

**Analysis of Indoor Air Quality in Eating and Drinking  
Establishments In La Crosse County**

**June 2008**

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*The report was written by the University of Wisconsin Population Health Institute in cooperation with the University of Wisconsin Comprehensive Cancer Center Training and Technical Assistance Program. The study was conducted by volunteers and staff members with the La Crosse County Health Department.*

*The study was funded by the Wisconsin Tobacco Prevention and Control Program, Division of Public Health, Wisconsin Department of Health and Family Services.*

## Executive Summary

Air quality was tested in 19 establishments in La Crosse County on February 22-23, 2008 by measuring the fine particulate matter in air. Particulate pollution, also called particulate matter is a complex mixture of extremely small particles and liquid droplets in the air. A common standard of measurement of air quality is the amount of fine particulate matter in the air. The size of these fine particles is less than or equal to 2.5 microns, or about one tenth the width of a human hair. At 210 micrograms per cubic meter, the air is considered hazardous. Exposure to particulate matter is linked to a variety of significant health problems ranging from aggravated asthma to premature death of people with heart and lung diseases.

In 13 of the 19 establishments evaluated in this study, the air quality exceeded the hazardous limit of the Air Quality Index established by the Wisconsin Department of Natural Resources (WI DNR). At the hazardous limit, children, elderly and individuals with chronic disease are strongly advised to avoid breathing air with this level of particulate matter. Everyone else is warned to avoid physical activity.

The data indicate air quality in some of the establishments in this study was, **up to four times** higher than the hazardous level. In 6 of 19, the air quality was two to three times higher than the hazardous-level. The air quality in these eating and drinking establishments posed a serious health risk for patrons and employees because:

- There is no safe level of exposure to environmental tobacco smoke.
- It is not possible for patrons and employees to determine the level of fine particulate matter from secondhand tobacco smoke in any specific establishment.
- Establishments may contain high levels of fine particulate matter for long periods after the last cigarette has been extinguished.
- Some hospitality workers are likely to be engaged in on-going strenuous physical activity while working in hazardous air quality conditions. Many patrons and employees are not aware of their risk due a chronic disease.
- Children, who are more susceptible to smoke-related illness, cannot choose to avoid smoke-filled environments.

## **Background and Introduction**

Since the 1986 U.S. Surgeon General's Report, *The Health Consequences of Involuntary Smoking*,<sup>1</sup> first made Americans aware of the dangers of secondhand smoke, public understanding of its health consequences has grown. Despite this increase in knowledge secondhand smoke is estimated to cause more than 800 lung cancer and heart disease deaths in Wisconsin each year, while thousands more are made seriously ill by asthma, allergic attacks and chronic diseases.<sup>2</sup>

While smoke free workplaces are increasingly the norm, eating and drinking establishments serving alcohol are among the last public places where smoking is allowed. As a result, these establishments commonly have high levels of secondhand smoke, typically at levels much higher than the WI DNR maximum daily exposure<sup>3</sup>. As a result of the exposure to secondhand smoke, hospitality workers and patrons may suffer from respiratory illness and have impaired lung function.<sup>4</sup>

In 2000, the La Crosse City Council enacted one of the first smoke-free restaurant ordinances in Wisconsin. This measure applied to establishments requiring a restaurant license and where alcohol sales were less than 33% of gross receipts. Restaurants having less than 50 seats were exempt. Smoking was permitted in a full-service bar area or in a room that was separately ventilated from other dining areas.

Holmen, Onalaska and West Salem passed similar ordinances in 2002. La Crosse County passed an ordinance in 2003 covering restaurants that had less than 50% of their revenue from alcohol sales.

As a result of the growing body of evidence of the harm caused by secondhand smoke, public health advocates sought information on fine particulate matter exposure inside eating and drinking establishments in La Crosse County.

## **Methods**

A convenience sample of 19 establishments was selected. These establishments were visited on February 22, from 5 PM to 10 PM and on February 23, from 8 AM to 10 AM and 5 PM to 11:30 PM to determine fine particulate matter. Each monitoring team spent approximately 30 minutes in each establishment. Teams recorded the number of people inside the establishment and the number of cigarettes burning every 15 minutes during the monitoring period.

A TSI SidePak air monitoring device was used to measure fine particulate matter. The TSI SidePak was zero-calibrated prior to each use. The equipment measured levels of fine particulate matter every second and recorded data at one minute intervals. The monitor was located at various customer seating locations within the main room of each establishment to get a sample of readings. All of the single-minute data points were averaged to provide a fine particulate matter concentration within each establishment.

Prior to testing establishments, outdoor air samples were taken to obtain a baseline measure. This was done to assure the air quality measured inside was not affected by potentially polluted air from outside. The outdoor fine particulate matter measurements were 20-30 micrograms per cubic meter which indicated good air quality. **(Figure 1)** The data from the TSI SidePak was downloaded to the University of Wisconsin Comprehensive Cancer Center Surveillance and Evaluation Program whose staff analyzed the data.

(Note on confidentiality of data: The establishments monitored for air quality were not identified by name. The study authors did not want to give the impression these establishments had more or less polluted air than others in La Crosse County.)

## **Results**

Upon completion of the monitoring, data from the TSI SidePak was downloaded to the University of Wisconsin Comprehensive Cancer Center Surveillance and Evaluation Program. The Air Quality Standards of the WI DNR were used to evaluate the establishments in this study. **(Figure 1)** The Environmental Protection Agency (EPA) sets national air quality standards that are adopted by most states, including Wisconsin. An acceptable level for fine particulate matter is the limit set to protect public health, including the health of sensitive populations such as asthmatics, children and the elderly. The acceptable level or standard for daily exposure is 35 micrograms/cubic meter averaged over a 24-hour period. The data indicated 13 of 19 establishments had air quality above the level considered hazardous to health (210 ug/m<sup>3</sup>).

**FEBRUARY 22, 2008** The air quality in 7 establishments was tested from 5-10 PM on February 22, 2008. Six of the 7 establishments exceeded the hazardous level. The first 3 establishments tested were facilities that served food and alcohol. Two of the 3 had children present. Two of the 3 exceeded the hazardous limit. Later that evening 4 establishments were tested and all had hazardous levels of fine particulate matter. One of the 4 recorded 870 micrograms/cubic meter. There were many individuals dancing in this environment. WI DNR

recommends the public refrain from all physical activity when fine particulate matter levels are 210 micrograms/cubic meter or greater. Physical activity in this environment can have adverse health effects. **(Figure 2)**

**FEBRUARY 23, 2008** The first establishment monitored the morning of February 23, was a restaurant exempt from the smoke-free restaurant ordinance because seating was less than 50. Monitors noted fifteen customers were in the establishment during the survey period and five cigarettes were smoked. During much of the period fine particulate matter exceeded the hazardous level. **(Figure 3)** The next 2 establishments monitored had wide variations in air quality. Each of these establishments had approximately 15 patrons. During the monitoring period a small number of cigarettes (1-3) were smoked and these resulted in high levels of fine particulate matter. **(Figure 3)**

On the evening of February 23<sup>rd</sup>, 2 establishments visited from 5:30- 7:30 PM had good air quality levels. One of the establishments was smoke-free. The other establishment was visited early in the evening and no one was smoking. A third establishment monitored around 8 PM had 400 micrograms per cubic meter, a level almost twice the hazardous limit. Monitors noted that a number of children were in this establishment throughout their visit. The 4<sup>th</sup> establishment visited had lower, but still was at an unhealthy level of air quality. **(Figure 3)** At 9:30 P.M. a 5<sup>th</sup> establishment had a concentration four times the hazardous limit (986ug/m<sup>3</sup>). Patrons at this establishment included one individual on oxygen. The air in 5 of 6 establishments where smoking was observed exceeded the hazardous limit. **(Figure 4)**

**Figure 1: Ambient Air Quality Standards (DNR)**

| Index Values   | Levels of Health Concern       | Cautionary Statements  |
|--|--------------------------------|--|
| 0-50<br>(Below 15 micrograms/m <sup>3</sup> or less) | Good                           | None   |
| 51-100*<br>(16 -35 micrograms/m <sup>3</sup> )       | Moderate                       | Unusually sensitive people should consider reducing prolonged or heavy exertion.   |
| 101-150<br>(36-55 micrograms/m <sup>3</sup> )        | Unhealthy for Sensitive Groups | People with heart or lung disease, older adults, and children should reduce prolonged or heavy exertion.   |
| 151-200<br>(56-140 micrograms/m <sup>3</sup> )       | Unhealthy                      | People with heart or lung disease, older adults, and children should avoid prolonged or heavy exertion. Everyone else should reduce prolonged or heavy exertion.             |
| 201-300<br>(141-210 micrograms/m <sup>3</sup> )      | Very Unhealthy                 | People with heart or lung disease, older adults, and children should avoid all physical activity outdoors. Everyone else should avoid prolonged or heavy exertion.           |
| 301-500<br>(>210 micrograms/m <sup>3</sup> )         | Hazardous                      | People with heart or lung disease, older adults, and children should remain indoors and keep activity levels low. Everyone else should avoid all physical activity outdoors. |

\*An AQI of 100 for particles up to 2.5 micrometers in diameter corresponds to a level of 34 micrograms per cubic meter (averaged over 24 hours).

Figure 2: Indoor Air Quality, La Crosse, 2/22/08

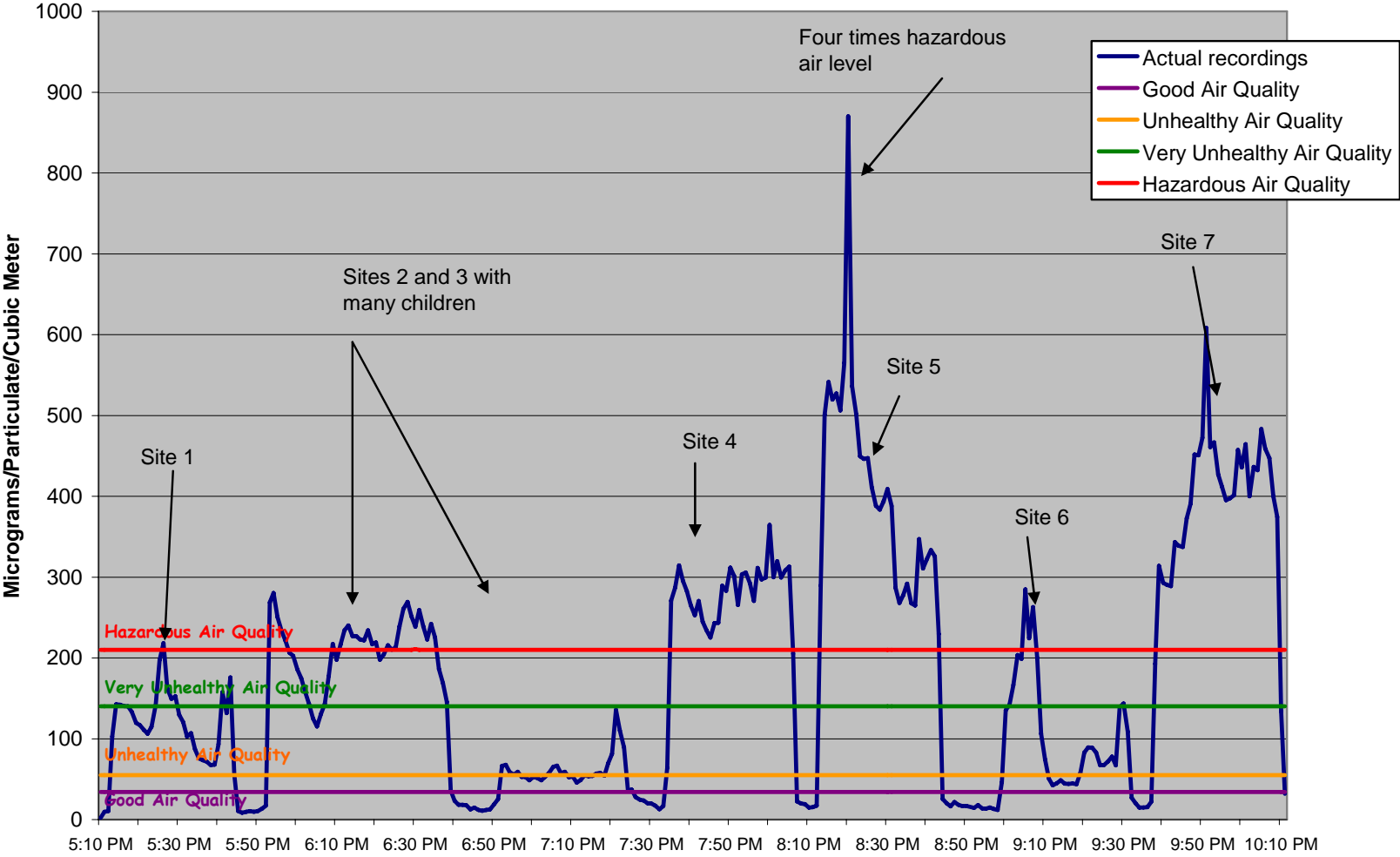


Figure 3: Indoor Air Quality, La Crosse, 2/23/08

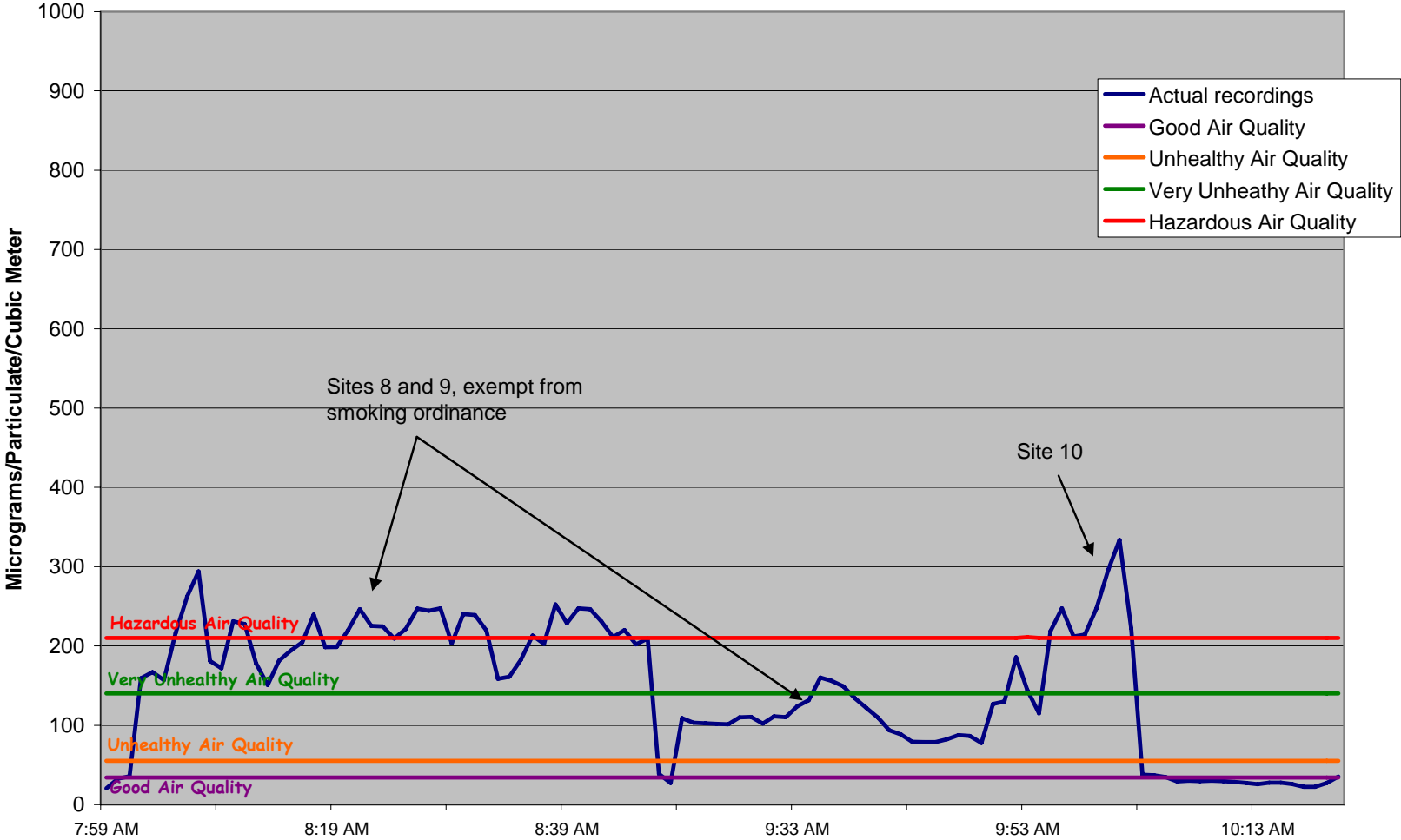
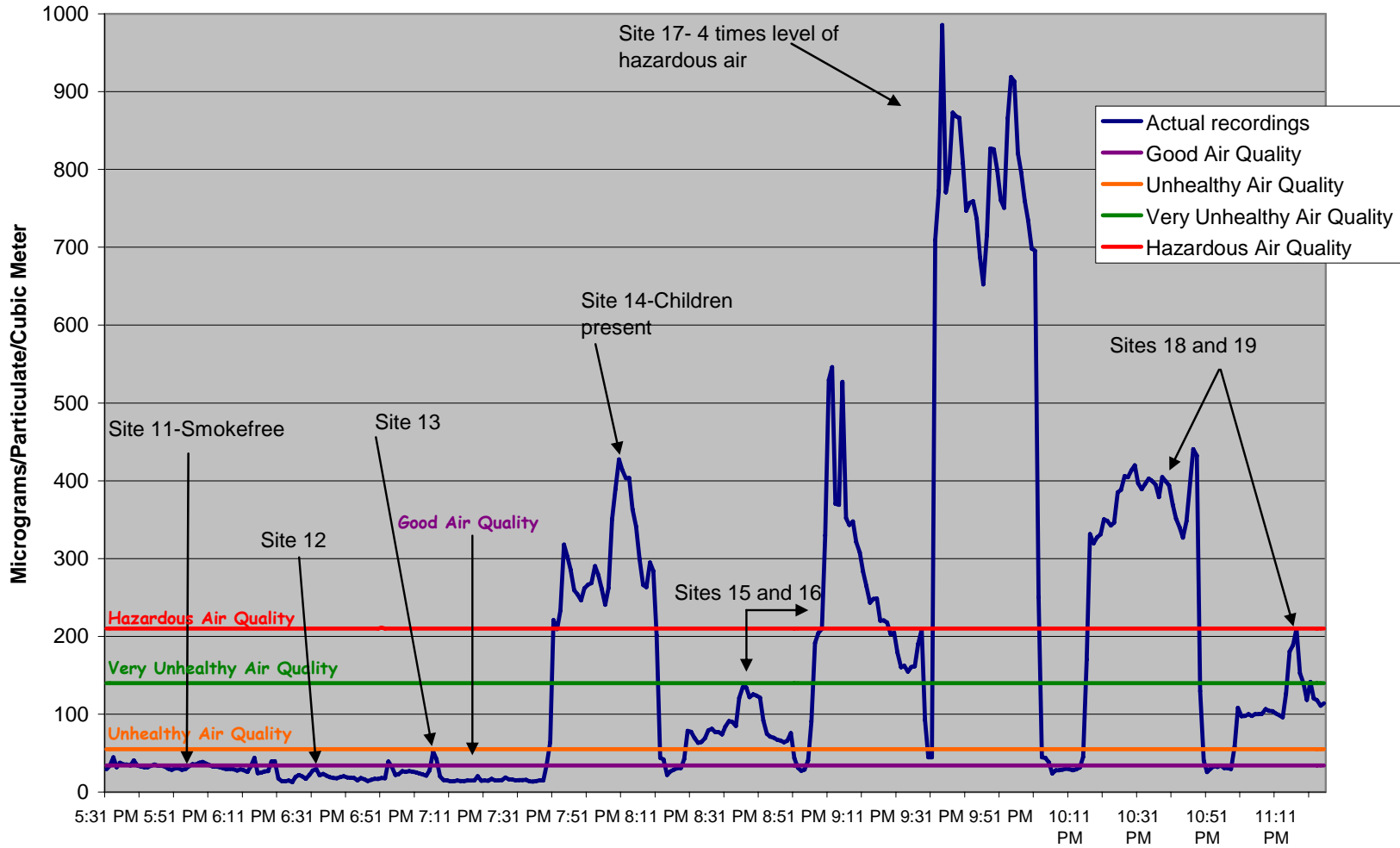


Figure 4: Indoor Air Quality, La Crosse County, 2/23/08



**Discussion:**

Periodically the Coulee Region comes under outdoor air quality alerts issued by the WI DNR. During these periods, the air quality is considered unhealthy for sensitive groups. Individuals with a compromising illness were warned against strenuous physical activity.<sup>5</sup>

The data in this report indicated patrons and hospitality workers of establishments in La Crosse County are often exposed to hazardous levels of fine particulate matter from secondhand smoke as defined by the WI DNR Air Quality Index. This exposure presents immediate and long-term health risks for patrons and employees.

The 2006 Surgeon General's Report "The Health Consequences of Involuntary Exposure to Tobacco Smoke" states secondhand smoke is a health hazard at any level. It goes on to say separating smokers from nonsmokers, cleaning the air, and ventilating buildings does not eliminate exposure to secondhand smoke.<sup>6</sup> People opposed the regulation of smoking in public places propose the posting of warning notices to alert customers and employees of the presence of secondhand smoke. Their proposal will not be protective of public health. The warning assumes people with chronic diseases such as heart and lung problems are aware of their disease. In many cases, the first knowledge of heart disease is a heart attack or stroke. As a result, customers and employees with serious but undiagnosed disease would continue to be exposed to levels of fine particle matter that could trigger a heart attack or worsen an on-going chronic lung condition such as emphysema.

Secondly, the work of hospitality employees is taxing and often requires physical exertion. Physical exertion in an environment with poor air quality could cause a range of pulmonary and cardiac problems. Customers too should limit physical activity and most do not know that such activity can be dangerous due to high concentrations of fine particulate matter.

Thirdly, young children cannot control their exposure to fine particulate matter. The effects of the smoke on children are different than on adults and are more immediate and acute. Asthma and allergic attacks as well as ear and respiratory infections are common outcomes of exposure, even for relatively brief periods of time.<sup>7</sup> Those collecting the data reported instances where children were present at the establishments with hazardous levels of fine particulate matter.

Fourthly, individuals have no ability to assess the level of fine particulate matter in any particular establishment. Except for the presence of odor and visible smoke a customer is unable

to determine the risk to their health. Any establishment that permits smoking has secondhand smoke residuals that present a human health hazard.

There are more particles in the smoke coming off the end of a burning cigarette than inhaled smoke because there is incomplete combustion at this lower temperature. The public is unaware that secondhand smoke is much more toxic than smoke inhaled directly from a cigarette. They do not know that when smoke is aged (smoke more than 30 minutes old) it is 3-4 times more toxic than fresh smoke.<sup>8</sup> The data from this study indicates that in a number of cases a small number of smokers created enough fine particulate matter to make air hazardous (210 ug/m<sup>3</sup> or greater) in an entire establishment.

### **Conclusion**

It is well documented that secondhand smoke causes cancer, heart disease and a host of other illnesses. The data presented in this report found the majority of customers and hospitality workers in eating and drinking establishments in La Crosse County were exposed to hazardous levels of fine particulate matter from secondhand smoke. Many individuals are unaware of their health status and how exposure to secondhand smoke can negatively influence their health. Previous studies have indicated even short-term exposure of 20 minutes can cause sudden life threatening cardiac events. This study confirms the presence of health hazards in eating and drinking establishments in La Crosse County. Local or state-wide legislation prohibiting smoking in these establishments would remove an unnecessary health risk to the public and employees of the hospitality industry.

## References

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<sup>1</sup> *The health consequences of smoking: a report of the Surgeon General*. Atlanta, GA: Dept of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; Washington DC, 2004

<sup>2</sup> Umland MA, Palmersheim KA, Ullsvik JC, Wegner MV. Burden of Tobacco in Wisconsin. University of Wisconsin Comprehensive Cancer Center. Madison, WI: February 2006

<sup>3</sup> Pechacek T, Repace J, Caraballo R., Cummings K M., Travers M, Hyland A, Babb S. Indoor air quality in hospitality venues before and after implementation of a clean indoor air law - Western New York, 2003. Morbidity and Mortality Weekly Report, 2004 (Vol. 53) (No. 44) 1038-1041.

<sup>4</sup> Palmersheim KA, Remington PL, Wegner MV. The impact of a smoke-free ordinance on the health of bartenders: one year later. Surveillance Brief. Paul P. Carbone Comprehensive Cancer Center. 2007. Madison, WI.

<sup>5</sup> State extends air quality advisory through Monday, February 25, 2008 and DNR issues air quality warnings this winter, January 14, 2008, La Crosse Tribune

<sup>6</sup> The health consequences of involuntary exposure to tobacco smoke: a report of the Surgeon General : U.S. Dept of HHS, Centers of Disease Control and Prevention, National Center for Chronic disease Prevention and Health Promotion, Office on Smoking and Health, Washington DC, 2006

<sup>7</sup> The health consequences of involuntary exposure to tobacco smoke: a report of the Surgeon General : U.S. Dept of HHS, Centers of Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, Washington DC, 2006

<sup>8</sup> Schick S, Glantz S. Sidestream cigarette smoke toxicity increases with aging and exposure duration. Tobacco Control, 2006;15:424-429.

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