

*MEMO: Clarification of Outdoor Tobacco Smoke Findings for Outdoor Dining Patios*

*DATE: May 24, 2007*

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## **TO WHOM IT MAY CONCERN:**

Some representatives of so-called "smokers' rights" organizations have been mischaracterizing the findings of our recently published study performed at Stanford University, entitled "Real-Time Measurement of Outdoor Tobacco Smoke Particles" (<http://tobaccosmoke.org/KOS07>). I would like to clarify the findings of our research with respect to exposures occurring on outdoor dining patios.

Our results show that a nonsmoker, who is near a smoker at an outdoor pub, cafe, or restaurant, can potentially inhale toxic smoke produced from a cigar or cigarette at very high levels. Our research proves that drifting secondhand smoke can indeed pose a significant nuisance or health risk for nonsmokers sitting or standing near smokers on outdoor patios.

Obviously, factors such as wind, size of the venue, and distance from smokers all make a difference, but the question relevant to involuntary exposure in public locations is: "WILL I BE EXPOSED WHEN I VISIT A TYPICAL OUTDOOR SETTING THAT ALLOWS SMOKING?" Even for a small number of smokers, WE FOUND THE ANSWER TO THIS QUESTION TO GENERALLY BE "YES" FOR NEARLY ALL THE OUTDOOR SETTINGS THAT WE VISITED during our survey of 10 outdoor smoking venues. We were able to detect tobacco smoke particles at each of the outdoor locations where real smokers were present, even if we were not seated at a table immediately adjacent to the smoker(s). Often, we measured very high levels for brief time periods.

## **Exposure Versus Distance**

While we found that exposure can occur in most venues with smoking, as part of the study we also performed careful experiments of pollution level as a function of distance, so that the results of our study could be used to quantify exposures that would likely occur when nonsmokers are positioned at a variety of distances from the smoker(s).

As agrees with common sense, we measured the highest exposures within a few feet of a burning cigarette, corresponding to situations when a nonsmoker could be sitting within about 4 feet from the actual smoker, that is, the distance of about 2 typical arm lengths away from the smoker's body. The breathing zone of a nonsmoker at the same table, or perhaps an adjacent table, could come within 1.5 or 2 feet of the burning cigarette when the smoker puts the cigarette on the table or holds it in an outstretched hand. Toxic particle pollution at these close distances was surprisingly high with average levels during smoking sometimes exceeding 200 to 500 micrograms per meter cubed when we were downwind from the active cigarette or when we were conducting the experiment at a recessed storefront outdoor patio. Transient levels could actually exceed 1,000 micrograms at the closest positions. For reference, the EPA standard for particles in outdoor air is only 35 micrograms (24-hour average).

However, it is important to stress that measurable exposure also occurred at further distances. When a real smoker was present, rather than just smoldering cigarettes, or when we monitored at a position consistently downwind from a smoldering cigarette, we measured elevated average pollution levels even at 9 to 12 feet away from the active cigarette. Thus, EVEN IF A PERSON WERE SEATED 1 OR 2 TABLES REMOVED FROM A SINGLE SMOKER, THEY COULD STILL RECEIVE APPRECIABLE EXPOSURE TO OUTDOOR TOBACCO SMOKE.

We found an approximate theoretical relationship between exposure and the distance from a burning cigarette: As a person moves a given distance away from an active cigarette, the average pollution levels tend to drop off in equal proportion to this change in distance. For example, if a person moves from 1 foot to 10 feet away from a cigarette, which is a distance 10 times further away, the levels would be expected to drop off by a factor of approximately 10.

### **Exposure from Multiple Smokers**

The presence of multiple smokers is likely to increase exposure substantially from the single-smoker case. Our data can be used to estimate exposures for situations with multiple smokers. Since it is reasonable to assume that average smoke levels increase in proportion to the number of smokers, we can then roughly estimate levels of particle exposure for different distances from groups of smokers. A nonsmoker who is 1 or 2 feet away from a single burning cigarette, can easily inhale pollution that is 10 times greater, on average, than background "clean" levels, so that being 10+ feet away is required to avoid elevated average exposure during smoking. However, WITH MULTIPLE SMOKERS PRESENT, THE AVERAGE LEVELS COULD BE 20, 30, or 50+ TIMES GREATER THAN BACKGROUND AT CLOSE RANGE, SO THAT MOVING TO 20 TO 50+ FEET AWAY FROM THEM WOULD LIKELY BE REQUIRED TO AVOID EXPOSURE.

### **The Bottom Line**

A nonsmoker can expect to be exposed to some tobacco smoke in many types of outdoor pubs, cafes, and restaurants, even if only a single cigarette is active. In some cases, appreciable exposure can still occur out to 10+ feet, and when there are more smokers present, being up to 50 feet or more from tables of smokers would be required to avoid exposure.

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