Secondhand Smoke Exposure in Public Places in Guatemala: Comparison with other Latin American Countries

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Abstract

Objective: **To measure secondhand smoke levels in workplaces in Guatemala and to compare exposure to levels in other Latin American cities.**
Methods: **Exposure was estimated by passive sampling of vapor phase nicotine using a filter badge. Filters were placed in 1 hospital, 1 school, 2 universities, 1 government building, the airport, and 10 restaurants/bars. In total, 103 filters were deployed (plus 7 duplicates and 10 blanks). Nicotine ($\mu g/m^3$) was measured by gas chromatography. Medians [interquartile ranges (IQR)] of nicotine concentrations were reported and compared with other Latin American cities. A survey about attitudes for smoke-free workplaces was distributed among employees.**
Results: **Nicotine was detected in most (68%) locations surveyed (including workplaces where smoking is banned). The highest levels were found in bars [median, 4.58 $\mu g/m^3$ (IQR, 1.71-6.44)] and restaurants [median, 0.56 $\mu g/m^3$ (IQR, 0.46-0.71)]. Nicotine concentrations in bars and restaurants were 710 and 114 times higher, respectively, compared with hospital concentrations after adjustment for smoking ban signs, type of ventilation, and volume of the area. Support for smoke-free environments was high, except in bar/restaurant and airport workers. Airborne nicotine levels in Guatemala were similar to those found in other Latin American cities.**
Conclusion: **In Guatemala, exposure to secondhand smoke is highly prevalent. Workers in bars and restaurants are disproportionately exposed to secondhand smoke compared with other workers. There is an urgent need for complete smoke-free legislation and for educating workers about the benefits of smoke-free workplaces.** (Cancer Epidemiol Biomarkers Prev 2007;16(12):2730–5)

Introduction

Secondhand smoke (SHS), the mixture of mainstream and sidestream tobacco smoke, harms children and adults' health (1). Involuntary exposure to SHS occurs in places where active smoking takes place. The solution to SHS is simple and straightforward: smoke-free environments. In a recent study in selected cities of Latin America, however, exposure to SHS was common in most public places (2). Air nicotine concentrations were highest in bars and restaurants. In restaurants, tobacco smoke was also found in nonsmoking areas adjacent to smoking areas. Finally, tobacco smoke was detected in most hospitals and secondary schools surveyed (2).

On February 27, 2005 the WHO Framework Convention on Tobacco Control encouraged countries to ''Protect citizens from exposure to tobacco smoke in workplaces, public transport and indoor public places.'' Creating smoke-free environments has been shown to lead to significant decreases in heart disease and lung cancer mortality, smoking prevalence, and cigarette consumption (1, 3-5). For heart disease, although SHS increases the risk by 30%, recent evidence indicates that smoke-free environments have immediate cardiovascular benefit, decreasing heart attack admissions to the hospital and heart disease incidence rates (6-9). In addition, pulmonary function, respiratory symptoms, and inflammatory markers also decrease after smoke-free environments are implemented (10).

Guatemala signed the Framework Convention on Tobacco Control and ratified it in November 16, 2005. Guatemalan Law states that smoking is banned in healthcare and educational facilities, and public transportation (buses, taxis, and trains; ref. 11). In government and private work sites, restaurants, and other public places, the law states that smoking is restricted (allowed in designated areas). No ban or restriction of smoking is stated in bars (11). Currently, the tobacco industry *Courtesy of Choice* program, endorsing ventilation and accommodation as a solution to SHS exposure is well established in the country.[5] Yet, there is hope for

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Table 1. Number of samples and airborne nicotine concentrations ($\mu g/m^3$) in selected sites in Guatemala City

Institution	Analyzed samples (N = 89)	Lost/ damaged samples (N = 14)	Samples in which nicotine was detected (%)
Hospital	20	3	50
School	4	2	0
University	24	1	62
Government building	11	3	73
Airport	10	4	73
Restaurant	10	0	91
Bar	10	1	100

Guatemala to create smoke-free environments in all indoor public places including restaurants and bars. As of October 2007, Law 3309, which mandates 100% smoke-free environments in Guatemala, has been approved by the Congress's Health Commission and is still pending discussion in Congress for its approval. If the law were finally approved, Guatemala could become the second 100% smoke-free country in Latin America, after Uruguay, and the first country in Central America.

Given the outlined situation in Guatemala, determining levels of exposure to SHS in public places is vital to support the final approval of the smoke-free legislation and to effectively endorse and monitor the creation of smoke-free environments. The objective of this study was to determine levels of nicotine (as a measure of SHS exposure) in indoor public places and workplaces in Guatemala City, to be used as a tool to support the approval, implementation, and enforcement of Law 3309. In addition, we sought to compare levels of exposure to SHS in public places in Guatemala with levels of SHS exposure in other Latin American countries, using a common protocol.

Materials and Methods

This is a cross-sectional SHS exposure survey measuring environmental nicotine concentrations in selected public places and workplaces in Guatemala City. We followed the same methodology used by Navas-Acien et al. (2) in other Latin American cities. Public places included one tertiary hospital, one school in a low-middle class neighborhood, one city government building, two universities (one public and one private), the international airport, and restaurants and bars (Table 1). The workplaces selected were chosen given their relevance to be included in any comprehensive smoke-free law. The hospital, school, universities, and government building were selected on a convenience sample strategy and were similar to other health, education, and government facilities in Guatemala. To select restaurants and bars, we walked through two of the most popular towns in Guatemala City and asked for permission to place the monitors. Restaurant owners and managers were willing to collaborate and only three declined participation. Permission to place sampling devices was obtained from the responsible authorities at each site. The study was approved by the institutional review boards of the Roosevelt Hospital in Guatemala City, Guatemala and the Johns Hopkins Bloomberg School of Public Health, Baltimore, MD.

Sampling locations in each site were selected on a convenience basis, without knowledge of the extent of smoking taking place in each site, to represent areas where people frequently work or spend time. Sampling locations included physicians' rooms, nurses' rooms, patients' areas, cafeterias, and administrative offices in hospitals; teachers' rooms, hallways, stairways, students' bathrooms, and administrative offices in schools and universities; waiting rooms, administrative offices, hallways, and stairways in the government building; ticketing offices, boarding gates, duty-free shops, hallways, and baggage claim in the airport; and smoking and nonsmoking sections in restaurants and bars. Of 103 location samples, the sampling devices were lost or stolen in 14 (14%) sites leaving 89 for analysis. Losses most frequently occurred in the school (2, 33%) and the airport (4, 29%).

Several methods could be used to ascertain exposure to SHS, depending on the objective of the study. To track the effects of clean indoor air and policies (or the lack of thereof), the quantification of one or more tracers of SHS in the environment are critical. Nicotine is an attractive tracer of indoor air pollution and the methods used to measure it are relatively simple, accurate, and inexpensive. Vapor phase nicotine is a widely used tracer for SHS particulate matter and SHS as a whole (1, 12). In this study, the time-weighted average concentration of SHS was estimated by passive sampling of vapor phase nicotine using a filter badge treated with sodium bisulfate (13). Sampling devices were left in each location for 7 working days. The collected nicotine was extracted from the filter and analyzed at the Center for Urban Environmental Health at the Johns Hopkins Bloomberg School of Public Health via gas chromatography with nitrogen-selective detection. The concentration of nicotine is given in micrograms (μg) per effective volume of air sampled (m^3). For quality control, we placed a total of seven additional duplicate sampling devices. The intraclass correlation coefficient between log-transformed nicotine concentrations of duplicate samples was 0.97. We also placed 10 additional blank sampling devices used to calculate the nicotine detection limit ($0.0014\ \mu g/m^3$) and to determine blank-corrected nicotine concentrations. Thirty-two samples had nicotine concentrations below the detection limit ($0.0014\ \mu g/m^3$); 11 in the hospital, 4 in the school, 10 in the universities, 3 in the government building, 3 in the airport, 1 in the restaurants, and 0 in the bars. For consistency with previous reports in Latin America, we assigned a value of one half of the detection limit to samples that were below the detection limit (2).

Medians and interquartile ranges (IQR) were used to describe the data, and a box plot was used to graphically present the distribution of nicotine concentration for each institution and by location characteristics including the presence of smoking signs, type of ventilation, and volume of the area. To compare nicotine concentrations across institutions and by other location characteristics, we computed crude and multivariable adjusted ratios of the geometric mean of nicotine concentrations and its 95% confidence interval versus the reference category

Table 2. Airborne nicotine concentrations (μg/m³) by location characteristics

	N	Median	GM	IQR	Crude ratio of GM (95% confidence interval)	Adjusted ratio* of GM (95% confidence interval)
Institution						
Hospital	20	<LD	0.004	<LD-0.01	1.00 (reference)	1.00 (reference)
School/University	28	0.01	0.005	<LD-0.02	1.21 (0.49-3.01)	0.88 (0.33-2.37)
Government building	11	0.01	0.01	<LD-0.05	2.23 (0.70-7.17)	1.56 (0.28-8.73)
Airport	10	0.01	0.01	<LD-0.01	1.41 (0.42-4.68)	0.94 (0.23-3.77)
Restaurant	10	0.58	0.56	0.46-0.71	131 (39.3-436)	114 (32.1-400)
Bar	10	4.58	3.02	1.71-6.45	701 (210-2333)	710 (206-2442)
Smoking ban sign						
Yes	23	0.01	0.01	<LD-0.05	1.00 (reference)	1.00 (reference)
No	66	0.01	0.02	<LD-0.38	1.68 (0.46-6.19)	0.87 (0.34-2.18)
Ventilation						
Natural	56	0.01	0.03	<LD-0.41	1.00 (reference)	1.00 (reference)
Mechanical	17	0.01	0.01	<LD-0.05	0.59 (0.13-2.68)	1.04 (0.25-3.95)
Mixed	16	0.01	0.01	<LD-0.06	0.36 (0.08-1.73)	1.86 (0.63-5.48)
Volume (m³)						
<100	28	0.02	0.01	0.01-0.31	1.00 (reference)	1.00 (reference)
100-500	37	0.01	0.02	<LD-0.33	1.42 (0.36-5.61)	0.56 (0.24-1.34)
≥500	24	0.02	0.03	0.01-0.31	2.81 (0.61-12.9)	1.46 (0.54-3.93)

Abbreviations: GM, geometric mean; LD, limit of detection.
*Adjusted for type of public place, presence of a smoking ban sign, type of ventilation or volume of the area.

using linear regression models on log-transformed nicotine. Analyses were done using Stata version 7.0 (Stata Corp.).

At the end of the air nicotine sampling, all workers who occupied the places that had been monitored were invited to complete a short questionnaire about attitudes for smoke-free environments and perception of exposure to SHS [adapted from Stillman et al. (14)]. The questionnaires were distributed at the moment the sampling devices were removed. A total of 137 workers completed the survey and no worker refused to complete the questionnaire.

Results

Nicotine Concentrations in Public Places. Airborne nicotine was detected in most locations surveyed (68%), ranging from 0% in the school to 95% in bars/restaurants. Nicotine concentrations were higher in bars/restaurants and lower in the school (Table 2; Fig. 1). In the government building and the airport, nicotine concentrations were generally low, yet it was found in most sampling sites (73% in both places). The highest nicotine concentration was found in a bar, 8.86 μg/m³. In bars and restaurants, nicotine concentrations in nonsmoking areas [median, 0.77 μg/m³ (IQR, 0.44-4.18)] indicated that tobacco smoke was present at concentrations just slightly lower than nicotine concentrations in corresponding smoking areas [median, 0.99 μg/m³ (IQR, 0.46-5.58)]. Nicotine concentrations in restaurants and bars were 114 and 710 times higher, respectively, compared with hospital concentrations after adjustment for the presence of smoking ban sign, type of ventilation, or volume of the indoor area sampled (Table 2).

Compared with other Latin American cities, nicotine concentrations in Guatemala were similar for most sites (Table 3; ref. 2). In Latin American cities, low nicotine concentrations were found in hospitals, schools, and government buildings (except in Argentina and Uruguay). Nicotine concentrations were generally higher in airports (Guatemala airport yielded the lowest level). Consistently for all cities, the highest levels were found in restaurants and bars. Nicotine concentrations found in bars in Guatemala [4.58 μg/m³ (IQR, 1.71-6.44)] were among the highest in the region.

Workers' Perceptions. The mean age of the questionnaire respondents was 31 (SD, 11.46) years and 49% were male. Twelve percent (23% male and 1% female) classified themselves as current smokers and an additional 16% as occasional smokers. The prevalence of current smoking was highest in bar/restaurant workers and lowest in hospital workers, 25% and 4%, respectively. Most hospital and school/university workers agreed that workplaces should be smoke-free, 75% and 65%, respectively (Table 4). Agreement was lower in government building (50%), airport (39%), and bar/restaurant workers (30%). The percentages of agreement with smoke-free environments were similar when workers were asked specifically if their institution should be

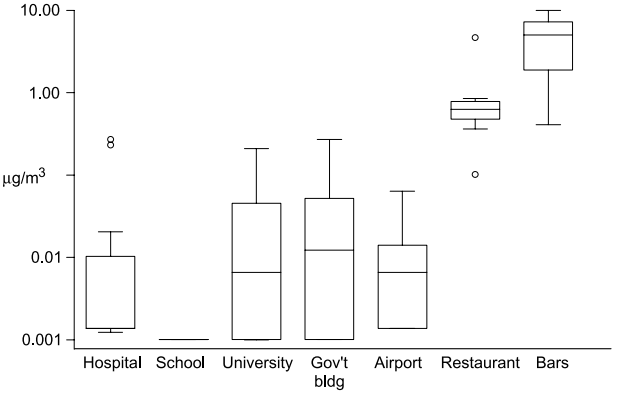

Figure 1. Concentrations of airborne nicotine in public places in Guatemala City, 2006. *Horizontal lines within boxes,* medians; *boxes,* IQR; *bars,* values within 1.5 times the IQR; *solid circles,* outlying data points.

Table 3. Median nicotine ($\mu g/m^3$) concentrations in public places in major Latin American Cities

	Hospitals	Schools	Government building	Airports	Restaurants	Bars
Guatemala	<LD (<LD-0.010)	<LD (<LD-<LD)	0.012 (<LD-0.05)	0.006 (<LD-0.01)	0.58 (0.46-0.71)	4.58 (1.71-6.45)
Costa Rica	0.02 (0.01-0.04)	<LD (<LD-<LD)	0.02 (0.01-0.05)	0.01 (0.01-0.03)	0.73 (0.46-1.80)	1.32 (0.75-7.43)
Honduras	<LD (<LD-0.02)	0.003 (<LD-0.005)	0.05 (0.01-0.15)	0.07 (0.02-0.59)	1.68 (0.35-2.29)	1.26 (0.77-1.77)
Panama	<LD (<LD-<LD)	<LD (<LD-<LD)	<LD (<LD-0.004)	0.03 (0.01-0.69)	0.15 (0.01-2.10)	2.36 (2.14-2.88)
Mexico	0.01 (0.004-0.02)	<LD (<LD-<LD)	0.10 (0.04-0.14)	0.21 (0.04-0.50)	0.69 (0.52-0.86)	6.00 (3.85-8.60)
Argentina*	1.33 (0.51-3.12)	0.14 (0.05-0.23)	2.60 (1.43-2.99)	0.26 (0.18-0.67)	2.04 (0.90-2.60)	3.65 (3.58-3.65)
Brazil	0.05 (0.02-0.09)	<LD (<LD-0.03)	0.04 (0.03-0.21)	0.10 (0.03-0.16)	2.52 (1.25-3.95)	N/A
Chile	0.13 (0.03-0.47)	0.01 (0.003-0.02)	1.13 (0.08-0.13)	1.07 (0.64-1.07)	2.08 (1.08-3.56)	3.33 (2.06-4.82)
Paraguay	0.01 (0.001-0.03)	0.001 (<LD-0.05)	0.05 (0.03-0.10)	0.07 (0.05-0.20)	0.24 (0.06-0,36)	1.59 (0.78-6.68)
Peru	0.02 (0.01-0.07)	0.01 (0.01-0.08)	0.07 (0.01-0.31)	0.93 (0.20-1.30)	0.80 (0.15-2.42)	6.21 (4.00-9.12)
Uruguay*	0.80 (0.31-1.69)	0.08 (0.02-0.61)	0.67 (0.47-0.94)	1.15 (0.74-2.49)	1.41 (0.41-2.48)	3.14 (0.77-4.82)

The cities were Guatemala City in Guatemala, Tegucigalpa in Honduras, Panama City in Panama, San Jose in Costa Rica, Mexico City in Mexico, Buenos Aires in Argentina, Rio de Janeiro in Brazil, Santiago in Chile, Asuncion in Paraguay, Lima in Peru, and Montevideo in Uruguay. University concentrations were not included because these institutions were not evaluated in the other Latin American cities.
Abbreviation: LD, limit of detection.
*Since the time of the survey, Uruguay has passed a smoke-free legislation that bans smoking in all public places including bars and restaurants. The city of Buenos Aires has also passed a smoke-free legislation that covers many bars and restaurants.

smoke-free (Table 4). Most workers agreed that tobacco smoke harms others. Bar/restaurant workers were less likely to agree that tobacco smoke harms others (57%). Across sites surveyed, most workers did not agree that smoking bans are unfair to smokers.

The odds of concurrence with the statements ''workplaces should be smoke-free'', ''my institution should be smoke-free'', ''tobacco smoke harms others'', and ''a smoke ban is unfair to smokers'' comparing respondents in bars and restaurants to respondents in hospitals were 0.14 (0.05-0.43), 0.23 (0.08-0.65), 0.29 (0.09-0.92), and 2.68 (0.65-11.01), respectively. After multivariable adjustment for smoking status, age, and sex, the corresponding odds ratios were 0.14 (0.04-0.51), 0.25 (0.08-0.92), 0.19 (0.05-0.75), and 2.88 (0.60-13.85), respectively.

Discussion

In Guatemala, as in other Latin American countries, nicotine was detected in most places that were surveyed and nonsmoking areas in bars and restaurants did not effectively protect nonsmokers from exposure to SHS. In hospitals and schools, the levels were very low, undetectable in most samples. In the Universities, despite a smoke-free university campus initiative recently launched by the Pan American Health Organization, nicotine was detected in more than half of the samples, suggesting that the initiative needs to be better implemented and enforced. Compared with other workers, workers in bars and restaurants are disproportionately exposed to SHS in their workplace. Our results have the strength to be highly sensitive and specific to assess SHS exposure. Because tobacco smoke is the only source of nicotine in the environment, confounding by other traces of indoor air pollution (e.g., particulate matter from diesel combustion) is not a concern (13).

As in other Latin American countries, nicotine concentrations were lower compared with those reported in the 1990s in the United States (nicotine levels ranged from 0.3 to 30 $\mu g/m^3$) or to current concentrations in most European and Chinese cities (15-17). The lower smoking prevalence and number of cigarettes smoked per day in Latin America might explain these differences (2). Better enforcement of the regulations available, particularly in hospitals and schools, could also account for these lower levels. In Guatemala, only bars yielded nicotine levels as high as those documented in the United States prior to the implementation of smoke-free environments or as those currently documented in Europe (15, 16).

Table 4. Percentage (95% confidence interval) of respondents that concur with attitudes about smoke-free environments and SHS exposure (Guatemala City, Guatemala)

	Workplaces should be smoke-free	My institution should be smoke-free	Tobacco smoke harms others	Smoke ban unfair to smokers
Public place				
Hospital (n = 28)	75 (55-89)	68 (48-84)	85 (66-96)	11 (2-29)
School/University (n = 36)	67 (49-81)	82 (65-93)	91 (76-98)	5 (0.7-20)
Government building (n = 20)	50 (27-73)	55 (32-77)	85 (62-97)	5 (0.1-25)
Airport (n = 18)	39 (17-64)	50 (26-74)	89 (65-99)	11 (1.4-35)
Bar/restaurant (n = 37)	30 (16-47)	32 (18-50)	57 (39-73)	25 (12-42)
Smoking status				
Never (n = 88)	63 (52-73)	70 (59-80)	82 (73-90)	12 (6-21)
Former (n = 11)	64 (31-89)	64 (31-89)	91 (59-100)	9 (0.2-41)
Current* (n = 39)	28 (15-44)	30 (17-47)	70 (53-83)	15 (6-31)

*Current smokers include daily and less than daily smokers.

In the study questionnaire, the workers seemed to be knowledgeable about the health effects of SHS, however, the level of knowledge was lower compared with other Latin American countries (18). Most important, support for smoke-free environments was high among employees of most institutions. When analyzed separately by smoking status, in general, smokers were less likely to support smoke-free environments and to be knowledgeable about the damage caused by tobacco smoke. Yet, tobacco control advocates need to especially focus their education efforts among bar and restaurant workers for several reasons. Although exposure to SHS was highest in bars and restaurants, workers in these venues were less supportive of smoke-free environments and were less knowledgeable about the health effects of exposure to SHS. The lack of support of workers in bars and restaurants for smoke-free environments could be a result of the tobacco industry's *Courtesy of Choice* program.

This program, that is well established in Guatemala, works with bar and restaurant owners to install expensive and ineffective ventilation systems to implement smoking and nonsmoking sections. The lower knowledge among bar and restaurant workers of the harmful effects of SHS compared with workers in other settings is particularly preoccupying because workers in bars and restaurants are continuously exposed to SHS. Yet, as evidenced from the California tobacco control program, as smoke-free laws are implemented, patronage and workers' support for the law should increase (19, 20). Therefore, restaurant/bar owners and workers' support for smoke-free environments is likely to increase if complete smoke-free legislation were approved.

Our results have several limitations. Sampling locations were selected on a convenience basis. Yet, the objective of the study was to collect policy-relevant monitoring data that could be used to document exposure to SHS in key locations and to promote smoke-free regulations in Guatemala. We followed the same protocol used in other Latin American cities to allow for comparability across countries. Although the location characteristics evaluated, including smoking ban signs, ventilation, and volume, did not seem to account for differences in nicotine concentrations across institutions, the study protocol did not comprehensively assess building characteristics as determinants of nicotine concentrations. Finally, nicotine measurements were made continuously and not during the time of occupancy only. Consequently, our results tend to be underestimates of those occurring during the time of occupancy.

The tobacco industry has played a determinant role in obstructing smoke-free legislation in Guatemala as in the rest of Latin America. The Latin Project, organized by Philip Morris and British American Tobacco in the early 1990s, sought to obstruct sound antitobacco legislation, hire well-placed physicians to act as ''third-person'' spokesmen, and lobbied politicians (21, 22). Guatemala, Costa Rica, Argentina, Brazil, Chile, Venezuela, and Ecuador were included in the project. The most notable case, thus far, of the industry's interference with tobacco legislation is Argentina, where in the early 1990s, tobacco industry consultant, Dr. Carlos Alvarez, successfully lobbied then President Carlos Menem to veto a strong antitobacco law (21, 23).

Currently, Guatemala is fighting to pass Law 3309 which mandates smoke-free workplaces. The law has been initially approved in the Congress Health Commission but it has been in Congress for almost 1 year without having been voted on. Bars and restaurants have to be included in the law as it is where most of the exposure to passive smoking is happening. Previous experience in Uruguay shows that the quantification of exposure to SHS in public places can move smoke-free legislations forward (2). The solution to SHS exposure is simple and straightforward, smoke-free environments.

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References

1. U.S. Department of Health and Human Services. The health consequences of involuntary exposure to tobacco smoke: a report of the Surgeon General. Atlanta (GA); 2006.
2. Navas-Acien A, Peruga A, Breysse P, et al. Secondhand tobacco smoke in public places in Latin America, 2002–2003. JAMA 2004;291:2741–5.
3. Fichtenberg CM, Glantz SA. Association of the California Tobacco Control Program with declines in cigarette consumption and mortality from heart disease. N Engl J Med 2000;343:1772–7.
4. Fichtenberg CM, Glantz SA. Effect of smoke-free workplaces on smoking behaviour: systematic review. BMJ 2002;325:188.
5. Barnoya J, Glantz S. Association of the California tobacco control program with declines in lung cancer incidence. Cancer Causes Control 2004;15:689–95.
6. Barnoya J, Glantz SA. Cardiovascular effects of secondhand smoke: nearly as large as smoking. Circulation 2005;111:2684–98.
7. Sargent RP, Shepard RM, Glantz SA. Reduced incidence of admissions for myocardial infarction associated with public smoking ban: before and after study. BMJ 2004;328:977–80.
8. Bartecchi C, Alsever RN, Nevin-Woods C, et al. Reduction in the incidence of acute myocardial infarction associated with a citywide smoking ordinance. Circulation 2006;114:1490–6.
9. Samet JM. Smoking bans prevent heart attacks. Circulation 2006;114:1450–1.
10. Menzies D, Nair A, Williamson PA, et al. Respiratory symptoms, pulmonary function, and markers of inflammation among bar workers before and after a legislative ban on smoking in public places. JAMA 2006;296:1742–8.
11. Shafey O, Dolwick S, Guindon GE, eds. Tobacco control country profiles. Atlanta (GA); 2003.
12. Daisey JM. Tracers for assessing exposure to environmental tobacco smoke: what are they tracing? Environ Health Perspect 1999;107 Suppl 2:319–27.
13. Hammond S. Evaluating exposure to environmental tobacco smoke. In: Winegar E, Keith L, editors. Sampling and analysis of airborne pollutants: Lewis Publishers.
14. Stillman FA, Hantula DA, Swank R. Creating a smoke-free hospital: attitudes and smoking behaviors of nurses and physicians. Am J Health Promot 1994;9:108–14.
15. California Environmental Protection Agency. Proposed identification of environmental tobacco smoke as a toxic air contaminant. Part A: Exposure assessment. Office of Environmental Health Hazard Assessment, 2005 June 24.
16. Nebot M, Lopez MJ, Gorini G, et al. Environmental tobacco smoke exposure in public places of European cities. Tob Control 2005;14:60–3.

17. Stillman FA, Navas-Acien A, Ma J, et al. Secondhand tobacco smoke in public places in urban and rural China. Tob Control 2007;16:229–34.
18. Navas-Acien A, Curi Hallal A, Peruga A, et al. Workers' support for smoke-free workplaces in Latin America, 2002–2004. 13th World Conference on Tobacco or Health Washington, DC, July 2006. http://2006.confex.com/uicc/wctoh/techprogram/P5521.HTM. Accessed 11/11/07.
19. Tang H, Cowling DW, Lloyd JC, et al. Changes of attitudes and patronage behaviors in response to a smoke-free bar law. Am J Public Health 2003;93:611–7.
20. Tang H, Cowling DW, Stevens CM, Lloyd JC. Changes of knowledge, attitudes, beliefs, and preference of bar owner and staff in response to a smoke-free bar law. Tob Control 2004;13:87–9.
21. Barnoya J, Glantz S. Tobacco industry success in preventing regulation of secondhand smoke in Latin America: the ''Latin Project''. Tob Control 2002;11:305–14.
22. Aguinaga Bialous S, Shatenstein S. Profits over people. Pan American Health Organization, 2002 November.
23. Sebrie EM, Barnoya J, Perez-Stable EJ, Glantz SA. Tobacco industry successfully prevented tobacco control legislation in Argentina. Tob Control 2005;14:e2.