SPECIAL ARTICLE

Cardiovascular Health and Economic Effects of Smoke-Free Workplaces

Michael K. Ong, MD, PhD, Stanton A. Glantz, PhD

PURPOSE: Smoking is the leading controllable risk factor for heart disease. Only about 69% of U.S. indoor workers are currently covered by a smoke-free workplace policy. This analysis projects the cardiovascular health and economic effects of making all U.S. workplaces smoke free after 1 year and at steady state.

METHODS: We estimated the number of U.S. indoor workers not covered by smoke-free workplace policies, and the effects of making all workplaces smoke free on smoking behavior and on the relative risks of acute myocardial infarctions and strokes. One-year and steady-state results were calculated using an exponential decline model. A Monte Carlo simulation was performed for a sensitivity analysis.

RESULTS: The first-year effect of making all workplaces smoke free would produce about 1.3 million new quitters and prevent over 950 million cigarette packs from being smoked annually, worth about $2.3 billion in pretax sales to the tobacco industry. In 1 year, making all workplaces smoke free would prevent about 1500 myocardial infarctions and 350 strokes, and result in nearly $49 million in savings in direct medical costs. At steady state, 6250 myocardial infarctions and 1270 strokes would be prevented, and $224 million would be saved in direct medical costs annually. Reductions in passive smoking would account for 60% of effects among acute myocardial infarctions.

CONCLUSION: Making all U.S. workplaces smoke free would result in considerable health and economic benefits within 1 year. Reductions in passive smoking would account for a majority of these savings. Similar effects would occur with enactment of state or local smoke-free policies. **Am J Med. 2004;117: 32–38.** ©2004 by Elsevier Inc.

Smoking is the largest modifiable risk factor for coronary disease (1). Cardiovascular disease makes up 34% of smoking-related mortality and smoking accounts for 16% of all cardiovascular mortality (2). These estimates do not include the effects of passive smoking on cardiovascular disease (3,4); the relative risk of death from coronary heart disease for passive smokers is 1.25 (5). Smoke-free workplaces substantially reduce exposure to secondhand smoke and the associated cardiovascular risks for passive smokers. Smoke-free workplaces also reduce cigarette consumption among smoking employees by 29% by making it easier for them to quit or reduce consumption (6). However, only about 69% of U.S. indoor workers reported being covered by a smoke-free workplace policy in 1999 (7). Because the risks of myocardial infarction fall rapidly after smoking cessation (8) and, presumably, after reduced exposure to secondhand smoke, we projected the cardiovascular health and economic effects if all remaining U.S. workplaces were made smoke free.

From the Divisions of General Internal Medicine (MKO) and Cardiology (SAG), Department of Medicine, and Cardiovascular Research Institute (SAG), University of California, San Francisco; Veterans Affairs Palo Alto Health Care System (MKO), Palo Alto, California; and Center for Primary Care and Outcomes Research (MKO), Stanford University, Stanford, California.

This work was supported by National Cancer Institute Grant CA-61021 and by Health Resources and Services Administration Training Grant 1D22HP00349.

Requests for reprints should be addressed to Stanton A. Glantz, PhD, Division of Cardiology, Department of Medicine, University of California, San Francisco, Box 1390, San Francisco, California 94143-1390, or glantz@medicine.ucsf.edu.

Manuscript submitted July 29, 2003, and accepted in revised form February 13, 2004.

METHODS

Estimation of the Number of New Nonsmokers by Making All U.S. Workplaces Smoke Free

The number of indoor workers was estimated using the 2000 Occupational Employment Statistics Survey (9). The 1999 Current Population Survey definition of an indoor worker was a person at least 15 years of age who was currently employed outside the home, but who was not self-employed, working outdoors or in a motor vehicle, traveling to different building or sites, or working in someone else's home (7). Persons who were not considered indoor workers included athletes and sports competitors (n = 9920); police and sheriff's patrol officers (n = 571,210); crossing guards (n = 72,830); maids and housekeeping cleaners, pest control workers, landscaping and groundskeeping workers, pesticide handlers, sprayers, and applicators, tree trimmers and pruners (n = 1,820,180); and couriers and messengers (n = 130,210); as well as those working in the farming, fishing, or forestry industry (n = 460,700); the construction or extraction industry (n = 6,187,360); installation (n =

0002-9343/04/$–see front matter
doi:10.1016/j.amjmed.2004.02.029

5,318,490); and the transportation or materials moving industry (n = 9,569,390). The indoor worker sample that was not covered by a smoke-free workplace policy was estimated by multiplying the total indoor worker sample by the percentage of workers lacking such coverage (31.4%) (7). This cohort was then divided into active and passive smokers by multiplying the indoor worker sample lacking smoke-free workplace policy coverage by the smoking prevalence for adults aged 18 to 64 years (25.9%). This prevalence was calculated by multiplying age-specific smoking prevalence (1) by the respective age cohort from the 2000 Census (10). Nonsmoking indoor workers lacking smoke-free workplace policy coverage were defined as passive smokers. A homogeneous risk of smoking and passive smoking was assumed.

The 29% reduction (6) in total cigarette consumption when a workplace becomes smoke free is a result of a 3.8% reduction in absolute smoking prevalence (which corresponds to 14.7% of smokers quitting) and a 1.3 cigarette per day reduction in daily consumption (a 12.2% reduction) among continuing smokers. The resultant quitter sample was calculated by multiplying the percentage of quitters by the active smoker indoor worker sample. We assumed that quitting occurred immediately following policy introduction (6).

We made several assumptions about passive smoking. First, a national smoke-free workplace policy immediately eliminates passive smoking in all workplaces currently not covered by a policy (6). Second, passive smokers who work indoors are not exposed to passive smoking outside of work. Finally, we did not account for reductions in passive smoking (generated by a national smoke-free workplace policy) outside of the workplace, at home, or in other locations.

Estimation of Cigarette Consumption Reduced by a Nationwide Smoke-Free Workplace Policy

The 2000 U.S. adult per capita cigarette consumption was 104.3 packs per year (11). The 2000 adult smoker per capita cigarette consumption is equal to the adult per capita cigarette consumption divided by the adult smoking prevalence (23.3%) (1), or 447.6 packs per year. The annual reduction in cigarette consumption due to a nationwide smoke-free workplace policy is equal to the consumption forgone by quitters plus the consumption reduction among remaining smokers. The consumption forgone by quitters is the number of quitters multiplied by the 2000 adult smoker per capita consumption. The consumption reduction is the number of remaining smokers multiplied by both the 2000 adult smoker per capita consumption and the 12.2% reduction in cigarette consumption.

The 2000 pretax price of a pack of cigarettes was $2.36 (11). The total pretax value of forgone cigarette consumption to the tobacco industry is equal to the total number of forgone packs multiplied by the pretax pack price.

Estimation of Cardiovascular Health Effects

Cardiovascular disease was defined as both acute myocardial infarction and stroke. The risk of early cardiovascular disease is highest between the ages of 35 to 64 years; this age range accounted for 57.5% of persons aged 18 to 64 years (10). We estimated cardiovascular health effects for both quitters and former passive smokers aged 35 to 64 years; we generated samples of quitters and former passive smokers in this age group by multiplying the original quitter and former passive smoker samples by 57.5%. Effect estimates were performed for both quitters and former passive smokers for myocardial infarctions, but only for quitters for strokes (because there was only one study estimating the relative risk of stroke due to secondhand smoke [12]). We did not estimate the effects on cardiovascular risks for continuing smokers who reduced their consumption. For quitters, sex-specific relative risks for myocardial infarction were available, and quitters were split using the age-specific sex ratio (50.9% women) (10).

The relative risk of myocardial infarction for smokers was 2.88 (95% confidence interval [CI]: 1.54 to 5.39) for men and 3.85 (95% CI: 1.53 to 9.67) for women (8), and 1.25 (95% CI: 1.17 to 1.32) for passive smokers (5). The relative risk of stroke for smokers was 2.80 (95% CI: 1.86 to 4.23) (8). Relative risks for cardiovascular disease decline rapidly over time once smoking cessation occurs. The model (8) used to calculate this decline was $RR(t) = (RR(0) - RR(S))e^{-t/T} + RR(S)$, where $RR(t)$ = relative risk at time t after quitting (or ending secondhand smoke exposure), $RR(0)$ = relative risk at baseline, $RR(S)$ = relative risk at steady state, t = time, and T = time constant for the fall in risk after cessation (of smoking or secondhand smoke exposure). The time constant was 19.1 months for myocardial infarctions and 16.2 months for strokes (8). The steady-state relative risk of myocardial infarction in quitters was 1.17 (95% CI: 0.91 to 1.51) for men and 1.40 (95% CI: 0.93 to 2.11) for women (8). The steady-state relative risk of myocardial infarction in former passive smokers was 1.11 (95% CI: 0.70 to 1.74) (13), whereas the steady-state relative risk of stroke was 1.42 (95% CI: 1.54 to 2.02) for all quitters (8). Using this formula, the relative risk of myocardial infarction declined from 2.88 for currently smoking men to 2.08 one year after quitting; for currently smoking women, the risk dropped from 3.85 to 2.71. The relative risk of myocardial infarction in passive smokers declined to 1.16 after a year without exposure. The relative risk of strokes declined from 2.80 for all smokers to 2.16 one year after quitting.

The number of prevented conditions in the first year was calculated by multiplying the cohort by the never-smoker incidence rate and the difference between initial

Table 1. Initial Parameters of the Monte Carlo Simulation

Key Assumptions	Baseline ± SD or Relative Risk (95% Confidence Interval)	Reference
Proportion of indoor workers covered by smoke-free workplace policies	0.686 ± 0.002	(7)
Smoking prevalence	0.259 ± 0.005	(1)
Initial relative risk of myocardial infarction for men	2.88 (1.54–5.39)	(8)
Steady-state relative risk of myocardial infarction for men	1.17 (0.91–1.51)	(8)
Initial relative risk of myocardial infarction for women	3.85 (1.53–9.67)	(8)
Steady-state relative risk of myocardial infarction for women	1.40 (0.93–2.11)	(8)
Initial relative risk of stroke	2.80 (1.86–4.23)	(8)
Steady-state relative risk of stroke	1.42 (1.00–2.02)	(8)
Initial relative risk of myocardial infarction for passive smokers	1.25 (1.17–1.32)	(5)
Incidence of myocardial infarction for men per 1000 person-years	3.11 ± 0.62	(8)
Incidence of myocardial infarction for women per 1000 person-years	0.89 ± 0.26	(8)
Incidence of stroke per 1000 person-years	1.37 ± 0.27	(8)
Discount rate	0.03 ± 0.015	(16)

and current relative risk. Because cardiovascular risk is gradually reduced over time within a given year, a midpoint adjustment was modeled by multiplying the effect observed at the end of a given year by 0.5. Never-smoker incidence rates were extrapolated from hospitalization discharge rates for persons aged 35 to 64 years from the Centers for Disease Control and Prevention's Wide-ranging Online Data for Epidemiologic Research (WONDER) system between 1988 and 1990 (8). The never-smoker incidence rate for all myocardial infarctions (fatal and nonfatal combined) was 3.11 events per 1000 person-years for men and 0.89 events per 1000 person-years for women, and for strokes the rate was 1.37 events per 1000 person-years. These rates may underestimate the true event incident rates due to deaths occurring before arrival at a hospital.

The number of prevented deaths was the sum of prevented immediate deaths and prevented deaths within a given year following the event. Prevented immediate deaths were the product of the number of prevented events and the probability of immediate death from the event. Prevented deaths within 1 year of the initial event were the difference between the number of prevented events and the number of prevented immediate deaths, multiplied by the survival probability. These deaths were then adjusted to account for gradual reduction in risk over time using the midpoint methodology listed previously. The immediate mortality rate for myocardial infarction was 0.115 for men and 0.167 for women (14); the rate for stroke was 0.043 (15). The annual survival probability was 0.992 for men at risk of acute myocardial infarction and 0.995 for women, and 0.993 for persons at risk of stroke (8). The annual survival probability in the first year after a myocardial infarction was 0.812 for men and 0.765 for women; after a stroke, the probability was 0.663 (8). The annual survival probability in subsequent years following a myocardial infarction was 0.994 for men and 0.933 for women; for stroke, the probability was 0.961 (8).

Steady-state results were calculated by advancing this cohort through time. For each subsequent year, the surviving cohort was calculated by multiplying the previous cohort by the annual survival probability. This new cohort was then multiplied by the event incidence and by the difference between relative risks from the prior year and the current year. Prevented total events, immediate deaths, and total deaths were calculated as described previously. Savings from the prior years were also calculated after multiplying the prior cohort by the annual survival probabilities. Due to the midpoint correction, half of the sample was multiplied by the annual survival probability one more time than its corresponding other sample half in each time period.

A Monte Carlo simulation was performed (SimTools, Chicago, Illinois; http://home.uchicago.edu/~rmyerson/addins.htm) to estimate the distribution of the reduction in cardiovascular events. Ten thousand trials were generated. Individual parameters that were varied simultaneously in the simulation included the percentage of workers covered by smoke-free workplace policies,

Table 2. Results of Monte Carlo Simulation

Variable	2.5% Point	Median	97.5% Point
Number of quitters after smoke-free workplace policy	0.93 million	1.26 million	1.59 million
Within 1 year			
Prevented myocardial infarctions	1090	1540	2010
Prevented deaths due to myocardial infarction	340	480	630
Prevented strokes	200	350	540
Prevented deaths due to stroke	70	130	200
Prevented myocardial infarctions in previous passive smokers	540	910	1300
Prevented deaths due to myocardial infarction in previous passive smokers	170	290	420
Savings from prevented myocardial infarctions	$34.41 million	$48.57 million	$63.45 million
Savings from prevented stroke	$6.54 million	$11.64 million	$17.89 million
Savings from prevented myocardial infarctions in previous passive smokers	$16.90 million	$28.68 million	$40.67 million
Within 7 years			
Cumulative prevented myocardial infarctions	4430	6250	8160
Cumulative prevented deaths due to myocardial infarction	1390	1960	2560
Cumulative prevented strokes	700	1250	1930
Cumulative prevented deaths due to stroke	260	460	700
Cumulative prevented myocardial infarctions in previous passive smokers	2180	3710	5250
Cumulative prevented deaths due to myocardial infarction in previous passive smokers	700	1190	1690
Discounted cumulative savings from prevented myocardial infarctions	$160.07 million	$225.49 million	$296.06 million
Discounted cumulative savings from prevented stroke	$30.66 million	$54.80 million	$84.31 million
Discounted cumulative savings from prevented myocardial infarctions in previous passive smokers	$78.48 million	$133.12 million	$189.46 million

smoking prevalence, effect of smoke-free workplace policies on quitting, initial and steady-state relative risks of myocardial infarctions (both sexes) and strokes, initial relative risk of myocardial infarction among passive smokers, and incidence of myocardial infarctions (both sexes) and strokes (Table 1). The steady-state relative risk of myocardial infarctions among passive smokers was not varied. Normal distributions were used, except for relative risks that had a log-normal distribution (5,8). We report our findings by using the median of the Monte Carlo simulation. The 2.5% and 97.5% points in the distribution are reported (Table 2).

Estimation of Cardiovascular Health Costs

Direct medical cost savings were equal to the difference between prevented events and the number of prevented immediate deaths, multiplied by the cost of disease. Immediate deaths did not incur direct medical costs as these subjects died before receiving treatment. The average medical costs (in 2000 dollars) of cardiovascular disease during the first year after an event were $36,531 for myocardial infarctions and $34,368 for strokes. The average second- and third-year costs for myocardial infarctions were $2212 and $1439. For strokes, average costs accrued through 6 years, with $8150 in the second year, $1915 in the third year, $1753 in the fourth year, $1408 in the fifth year, and $702 in the sixth year. These costs were previously described for 1995 (8); 2000 costs were estimated using the medical cost component of the Consumer Price Index. For myocardial infarctions, this included the initial costs of treatment, expected cost of a major surgical procedure (angioplasty or coronary artery bypass surgery), and follow-up and rehabilitation costs after the initial hospitalization. For strokes, this included direct medical short-term costs of treatment, rehabilitation costs, and cost of care in nursing facilities. Reported costs were discounted using a 3% rate (16). The Monte Carlo simulation also estimated the distribution of cardiovascular medical cost savings.

RESULTS

Cigarette Consumption Effects

A total of 105.6 million individuals were indoor workers. Of these workers, 33.2 million individuals were not covered by a smoke-free workplace policy. Active smokers made up 8.6 million of the noncovered sample. The other 24.6 million subjects were considered passive smokers. Implementation of a nationwide smoke-free workplace policy would produce 1.3 million new nonsmokers (Table 3).

A national smoke-free workplace policy would annually cause quitters to forgo 564 million packs and remain-

Table 3. Effect of a National Smoke-Free Workplace Policy on Cigarette Consumption

Variable	New Quitters	Residual Smokers
Number of affected persons	1.26 million	7.33 million
Packs per smoker per year	0	392.9
Reduction in consumption	100%	12.2%
Packs forgone per year after going smoke free	564 million	401 million
Pretax value to tobacco industry of packs forgone	$1333 million	$949 million

ing smokers to forgo 401 million packs, an annual total of over 965 million cigarette packs. The total pretax value of forgone cigarette consumption would be a $2.3 billion annual loss to the tobacco industry (Table 3).

Cardiovascular Health Effects

Among persons aged 35 to 64 years, there would be 725,000 new quitters and 14.1 million former passive smokers. Making all workplaces smoke free would prevent 1540 myocardial infarctions and 360 strokes in the first year. Total deaths prevented in the first year would include 480 deaths due to myocardial infarction and 130 deaths due to stroke (Table 4). Passive smoking effects would account for 59% (910/1540) of the total myocardial infarctions and 61% (290/480) of the total deaths due to myocardial infarction.

Steady state was reached at year 7, at which point our model estimated that 6250 cumulative myocardial infarctions and 1270 cumulative strokes would be averted (Table 4). Among myocardial infarctions, 3700 (59%) would be among former passive smokers. The number of total deaths prevented would include 1960 by myocardial infarction and 460 by stroke. Passive smokers would account for 1190 (61%) of fatal myocardial infarctions prevented.

Cardiovascular Health Costs

The total averted costs within the first year would include $48.6 million from prevented myocardial infarctions, of which $28.6 million (59%) would be attributable to prevented myocardial infarctions among former passive smokers and $11.8 million from prevented strokes (Table 4). These first-year averted medical costs would total over $60 million. The total cumulative averted costs over 7 years would be nearly $280 million, including $224 million from prevented myocardial infarctions and $55 million from prevented strokes. Former passive smokers would account for $132 million (61%) of the cumulative savings from prevented myocardial infarctions.

DISCUSSION

We found that making workplaces smoke free not only reduces worker exposure to secondhand smoke, but also contributes substantially to reducing cardiovascular disease among nonsmokers and smokers. Nonsmokers who are no longer exposed to secondhand smoke realize 60% of the benefit and smokers who quit realize 40% of the benefit. Although passive smokers have a lower risk of heart disease than do smokers, the sample at risk is nearly three times larger than the active smoking sample. In addition, smoke-free workplaces eliminate risks to all passive smokers even though they only lead some active smokers to quit entirely.

This analysis underestimates the true cost of cardiovascular disease due to smoking. We made no estimates of stroke reduction among passive smokers, nor did we include any indirect savings from prevented lost work productivity. In addition, we did not estimate the health and resultant economic effects of reduced consumption among remaining smokers, as well as the effects on reductions in passive smoking that occur outside of the workplace.

Table 4. Health and Economic Effects of a National Smoke-Free Workplace Policy on Cardiovascular Disease

Variable	Quitters (n = 0.73 million)		Passive Smokers (n = 14.13 million)	Total Myocardial Infarction (n = 15.86 million)
	Stroke	Myocardial Infarction	Myocardial Infarction	
Initial year results (year 1)				
Prevented events	360	630	910	1540
Prevented deaths	130	190	290	480
Averted costs of event	$11.79 million	$19.97 million	$28.65 million	$48.62 million
Steady-state results (year 7)				
Prevented cumulative events	1270	2550	3700	6250
Prevented cumulative deaths	460	770	1190	1960
Averted cumulative costs of events	$55.12 million	$92.05 million	$132.16 million	$224.22 million

Although we used a uniform estimate for smoking prevalence and smoke-free workplace coverage in this analysis, smoking prevalence and smoke-free workplace coverage varies by occupation (17). Blue-collar and service workers are more likely to smoke and less likely to be covered by a smoke-free workplace policy compared with white-collar workers (17). Smoke-free workplaces also lead to greater reductions in smoking prevalence among blue-collar and service workers compared with white-collar workers (18). Since smoke-free workplace policy effects are based primarily on white-collar workers, we may have underestimated the effect of a national smoke-free workplace policy because a larger proportion of the affected persons would be blue-collar and service workers. This underestimation is counterbalanced by the smaller fractions of blue-collar passive smokers and blue-collar indoor workers. Unfortunately, the most recent estimates of smoking prevalence, smoke-free workplace coverage, and smoke-free workplace effect by occupation are 10 years old, from the 1992–1993 Current Population Survey (17,18). As a result, we did not use occupation-specific rates in this analysis.

Our analysis may also overestimate the effect of a national smoke-free workplace policy given recent increases in smoke-free workplace policies. Data from selected states in 2000 indicate that there have been increases in smoke-free workplace coverage compared with the 1999 data used for this analysis (19). Furthermore, findings from our model may have been affected by improvements in treatments for cardiovascular disease. However, improvements in care may also be more costly, in which case prevention of cardiovascular events may result in further health care savings.

Not all persons are regular smokers; some are occasional smokers. This analysis does not directly address this issue as we could not differentiate between occasional smokers and regular smokers. Occasional smoker consumption was folded in with all smokers, and likely contributed to some of the quitting behavior seen with smoke-free workplaces. Previous research has shown a correlation between more comprehensive smoke-free workplace policies and either staying an occasional smoker or becoming a former smoker 1 year following implementation of a smoke-free workplace policy (20).

Smoke-free workplace policies are also associated with reductions in youth smoking prevalence and consumption (6). These reductions exceed expected reductions from working teenagers, suggesting that these policies have additional indirect effects, such as alterations of social norms, and thus will have long-run effects on reducing heart disease mortality by reducing the number of new smokers.

While smoke-free workplaces yield substantial health benefits in terms of cardiovascular disease, the tobacco industry would also be substantially affected by a nationwide smoke-free workplace policy. Over 900 million cigarette packs would go unsmoked, and the tobacco industry at large would lose over $2.3 billion in revenue every year. This substantial cost to the tobacco industry explains why it opposes these measures so vigorously.

Legislation is the best way to create smoke-free workplaces (21,22). Although this analysis addresses the hypothetical case of making all U.S. workplaces smoke free at once, action at the state or national level is least likely to provide strong smoke-free legislation due to the massive ability of the tobacco industry to make campaign contributions and hire well-connected lobbyists. Such legislation is generally best done at the local level, where public health forces are relatively strong and the tobacco industry's influence is relatively weak (22).

ACKNOWLEDGMENT

We appreciate comments by Eliseo Perez-Stable on a previous version of this manuscript.

REFERENCES

1. Cigarette smoking among adults—United States, 2000. *MMWR Morb Mortal Wkly Rep*. 2002;51:642-645.
2. Annual smoking-attributable mortality, years of potential life lost and economic costs—United States, 1995–1999. *MMWR Morb Mortal Wkly Rep.* 2002;51:300-303.
3. National Cancer Institute. *Health Effects of Exposure to Environmental Tobacco Smoke: the Report of the California Environmental Protection Agency/California Environmental Protection Agency, Office of Environmental Health Hazard Assessment*. Bethesda, Maryland: U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Cancer Institute; 1999. Smoking and Tobacco Control Monograph, No. 10. NIH Publication No. 99-4645.
4. Taylor A, Johnson D, Kazemi H. Environmental tobacco smoke and cardiovascular disease. A position paper from the Council on Cardiopulmonary and Critical Care, American Heart Association. *Circulation.* 1992;86:699–702.
5. He J, Vupputuri S, Allen K, et al. Passive smoking and the risk of coronary heart disease—a meta-analysis of epidemiologic studies. *N Engl J Med.* 1999;340:940–946.
6. Fichtenberg C, Glantz S. Effect of smokefree workplaces on smoking behaviour: systematic review. *BMJ.* 2002;325:188–194.
7. Shopland D, Gerlach K, Burns D, et al. State-specific trends in smokefree worksite policy coverage. The Current Population Survey 1993 to 1999. *J Occup Environ Med.* 2001;43:680–686.
8. Lightwood J, Glantz S. Short-term economic and health benefits of smoking cessation: myocardial infarction and stroke. *Circulation.* 1997;96:1089–1096.
9. Occupational Employment Statistics Survey. Bureau of Labor Statistics. Available at: http://www.bls.gov/oeshome.htm. Last accessed May 2002.
10. U.S. Census Bureau. Available at: http://www.census.gov. Last accessed November 2003.
11. *Tax Burden on Tobacco*. Vol. 37. Arlington, Virginia: Orzechowski and Walker; 2002:34.
12. Bonita R, Duncan J, Truelsen T, et al. Passive smoking as well as active smoking increases the risk of acute stroke. *Tob Control.* 1999; 8:156–160.

13. Rosenlund M, Berglind N, Gustavsson A, et al. Environmental tobacco smoke and myocardial infarction among never-smokers in the Stockholm Heart Epidemiology Program (SHEEP). *Epidemiology.* 2001;12:558–564.
14. Vaccarino V, Parsons L, Every N, et al. Sex-based differences in early mortality after myocardial infarction. *N Engl J Med.* 1999;341:217–225.
15. Longstreth W, Bernick C, Fitzpatrick A, et al. Frequency and predictors of stroke death in 5,888 participants in the Cardiovascular Health Study. *Neurology.* 2001;56:368–375.
16. *Cost-Effectiveness in Health and Medicine*. In: Gold M, Siegel J, Russell L, Weinstein M, eds. Oxford, United Kingdom: Oxford University Press; 1996:230–233.
17. Gerlach K, Shopland D, Hartman A, et al. Workplace smoking policies in the United States: results from a national survey of more than 100000 workers. *Tob Control.* 1997;6:199–206.
18. Farrelly M, Evans W, Sfekas A. The impact of workplace smoking bans: results from a national survey. *Tob Control.* 1999;8:272–277.
19. State-specific prevalence of current cigarette smoking among adults and policies and attitudes about secondhand smoke. *MMWR Morb Mortal Wkly Rep*. 2001;50:1101–1106.
20. Woodruff T, Rosbrook B, Pierce J, et al. Lower levels of cigarette consumption found in smokefree workplaces in California. *Arch Intern Med.* 1993;153:1485–1493.
21. Glantz S. Achieving a smokefree society. *Circulation.* 1987;76:746–752.
22. Glantz S. Back to basics: getting smokefree workplaces back on track. *Tob Control.* 1997;6:164–166.