	7.31	7.93	6.01
NM	0.17	−0.31	0.11	0.63	0.82	1.12	1.96	2.70	2.53
NV	−1.12	−1.51	−1.54	−1.35	−1.15	−0.92	0.48	1.27	2.39
NY	2.18	2.91	4.40	5.10	5.66	6.08	7.34	8.03	5.85
OH	−1.96	−2.25	−0.96	−0.26	0.17	0.61	1.71	2.40	4.36
OK	−2.13	−2.70	−2.21	−1.73	−1.09	−0.38	0.78	1.46	3.59
OR	1.68	1.15	1.75	1.82	1.93	3.47	4.42	4.96	3.28
PA	−1.87	−2.68	−2.06	−1.25	−0.71	0.12	1.01	1.79	3.66
RI	1.60	0.91	3.74	4.67	4.69	5.32	6.23	6.88	5.28
SC	−1.90	−2.56	−1.53	−0.47	−1.63	−1.05	−0.22	0.47	2.37
SD	−1.40	−2.15	−1.08	−1.00	−0.68	−0.35	0.16	0.75	2.15
TN	−3.08	−3.58	−3.02	−2.41	−1.99	−1.44	−0.13	0.58	3.66
TX	1.54	0.63	1.28	1.70	1.63	2.12	3.15	3.75	2.21
UT	3.68	3.20	3.48	4.24	4.70	6.31	7.18	7.77	4.09
VA	−2.37	−2.44	−1.51	−0.92	−0.76	−0.48	0.76	1.44	3.81
VT	1.09	0.87	1.43	4.57	4.65	5.02	5.79	6.37	5.28
WA	4.40	5.18	5.43	6.36	7.00	7.21	7.78	8.45	4.05
WI	1.20	0.76	2.23	3.30	3.22	3.59	5.13	5.74	4.54
WV	−2.48	−2.79	−1.77	−0.85	−0.45	0.15	1.22	1.77	4.25
WY	−2.51	−3.12	−2.53	−1.77	−1.68	−1.42	−0.38	0.33	2.84
Overall									
Mean	0.00	−0.38	0.42	1.24	1.56	2.19	3.36	4.05	4.05
SD	2.32	2.44	2.48	2.66	2.67	2.79	2.84	2.84	1.26
ASSIST									
Mean	0.21	−0.03	1.16	1.91	2.19	2.74	4.03	4.68	4.47
SD	2.47	2.60	2.75	2.75	2.95	2.92	3.00	2.99	1.34
Non-ASSIST									
Mean	−0.10	−0.55	0.05	0.90	1.23	1.91	3.03	3.74	3.85
SD	2.27	2.37	2.29	2.58	2.50	2.72	2.73	2.75	1.18

Figure 4.7. Initial Outcomes Index Versus Adult Smoking Prevalence
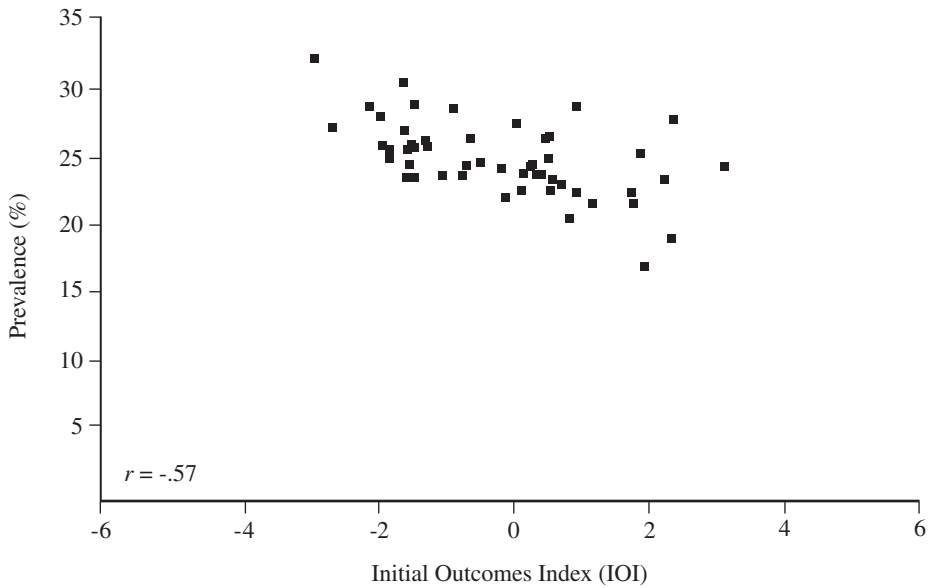
Note: Source for prevalence data: National Cancer Institute. 2005. What is the TUS-CPS? http://riskfactor. cancer.gov/studies/tus-cps.

Figure 4.8. Initial Outcomes Index Versus per Capita Cigarette Consumption
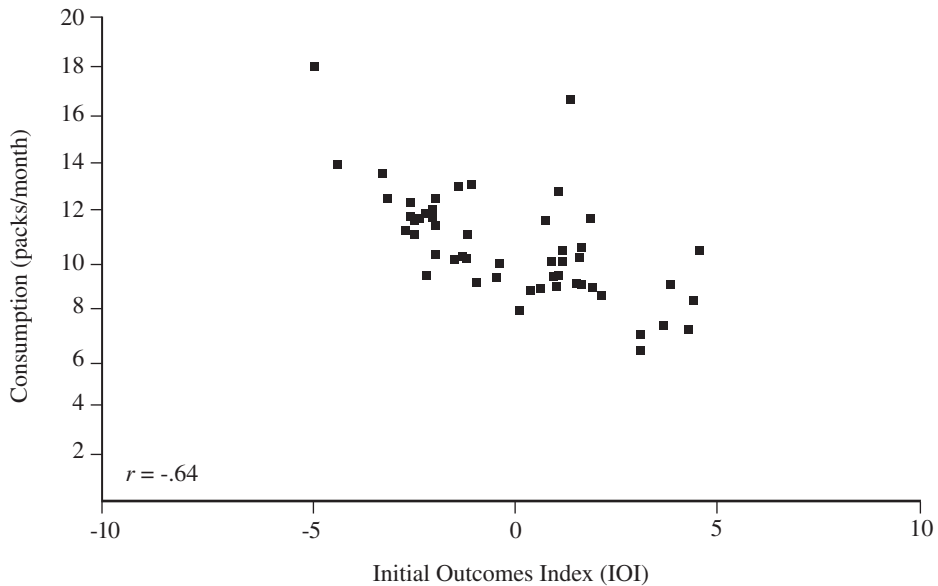
Note: Source for per capita consumption data: National Cancer Institute. 2005. What is the TUS-CPS? http:// riskfactor.cancer.gov/studies/tus-cps.

For each state, figure 4.9 plots change in the IOI against change in adult smoking prevalence. Figure 4.10 plots change in the IOI against per capita cigarette consumption between baseline and the end of the program.

While these results are not completely convincing in the context of the ASSIST evaluation, they do not mean that the approach would not be useful in another program evaluation. As illustrated earlier in this chapter, other measures of tobacco control activity could have been included in the IOI measure for ASSIST that perhaps would have made it more sensitive to program effects. As it stands, the description of the IOI provided in this chapter should be taken as a model of how to combine such measures into an index for further analysis.

In addition, the 50 states and the District of Columbia were divided into three groups of 17 based on their IOI at baseline. To examine trends in per capita cigarette consumption in each group, the bimonthly consumption values were averaged over the states in each group from 1983 to early 2000. The results are shown in figure 4.11. A smoothed trend line was computed for each group.[29] In the pre-ASSIST period, the trends in per capita cigarette consumption for the three groups were nearly parallel and diverged from one another only slightly. After mid-1993, the low IOI group showed a general increase in per capita cigarette consumption that did not turn down again until 1999, and the medium and high IOI groups showed greater separation than previously. Although both continued to decline, the rate of decline was somewhat slower than earlier, except that the high IOI group appeared to gain momentum again in 1997. In April 1993, the price of premium brands of cigarettes decreased,[30] and particularly in the low IOI group, it appeared that tobacco control efforts were not sufficient to completely counteract the influence of the price drop on consumption.

Table 4.6. Correlation of Initial Outcomes with Final Outcomes and Change in Initial Outcomes with Change in Final Outcomes

	1992–93	1995–96	1998–99	Change
Cigarette price				
Adult smoking prevalence	−.392**	−.391**	−.366**	−.073
Per capita cigarette consumption	−.671****	−.705****	−.675****	−.683****
Legislative score				
Adult smoking prevalence	−.366**	−.277*	−.320*	−.092
Per capita cigarette consumption	−.299*	−.348*	−.385**	.018
Smoke-free workplaces				
Adult smoking prevalence	−.571****	−.687****	−.633****	.108
Per capita cigarette consumption	−.516****	−.465***	−.517****	.207
IOI				
Adult smoking prevalence	−.574****	−.557****	−.495***	−.051
Per capita cigarette consumption	−.641****	−.661****	−.666****	−.425**

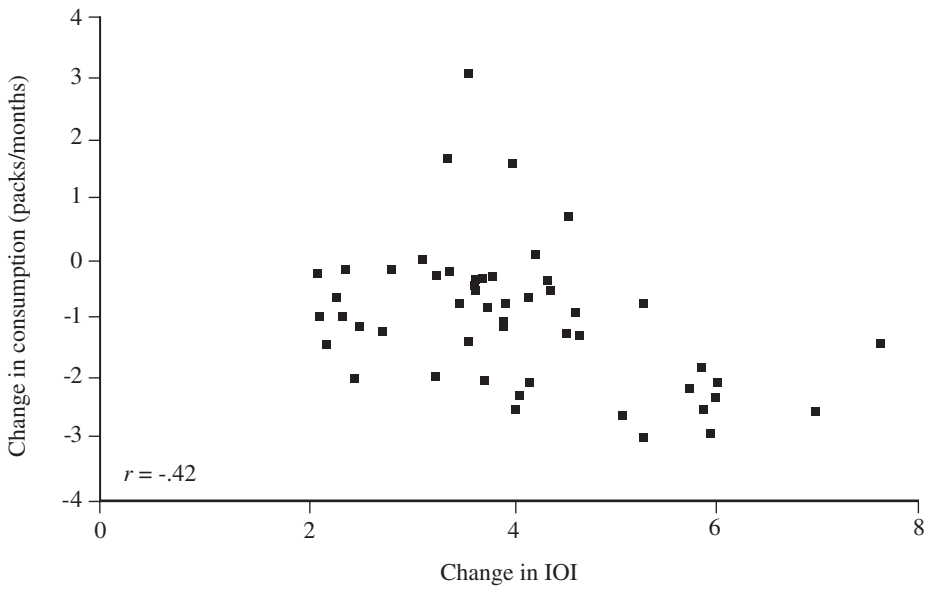*Note:* IOI indicates Initial Outcomes Index.

*$p < .05$. **$p < .01$. ***$p < .001$. ****$p < .0001$.

Figure 4.9. Change in Initial Outcomes Index Versus Change in Adult Smoking Prevalence
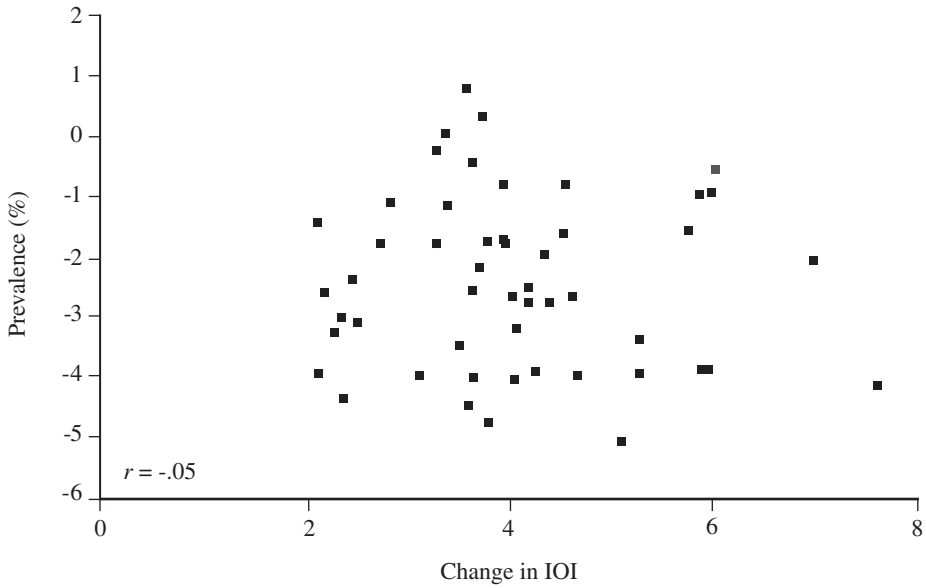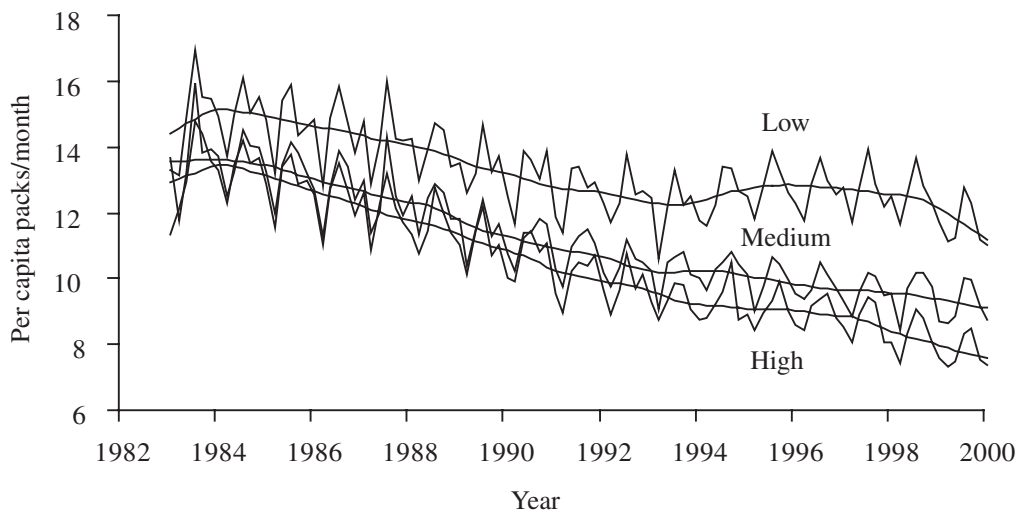

Figure 4.10. Change in Initial Outcomes Index Versus Change in per Capita Cigarette Consumption

Figure 4.11. Trends in per Capita Cigarette Consumption for States in Each Tertile Group of Tobacco Control Initial Outcomes Index

Summary

An initial outcome is an early indication of whether the efforts of a tobacco control program are having an effect. An early indication of program effectiveness is sometimes necessary to convince legislators that the program is having an effect even before the program would be expected to influence the smoking behavior of a population. Increases in the levels of initial outcomes should eventually discourage tobacco use and thereby improve public health. To be useful in evaluating tobacco control programs, an initial outcome should (1) be measured consistently over time and among the units of observation (e.g., states for the ASSIST evaluation), (2) show variability among the units of observation, (3) reflect successful implementation of tobacco control program efforts, and (4) be related at least logically to the final outcome measures—smoking prevalence and per capita cigarette consumption.

Many outcomes could be selected as initial outcomes. The choice of outcomes will vary among programs and will depend on individual program emphases and the availability of measures. The initial outcomes selected for the ASSIST evaluation were cigarette price, a score (or rating) of local and state clean indoor air policies, and the percentage of indoor workers who reported that they worked in a 100% smoke-free environment. Each of these initial outcomes (1) could be measured consistently among states and over time, (2) showed a high degree of variability among states, (3) was related to a specific ASSIST program area, and (4) was significantly correlated with both adult smoking prevalence and

per capita cigarette consumption. The changes over time were noticeable, and ASSIST states appeared to change more than non-ASSIST states. However, the differences in change between the two groups of states were not large. It might be that for large changes to occur, states might have to achieve a certain threshold of public support. Once this "tipping point" is reached, legislatures might more readily enact legislation regarding both taxation and protection from secondhand smoke.

Because of the limited number of units of observation available for the ASSIST evaluation, an IOI was created for use in the analyses of the final outcomes. Such an index may also be necessary for the evaluation of state programs if the unit of observation is a limited number of jurisdictional levels (e.g., counties, regions) of program delivery and assessment. However, if the program has only one or two program areas of emphasis or if little is gained by combining the initial program measures, it would be best to evaluate the initial outcomes separately.

The three initial outcome measures for the ASSIST evaluation were not selected until after ASSIST program implementation. It would have been optimal to have had more discussion during the planning phases of the intervention regarding which initial outcomes would be assessed. Such discussions should include the methodology for repeatedly assessing the initial outcomes over the units of observation at different points in time, before, during, and after the intervention period. It turned out that no initial outcome measures were available for two of the ASSIST program areas.

Another limitation of the initial outcomes selected for ASSIST is the overlap between the legislative score and the percentage of indoor workers reporting smoke-free workplaces. In addition, as mentioned above, readiness to enact legislation regarding taxation might also be associated with readiness to enact clean indoor air laws. Nevertheless, the ASSIST IOI was correlated with the final outcomes measured at baseline (1992–93), during the program (1995–96), and at the end of the program (1998–99). Change in the IOI was significantly correlated with changes in per capita cigarette consumption, mainly because of the strong correlation of cigarette price and this outcome, but change in the IOI was not correlated with change in adult smoking prevalence.

During the ASSIST intervention period, tobacco control efforts were gathering momentum in non-ASSIST states, which complicated the evaluation of ASSIST. (See chapters 1 and 2.) For example, a tobacco control program had been ongoing in California (a non-ASSIST state) since 1990 (see Monograph 16, chapter 5, pp. 146–147, and chapter 11, pp. 497–498). Also, the Centers for Disease Control and Prevention and the Robert Wood Johnson Foundation provided modest funding for tobacco control activities, including Initiatives to Mobilize for the Prevention and Control of Tobacco Use (IMPACT), the SmokeLess States National Policy Initiative, and the Campaign for Tobacco-Free Kids, in many other states. The Robert Wood Johnson Foundation's SmokeLess States initiative faced fewer political and bureaucratic

barriers than did ASSIST and IMPACT. Rather than working directly with state agencies, SmokeLess States employed voluntary health organizations or other nongovernmental organizations, such as state tobacco control coalitions, as their lead agencies. As shown in the analyses described in this chapter, many states made significant progress in (1) increasing cigarette prices, (2) improving their legislative clean indoor air scores, and (3) increasing the percentages of indoor workers in smoke-free workplaces.

The methodology described in this chapter for specifying and combining initial outcome measures was illustrated in the context of the ASSIST evaluation but could be adapted for evaluations of other tobacco control programs at the state and local levels. There are lessons to be learned from the ASSIST experience with regard to selection of initial outcomes. For example, if a prevention program plans to focus efforts on enforcing youth access laws, there should be a metric in place to evaluate whether such enforcement has occurred. This metric could be derived from sales checks or could rely on an adolescent smokers population survey that asks whether the adolescent was asked for identification the last time he or she tried to buy cigarettes. Presumably this metric would show variability in levels over the units of observation and should be related ultimately to measures of youth smoking behavior (e.g., prevalence of smoking in the past 30 days, daily smoking). Ideally, appropriate measures for the initial outcomes expected from each program component should be designed before a comprehensive program is initiated.

However, useful information can still be provided even if not all program areas have initial outcomes that can be assessed. As mentioned above, an index of these initial outcomes may be necessary if the initial outcomes are many and the observational units are few.

Conclusions

1. It may take many years for tobacco control programs to demonstrate desired changes in tobacco use. Measurements such as the change in policy assessed by the Initial Outcomes Index represent a promising way to assess program effectiveness within a shorter term.
2. Criteria for selecting initial outcomes for the ASSIST evaluation included continuous measurability, sufficient variability over time or other units of observation, a relationship with a tobacco control intervention, and evidence indicating a relationship with tobacco-related health outcomes.
3. The Initial Outcomes Index used in the ASSIST evaluation analysis was defined as an equal weighting of three factors that were initially correlated with lower tobacco use: total cigarette price, a rating of local and state clean indoor air policies, and the percentage of workers covered by 100% smoke-free workplaces.
4. Overall, ASSIST states showed a greater increase in the Initial Outcomes Index than non-ASSIST states. The Initial Outcomes Index was also significantly related to tobacco prevalence and consumption. However, the only Initial Outcomes

Index component related to changes in outcomes was the relationship between cigarette price and per capita consumption. This metric represented an important first step in establishing the relationship between initial policy outcomes for tobacco control and long-term program outcomes.

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