

Indoor Air Quality in New Albany Indiana Hospitality Venues, 2008

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Executive Summary

Indoor air quality was assessed in a total of 10 hospitality venues in New Albany, Indiana. The venues included 7 restaurants, 2 bars and one entertainment venue. Fine particulates were measured January 17 and 18, 2008 in New Albany, using the TSI SidePak AM510 Personal Aerosol Monitor. The average PM_{2.5} level from the 10 New Albany locations was compared to the average PM_{2.5} levels in Louisville pre-law and after implementation of the partial and comprehensive smoke-free laws, as well as the National Ambient Air Quality Standard (NAAQS; 35 µg/m³) for 24 hours.

Key findings of the study are:

- The level of indoor air pollution in hospitality venues measured in New Albany (average PM_{2.5} = 104 µg/m³) was approximately 11.6 times higher than Louisville after implementation of the comprehensive smoke-free law (see Figure 1). Further, the level of indoor air pollution in New Albany hospitality venues was 3.0 times higher than the National Ambient Air Quality Standard for outdoor air.
- The New Albany venues had average PM_{2.5} levels ranging from 5 to 348 µg/m³ (see Figure 2). Air pollution in six of the 10 New Albany venues exceeded the National Ambient Air Quality Standard for outdoor air.

Introduction

Secondhand smoke (SHS) contains at least 250 chemicals that are known to be toxic.^{1,2} There is no safe level of exposure to SHS.² SHS exposure is the third leading cause of preventable death in the United States.³ SHS is a mixture of the smoke from the burning end of tobacco products (sidestream smoke) and the smoke exhaled by smokers (mainstream smoke) and is known to cause cancer in humans.^{1,2,3} SHS exposure is a cause of heart disease and lung cancer in nonsmoking adults.¹⁻⁴ An estimated 3,000 nonsmokers die from lung cancer⁵ annually and over 46,000 nonsmokers die from heart disease² every year in the U.S due to secondhand smoke exposure. It is estimated that approximately 60% of people in the United States have biological evidence of SHS exposure.⁶

Currently in the U.S., 12,724 local municipalities are covered by either local or state 100% smoke-free laws in workplaces and/or restaurants and/or bars.⁷ It is estimated that approximately 64.3% of the U.S. population are protected by clean indoor air regulations that cover virtually all indoor worksites including bars and restaurants. There are 2,791 local ordinances or regulations that restrict smoking to some extent in workplaces across the United States and Washington D.C.⁷ The extent of protection provided by these laws vary widely from community to community.

Currently in Indiana, 35 communities and the Indianapolis Airport Authority have enacted and implemented smoke-free laws. The most comprehensive ordinances/regulations, 100% smoke-free workplace *and* 100% smoke-free enclosed public place laws, have been implemented in Bloomington, Cumberland, Fort Wayne, Greencastle, Monroe County, Plainfield, West Lafayette and Zionsville. The remaining communities and entities have enacted partial smoke-free laws, protecting workers and patrons in some public venues. As of May 2008, there was no smoke-free law in New Albany.

In Louisville, Kentucky, two different types of smoke free laws have been enacted and implemented since 2005. In November 2005, a smoke-free law covering most buildings open to the public but with significant exemptions was implemented in Louisville Metro. In July 2007, Louisville Metro strengthened their ordinance to cover all workplaces and all buildings open to the public.

The purpose of this study was to (a) assess air quality in 10 selected hospitality venues in New Albany, Indiana; and (b) compare the results to Louisville, Kentucky air quality data before and after the implementation of a partial smoke-free law in November 2005 and after the implementation of a comprehensive smoke-free law in July 2007.

Methods

On January 17 and 18, 2008, indoor air quality was assessed in 10 indoor locations including 7 restaurants, 2 bars and one entertainment venue in New Albany. Sites were of various sizes; some sites were individually owned establishments and some were part of local or national chain entities.

TSI SidePak AM510 Personal Aerosol Monitor



A TSI SidePak AM510 Personal Aerosol Monitor (TSI, Inc., St. Paul, MN) was used to sample and record the levels of respirable suspended particles in the air. The SidePak uses a built-in sampling pump to draw air through the device and the particulate matter in the air scatters the light from a laser to assess the real-time concentration of particles smaller than $2.5\mu\text{m}$ in micrograms per cubic meter, or PM_{2.5}. The SidePak was calibrated against a light scattering instrument, which had been previously calibrated and used in similar studies. In addition, the SidePak was zero-calibrated prior to each use by attaching a HEPA filter according to the manufacturer's specifications.

The equipment was set to a one-minute log interval, which averages the previous 60 one-second measurements. Sampling was discreet in order not to disturb the occupants' normal behavior. For each venue, the first and last minute of logged data were removed because they are averaged with outdoor and entryway air. The remaining data points were summarized to provide an average PM_{2.5} concentration within each venue. The Kentucky Center for Smoke-free Policy (KCSP) staff trained researchers from the Indiana Tobacco Prevention and Cessation Program and Floyd County Tobacco Prevention and Cessation Coalition, who did the sampling and sent the data to KCSP for analysis.

Statistical Analyses

Descriptive statistics including the venue volume, number of patrons, number of burning cigarettes, and smoker density (i.e., average number of burning cigarettes per 100 m³) were reported for each venue and averaged for all venues.

Results

In New Albany, the 7 restaurants, 2 bars and one entertainment venue were visited Thursday through Friday for an average of 51 minutes (range 45-58 minutes). Visits occurred at various times of the day from 10:20 AM to 11:43 PM. The average size of the New Albany venues was 1,992 m³ (range 201-10,670 m³) and the average smoker density was 0.69 #bc/100 m³. On average, 52 patrons were present per venue and 4.6 burning cigarettes per venue were observed. Descriptive statistics for each venue are summarized in Table 1.

As depicted in Figure 1, the average level of indoor air pollution in the 10 New Albany venues (104 $\mu\text{g}/\text{m}^3$) was approximately 11.6 times higher than Louisville after the comprehensive law was implemented and 3.0 times higher than the National Ambient Air Quality Standard (35 $\mu\text{g}/\text{m}^3$) for 24 hours.

Table 1. Air Quality Data for 10 Venues in New Albany, Indiana, January 2008

Venue	Date Sampled	Size (m ³)	Average # people	Average # burning cigs	Smoker density (#bc/100m ³)	Average PM _{2.5} level
Restaurant A	1/17/2008	720	82	23.4	3.25	110
Restaurant B	1/17/2008	5038	71	1.4	0.03	25
Restaurant C	1/18/2008	535	14	0.0	0.00	5
Restaurant D	1/18/2008	737	37	1.0	0.14	28
Restaurant E	1/18/2008	1184	78	1.4	0.12	39
Restaurant F	1/18/2008	389	6	0.0	0.00	5
Restaurant G	1/18/2008	201	28	3.3	1.64	175
Bar A	1/17/2008	236	38	3.7	1.57	348
Bar B	1/17/2008	209	7	2.0	0.96	39
Enter.	1/17/2008	10670	156	9.7	0.09	266
Averages		1992	52	4.6	0.69	55

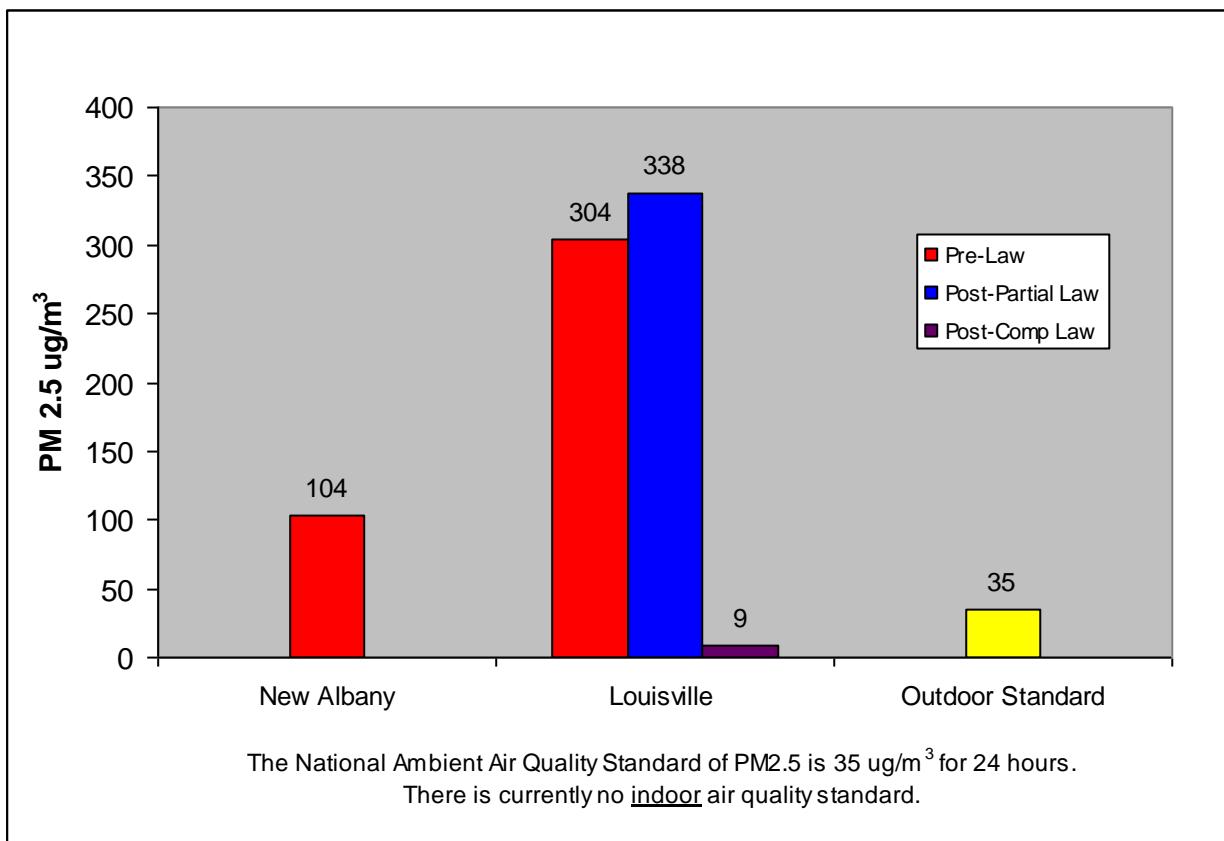


Figure 1. Average fine particle air pollution in two communities

Note: Post-Law I in Louisville reflects air quality following implementation of a partial smoke-free law and Post-Law II reflects the results of a comprehensive smoke-free law.

It is important to note that after a partial smoke-free law was implemented in Louisville, the average PM_{2.5} level rose slightly to 338 $\mu\text{g}/\text{m}^3$ (see Figure 1). Only 3 of the 10 venues were smoke-free as a result of the partial ordinance. After the comprehensive smoke-free law was implemented, the average PM_{2.5} level dropped substantially to 9 $\mu\text{g}/\text{m}^3$, with all 10 venues being smoke-free.

Figure 2 shows the average level of indoor air pollution in each of the 10 tested venues in New Albany. The average PM_{2.5} levels ranged from 5 to 348 $\mu\text{g}/\text{m}^3$. Air pollution in 6 venues exceeded the National Ambient Air Quality Standard for outdoor air (NAAQS; 35 $\mu\text{g}/\text{m}^3$).

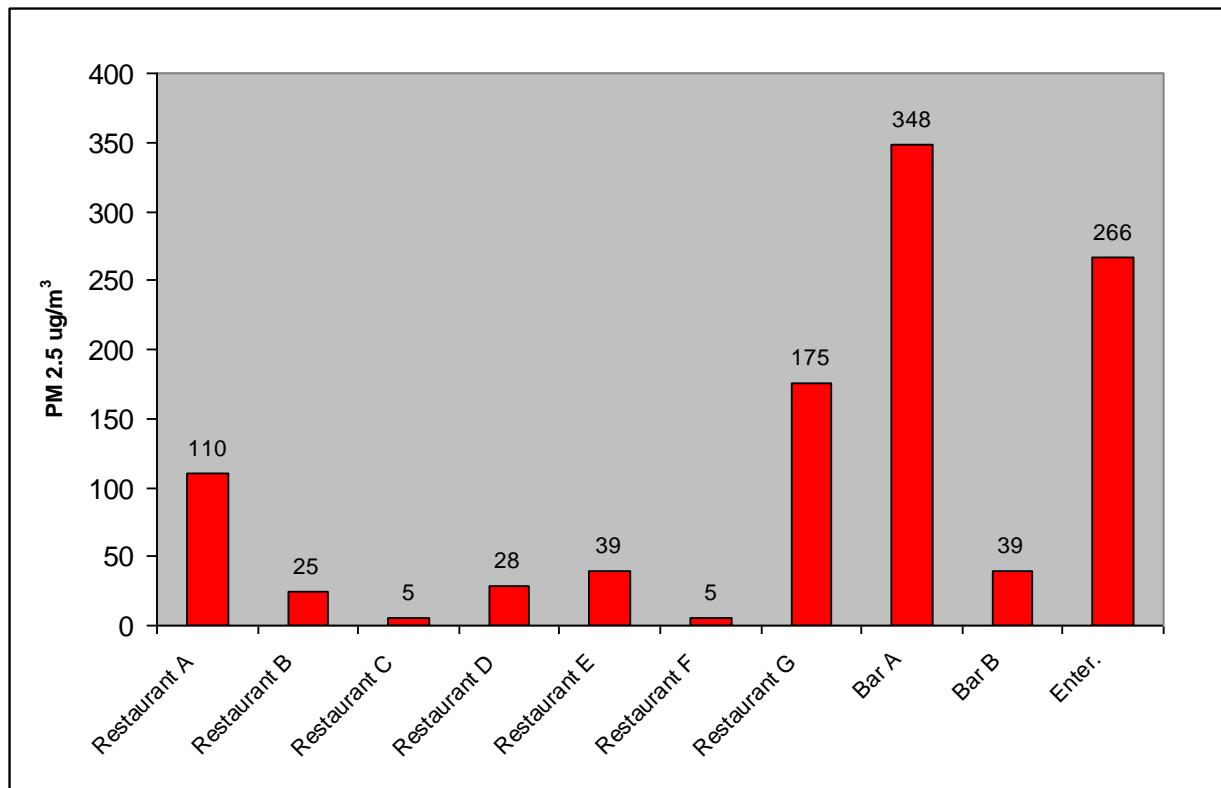


Figure 2. Average indoor fine particle concentrations in 10 New Albany, Indiana venues, January 2008

Discussion

The average PM_{2.5} level in the New Albany venues was 104 $\mu\text{g}/\text{m}^3$, which is 3.0 times higher than the National Ambient Air Quality Standard (NAAQS) for 24 hours (35 $\mu\text{g}/\text{m}^3$). There were over 80 EPA cited epidemiologic studies in creating a particulate air pollution standard in 1997.⁸ To protect the public's health, the EPA set a new limit of 35 $\mu\text{g}/\text{m}^3$ for PM_{2.5} on December 17, 2006 as the average level of exposure over 24-hours in *outdoor environments*. There is no EPA standard for indoor air quality.

Compared to Louisville, Kentucky, the average level of indoor air pollution was 304 $\mu\text{g}/\text{m}^3$ pre-law and dropped to 9 $\mu\text{g}/\text{m}^3$ after implementation of a comprehensive smoke-free law, indicating an approximate 97% decrease in indoor air pollution. However, when they implemented an

earlier partial smoke-free law, Louisville workers and patrons remained exposed to dangerous air pollution levels, approximately 9.7 times higher than the NAAQS.

Two Kentucky air quality studies have demonstrated significant improvements in air quality as a result of implementing a comprehensive smoke-free law. Hahn et al. showed a 91% decrease in indoor air pollution after Lexington, Kentucky implemented a comprehensive smoke-free law on April 27, 2004.⁹ The average level of indoor air pollution was 199 $\mu\text{g}/\text{m}^3$ pre-law and dropped to 18 $\mu\text{g}/\text{m}^3$ post-law. Average levels of indoor air pollution dropped from 86 $\mu\text{g}/\text{m}^3$ to 20 $\mu\text{g}/\text{m}^3$ after Georgetown, Kentucky implemented a comprehensive smoke-free law on October 1, 2005.¹⁰ Similarly, other studies show significant improvements in air quality after implementing a smoke-free law. One California study showed an 82% average decline in air pollution after smoking was prohibited.¹¹ When indoor air quality was measured in 20 hospitality venues in western New York, average levels of respirable suspended particle (RSP) dropped by 84% after a smoke-free law took effect.¹²

Other studies have assessed the effects of SHS on human health. Hahn et al. found a 56% drop in hair nicotine levels in a sample of workers after Lexington implemented a smoke-free law, regardless of whether workers were smokers or nonsmokers.¹³ Workers were also less likely to report colds and sinus infections after the law went into effect. Similarly, Farrelly et al. also showed a significant decrease in both salivary cotinine concentrations and sensory symptoms in hospitality workers after New York State implemented a smoke-free law in their worksites.¹⁴ Smoke-free legislation in Scotland was associated with significant improvements in symptoms, spirometry measurements, and systemic inflammation of bar workers. The significant improvement of respiratory health was reported in only one month after smoke-free law.¹⁵

There is no longer any doubt in the medical or scientific communities that SHS is a significant public health problem. In 2006, U.S. Surgeon General Carmona, said “The scientific evidence is now indisputable: secondhand smoke is not a mere annoyance. It is a serious health hazard that can lead to disease and premature death in children and nonsmoking adults.”² SHS causes coronary heart disease, lung cancer, other cancers, and lung disease in nonsmoking adults.

Many millions of Americans, both children and adults, are still exposed to secondhand smoke in their homes and workplaces. Approximately 60% of people in the United States have biological evidence of SHS exposure.⁶ U.S. Surgeon General Carmona said, “Eliminating smoking in indoor spaces fully protects nonsmokers from exposure to secondhand smoke. Separating smokers from nonsmokers, cleaning the air, and ventilating buildings cannot eliminate exposure of nonsmokers to secondhand smoke.”²

Conclusions

This study demonstrated that workers and patrons in New Albany, Indiana, are exposed to harmful levels of secondhand smoke in hospitality venues. On average, workers and patrons in New Albany were exposed to indoor air pollution levels 3.0 times the National Ambient Air Quality Standard, and the level of indoor air pollution was approximately 11.6 times higher than in Louisville after implementation of their comprehensive smoke-free law. Partial smoke-free laws do not protect workers and patrons from harmful indoor air pollution. However, when

smoking is completely prohibited as with Louisville's comprehensive smoke-free ordinance, air quality is significantly improved.

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