



The Impact of a Smoke-Free Ordinance on the Health and Attitudes of Bartenders, One Year Later

Karen A. Palmersheim, PhD, MS¹, Patrick L. Remington, MD, MPH²,
Mark V. Wegner, MD, MPH³

Abstract

Introduction: This report presents the findings from two cross-sectional studies designed to assess upper respiratory health symptoms and attitudes regarding secondhand smoke exposure among bartenders in Madison and Appleton, Wisconsin. The first study was conducted just prior to the implementation of smoke-free workplace ordinances, which occurred on July 1, 2005. The second study was conducted approximately one year later.

Methods: Surveys conducted before and after the ordinances were implemented collected information on the number of hours exposed to secondhand smoke, prevalence of upper respiratory tract symptoms, attitudes towards smoking in bars and restaurants, and perceptions of risk related to secondhand smoke exposure.

Results: Mean reported exposure to secondhand smoke during an average week decreased from about 21 hours to 2 hours in the workplace, from 8 hours to about 4 hours in other places, and from 4 hours to 3 hours in the home. Among non-smokers, the prevalence of all eight upper respiratory symptoms decreased significantly (wheezing or whistling in chest, shortness of breath, cough first thing in the morning, cough during the rest of the day and night, cough up any phlegm, red or irritated eyes, runny nose, nose irritation, or sneezing, and sore or scratchy throat). Among smokers, a significant reduction in red or irritated eyes, and sore or scratchy throat was observed. Support for not allowing smoking in bars that are also restaurants and in bars/taverns increased significantly. Perceived level of health risk associated with exposure to secondhand smoke increased significantly, except among smokers.

¹ Dr. Palmersheim is an epidemiologist and Director of the Tobacco Surveillance and Evaluation Program, University of Wisconsin Paul P. Carbone Comprehensive Cancer Center.

² Dr. Remington is Associate Director of Cancer Control and Outreach, University of Wisconsin Paul P. Carbone Comprehensive Cancer Center.

³ Dr. Wegner is Chronic Disease Medical Director within the Bureau of Community Health Promotion, Wisconsin Division of Public Health.

Conclusion: This study demonstrates a significant reduction in upper respiratory symptoms among bartenders following the establishment of smoke-free workplace ordinances in two Wisconsin cities, especially among non-smokers. These results suggest that this policy will help reduce the future risk of disease related to secondhand smoke among employees and patrons of bars in Madison and Appleton. In addition, the establishment of smoke-free ordinances can be accompanied by increased employee support for smoke-free environments over time.

Introduction

Exposure to secondhand smoke has increasingly become an issue of concern to the public health community. In particular, a heightened awareness has followed the release of the 2006 report by the US Surgeon General¹ which reviews a number of published studies that link passive smoking to a number of disease processes. For example, exposure to secondhand smoke is associated with an increased risk for developing lung cancer and coronary heart disease in non-smoking adults.^{1,2,3,4} Young children exposed to secondhand smoke are at increased risk of sudden infant death syndrome (SIDS), worsening of asthma, bronchitis, and pneumonia.^{1,2,5} Other conditions that have been found to be associated with secondhand smoke include chronic coughing, excess phlegm production, wheezing, chest discomfort, eye and nose irritation.^{1,2,4,6}

Individuals are differentially exposed to secondhand smoke, depending upon their home and work environments. For example, Wortley et al. analyzed data on a nationally representative sample of the non-institutionalized population from the Third National Health and Nutrition Examination Survey (NHANES III) (1988 to 1994).⁷ The analysis was restricted to 4,952 employed nonsmoking adults who reported no home exposure to cigarette smoke. They found mean serum cotinine levels were highest for those working in the restaurant and hospitality industry (i.e., wait staff, bartenders). These findings suggest that individuals employed in these types of occupations would be at an increased risk of developing conditions associated with secondhand smoke, and accordingly, would benefit most from the elimination of such exposure.

The purpose of this study was to assess change in the health and attitudes of bartenders relative to decreased exposure to secondhand smoke in the workplace, one-year after the establishment of a smoke-free workplace ordinance.

Methods

The pre-ordinance and post-ordinance surveys were conducted by the University of Wisconsin Survey Center, under the direction of the University of Wisconsin Tobacco Surveillance and Evaluation Program and the Wisconsin Tobacco Prevention and Control Program. Pre-ordinance data were collected during the 2 months prior to the ordinance, which went into effect July 1, 2005. The post-ordinance survey was conducted approximately one year after the establishment of the ordinance, during May through July of 2006. A detailed report discussing the methods and results of the pre-ordinance study can be found at <http://www.medsch/mep/>.

Study Populations: The sampling frames for each survey included all individuals licensed to sell alcoholic beverages in Madison and Appleton. Lists were obtained from city clerks in April of 2005 and 2006 for the pre-ordinance and post-ordinance studies, respectively. A total of 3,100 good addresses were obtained for the pre-ordinance study (2,323 for Madison, and 777 for

Appleton). For the one-year post-ordinance study, a total of 3,102 good addresses were obtained (2,303 for Madison, and 799 for Appleton). Using the number of licensees with valid addresses as a denominator, the final adjusted response rate for the number of surveys returned at pre-ordinance was 60% (Madison) and 56% (Appleton), and 55% (Madison) and 59% (Appleton) for the post-ordinance study.

It is important to note, however, that not all individuals licensed to sell alcoholic beverages work as bartenders. While the questionnaire included a statement that instructed only recipients who were tending bar at that time to complete the survey, and others to return the uncompleted questionnaire, it is not possible to assess how many of the recipients were actually working as bartenders. However, a follow-up telephone survey of non-respondents to the baseline survey suggested the majority of individuals that did not return the survey had self-selected out because they were not working as bartenders or they were tending bar in a smoke-free establishment.

Data Collection: Information was collected using a 4-page, self-administered questionnaire that assessed the number of hours exposed to secondhand smoke while at home, at work, and in other places, the prevalence of eight upper respiratory tract symptoms, attitudes towards smoking in bars and restaurants, and perceptions of the health risk associated with secondhand smoke exposure. Questionnaire packets were sent via U.S. mail and included a cover letter, the questionnaire, a \$2 incentive, and a postage-paid return envelope.

Analytical Samples: In order to be included in the current analysis, subjects had to be bartending within the city limits of either Appleton or Madison. In addition, the pre-ordinance study respondents had to be working in an establishment that allowed smoking, and the post-ordinance study respondents had to be working in a smoke-free establishment. Further, bartender smoking status needed to be known in order to control for this factor in analyses. There were 793 participants meeting these criteria in the pre-ordinance study, and 735 in the post-ordinance study, for a total final sample of 1,528.

Analyses: Chi-square analysis was employed to compare pre-ordinance scores to post-ordinance scores on measures of upper respiratory symptoms, and attitudes towards allowing smoking in bar/restaurants and bars/taverns. Independent-samples t-tests were used to compare pre-ordinance to post-ordinance levels of exposure to secondhand smoke at home, at work, and other places, and measures of perceived risk associated with exposure to secondhand smoke.

Results

Survey: Sample characteristics of bartenders who participated in the pre-ordinance and post-ordinance studies are presented in Table 1. Reflecting the different sizes of the cities, the Madison sample was larger than the Appleton sample in both studies. In general, the pre-ordinance and post-ordinance samples were very similar in terms of age, gender, race/ethnicity, and educational attainment. The range in number of months working at their current bar and hours working per week was greater for the post-ordinance participants, but the corresponding means and medians were slightly smaller for this group. The percentage of bartenders that reported being current smokers was greater during the pre-ordinance study compared to the post-ordinance study (48% and 41%, respectively). Range and mean level of daily cigarette consumption was also lower at post-ordinance.

Table 2 displays the ranges and mean estimates of exposure to secondhand smoke in the home, at work, and other places, during pre-ordinance and at post-ordinance. Exposure was self-reported as the number of hours exposed during the past 7 days. Outliers were truncated at the sample 99th percentile of the pre-ordinance scores (those subjects that reported an extra-ordinarily high number of hours were assigned the value at which 99% of the sample fell at or below). Exposure to secondhand smoke in the home ranged from 0 to 60 hours at both pre-ordinance and post-ordinance. Mean exposure was 3.9 hours at pre-ordinance and 2.8 hours at post-ordinance. Exposure to secondhand smoke at work ranged from 0 to 60 hours at both pre-ordinance and post-ordinance. Mean exposure at work decreased from 20.7 hours at pre-ordinance to 1.6 hours at post-ordinance. Exposure to smoke in other places ranged from 0 to 50 during both time periods. Similar to workplace exposure, mean exposure decreased from 8.2 hours at pre-ordinance to 4.1 hours during the post-ordinance phase. The last column displays the p-value for the t-test analyses. The observed decrease in exposure was statistically significant for all three areas assessed (p-values = .031, .000, and .000, respectively).

Respondents were also asked to report how often they experienced a number of upper respiratory symptoms over the past 4 weeks. Data were dichotomized (collapsed into yes/no categories) for the current analyses. In order to control for the effects of smoking status, the sample was stratified by bartender smoking status. Table 3 presents the findings for those participants who reported being non-smokers. A statistically significant decrease was observed for all eight upper respiratory symptoms. For example, an absolute percent change of 13% was revealed for 'shortness of breath' (40% to 27%; p=.000), while an absolute percent change of 31% was noted for 'red or irritated eyes' (72% to 41%; p=.000).

Table 4 presents the prevalence of upper respiratory symptoms at pre-ordinance and post-ordinance for those participants who reported being current smokers. Fewer bartenders experienced seven of the eight symptoms at post-ordinance, compared to pre-ordinance. This decrease was statistically significant for two symptoms, 'red or irritated eyes' and 'sore or scratchy throat'. Fifty-seven percent of the participants reported experiencing red or irritated eyes at pre-ordinance compared to 46% at post-ordinance (p=.005), while the percentage reporting sore or scratchy throat decreased from 58% to 47% (p=.005).

Respondents were asked whether they thought smoking should be allowed in bars that are also restaurants (restaurant/bars). Overall, there was a statistically significant increase in support for smoke-free restaurant/bars from pre-ordinance to post-ordinance (50% to 67%; p=.000) (see Table 5). The sample was further stratified by smoking status in analyzing these data. Non-smokers were generally more supportive of smoke-free restaurant/bars at both pre-ordinance and post-ordinance. Though, a significant increase in support was observed among both groups (65% to 78%; p=.000, and 34% to 51%; p=.000, respectively). To investigate potential regional differences in attitudes, the sample was stratified by city. Madison bartenders expressed stronger support during both studies, but again, a statistically significant increase in support for smoke-free restaurant/bars was observed for both groups of bartenders (53% to 68%; p=.000, and 41% to 65%; p=.000, respectively).

A parallel question examined whether participants thought smoking should be allowed in bars that are not restaurants (bars/taverns). Table 6 displays the percentage of bartenders that felt smoking should not be allowed in bars/taverns at pre-ordinance and post-ordinance, respectively. Overall, there was a statistically significant increase in support for smoke-free bars/taverns from pre-ordinance to post-ordinance (28% to 39%; p=.000). While non-smokers were considerably more supportive of smoke-free bars/taverns than smokers, an increase in support was observed

among both smokers and non-smokers (9% to 18%; $p=.001$, and 45% to 54%; $p=.007$). As with restaurant/bars, Madison bartenders expressed stronger support in general for smoke-free bars/taverns, but a significant increase in support was noted among both Madison and Appleton bartenders (31% to 42%; $p=.000$, and 17% to 33%; $p=.000$).

Finally, respondents indicated on a scale from 1 to 5, how great of a health risk they felt secondhand smoke presents, with “1” representing “no risk at all” and “5” indicating “extremely serious risk” (Table 7). Overall, there was a small but statistically significant increase in bartenders’ perceptions of the health risk associated with exposure to secondhand smoke. Overall perceived risk was 3.3 at pre-ordinance and 3.4 at post-ordinance ($p=.004$). Non-smokers were more likely to think secondhand smoke is harmful than smokers at both pre-ordinance and post-ordinance, and their mean score increased from pre- to post-ordinance (3.6 to 3.8; $p=.012$). Non-smokers’ mean perception of risk did not change (2.9 both pre- and post-ordinance). Regional differences also remained fairly consistent from pre- to post-ordinance, with Madison bartenders perceiving secondhand smoke as a greater health risk than Appleton bartenders. Yet, a significant increase in perceived risk was observed among both groups (3.3 to 3.5; $p=.028$, and 3.1 to 3.4; $p=.017$, respectively).

Discussion

This study demonstrates that the establishment of a smoke-free workplace ordinance was associated with a significant reduction in secondhand smoke exposure among bartenders while at work. The workplace ordinance was also associated with significant reductions in exposure in other places, and in the home. These latter findings suggest that when bartenders are not at work, they are spending some of their time in establishments that may have become smoke-free. Moreover, the impact of the smoke-free workplace ordinance may have carried over into the home environment.

In addition, analyses suggest that the reduced level of exposure to secondhand smoke corresponded with a reduction in the prevalence of upper respiratory symptoms among these workers. Non-smokers in particular appeared to have benefited from the decreased exposure to smoke, with the prevalence of eight upper respiratory symptoms being significantly lower after the establishment of a smoke-free workplace ordinance compared to that observed prior to the ordinance. Though the change in symptoms was not as great among smokers, even this group reported a significant reduction in the prevalence of two of the eight symptoms.

These findings are similar to those reported by Eisner et al.¹² in a cohort study of bartenders in San Francisco, and a second study conducted by Menzies et al.¹³ in Scotland. However, due to relatively smaller sample sizes, results in the previous two studies were reported as groups of symptoms. In addition, the Menzies study only included non-smokers. The current study had ample power by which to analyze each symptom independently, in addition to stratifying the sample by smoking status.

The study also revealed an overall increase in support for smoke-free bars if they are also restaurants, as well as for bars/taverns, though greater support is observed for smoke-free bars if they are also restaurants compared to bars/taverns. These findings are consistent with those found in previous surveys (2003 Wisconsin Tobacco Survey¹⁴) and national public opinion polls¹⁵, that have revealed stronger support, and a slightly more rapid growth in support, for smoke-free restaurants, compared to bar/taverns. Overall, support continues to be stronger

among non-smokers compared to smokers, but a significant increase in support was observed among both groups. Regional variations continue, with Madison bartenders reporting greater support for smoke-free bar/restaurants and bars/tavern compared to Appleton bartenders. However, support in Appleton increased at a relatively greater rate from pre- to post-ordinance, resulting in a narrowing of this gap. Moreover, a significant increase in this support was observed among bartenders in both cities since the establishment of the ordinance.

Overall perceptions of the level of health risk associated with exposure to secondhand smoke increased significantly from pre- to post-ordinance. This increase was also observed among non-smokers, but not among smokers. Further, both Madison and Appleton bartenders perceived it as a slightly greater risk at post-ordinance compared to pre-ordinance.

Limitations

It is difficult to know how potential differences between this sample and the entire population of bartenders in the two cities may limit the generalizability of these findings to all bartenders in Appleton and Madison. In addition, the current analytical approach did not control for sociodemographic factors, or other factors that may affect upper respiratory symptoms (i.e., asthma or chronic obstructive pulmonary disease). Analyses revealed that 13% of the entire sample of bartenders reported having asthma and 3% reported having chronic obstructive pulmonary disease (data not shown). Future analyses can control for these factors.

The study did not assess the prevalence of allergies in the sample; however, findings based on data from the third National Health and Nutrition Examination Survey show that 54.3% of individuals aged 6-59 years old had a positive skin test response to at least one of the 10 allergens tested⁸. Given the high prevalence of allergies in the general population, it is likely that equally high percentages of bartenders in both groups (those working in bars where smoking was allowed during the pre-ordinance study, and those working in smoke-free bars during the post-ordinance study) would have some type of allergy.

An additional limitation to the present study is the use of a self-administered questionnaire. A number of studies demonstrate a modest correlation between self-reported levels of secondhand smoke exposure and biomarkers (i.e., serum cotinine).^{9,10,11} However, it is difficult to exclude potential misclassification of exposure. Bartenders experiencing respiratory symptoms may be more likely to report secondhand smoke exposure, whereas those without symptoms may underreport exposure. Further, there may be differential reporting depending upon whether the bartender agrees with the smoking ban ordinance.

Conclusions

This study demonstrated a significant reduction in upper respiratory symptoms among non-smoking bartenders following the establishment of a smoke-free workplace ordinance in two Wisconsin cities—a result associated with a significant reduction in exposure to secondhand smoke. These results suggest this policy should help reduce the future risk of disease related to secondhand smoke among employees and patrons of bars in Madison and Appleton. In addition, it appears that support for smoke-free workplaces may increase among barworkers after they have had ample time to appreciate the benefits of working in a smoke-free environment.

Acknowledgements

This study was supported by the Wisconsin Tobacco Prevention and Control Program, Bureau of Community Health Promotion, Division of Public Health, Wisconsin Department of Health and Family Services. The authors wish to thank Dr. D. Paul Moberg for his helpful review and comments on this report.

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: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Coordinating Center for Health Promotion, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2006.
2. National Cancer Institute. Health Effects of Exposure to Environment Tobacco Smoke. Smoking and Tobacco Control Monograph No. 10. Bethesda, MD: U.S. Department of Health and Human Services, National Institutes of Health, National Cancer Institute; 1999. NIH Pub. No. 99-4645.
3. National Toxicology Program. 10th Report on Carcinogens. Research Triangle Park, NC: U.S. Department of Health and Human Services, Public Health Service, National Toxicology Program, December, 2002.
4. U.S. Environmental Protection Agency. Respiratory Health Effects of Passive Smoking: Lung Cancer and Other Disorders. Washington, DC: U.S. Environmental Protection Agency; 1992. Pub. No. EPA/600/6-90/006F.
5. U.S. Department of Health and Human Services. *Women and Smoking: A Report of the Surgeon General*. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Office of the Surgeon General; 2001.
6. U.S. Surgeon General. *The Health Consequences of Involuntary Smoking*. Rockville, MD: Public Health Service, U.S. Department of Health and Human Services; 1986.
7. Wortley, PM, Caraballo, RS, Pederson, LL, Pechacek, TF. Exposure to Secondhand Smoke in the Workplace: Serum Cotinine by Occupation. *Journal of Occupational & Environmental Medicine*. 2002; 44(6):503-509.
8. <http://allergies.about.com/od/research/a/blnih080405.htm>
9. Pirkle JL, Flegal KM, Bernert JT, et al. Exposure of the US population to environmental tobacco smoke. *JAMA*. 1996;275:1233-1240.
10. Emmons KM, Abrams DB, Marshall R, et al. An evaluation of the relationship between self-report and biochemical measures of environmental tobacco smoke exposure. *Prev Med*. 1994;23:35-39.
11. Delfino RJ, Ernst P, Jaakkola MS, et al. Questionnaire assessments of recent exposure to environmental tobacco smoke in relation to salivary cotinine. *Eur Respir J*. 1993;6:1104-1108.
12. Eisner MD, Smith AK, Blanc PD. Bartenders' respiratory health after establishment of smoke-free bars and taverns. *JAMA*. 1998; 280:1909-1914.
13. Menzies D, Nair A, Williamson P, 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; 296:1742-1748.
14. http://www.ctri.wisc.edu/Advocates/advocates_WTS_Action%20Papers.htm
15. http://secondhandsmokesyou.com/resources/one_news_article.php?id=98

Table 1. Sample Characteristics, Pre-Ordinance and Post-Ordinance

	Pre-Ordinance (N=793)	Post-Ordinance (N=735)
City (n)		
Madison	621	510
Appleton	172	225
Age (years)		
Range	19-80	19-76
Mean	35	35
Median	32	31
Gender (%)		
Female	52	54
Race/Ethnicity (%)*		
White	95	96
Other	6	5
Hispanic	2	3
Education (%)		
Less than high school	2	1
High school diploma/ GED	18	16
Some college (no degree yet)	38	39
Associate's degree	12	12
Bachelor's degree	24	26
Graduate or professional degree	5	5
Months bartending at current bar (#)		
Range	1-480	1-516
Mean	64	61
Median	36	35
Hours work in current bar (# per week)		
Range	1-70	1-80
Mean	24	23
Median	22	20
Current Smoker (%)		
	48	41
Cigarettes smoked per day (#)		
Range	0-80	0-40
Mean	13	11
Median	10	10

* Because respondents could check more than one race, totals may not add to 100.

Table 2. Level of Exposure to Secondhand Smoke at Home, Work, and Other Places, Pre-Ordinance and Post-Ordinance

Place of Exposure	Pre-Ordinance (# of hours/past 7 days)	Post-Ordinance (# of hours/past 7 days)	p-value^a
Home			
Range	0 - 60	0 - 60	
Mean	3.9	2.8	.031
Work			
Range	0 - 60	0 - 60	
Mean	20.7	1.6	.000
Other			
Range	0 - 50	0 - 50	
Mean	8.2	4.1	.000

^a Comparison of Pre-Ordinance to Post-Ordinance; Independent-Samples T Test Analyses, 2-tailed

Table 3. Percent Reporting Upper Respiratory Symptoms, Pre-Ordinance and Post-Ordinance (Non-Smokers)

Upper Respiratory Symptoms (past 4 weeks)	Percent Reporting Symptom		
	Pre-Ordinance (N=409)	Post-Ordinance (N=433)	p-value^a
Wheezing or whistling in chest	31	16	.000
Shortness of breath	40	27	.000
Cough first thing in the morning	44	24	.000
Cough during the rest of the day/night	50	29	.000
Cough up any phlegm	50	32	.000
Red or irritated eyes	72	41	.000
Runny nose/irritation, sneezing	76	53	.000
Sore or scratchy throat	62	38	.000

^a Comparison of Pre-Ordinance to Post-Ordinance; Pearson Chi-square Analyses, 2-tailed

Table 4. Percent Reporting Upper Respiratory Symptoms, Pre-Ordinance and Post-Ordinance (Smokers)

Upper Respiratory Symptoms (past 4 weeks)	Percent Reporting Symptom		
	Pre-Ordinance (N=384)	Post-Ordinance (N=302)	p-value ^a
Wheezing or whistling in chest	41	38	.341
Shortness of breath	48	50	.550
Cough first thing in the morning	58	52	.137
Cough during the rest of the day/night	58	51	.098
Cough up any phlegm	60	56	.303
Red or irritated eyes	57	46	.005
Runny nose/irritation, sneezing	64	57	.087
Sore or scratchy throat	58	47	.005

^a Comparison of Pre-Ordinance to Post-Ordinance; Pearson Chi-square Analyses, 2-tailed

Table 5. Bartenders' Opinions on Whether Smoking Should Be Allowed in Restaurant/Bars, Pre-Ordinance and Post-Ordinance

	Pre-Ordinance (% "No")	Post-Ordinance (% "No")	p-value^a
All Respondents	50	67	.000
Smokers	34	51	.000
Non-Smokers	65	78	.000
Madison	53	68	.000
Appleton	41	65	.000

^a Comparison of Pre-Ordinance to Post-Ordinance; Pearson Chi-square Analyses, 2-tailed

Table 6. Bartenders' Opinions on Whether Smoking Should Be Allowed in Bars/Taverns, Pre-Ordinance and Post-Ordinance

	Pre-Ordinance (% "No")	Post-Ordinance (% "No")	p-value^a
All Respondents	28	39	.000
Smokers	9	18	.001
Non-Smokers	45	54	.007
Madison	31	42	.000
Appleton	17	33	.000

^a Comparison of Pre-Ordinance to Post-Ordinance; Pearson Chi-square Analyses, 2-tailed

Table 7. Bartenders' Perceived Health Risk of Exposure to Secondhand Smoke, Pre-Ordinance and Post-Ordinance

Question: Perceived health risk of secondhand smoke (1 = no risk, 5 = extremely serious risk)

	Pre-Ordinance (mean)	Post-Ordinance (mean)	p-value^a
All Respondents	3.3	3.4	.004
Smokers	2.9	2.9	.745
Non-Smokers	3.6	3.8	.012
Madison	3.3	3.5	.028
Appleton	3.1	3.4	.017

^a Comparison of Pre-Ordinance to Post-Ordinance; Independent-Samples T Test Analyses, 2-tailed