

Indoor Air Quality in Hospitality Venues Before and After Implementation of a Clean Indoor Air Law — Western New York, 2003

Secondhand smoke (SHS) contains more than 50 carcinogens (1). SHS exposure is responsible for an estimated 3,000 lung cancer deaths and more than 35,000 coronary heart disease deaths among never smokers in the United States each year (2), and for lower respiratory infections, asthma, sudden infant death syndrome, and chronic ear infections among children (3). Even short-term exposures to SHS, such as those that might be experienced by a patron in a restaurant or bar that allows smoking, can increase the risk of experiencing an acute cardiovascular event (4). Although population-based data indicate declining SHS exposure in the United States over time (5), SHS exposure remains a common but preventable public health hazard. Policies requiring smoke-free environments are the most effective method of reducing SHS exposure (6). Effective July 24, 2003, New York implemented a comprehensive state law requiring almost all indoor workplaces and public places (e.g., restaurants, bars, and other hospitality venues) to be smoke-free. This report describes an assessment of changes in indoor air quality that occurred in 20 hospitality venues in western New York where smoking or indirect SHS exposure from an adjoining room was observed at baseline. The findings indicate that, on average, levels of respirable suspended particles (RSPs), an accepted marker for SHS levels, decreased 84% in these venues after the law took effect. Comprehensive clean indoor air policies can rapidly and effectively reduce SHS exposure in hospitality venues.

The specific class of RSP monitored was $PM_{2.5}$ (i.e., particulate matter that is <2.5 microns in diameter). Particles of this size are released in substantial amounts from burning cigarettes and are easily inhaled deep into the lungs. Baseline measurements were made during July 11–23 in a purposeful sample of 22 hospitality venues in three counties in western New York. Sites were selected to provide a range of venue types, sizes, and locations. The sample consisted of seven bars, six bar/restaurants, five restaurants, two bowling alleys, a pool hall, and a bingo hall. The venues were located in popular downtown entertainment districts and suburban areas and ranged from small neighborhood bars to large bar/restaurant chains.

At baseline, smoking was occurring in 14 bars and restaurants and four large recreation venues. Two bar/restaurant combinations allowed smoking in the bar section but not in the adjoining restaurant section. In these two venues, air quality was monitored separately in the restaurant and bar areas. In two restaurants, no smoking was occurring at baseline because

restaurants were already required to be smoke-free by local clean indoor air ordinances. Follow-up measurements of air quality were made in all 22 venues during September 9–November 1. The follow-up measurements were taken on the same day of the week and at approximately the same time of day as the measurements taken before the smoke-free law was implemented.

The median time spent in each venue for all 44 baseline and follow-up observations combined was 38 minutes (range: 22–140 minutes). Measurements were taken at 1-second intervals. The number of persons and the number of burning cigarettes in each venue were recorded every 10 minutes during sampling, and the average number of persons and the average number of burning cigarettes in each venue were calculated. The volume of each venue also was measured*, and the cigarette density was calculated by dividing the average number of burning cigarettes by the room volume.

An air monitor† was used to sample and record RSP levels. The monitor was placed in a central location on a table or bar near the height at which a person breathes air. The monitor recorded continuous measurements, which were averaged over time. The first and last minute of logged data were removed, and the remaining data points were averaged to provide an average concentration of $PM_{2.5}$ within the venue. The percentage change in $PM_{2.5}$ levels was then determined by comparing average $PM_{2.5}$ levels in each venue before the law went into effect with levels after the law was implemented. The Wilcoxon signed-rank test was used to assess changes between pre-law and post-law $PM_{2.5}$ levels, stratified by type of venue.

The average $PM_{2.5}$ concentration was substantially lower after the law went into effect in every venue where smoking or indirect SHS exposure had been observed at baseline, with a grand mean reduction in $PM_{2.5}$ concentration of 84% ($324 \mu\text{g}/\text{m}^3$ to $25 \mu\text{g}/\text{m}^3$; $p < 0.001$) (Table). When stratified by the type of venue sampled, the average $PM_{2.5}$ concentration decreased 90% ($412 \mu\text{g}/\text{m}^3$ to $27 \mu\text{g}/\text{m}^3$; $p < 0.001$) in the 14 bars and restaurants in which smoking was occurring at baseline (including bar/restaurant J, which was the only venue where smoking was observed during the post-law sampling). The restaurant portions of the two bar/restaurants that allowed smoking in the bar section but not in the restaurant section experienced an average 58% decrease in $PM_{2.5}$

*The Zircon DM S50 Sonic Measure® (Zircon Corporation, Campbell, California) was used to perform this measurement.

†The air monitor used was a TSI SidePak AM510 Personal Aerosol Monitor® (TSI, Inc., St. Paul, Minnesota). The SidePak uses a built-in sampling pump to draw air through the device, which then measures the real-time concentration in milligrams per cubic meter of $PM_{2.5}$. The SidePak was calibrated against a SHS-calibrated nephelometer, which had been previously calibrated and used in similar studies. The SidePak was zero-calibrated before each use according to the manufacturer's specifications.

TABLE. Change in concentrations of respirable suspended particles after the implementation of a clean indoor air law, by venue — western New York, 2003

Venue	Size (m ³)	Cigarette density*		Average PM _{2.5} [†] level (μg/m ³)		% reduction in PM _{2.5}
		Before July 24, 2003	After July 24, 2003	Before July 24, 2003	After July 24, 2003	
Bars and restaurants in which smoking was occurring						
Bar A	349	0.86	0	353	56	84.1
Bar B	453	1.32	0	375	20	94.7
Bar C	225	1.34	0	1,375	52	96.2
Bar D	319	0.94	0	386	35	90.9
Bar E	245	0.86	0	104	28	73.1
Bar F	339	3.25	0	569	26	95.4
Bar G	335	1.79	0	681	13	98.1
Bar/Restaurant H	299	1.34	0	425	10	97.6
Bar/Restaurant I	321	1.56	0	198	21	89.3
Bar/Restaurant J	551	1.45	0.09	597	83	86.1
Bar/Restaurant K	479	0.42	0	62	10	83.9
Bar/Restaurant L	318	0.52	0	352	6	98.0
Bar/Restaurant M	786	0.25	0	54	11	79.6
Restaurant N	95	3.15	0	233	6	97.4
Mean [§]	365	1.36	0.01	412	27	90.3
Restaurant portions of bar/restaurant combinations with indirect secondhand smoke (SHS) exposure[¶]						
Restaurant O	438	0	0	273	34	87.5
Restaurant P	381	0	0	38	27	28.9
Mean [§]	410	0	0	156	31	58.2
Other venues in which smoking was occurring						
Bowling alley Q	5,930	0.03	0	35	13	62.9
Bowling alley R	2,916	0.17	0	87	26	70.1
Pool hall S	1,570	0.26	0	176	6	96.6
Bingo hall T	3,704	0.40	0	105	26	75.2
Mean [§]	3,530	0.22	0	101	18	76.2
Grand mean**	1,003	1.01	0.01	324	25	84.3
Restaurants in which no smoking and no indirect SHS exposure was occurring						
Restaurant U	446	0	0	6	6	0.0
Restaurant V	337	0	0	41	40	2.4
Mean [§]	392	0	0	24	23	1.2

* Average number of burning cigarettes per 100 m³.

† Particulate matter <2.5 microns in diameter.

§ Results represent the average of the values for the venues listed in each category.

¶ Restaurant O is attached to Bar A with little physical separation between the two spaces; Restaurant P is attached to Bar B but with substantial physical separation between the two spaces.

** For all venues where any smoking or indirect SHS exposure was occurring at baseline (i.e., venues A–T).

concentrations (156 μg/m³ to 31 μg/m³; p<0.001) after the law was implemented, even though they had only indirect SHS exposure at baseline. In the four other large recreation venues, which had larger volumes and lower smoker densities, the average PM_{2.5} concentration decreased 76% (101 μg/m³ to 18 μg/m³). In contrast, the PM_{2.5} concentration remained low and virtually constant in the two restaurants that were already smoke-free at baseline; these venues were not included in the grand mean calculation.

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Editorial Note: The findings in this report indicate that a statewide law to eliminate smoking in enclosed workplaces and public places substantially reduced RSP levels in western New York hospitality venues. RSP levels were reduced in

every venue that permitted smoking before the law was implemented, including venues in which only SHS from an adjacent room was observed at baseline.

These findings are consistent with those of previous studies. In Delaware, a similar decline in RSP levels was observed in eight hospitality venues after smoking was prohibited there by state law (7). Previous studies also have assessed the health effects of smoke-free laws. One study indicated that respiratory health improved rapidly among a sample of bartenders after a state smoke-free workplace law was implemented in California (8), and another study reported a 40% reduction in acute myocardial infarction admissions to a regional hospital during the 6 months that a local smoke-free ordinance was in effect in Helena, Montana (9). The results of these studies (both those assessing changes in indoor air quality and those assessing changes in health) suggest that improvements can occur within months of policy implementation.

The findings in this report are subject to at least two limitations. First, the venues sampled were not necessarily representative of venues in western New York. However, they did provide a range of venue types, sizes, and locations. Second, SHS is not the only source of indoor particulate matter. However, although ambient particle concentrations and cooking are additional sources of indoor particle levels, secondhand smoke is the largest contributor to indoor RSP pollution (3).

Eliminating nonsmoker exposure to SHS is one of the four goals of comprehensive state tobacco-control programs, as set forth in CDC's *Best Practices for Comprehensive Tobacco Control Programs* (10). The results of the study described in this report indicate that a comprehensive statewide ban on smoking in indoor workplaces and public places can substantially reduce SHS exposure in these settings. Six states (California, Connecticut, Delaware, Maine, Massachusetts, and New York) currently meet the national health objective for 2010 calling for implementation of such laws. These six states account for approximately 23% of the U.S. population. Rhode Island also has adopted such a law, but the law does not take full effect until 2006. To further reduce the nearly 40,000 deaths among never smokers caused by SHS exposure each year, similar comprehensive laws are needed in the other 43 states and the District of Columbia.

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Vaccination Coverage Among Children Entering School — United States, 2003–04 School Year

One of the national health objectives for 2010 is to sustain $\geq 95\%$ vaccination coverage among children in kindergarten through first grade (objective 14-23) (1). To determine the percentage of vaccination coverage among children entering kindergarten, data on vaccination coverage were analyzed from reports submitted to the National Immunization Program by states, the District of Columbia (DC)*, and eight current or former U.S. territories for the 2003–04 school year. This report summarizes the results of that analysis, which determined that coverage for all vaccines except hepatitis B (HepB) and varicella was reported at $>90\%$ in 45 areas. However, the vaccines required in each reporting area and the methods for surveying kindergarten-aged children vary substantially; in seven states, $<20\%$ of eligible children were surveyed. The wide variations in survey populations underscore the need for CDC to continue working with immunization programs in states, DC, and current or former territories to improve survey methods and automate reporting of data.

For the 2003–04 school year, all states except one submitted reports of vaccination coverage levels for children entering kindergarten. Fifty reports included coverage for poliovirus vaccine, diphtheria and tetanus toxoids and pertussis vaccine, diphtheria and tetanus toxoids and acellular pertussis vaccine,

*For this report, DC is included in state totals.