Care Management Science. 2003;6: 155–164.

12. *Statistical Abstract of the United States: 2002.* Washington, DC: US Census Bureau; 2003. Available at: http://www.census.gov/prod/www/statistical-abstract-02.html. Accessed January 26, 2005.

13. US Census Bureau Web site. Historical Health Insurance Tables. Available at: http://www.census.gov/hhes/hlthins/historic/hihistt7.html. Accessed January 26, 2005.

14. Centers for Disease Control and Prevention, National Center for Health Statistics Web site. National Health Interview Survey (NHIS). Available at: http://www.cdc.gov/nchs/nhis.htm. Accessed January 26, 2005.

15. Centers for Disease Control and Prevention, National Center for Health Statistics Web site. National Health and Nutrition Examination Survey (NHANES). Available at: http://www.cdc.gov/nchs/nhanes.htm. Accessed January 26, 2005.

16. Centers for Disease Control and Prevention, Behavioral Risk Factor Surveillance System Web site: Prevalence Data and Trends Data. Available at: http://www.cdc.gov/brfss. Accessed January 26, 2005.

17. Homer J, Jones A, Seville D. *Diabetes System Model Reference Guide.* Hartland, Vt: Sustainability Institute; 2004. Available at: http://sustainer.org/pubs/diabetessystemreference.pdf. Accessed May 28, 2005.

Simulation Modeling and Tobacco Control: Creating More Robust Public Health Policies

David T. Levy, PhD, Joseph E. Bauer, PhD, and Hye-ryeon Lee, PhD

Although previous empirical studies have shown that tobacco control policies are effective at reducing smoking rates, such studies have proven of limited effectiveness in distinguishing how the effect of policies depend on the other policies in place, the length of adjustment period, the way the policy is implemented, and the demographic groups considered.

An alternative and complementary approach to purely statistical equations is simulation models. We describe the SimSmoke simulation model and how we used it to assess tobacco control policy in a specific case study. Simulation models are not only useful for policy prediction and planning but also may help to broaden our understanding of the role of different public health policies within a complex, dynamic social system. (*Am J Public Health.* 2006;96: 494–498. doi:10.2105/AJPH.2005.063974)

SINCE THE LANDMARK REPORT on smoking and health by the Surgeon General in 1964,[1] substantial progress has been made in reducing smoking rates in the United States. In 2003, about 21.6% of adults smoked.[2] The Healthy People 2010 goal is to reduce smoking prevalence to 12% by the year 2010.[3] Although some states (e.g., California and Utah) have nearly achieved that goal, other states still have a long way to go, with rates near 30%.[4]

Much of the decline in smoking rates is attributable to effective tobacco control policies.[5,6] Nevertheless, we expect that continued reductions in smoking rates may be more difficult[7] and will require more robust policies. It will be necessary to determine how individual policies can best be implemented, to sort out the independent effects that different policies have on different populations, and to determine how the effects of multiple policies interact with each other. To get at these issues, we must move toward building models that can help us design policies that replicate past successes and tailor policies to those populations at the highest risk.

A substantial body of research has examined the effect of public policies on smoking attitudes and behaviors.[5,6,8] However, although we have good evidence on the effects of some policies (e.g., taxes and worksite restrictions), our knowledge of other policies (e.g., youth access policies, media policies, and advertising bans) is relatively weak.[6,8] Even for the better-studied policies, our knowledge is often limited in terms of how the effect of that policy depends on the following:

- The initial level (e.g., the amount of the tax before any policy change)
- The extent of change (e.g., the change in the tax rate or per capita media expenditures)
- The manner in which a policy is implemented (e.g., whether a clean air law is publicized and enforced)
- The period of time that it has been in effect (e.g., the effect of a policy that predominantly affects youth will generally have increasing effects on adult prevalence with time)
- The other policies in place or currently being implemented (e.g., the effect of a public media campaign may be greater if there is already a ban on industry advertising)
- The sociodemographic or smoking characteristics of the population (e.g., a policy may have less effect on heavy smokers than on lighter smokers)

Understanding these nuances is important for creating more robust tobacco control policies.

Except for a small number of empirical studies that simultaneously considered the effect of 2 tobacco control policies,[9–11] most consider the effect of only 1 policy, thus making it difficult to learn how multiple policies interact with one another. Except for tax policy, little is known about the reactions of different sociodemographic groups.[6] The other issues listed also are not considered in most studies. Information is often not available to estimate complex statistical models; data on outcomes, policies, or other influencing factors may be poorly measured or unavailable over sufficiently long time periods. In addition, the variables of interest may not exhibit sufficient variability to accurately estimate complex relationships.

An alternative to pure statistical modeling, but one that we argue is a complementary approach, is simulation modeling. Rather than attempting to estimate all the pathways in a single statistical equation or group of equations, simulation models may systematically combine information from different studies with plausible theoretical relationships. The model is then validated against actual trends and turning points in smoking rates for the population as a whole and for various population subgroups. As new empirical studies are conducted, information from those studies can be incorporated in the model, and the validation exercise begins again.

Simulation models of smoking behaviors date back at least to the 1980s.[12] More recently, models of the effect of tobacco control policies, trends in smoking prevalence, and health outcomes have been developed by Mendez and Warner,[13,14] Orme et al.,[15] Tengs et al.,[16,17] and Levy et al.[18,19] The SimSmoke model of Levy et al. considers a broader array of public policies than the other models[18,19] and is the focus of this article.

We describe the genesis of the SimSmoke model and how it has been applied in real-world situations to assess tobacco control policy. A specific case study will be described to provide context and to help visualize the possibilities of a simulation modeling approach. Finally, we will discuss limitations of the model and how simulation models might be used in the future. Although this article focuses on the use of the SimSmoke model for prediction and planning, simulation models generally help to broaden our understanding of the role of different public health policies within a complex, dynamic social system. Our ultimate purpose is to describe a vision of how simulation models might become an integral part of local, state, or national surveillance and policy evaluation systems.

THE SIMSMOKE MODEL

SimSmoke is a system-based simulation model that assesses the impact of past tobacco control policies and generates predictions about the future effect of policies on smoking prevalence and premature mortality attributable to smoking. The basic model utilizes a population component, a smoking component, and a number of tobacco control policy components in moving the population forward through time. For the population component, the population changes through births and deaths. For the smoking component, smoking is defined in terms of established smoking (≥100 cigarettes lifetime), and individuals are classified as never smokers, current smokers, or ex-smokers at baseline. Over time, the numbers change through smoking initiation among never smokers, smoking cessation among current smokers, and smoking relapse among ex-smokers.

For the policy component, separate modules are developed for different types of tobacco control policies, including price interventions (taxes), clean air laws (workplace, restaurant, and other public places), mass media/comprehensive campaigns, advertising restrictions (bans/warning labels), cessation treatment policies (encouraging interventions by health care providers and providing financial coverage for treatments), and policies that limit youth access to cigarettes (enforcement of underage laws and vending machine and self-service bans). The policy parameters in the model used to generate the predicted effects are based on reviews of the literature[19–25] and "reasonable estimates" developed with the advice of an expert panel. The structure depends on theoretical constructs from the social sciences, as well as empirical studies. For example, the cessation treatment module allows for substitution among different treatments and diminishing effectiveness at the population level, and the mass media module incorporates the classic S-shaped dissemination curve, in which per capita expenditures must be high enough for messages to reach smokers a sufficient number of times, and then shows diminishing returns.

The effect of policies depends on the initial level of policies (e.g., the current level of cigarette taxes), the extent of change in policies (e.g., the change in the tax), and how the policies are implemented (e.g., per unit or as a percentage of sales). Advertising bans and clean air laws depend on the types and extent of restrictions already in place and those newly implemented. Cessation treatment use and effectiveness depend on the treatments covered and the degree of physician involvement. The youth access module considers the role of compliance checks (with diminishing returns), penalties, and merchant concern (through a multiplicative function) as it affects retail compliance, which in turn affects smoking rates (through an S-shaped curve).

The time pattern of policy effects depends on how they alter initiation and cessation rates over time. On the basis of evidence from prior studies, most of the policies have a large immediate effect through prevalence rates apportioned over the first 3 years that the policy is in effect. Policies continue to affect cessation and initiation rates as long as the policy is sustained. For example, higher taxes or clean air laws continue to increase quit rates because of policy-induced reductions in the quantity smoked by continuing smokers and continued incentives to quit.

One of the reasons for implementing different policies is that they affect different demographic or smoking groups (e.g., heavy vs light smokers). For example, taxes have greater effects on the young and on certain minorities. Policies, such as worksite laws, have greater effects on males and those of working age because of greater labor participation and thereby have a more immediate impact on deaths attributable to smoking. A policy that affects youth translates into significant reductions in adult smoking rates only in later years, as those youths age.[19]

Although the model focuses on individual policies, multiple policies may act synergistically in shaping individual and societal attitudes toward smoking. The model assumes that the percentage of reductions from the different policies are multiplicatively applied but allows for some specific synergies between policies. Media campaigns are more potent when other policies are simultaneously implemented because of reinforcing messages from their publicity. In addition, as other policies reduce the number of older smokers, youth have fewer alternative sources for acquiring cigarettes when retail sources become less accessible.

THE ROLE OF POLICY SIMULATION MODELS

The original intent for developing SimSmoke was to provide justification for tobacco control to policymakers. The SimSmoke model shows future trends in smoking, the associated health outcomes, and the effects of public policies on those outcomes. By projecting the number of lives saved from implementing polices, tobacco control activities can be better justified. The model can also be used for planning purposes (how to refine existing policies, the need for additional policies, or particular demographic groups to target).

The SimSmoke model has been applied to the United States as a whole, single states within the United States (i.e., Arizona, California, and New York), and other sovereign nations (i.e., Argentina, China, Taiwan, and Vietnam). Where sufficient data are available, the model tracks the effect of policies from a baseline year before major policy changes are implemented. The reliability of the model necessarily depends on the quality of available information about smoking rates and policy effects for the country or state being modeled.

Once the model is developed, predictions of the smoking rate are tracked from the baseline year to the most recent year for which data are available. Smoking rates change because of the smoking patterns of different cohorts of smokers and because of the effects of the different policies implemented during the tracking period. By maintaining policies at their baseline level over the tracking period, trends in smoking rates in the absence of policy change can be predicted. By then programming the actual changes in individual policies, the effect of policies individually and in combination can be predicted.[26]

To validate the model, levels and trends in smoking prevalence with actual policy changes over the tracking period are compared to estimates from large-scale surveys. Comparisons are made for the adult population as a whole and for specific demographic groups. Using mean square error and other criterion, the comparisons serve to validate the model for future projections and to determine weaknesses of the model.

Ideally, the SimSmoke model can become a central part of a surveillance and evaluation system. Where data has not been systematically collected, the model suggests the type of data needed to improve surveillance systems for monitoring smoking rates of the entire population and by age and gender, the extent of policies implemented, and progress toward health objectives. The model also may provide guidance on the factors relevant to measuring policies (e.g., the characteristics relevant to policy success and the role of other policies), the outcomes to be considered (e.g., the specific populations likely to be affected and time pattern of effects), and whether the results are plausible in light of past studies.

Like the model itself, the informational process involves adjustments in a dynamic context. As new surveillance data are collected, the improved measures (e.g., smoking rates) are inputted for better accuracy. As new evaluation studies are conducted, these studies are used to revise policy parameters in the model. With these improvements, the model provides a sounder basis for planning.

CASE STUDY: THE FULL COURT PRESS EVALUATION

Between 1996 and 2001, The Robert Wood Johnson Foundation funded a comprehensive, community-based adolescent tobacco use prevention program in Tucson, Arizona, called "Full Court Press" (FCP). This tobacco control program, under the auspices of Robert Wood Johnson's SmokeLess States national program, was a multifaceted effort to reduce the prevalence of tobacco use by 10% of the baseline rate. FCP's focus was on changing broad community norms about tobacco through policy advocacy activities. By creating changes in the larger community, it sent the message to youth that tobacco use was not acceptable, thus creating a more enduring behavioral change than individual-based interventions. FCP mounted comprehensive interventions directed to the community at large as well as to youth.

FCP was a community program confined to the city of Tucson, with a focus on outcomes among youth. However, the program was carried out against the backdrop of a larger state program, the Arizona Tobacco Education and Prevention Program (TEPP). Funded by the tobacco tax increase of 1994, TEPP began implementing statewide media campaigns, cessation programs, youth programs, community-based projects, and various pilot projects in 1995. TEPP also had an evaluation component that was not implemented until a year after the program began in 1996.

A study by the Arizona Criminal Justice Commission[27] examined changes in youth smoking prevalence in Arizona between 1996 and 1999. The evaluation documented a 27% prevalence reduction in Tucson, which was larger than the rest of the state. However, it was impossible to distinguish the effect of FCP from the effects of the Arizona TEPP or long-term downward trends in smoking rates. Yet, it was necessary to isolate the effects of TEPP to determine the independent effects of FCP.

To determine trends in youth smoking rates and the effects of policies on those rates, an Arizona SimSmoke simulation model was developed.[28] Once we estimated the effect of long-term trends and the policies in Arizona through the simulation model, we could use the results to distinguish the changes in Tucson smoking rates attributable to FCP. The Arizona model began in 1993, before the tax hike and TEPP were implemented, so that these policies could be tracked. The model used data from the state representative CPS–Tobacco Use Supplement to establish baseline smoking rates and then used that and other data sources to validate the model.

The Arizona SimSmoke model predicted levels and changes in smoking prevalence well. The simulation model concluded that Arizona state policies were effective in reducing smoking prevalence by approximately 20%. This finding was consistent with an earlier study[29] that showed similar rates of effectiveness. However, the Arizona SimSmoke model went beyond that previous study by also examining the role of long-term trends and linked the reduction in smoking prevalence to specific policies. About 70% of the effect was attributed to price increases, almost 30% of the overall effect to media policies, and a small percentage to clean air laws and youth access policy. In addition, the model predicted that over 25,000 lives would be saved through 2040 as a result of the policies implemented.

Given the lack of a consistent time series of data prior to program implementation, the model provided a firmer basis for distinguishing the role of the state policies from that of FCP. Specifically, results from the Arizona SimSmoke demonstrated that 20% of the 27% prevalence reduction in youth smoking rates in Tucson following the introduction of FCP were attributable to policy changes and long-term trends at the state level. Teasing out the impact using this SimSmoke approach generates an estimate of the FCP program in Tucson that is more in line with estimates that were originally expected as a result of the implementation of FCP. The model was also used to examine future implications of FCP. After scaling to the Tucson population, the model could examine how the changes in youth smoking through the FCP program would later impact adult smoking and—ultimately—future deaths attributable to smoking. As policies change in future years, the Arizona SimSmoke model will be updated and used to determine how well past policies continue to work and how recent scale backs of TEPP and FCP affect trends.

Given that many community-based tobacco control interventions take place against the backdrop of changing national and state policy environment and that often there are not appropriate data that can help us tease out the independent impact of these programs as was the case in FCP, SimSmoke is a useful tool that can help establish the impact of policy changes on overall program outcome and help examine the long-term impact of the program.

DISCUSSION

SimSmoke models the time pattern of effects of an array of policies on smoking rates and smoking attributable deaths and how those effects depend on the way that policies are implemented. The model is developed as a system of equations, which considers the different demographic groups affected and the interactive effects of the various policies. The model has been developed in a manner to allow for flexibility in adding new data and changing the parameters of the model.

In previous applications of SimSmoke to the United States, Arizona and California have accurately predicted trends and turning points in population smoking rates,[26,28,30] providing some confirmation that the currently employed parameters and assumptions are valid. However, each of the models overpredict the effect of policies on 18–24 year old smokers (i.e., the models predicted relatively steep declines in smoking for this age group since 1993, but their rates have stayed relatively constant[2]), suggesting the need for further study. In the absence of policies directed at younger adults, smoking initiation may be delayed to older ages.

The model is limited by the quality of the data and our knowledge of the effects of policies. In particular, our knowledge of the interactive effects between policies and the effect of policies on different age groups is generally weak. This problem is arguably attributable to limitations in our ability to construct sufficiently robust empirical models. Simulation models, by combining information from different studies and model validation, may help to improve our knowledge of these effects and to encourage future studies of these issues. As new studies are conducted, information from those studies can be incorporated in the simulation model, and the validation exercise can begin again.

The impact that an array of tobacco control policies has on different sectors of the population can be exceedingly complex. SimSmoke makes some important simplifications that make the model more tractable but also add potential limitations. The model does not consider changes in population trends that are attributable to emigration and immigration, which can limit the ability of the Arizona model in particular to track long-term trends through changes in smoking behaviors as immigrants become more acculturated.[31–33] The model also might be extended to consider the steps in the progression to smoking initiation and to smoking cessation, rather than just simple initiation and cessation. The increasing smoking rate of young adults relative to youth suggests that the progression to established smoking has changed in recent years. The effect of quantity reductions by continuing smoking on future smoking prevalence and smoking-attributable death might also be explicitly considered. Models are also currently being developed to consider the potential effects of alternative nicotine delivery products, such as low nitrosamine smokeless tobacco or nicotine inhalers.

A second simplification is that policies are modeled as having a unidirectional effect on smoking rates. As such, the model does not explicitly model potential feedbacks through industry practices, social norms and attitudes, and peer and family behaviors.

As policies are implemented, the tobacco industry might acquiesce to policies or strategically respond through pricing or marketing practices. For example, in the past 10 years, the high smoking prevalence in the United States of individuals aged 18–24 years might be attributable to the industry targeting its marketing efforts at this group to compensate for lost sales among older smokers. Empirical studies have generally not considered how the effects of tobacco control policy might depend on current industry practices and industry reactions to the policy.

Although allowing for some of the synergies that might be caused by changing social norms, SimSmoke does not explicitly model attitudes or norms. Movements toward antismoking norms may enhance the effect of policies and may further fuel programmatic change, which in turn can lead to further changes that reduce smoking rates. For example, media policies in California and Massachusetts were directed at passing clean air laws, as well as at smoking behaviors. Like industry reactions, modeling these features would add considerably to the complexity of the model, and we did not find sufficient empirical studies to support such model components.

Although peer and parental smoking influence the effect of youth-oriented policies, SimSmoke does not explicitly model direct social interactions or feedback. Reductions in peer and adult smoking may spill over and reduce subsequent initiation.

Despite its limitations, the SimSmoke model is a useful tool for estimating the long-term implications of the current and future policies at a systems level. As our knowledge of some of the linkages not yet incorporated in the SimSmoke model increases, extension of the model will help us systematically explore the potential structure of such relationships. We can, thereby, improve our ability to estimate and more systematically understand the long-term impact of policies. Moreover, because tobacco control is one of the more heavily researched areas in public health, the model might serve as a guide to other areas, such as drug abuse and obesity issues. ■

About the Authors

David T. Levy is with the Pacific Institute for Research and Evaluation of Calverton, Md, and the University of Baltimore, Baltimore, Md. Joseph E. Bauer is with the Roswell Park Cancer Institute of Buffalo, NY. Hye-ryeon Lee is with the Department of Speech at the University of Hawaii, Manoa.

Requests for reprints should be sent to David T. Levy, PhD, 11710 Beltsville Drive, Suite 300, Calverton, MD 20705 (e-mail: levy @pire.org).

This article was accepted September 29, 2005.

Contributors

D.T. Levy wrote the first draft and revisions. J. Bauer was involved in the conceptualization and development of the article and in revisions. Hye-ryeon Lee was also involved in the conceptualization and development of the article and in revisions.

Acknowledgments

The writing of this article was supported by the Robert Wood Johnson Foundation (grant 044749). David Levy also received funding through the National Cancer Institute's Cancer Intervention and Surveillance Modeling Network Program (grant UO1-CA-097450).

The authors thank Hana Ross, who helped in the development of the Arizona model described in the case study section.

Human Participant Protection

No protocol approval was needed for this study.

References

1. US Department of Health and Human Services. *Smoking and Health: Report of the Advisory Committee to the Surgeon General of the Public Health.* Atlanta, Ga: US Department of Health, Education, and Welfare; 1964.

2. Centers for Disease Control and Prevention. Tobacco Information and Prevention Source (TIPS). Available at: http?//www.cdc.gov/tobacco/research_data/adults_prev/adstat3.htm and www.cdc.gov/tobacco/research_data/adults_prev/tab_3.htm. Accessed October 10, 2004.

3. US Department of Health and Human Services. *Healthy People 2010.* Atlanta, Ga: Centers for Disease Control and Prevention, Office of Disease Prevention and Health Promotion; 2000.

4. Centers for Disease Control and Prevention. State-specific prevalence of current cigarette smoking among adults: United States, 2003. *MMWR Morb Mortal Wkly Rep.* 2004;53:1035–1037.

5. US Department of Health and Human Services. *Reducing Tobacco Use: A Report of the Surgeon General.* Atlanta, Ga: Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2000.

6. Levy DT, Gitchell JG, Chaloupka F. The effects of tobacco control policies on smoking rates: a tobacco control scorecard. *J Public Health Manag Pract.* 2004;10:338–351.

7. Levy DT, Nikolayev N, Mumford EA. The *Healthy People 2010* smoking prevalence and tobacco control objectives: results from the SimSmoke tobacco control policy simulation model. *Cancer Causes Control.* 2005;16: 359–371.

8. Hopkins DP, Briss PA, Ricard CJ, et al. Reviews of evidence regarding interventions to reduce tobacco use and exposure to environmental tobacco smoke. *Am J Prev Med.* 2001;20(Suppl. 2):16–66.

9. Chaloupka FJ, Wechsler H. Price, tobacco control policies and smoking among young adults. *J Health Econ.* 1997;16:359–373.

10. Farrelly MC, Pechacek TF, Chaloupka FJ. The impact of tobacco control program expenditures on aggregate cigarette sales: 1981–2000. *J Health Econ.* 2003;22:843–859.

11. Hu TW, Sung HY, Keeler TE. Reducing cigarette consumption in California: tobacco taxes vs an antismoking media campaign. *Am J Public Health.* 1995;85:1218–1222.

12. Roberts EB, Homer J, Kasabian A, Varrell M. A systems view of the smoking problem: perspective and limitations of the role of science in decision-making. *Int J Biomed Comput.* 1982;13: 69–86.

13. Mendez D, Warner KE, Courant PN. Has smoking cessation ceased? Expected trends in the prevalence of smoking in the United States. *Am J Epidemiol.* 1998;148:249–258.

14. Mendez D, Warner KE. Adult cigarette smoking prevalence: declining as expected (not as desired). *Am J Public Health.* 2004;94:251–252.

15. Orme ME, Hogue SL, Kennedy LM, Paine AC, Godfrey C. Development of the health and economic consequences of smoking interactive model. *Tob Control.* 2001;10:55–61.

16. Tengs TO, Osgood ND, Lin TH. Public health impact of changes in smoking behavior: results from the Tobacco Policy Model. *Med Care.* 2001; 39:1131–1141.

17. Tengs TO, Ahmad S, Moore R, Gage E. Federal policy mandating safer cigarettes: a hypothetical simulation of the anticipated population health gains or losses. *J Policy Anal Manage.* 2004; 23:857–872.

18. Levy DT, Chaloupka F, Gitchell J, Mendez D, Warner KE. The use of simulation models for the surveillance, justification and understanding of tobacco control policies. *Health Care Manag Sci.* 2002;5:113–120.

19. Levy DT, Cummings KM, Hyland A. A simulation of the effects of youth initiation policies on overall cigarette use. *Am J Public Health.* 2000;90:1311–1314.

20. Levy DT, Friend K, Polishchuk E. Effect of clean indoor air laws on smokers: the clean air module of the SimSmoke computer simulation model. *Tob Control.* 2001;10:345–351.

21. Levy DT, Friend K, Holder H, Carmona M. Effect of policies directed at youth access to smoking: results from the SimSmoke computer simulation model. *Tob Control.* 2001;10:108–116.

22. Levy DT, Friend K. Examining the effects of tobacco treatment policies on smoking rates and smoking related deaths using the SimSmoke computer simulation model. *Tob Control.* 2002; 11:47–54.

23. Levy DT, Friend K. A simulation model of policies directed at treating tobacco use and dependence. *Med Decis Making.* 2002;22:6–17.

24. Levy DT, Friend K. A computer simulation model of mass media interventions directed at tobacco use. *Prev Med.* 2001;32:284–294.

25. Levy DT, Cummings KM, Hyland A. Increasing taxes as a strategy to reduce cigarette use and deaths: results of a simulation model. *Prev Med.* 2000;31: 279–286.

26. Levy DT, Nikolayev N, Mumford EA. Recent trends in smoking and the role of public policies: results from the SimSmoke tobacco control policy simulation model. *Addiction.* 2005;10: 1526–1537.

27. *Substance Abuse and Public School Students: Survey of Elementary, Middle, and Secondary Public School Students in Arizona 1999.* Phoenix, Ariz: Arizona Criminal Justice Commission; 2000.

28. Levy DT, Bauer J, Ross H, Powell L, Nikolayev N. *The Role of Public Policies in Reducing Smoking Prevalence and Deaths Caused by Smoking in Arizona: Results from the Arizona Tobacco Policy Simulation Model.* Calverton, Md: Pacific Institute; 2004.

29. Centers for Disease Control and Prevention. Tobacco use among adults: Arizona, 1996 and 1999. *MMWR Morb Mortal Wkly Rep.* 2001;50:402–406.

30. Levy DT, Nikolayev N, Mumford EA. *The Role of Public Policies in Reducing Smoking Prevalence and Deaths Caused by Smoking in California: Results from the California Tobacco Policy Simulation Model.* Calverton, Md: Pacific Institute; 2004.

31. Wilkinson AV, Spitz MR, Strom SS, et al. Effects of nativity, age at migration, and acculturation on smoking among adult Houston residents of Mexican descent. *Am J Public Health.* 2005; 95:1043–1049.

32. Ma GX, Tan Y, Toubbeh JI, et al. Acculturation and smoking behavior in Asian-American populations. *Health Educ Res.* 2004;19: 615–625.

33. Chen X, Unger JB, Johnson CA. Is acculturation a risk factor for early smoking initiation among Chinese American minors? A comparative perspective. *Tob Control.* 1999;8:402–410.