

5.2 Measures to assess the effectiveness of smoke-free policies

Introduction

Article 8 of the FCTC, calls for greater protection from exposure to tobacco smoke (Figure 5.4). In the 1980s, some countries began to implement subnational smoke-free policies. By 2004, Ireland, Norway, and New Zealand were the first countries to implement comprehensive smoke-free worksite policies that also included restaurants and bars. Motivated in part by the FCTC mandate to expand smoke-free policies, other countries have followed suit, but the vast majority of nations have not made progress in this area. Understanding if these policies are effective in achieving their goal of reducing exposure to secondhand smoke and improving health outcomes, is important not only for policymakers in places that pass smoke-free policies, but also to help inform policymaking in other jurisdictions.

The main goal of smoke-free policies is to reduce secondhand

smoke exposure and thus to improve health outcomes. There are several measures that should be considered when assessing the effectiveness of smoke-free policies, and factors that might influence how the policy may contribute to reductions in secondhand smoke exposure, as well as more distal outcomes related to secondhand smoke beliefs, attitudes, and practices. Furthermore, there are also potential incidental effects of smoke-free regulations, such as possible business losses/gains, and increased cessation activity among smokers.

There is value to assessing constructs around smoke-free initiatives, both before, during, and after their introduction as policy. Before they are introduced in a jurisdiction, the main variables of interest are an inventory of the level of existing smoke-free policies, as well as the belief about the health harms, and attitudes to restrictions in various locations. During the early

implementation period of smoke-free policies, variables of interest are those associated with compliance with the policy and how this relates to secondhand smoke (SHS) exposure. During post-policy introduction, these variables remain of interest, but there are others including how health and economic indicators may have or have not changed. Understanding each of these areas is useful for evaluation purposes and helps to guide subsequent policymaking.

Figure 5.5 presents the logic model guiding the constructs discussed in detail in this section. First we need to understand the nature of the policies. What areas are covered and are there exemptions or possible loopholes? Within a jurisdiction, there may be local policies (from local government), or business-specific policies that need to be considered.

The next step is to consider the impact of these policies on markers of exposure to SHS, which is the

Parties recognize that scientific evidence has unequivocally established that exposure to tobacco smoke causes death, disease and disability. Each Party shall adopt and implement in areas of existing national jurisdiction as determined by national law and actively promote at other jurisdictional levels the adoption and implementation of effective legislative, executive, administrative and/or other measures, providing for protection from exposure to tobacco smoke in indoor workplaces, public transport, indoor public places and, as appropriate, other public places.

WHO (2003)

Figure 5.4 WHO FCTC Article 8: *Protection from exposure to tobacco smoke*

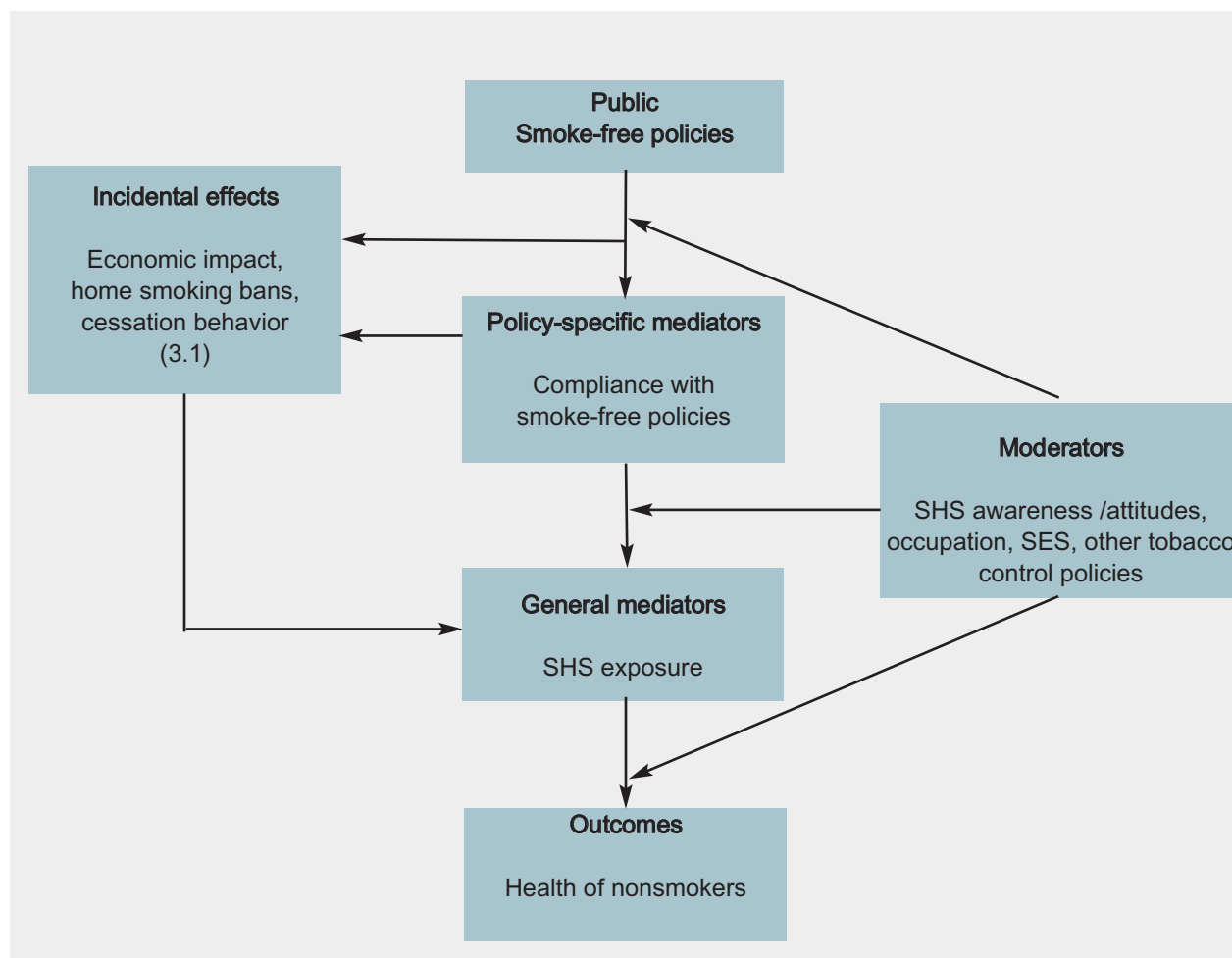


Figure 5.5 Conceptual framework for the evaluation of smoke-free policies

Numbers in parentheses indicate section in the volume covering the topic

SHS = secondhand smoke

SES = socio-economic status

key proximal variable of interest. Compliance with the policy is critical at this point in the model, as poor compliance will weaken the public health benefit of the smoke-free policy, and could even result in a backlash where policymakers overturn the policy because it is ineffectual.

More distal variables that may change in response to smoke-free policy implementation include: people's beliefs about the dangers of SHS, their opinions about the social norms of smoking in different places, as well as the translation of these beliefs into changes in their personal choices regarding rules about smoking in

their own personal spaces, such as their home and car. For example, local, grass roots movements in scores of communities in California waged a public information campaign, which led to the passage of local-level clean air policies. Policies can change social norms and beliefs and vice versa.

The primary goal of smoke-free policies is to protect the health of nonsmokers. The greatest benefits should be experienced by those who previously had the greatest exposure. For example, bartenders and wait staff, who previously worked in smoky environments, would derive greater health benefits than a stay-at-home mother or an employee whose worksite had already been smoke-free.

There may also be some incidental effects that need to be rigorously studied in order to address concerns about the impact of these policies. One concern that is raised in nearly every policymaking debate about the merits of smoke-free policies, is that its implementation will adversely impact the economy, as smokers will stop dining out and going to bars. Often this is *the* central issue of the debate and credible information addressing this point needs to be obtained. Some potential economic issues that might be worth considering are the cost savings due to employees' decreased health care costs, increased worker productivity, and decreased establishment maintenance costs. The other key incidental impact is that smoke-free policies reduce cigarette consumption in smokers. From the public health perspective, this is a beneficial incidental impact, but not the reason why smoke-free policies are considered.

Lastly, there is an array of potential moderating variables to consider for a thorough evaluation. For example, as previously mentioned, one's occupation will

moderate the impact of a smoke-free policy. The list of moderator variables presented is not exhaustive, but is meant to provide an overview of additional variables an evaluator should consider. More details on relevant moderating variables are presented in Section 3.2.

Smoke-free policy measures

Through the FCTC mandate, countries are obligated to push for stronger legislation protecting workers and the public from SHS. This is usually accomplished through the passage of policies restricting where smoking can occur in public environments. In some countries, this might mean something as simple as requiring hospitals to provide a smoke-free indoor environment, while others have adopted comprehensive regulations that prohibit smoking in all indoor workplaces, including bars and restaurants. Going beyond the mandate in Article 8 of the FCTC, some jurisdictions are pushing for outdoor smoke-free rules that apply to beaches, entryways to buildings, and parks, for example. In addition to these government mandated policies, individuals or businesses may also adopt voluntary smoke-free policies in their homes and workplaces, irrespective of government policy, although these are not the focus of this section. A summary of commonly used approaches to measure smoke-free policies is given in Table 5.9.

The advantages of assessing policies directly are that their

documentation is relatively simple to obtain, and their stipulations provide a standard to be validated against individual exposure data. The negative implications are that the implementation of policies does not always correlate well with actual exposure, due to poor compliance and enforcement. These policies only cover public spaces, and measuring them can get complicated in countries with sub-national policy activity.

Policy-specific mediators or proximal measures – compliance with smoke-free policy

Three types of smoke-free policy compliance measures are summarized in Table 5.10: 1) self-report of policy type implemented; 2) direct observation of compliance; and 3) government enforcement and compliance records.

Self-reported measures of exposure can provide a simple measure of the impact of a smoke-free policy. Following implementation of a comprehensive smoke-free policy, the percent of people who report that their workplace is smoke-free should go up and the percent of people who report seeing smoking the last time they went to a restaurant, for example, should go down. These measures are a proxy for the actual smoking policy, as shown in Table 5.9, but are also a key indicator of compliance with the policy, and are presented as such in the model in Figure 5.5. These data are relatively inexpensive to collect if there is an

existing survey in place in the relevant country, state/province, or community, where questions can be added, and the survey can provide for population-based measures of policy impact on compliance. While this measure may lack precision in terms of the extent of compliance, it does provide a useful barometer of the relative compliance levels. We also note that it is important to have pre-policy data, as well as post-policy data, so that the change in compliance can be assessed. For example, post-policy, 20% of people might report that they saw smoking the last time they went to a bar. That might seem high, but if the pre-policy data showed 100% reported seeing smoking in bars, then it demonstrates a dramatic im-

provement while pointing to areas where programmatic efforts to further increase compliance should be placed. We are not aware of studies that have directly validated these specific self-reported measures with atmospheric measures of SHS or biomarkers of exposure. Observational studies of compliance (i.e. when an independent observer assesses if smoking is occurring in a venue) have been validated (see subsequent sub-section), and the difference in pollution levels is dramatic between smoke-free and smoking-observed venues.

In contrast to self-reported measures of compliance, observational studies *may* provide a more reliable measure of compliance. Field staff are able to observe the presence of evidence

of smoking, such as ashtrays or cigarette butts, in such studies. The key element to consider is the design of the observational study. Results may be biased if the venue selection is not random and assessments are made at times that are not representative of typical activity levels. For example, doing an observational compliance study in bars by sending field staff to these locations during weekday afternoons will likely overstate compliance, while performing these checks only during peak times in the late evening will understate compliance. These studies may also not be as generalizable as self-reported data unless a large, random sample of venues is observed, which can be resource intensive.

Measure	Smoke-free air policies in key locations
Sources	Government records; The Americans for Non-smokers Rights Foundation; Smoke-free Lists, Maps, and Data (http://www.no-smoke.org/goingsmokefree.php?id=519 accessed January 25, 2007); CDC State Tobacco Activities Tracking and Evaluation (STATE) System (http://apps.nccd.cdc.gov/statesystem/ accessed January 25, 2007); WHO Global Tobacco Control Report (Shafey <i>et al.</i> , 2003)
Validity	“Gold standard” for measuring policy itself, but a strong policy may not translate to low SHS exposure.
Variations	Details of the policies, such as the locations covered, exemption, enforcement authority, and penalties for non-compliance should be tracked unless it proves to be too difficult. National and state/provincial policies are easier to track than local level policies, as there may be thousands of individual sub-national policies to track.
Comments	Tracking national policy will miss local level policy action, as well as voluntary policies passed by businesses and individuals. It may be important to track sub-national policies in some countries.

Table 5.9 Commonly Used Approaches to Measures Smoke-free Policies

Construct	(a) Self-Reported Measures																												
Measure	<p>Self-reported policy in these areas. Examples of questions include:</p> <p>(Source: ITC Survey) “Which of the following best describes the smoking policy where you work?” (Smoking is not allowed in any indoor area, Smoking is allowed only in some indoor areas, or Smoking is allowed in any indoor areas)</p> <p>(Source: Global ATS) “Which of the following best describes the indoor smoking policy where you work?” (Smoking is not allowed in any indoor areas, Smoking is allowed only in some indoor areas, No rules or restrictions, No indoor areas)</p> <p>(Source: ITC Survey) Public Places – “Which of the following best describes the rules about smoking in drinking establishments, bars, and pubs where you live?” (Smoking is not allowed in any indoor area, Smoking is allowed only in some indoor areas, No rules or restrictions)</p> <p>(Source: Global Adult Tobacco Survey) “During the past 7 days, did anyone smoke in the following indoor places that you visited? “</p> <table border="1" data-bbox="323 717 1165 920"> <thead> <tr> <th></th> <th>YES</th> <th>NO</th> <th>DID NOT VISIT</th> </tr> </thead> <tbody> <tr> <td>a. Government buildings or offices?</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>b. Health care facilities?</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>c. Schools or universities?</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>d. Private workplaces?</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>e. Bars or night clubs?</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>f. Restaurants?</td> <td>1</td> <td>2</td> <td>3</td> </tr> </tbody> </table> <p>Example question asked of individuals: (Source: ITC Survey) “The last time [you visited a bar/restaurant/etc.], were people smoking inside the pub or bar?” 01 – YES 02 – NO</p> <p>Example question asked of business owners: (Source: New York City Restaurateur Survey) “Is smoking allowed anywhere in your [restaurant/bar/etc.]?” 1 Yes 2 No</p>		YES	NO	DID NOT VISIT	a. Government buildings or offices?	1	2	3	b. Health care facilities?	1	2	3	c. Schools or universities?	1	2	3	d. Private workplaces?	1	2	3	e. Bars or night clubs?	1	2	3	f. Restaurants?	1	2	3
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Sources	Questionnaires; for example, Hyland <i>et al.</i> , 1999a ; Bauer <i>et al.</i> , 2005 ; Borland <i>et al.</i> , 2006a ; Borland <i>et al.</i> , 2006b ; Fong <i>et al.</i> , 2006b																												
Validity	Evidence of utility. No direct validity study of these self-reported measures, but observational studies assessing the same construct have been validated and show dramatic differences in pollution levels between smoke-free and smoking-observed venues in a variety of settings (see Leaderer <i>et al.</i> , 1994; Repace, 2004; Travers <i>et al.</i> , 2004).																												
Variations	Questions can be adapted to specific places of interest. Items reporting the observance of smoking in various places may underestimate exposure if actual smoking not observed.																												

Table 5.10 Measures of Compliance with Smoke-free Policies (Proximal Variables; Policy-specific Mediators)

Comments	This is a more direct measure of exposure than knowledge that a policy is in place (policy-only data), relatively easy to obtain data, adaptable to address many specific locations, as relevant by each specific policy, but still not a direct measure of actual SHS exposure.
Construct	(b) Direct Observation of Compliance Measures
Measure	Observer assessments/spot checks of compliance with smoke-free regulations.
Sources	In person assessments; Hyland <i>et al.</i> , 1999a ; Weber <i>et al.</i> , 2003 ; Skeer <i>et al.</i> , 2004; Engelen <i>et al.</i> , 2006
Validity	Clearly valid. Studies have shown large differences in indoor air pollution by type of smoking policy in workplaces, restaurants, bars, and homes (Leaderer <i>et al.</i> , 1994; Repace, 2004; Travers <i>et al.</i> , 2004).
Variations	The study can be adapted to observe compliance in specific locations as needed by the investigator.
Comments	This is an excellent approach to assess compliance and, budget permitting, should be strongly considered. To obtain a true compliance assessment, ratings need to be done at all hours and on all days, which can increase costs and raise issues of observer safety in some instances. Field work coordination may be more difficult, as observers are often geographically varied in location.
Construct	(c) Records of Government Statistics on Violations, Enforcement, and Compliance of Smoke-free Policies
Measure	Government records on the number of complaints, number of enforcement checks, violations, and fines collected.
Sources	Government records; Hyland <i>et al.</i> , 1999a; Engelen <i>et al.</i> , 2006
Validity	Face validity with concerns noted below.
Variations	Available data may depend on the reporting systems and available data from different jurisdictions.
Comments	High violation rates could be a function of strong enforcement efforts and may not indicate better true compliance. Complaints are also an indirect measure of compliance and the type of complaint needs to be considered (e.g. are complaints from nonsmokers upset about people smoking, or from smokers upset about not being able to smoke inside?).

Table 5.10 Measures of compliance with smoke-free policies

Government enforcement and compliance records are another way to assess observance of smoke-free policies. These are not recommended as the sole source for evaluating compliance, but they can provide useful complementary data when used in conjunction with other exposure assessment data sources. The advantage of these data is that they may be readily available and easy to use. Information typically obtained includes the number of complaints, enforcement operations, and amount of fines collected. Caution must be maintained, as high levels of complaints and violations do not necessarily indicate that the policy is not working well, and in fact, just the opposite may be true. Jurisdictions that take an active role in dedicated enforcement of

smoke-free policies will find more violations, and often the real threat of punishment if caught violating the law encourages greater compliance in the future. It is also important to consider the nature of the complaint. Complaints from those who are upset at smoking occurring where it is forbidden by the policy are much different than complaints by those who are upset with the policy itself.

General mediators or intermediate measures: secondhand smoke exposure measures

Two commonly used sources of actual SHS exposure measures have been previously reported; atmospheric studies, including airborne particulate concentration and nicotine studies, as well as biomarkers studies of exposure (see Table 5.11). Studies testing for the presence of nicotine in the air have the advantage of being specific to tobacco smoke exposure, but nicotine is not assayed in real-time and estimates will only tell about average exposure over time. Particulate matter concentration studies are not specific to tobacco smoke, as other factors like pollution and cooking fumes emit particles, but the presence of tobacco smoke is the dominant source of particulate matter in most cultures even in the presence of high levels of background pollution found in some parts of the world. In these studies the data collection methods allow for real-time particulate concentration data collection. Another advantage with

particulate concentration data is that measurements can be compared with well established standards for outdoor air, which aids in communicating results to the public. For example, the average level of particulate matter observed in these types of studies conducted in bars is well above the peak reading experienced during the largest forest fire in the USA State of Colorado's history, which was a 24-hour average PM_{2.5} concentration of 200 micrograms/cubic metre. This compelling imagery is powerful when discussing the risks of SHS exposure and the benefits of smoke-free policies. Both measures (airborne particulate and nicotine concentrations) can complement each other and selection of one measure over the other depends on the questions being asked in the evaluation and resources available. Regardless of which approach is considered, these data are often only collected in a small number of locations because of resource issues (i.e. expense and expertise), but such data can round out exposure assessment data obtained from other sources.

Perhaps the scientific "gold standard" for assessing changes in SHS exposure is examining changes in biomarkers of exposure (Hecht, 2004). Two biomarkers used specific to tobacco smoke exposure are cotinine, a by-product of nicotine metabolism, and 4-(*N*-nitroso-methylamino)-1-(3-pyridyl)-1-butanol (NNAL), a potent tobacco specific carcinogen. Cotinine is typically measured in the urine, saliva, hair, or

blood, and NNAL is commonly measured in the urine. Levels of these two biomarkers should be zero if unexposed to SHS, while any detectable level indicates SHS exposure. One methodological approach to collecting this type of data is to couple it with a particulate matter monitoring study where urine samples are collected from nonsmoking field staff before and after spending an evening taking measurements in smoky venues. The change in cotinine and NNAL give a measure of exposure after even a short-term visit. The finding of potent tobacco smoke carcinogens in the urine that were absent prior to going into the field provides a powerful communication message. After a smoke-free policy has been implemented, the cotinine and NNAL measurements in field staff (taken at the beginning and at the end of their work shift) would be expected to show little difference, if any. The main disadvantage of this type of study is the high cost and requirements for adequate facilities to handle storing samples; hence, results are not broadly available precluding much needed comparisons. However, if resources are available a biomarker study can provide very compelling evidence of the real impact the smoke-free policy has on SHS exposure.

Primary outcome of interest – health in nonsmokers

The primary health outcome expected to change following the

Construct	(a) Atmospheric Secondhand Smoke Monitoring
Measure	Direct measurement of particulate concentrations and nicotine levels in ambient air. Particle concentrations can be assessed using a light scatter device and nicotine concentrations can be assessed using a small portable badge that is placed on site for a period of time and sent to a laboratory for chemical analysis
Sources	Roswell Park Cancer Institute Tobacco Free Air website (www.tobaccofreeair.org); Hammond, 1999; Navas-Acien <i>et al.</i> , 2004; Repace 2004; Travers <i>et al.</i> , 2004; Nebot <i>et al.</i> , 2005
Validity	Clearly valid. A Norwegian study showed a strong correlation between ambient particulate matter and air nicotine concentrations ($r=0.83$) (Ellingsen <i>et al.</i> , 2006). One study showed cotinine levels decreased in 35 hotel workers by 69% after implementation of a smoke-free law, while air nicotine levels decreased by 83% (Mulcahy <i>et al.</i> , 2005).
Variations	Specific venues tested can vary depending on the policy.
Comments	Real-time assessment of particle concentrations is relatively inexpensive if many samples are being examined and can be compared to benchmarks for outdoor air quality; however, it is not specific to SHS. Nicotine monitoring is specific to SHS levels, but may be more costly than particle monitoring if large samples are collected and does not provide real-time data. Results are often very simple and effective in communicating with the public and policymakers.
Construct	(b) Biomarkers of Exposure
Measure	Urine, saliva, or blood cotinine levels provide most direct assessment of SHS exposure. NNAL, a tobacco specific carcinogen, can also be examined in the urine.
Sources	Anderson <i>et al.</i> , 2003; Mulcahy <i>et al.</i> , 2005; Farrelly <i>et al.</i> , 2005a; Engelen <i>et al.</i> , 2006
Validity	Considered the “gold standard” to which other assessments measure up to.
Variations	Can be combined with particle or nicotine monitoring study to provide a more detailed assessment of what is in the air as well as in the body.
Comments	Most direct SHS exposure assessment. Can be difficult and expensive to obtain, does not rule out other sources of nicotine exposure. Helps to demonstrate the need for stronger SHS policies and to evaluate impact of a policy. Particularly effective in communicating to policymakers.

Table 5.11 Secondhand Smoke Exposure Measures (Intermediate Measures; General Mediators)

implementation of smoke-free air policies is improved health in nonsmokers. A variety of approaches have been used to assess this, and we focus here on items that are not previously presented in Section 3.1. Some studies have relied on self-reported respiratory symptoms collected from large population-based samples (Wakefield *et al.*, 2003a; Lam *et al.*, 2005; Ho *et al.*, 2007). This has the advantage of providing more representative data; however, self-reported data are not validated, and the health significance of the report of fewer stuffy noses, for example, is questionable. Despite this, the information obtained from these types of questions provides useful information that fills in the causal chain between policy and changes in adverse health outcomes. Other studies collect more clinical data in smaller samples of workers assessed before and after implementation of a smoke-free policy, although findings may not relate to the general population. For instance, conducting a baseline clinical assessment of a group of nonsmoking bartenders before a smoke-free law is implemented, and then 12-months after the law takes effect, can measure changes in clinical parameters, such as lung function (measured by forced expiratory volume in 1 second and forced vital capacity determinations). These studies are typically expensive to conduct and require clinical facilities. Other studies focus on examining changes in disease rates at the population

level in places with and without smoke-free laws, although such studies are rare and it is difficult to identify the independent effect of SHS beyond the effects due to other tobacco control initiatives. The main issues with these studies are that the effect size expected is typically small, effects on nonsmokers specific to the policy cannot be disaggregated from incidental effects on smokers, and it is sometimes difficult to obtain data on the target population of interest. For example, if a large metropolitan area goes smoke-free, but surrounding areas do not, it will be difficult to assess changes in disease patterns, as those who live in the smoke-free metro area may be employed, receive health care, or have other business outside of the city and vice versa. Nationwide policy adoption would limit this concern.

We do not feel that any of these measures is required to be assessed for all smoke-free policy evaluation studies. In the presence of an existing survey already in the field, asking about respiratory effects and related symptoms is encouraged. Clinical or population-based studies examining changes in disease rates are technically demanding studies that require much more planning and resources, and groups with the capacity to conduct these studies are encouraged to do so. Table 5.12 provides a summary of these measures (distal variables).

Incidental outcomes of interest – economic impact, smoking in the home, and smoking cessation

A policy can be thought of as a medication that is intended to treat some condition. If the medication has severe side effects in relation to the benefit it might give the patient, then its utility is diminished. On the other hand, medications can have beneficial side effects making their use even more attractive. In the case of a smoke-free policy, which is the “medication,” the key side effect, typically discussed during policy debates, is whether the policy will have an economic impact on businesses. Another incidental effect raised in some policy debates is whether smoke-free policies will encourage smokers to smoke more cigarettes inside their home, thereby increasing their family members’ exposure to SHS. Other incidental considerations are whether there are cost savings resulting from increased worker productivity, decreased cleaning costs, and decreased health care costs, and whether the policy increases cessation indicators among smokers. The former two are not discussed in this section, and the latter is described in Section 3.1.

Economic outcomes:

Table 5.13 presents a summary of measures for evaluating the economic impact of a smoke-free policy. Historically, economic

Construct	(a) Self-Reported Changes in Symptoms and Illness
Measure	<p>(Respiratory symptoms) “During the past 4 weeks...”</p> <ol style="list-style-type: none"> a. have you had wheezing or whistling in your chest? (Yes or No) b. have you felt short of breath? (Yes or No) c. do you usually cough first thing in the morning? (Yes or No) d. do you cough at all during the rest of the day or night? (Yes or No) e. do you bring up any phlegm? (Yes or No)” <p>(Sensory symptoms) “In the past 4 weeks...”</p> <ol style="list-style-type: none"> a. have your eyes been red or irritated? (Yes or No) b. have you had a runny nose, sneezing, or nose irritation? (Yes or No) c. have you had a sore or scratchy throat? (Yes or No)”
Sources	Questionnaires; Farrelly <i>et al.</i> , 2005a ; Abrams <i>et al.</i> , 2006
Validity	Face validity.
Variations	Questions can be adapted to include different conditions.
Comments	These measures do not specifically address the impact of the policy, may be confounded by other factors, and their clinical relevance questioned; however, they do provide a simple way to assess how/why the policy may or may not be working.
Construct	(b) Clinical Studies Assessing Changes in Worker Health
Measure	Clinical parameters, such as lung function.
Sources	Clinical exams; Eisner <i>et al.</i> , 1998; Allwright <i>et al.</i> , 2005
Validity	Clearly valid, but changes in health status could be due to other factors besides the change in SHS exposure.
Variations	Studies can be designed to address health effects in particular subpopulations of interest.
Comments	While these studies provide useful information about the actual near-term health impacts of smoke-free policies, they are costly to perform and require a high level of sophistication to conduct. Implementing this type of study is only recommended for those groups with the resources and research interests to gain a better understanding of exactly how smoke-free policies may change health.

Table 5.12 Health Outcomes in Nonsmokers (Distal Variables or Outcome)

considerations have largely been raised in the restaurant and bar industries, and to a lesser extent, in the tourism and gambling industries. Potential economic impacts in other industries have generally not been studied, nor has there been a call by policymakers for these potential effects to be known.

An ideal economic evaluation would rely on objective measures supplemented with additional measures, such as the self-report of the frequency of visiting bars and restaurants. Objective measures include employment statistics and taxable sales information, as well as statistics on the number of licensed facilities and the number of new and expired licenses. Many countries have established monitoring systems in place that collect these data and access to it is simple; not so for places that do not have such systems. The actual information that can be obtained will differ depending on available data. In the USA, for example, monthly data on the number of employees working in narrow industry sub-segments, such as restaurants, can only be obtained from the Bureau of Labor Statistics at the county level. The data are uniformly collected at the national level, are available monthly, and the lag time in reporting the information is a few months, which is relatively quick compared with some taxable sales measures. Taxable sales data share many of the same attributes as employment data; however, tax collection systems are much more

variable. Some jurisdictions have a specific tax on meals, which can get tracked independently and is highly specific to that industry segment. Other places rely on general sales or income tax data, which often takes longer to acquire and makes the data less specific to certain industries. Licensure statistics can also provide some insight into the potential economic impact of smoke-free policies. These data only track the number of businesses, so they are not as specific as employment or taxable sales data. They can provide additional complementary evaluation information if available, but relying solely on licensure statistics for an economic evaluation it is not recommended. Both employment and taxable sales measures are excellent objective measures for evaluation, and researchers should investigate what data are available in their country and consider analysing both sets of data.

A useful complement to these objective data sources are self-reported measures of changes in patronage patterns after a policy is implemented. This information can help fill in the causal pathway between a policy and the incidental potential economic losses or gains. In addition, survey questions can be tailored to specific types of venues or to assess more subtle effects. For example, survey questions might assess if people are dining longer, spending more money when going out, or changing the types of places they frequent. These

assessments provide a more complete picture of what, if any, economic impact the smoke-free policy is having. The other advantage of reports from individuals is that data can be obtained close to real-time after policy implementation. Employment and taxable sales data take months or years to become available, and then it takes longer still to acquire enough post-law data to establish trends. Policymakers demand an answer to the question of whether the policy has hurt businesses immediately. Survey data, such as described above, can provide an initial glimpse of the potential impact while a case is made that time is needed to examine the objective data sources. Furthermore, self-reported survey items may be the only data source if objective employment and taxable sales data collection systems are not in place.

Another self-reported measure used by some investigators to assess the economic impact of a smoke-free law, is the self-reporting by business owners/managers of changes in sales. Virtually all of the economic studies done that have found an adverse economic impact have utilized this approach, whereas virtually all of the studies based on objective data or individual reports found either no impact or a small positive impact (Scollo *et al.*, 2003). Business owners' lack of support of a smoke-free law has been shown to be associated with more negative fiscal reports, which suggests these data may be

Construct	(a) Changes in Economic Outcomes – Self-reported Consumer Patronage Practices
Measure	Self-report in the change in rate of going out to bars, restaurants, and other locations covered by smoke-free rules. Example question... (Source: ITC Survey) “Do you now visit [pubs/restaurants/etc] more often than [before the law took effect], less often, or about the same amount?” 01 – More Often 02 – Less Often 03 – Same Amount 04 – Don’t visit pubs now and/or didn’t visit pubs a year ago
Sources	Questionnaires; Hyland & Cummings, 1999a ; Blecher, 2006
Validity	Evidence of utility. In New York City, taxable sales and employment in the hospitality industry increased, while a majority of NYC consumers reported they were dining out the same or more frequently after the 1995 law was implemented (Hyland & Cummings, 1999a; Hyland <i>et al.</i> , 1999b).
Variations	Questions can be adapted to ask about different locations. Some have obtained more detail by querying about the frequency of going out or actual money spent out, although investigators are cautioned that his information is difficult to recall and obtain from respondents to a population-based survey.
Comments	An economic evaluation should not solely rely on this measure if possible. Ideally, objective measures, like employment statistics or taxable sales data, should provide the basis of an economic evaluation, which can be supplemented with subjective data to help portray a more complete evaluation.
Construct	(b) Changes in Economic Outcomes – Business Owner Self-Reported Change in Sales
Measure	(Source: New York City Restaurateur Survey) Self-reported change in business after a smoke-free regulation takes effect. Example question... “[Over the past two years], would you say your business has increased, decreased, or stayed the same?”
Sources	Questionnaires; Hyland & Cummings, 1999b
Validity	Not recommended as a stand-alone for economic evaluation. Evidence suggests self-report on this item is associated with opinions about the law (i.e. owners who are negative toward smoke-free policies report more negative business outcomes), which may introduce bias into the measurement, and the question is not specific to losses attributable to smoke-free regulations. Some studies show negative outcomes using this approach, but objective data like taxable sales show no impact, or a positive impact, which suggests low validity. This item alone should never be solely relied on for an economic evaluation of a policy.
Variations	Some have obtained more detail, such as asking the actual revenues, but there are considerable levels of missing data when using this approach.
Comments	Many studies do rely solely on this measure; evaluators should be cautioned and aware of the relative merits of this approach.

Table 5.13 Measures for Evaluating the Economic Impact

Construct	(c) Changes in Economic Outcomes – Hospitality Employment Levels
Measure	Government employment statistics for specific industry sectors over time.
Sources	Bureau of Labor Statistics, or other similar government entity; Hyland & Cummings, 1999c
Validity	“Gold standard”
Variations	Can examine specific employment sectors per the policy’s specifics.
Comments	This is an excellent measure to evaluate. Study design is enhanced by adding in control employment sectors, as well as data from other jurisdictions not covered by the policy. Comparability of data sources between countries is an issue to consider.
Construct	(d) Changes in Economic Outcomes – Hospitality Taxable Sales
Measure	Government tax receipt statistics for specific industry sectors over time.
Sources	Office of Tax and Finance, or other similar government entity; Glantz & Smith, 1994; Hyland <i>et al.</i> , 1999b; Cowling & Bond, 2005 ; Blecher, 2006
Validity	“Gold standard”
Variations	Can examine specific sectors per the policy’s specifics.
Comments	This is an excellent measure to evaluate. Study design is enhanced by adding in control employment sectors, as well as data from other jurisdictions not covered by the policy. Comparability of data sources between countries is an issue to consider.

Table 5.13 Measures for Evaluating the Economic Impact

biased. For example, in New York City a business owner who was surveyed claimed that losses were experienced (see, for example McLaughlin and Associates Inc (2001) as cited in Scollo *et al.*, 2003), but a review of the objective employment and taxable sales data showed no economic down turn, which means this measure has low validity (see, for example Hyland *et al.*, 1999b and Hyland and Cummings, 1999c, as cited in Scollo *et al.*, 2003).

Business owner surveys are excellent for assessing the measures that they used to implement and comply with the new policy, but are not recommended for economic evaluation.

Smoking in the home:

Another potential incidental effect of smoke-free policies is that it may cause smokers, who can no longer smoke at bars for example,

to spend more time smoking at home, which leads to greater SHS exposure for other family members. While this issue was not generally raised during policy discussions in the USA, for example, it has gained attention in some European debates. This is a generally understudied area, but it is fairly straightforward to evaluate the likelihood of this potential incidental impact. The simplest approach is to ask smokers how their home smoking

strategy and home smoking behaviour has changed since policy implementation (see Table 5.14). Other approaches could involve tracking how many cigarettes are smoked inside the home before and after the policy in a cohort design. We are aware of only two published studies on this topic. One study used population-based survey data from smokers in four countries, and found that those who lived in a community that implemented a smoke-free bar policy were significantly more likely to implement 100% smoke-free home policies (Borland *et al.*, 2006a). The other study examined differences in smoke-free home policy adoption in Ireland, which had already implemented a smoke-free law, and the UK, which had not implemented smoke-free regulations at the time of the study. It was found that the percent of homes that were smoke-free was comparable between countries, and that Irish smokers consumed fewer alcoholic drinks in the home compared to UK smokers (Hyland *et al.*, 2007). Therefore, this potential incidental effect does not appear to be true, and if anything the opposite, but more studies may be needed.

Smoking cessation outcomes:

Studies have shown that smoke-free worksite policies also increase quit rates and reduce consumption among those who continue to smoke (Fichtenberg &

Glantz, 2002a; Fong *et al.*, 2006b). The theorized mechanism of action is that there is a direct impact by decreasing the number of opportunities to smoke and reducing sensory cues for smoking. This reduces the likelihood of relapse during a quit attempt. One large, prospective study on this issue found that smoke-free worksite policies were not associated with a greater rate of trying to stop smoking, but rather quit attempts were significantly more successful (Bauer *et al.*, 2005), which is consistent with what is predicted from the theorized mechanism. Indicators of smoking cessation worth considering for evaluation are quitting, quit attempts, smoking reductions, desire to quit, and utilization of evidenced-based treatments to quit smoking, to name a few. These are described in more detail in Section 3.1 and are not discussed further here.

Moderators

Many important moderating variables are described in Section 3.2. For smoke-free policies, some specific moderating variables of interest include occupation, socioeconomic status, awareness, and beliefs about SHS. Hospitality employees are much more likely to work in an environment where smoking is permitted (Shopland *et al.*, 2004); therefore, a policy that prohibits smoking in the workplace would have a disproportional effect on this population, although we are not aware of studies that

have tested this specific hypothesis. Similarly, those with lower socioeconomic status are more likely to work in smoky environments, and should therefore be impacted more by smoke-free policies than white collar workers. Viewing this from a population-perspective, relatively large policy impacts are expected if few workplaces were previously smoke-free and compliance is high; however, there could be little impact if that population is already working in a smoke-free environment. Lastly, those who are aware of smoke-free policies and believe that SHS is harmful are more likely to be compliant with the policy and have lower SHS exposure. Evaluators need to consider moderating variables to best assess how policies may or may not work in population subgroups.

Summary and recommendations

Article 8 of the FCTC calls for governments to increase smoke-free policies at the national and sub-national levels. Evaluating the effects of smoke-free policies is critical to understanding how they work and can be improved. Core constructs to evaluate whether smoke-free policies are working are compliance with the policy and exposure assessment. Based on our assessment of the validity of available data and ease of assessment, we recommend, that in most cases, population-based surveys be used as the primary means for assessing compliance

Measure	<p>Changes in home smoking rules</p> <p>(Source: ITC Survey) “Has the smoking ban in public places affected the rules about smoking in your home?”</p> <ol style="list-style-type: none"> 1 It has made me more strict about the amount I smoke at home when I am with non-smokers. 2 It has made me more strict about the amount I smoke at home in general. 3 It has made me smoke more at home when I am with non-smokers. 4 It has made me smoke more at home in general. 5 It has not affected the rules about smoking in my home. <p>Home smoking policy (Source: GATS) “In your home, is smoking allowed in every place, in some places or at some times, or not allowed in any place?”</p> <p>(Source: Global ATS) “In your home, is smoking allowed in every place, in some places or at some times, or not allowed in any place?”</p> <p>(Source: Adult Tobacco Survey) Car – “Which statement best describes the rules about smoking in your family car or cars? Would you say...Smoking is never allowed in any car, Smoking is allowed some times or in some cars, Smoking is allowed in all cars, or do not have a family car.”</p>
Sources	Self-report; Gillespie <i>et al.</i> , 2005 ; Borland <i>et al.</i> , 2006a
Validity	Face validity.
Variations	Can also assess changes in cigarettes smoked per day in the evening after work, for example, in a cohort design.
Comments	While nationwide SHS policies do not regulate smoking in individual’s private homes and property, they may change social norms and increase awareness about SHS harms that may result in individuals implementing such policies on their own. As more workplaces become smoke-free, SHS exposure in the home will be of greater relative importance. This is a relatively understudied area, but has grown to be an important issue in some policy debates.

Table 5.14 Smoking in the Home

with smoke-free policies (Table 5.10). These measures have been validated with ambient air monitoring, as well as biomarkers of exposure. Incidental impacts that may need to be examined are

whether smoke-free policies in workplaces affect smoking at home, and how smoke-free policies impact tobacco use behaviour. In some cases, there will be a need to evaluate potential

economic impact on businesses, and the use of employment or sales data to assess this impact is recommended.