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# Secondhand smoke raises the stakes in America's casinos

*New research from Stanford and Tufts universities shows secondhand smoke is a danger to tens of millions of casino patrons and hundreds of thousands of workers. Threats range from heart attacks to cancer.*

BY ANDREW MYERS

Millions of Americans visit casinos to unwind and test their luck against the hands of fate, but lurking in the shadows is a gamble few would contemplate before they stepped inside a casino's doors. The threat is not addiction. It's not the specter of losing a small fortune. The hidden danger is secondhand smoke.

According to a new study by scientists from Stanford and Tufts universities published in the journal *Environmental Research*, each year 50 million nonsmoking casino patrons and 400,000 nonsmoking casino workers gamble with their lives inside casinos that allow smoking. Less than 2 hours of exposure to secondhand smoke in half of the casinos surveyed is enough to impair the heart's ability to pump blood, placing susceptible casino patrons and workers at acute risk of heart disease.

Coronary heart disease is the leading cause of death in the United States and is a major cause of disability, costing the country an estimated \$151.6 billion in 2007. Approximately 8 percent of the population 45 to 64 years of age, and 20 percent of those aged over 65, suffers from coronary heart disease. These older people are at greater risk from exposure to secondhand smoke. Compounding the concern, the two age groups have higher gambling rates than those under 45.

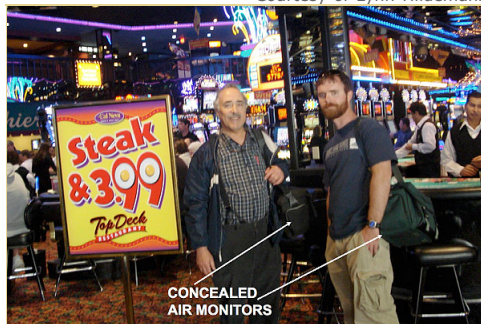
The team of experts from Stanford and Tufts examined pollution levels in 66 smoky casinos in five states, and three casinos that are smoke-free, comparing them with the pollution levels outdoors. The study is a continuation of earlier research conducted at 36 casinos in California. An additional 30 casinos were tested in four other states.

To make their measurements, the researchers operated covertly. Two to three researchers at a time entered casinos carrying small monitoring devices tucked inside purses or jackets. Combining the Stanford/Tufts data with previously published measurements from three other states, the team developed nationwide averages and ranges for pollution levels inside casinos.

The study focused on two types of air pollutants blamed for tobacco-related cancers: fine particulate matter, which deposits deep in the lungs, and a group of chemicals called particulate polycyclic aromatic hydrocarbons, or PPAHs, which include at least 10 different carcinogenic compounds. Results show that gamblers and casino workers in casinos that permit smoking are subject to levels of particulate air pollution 10 times higher than those who visit smoke-free casinos.

The researchers also found that ventilation and air cleaning do not control indoor smoke levels. "The only effective control for secondhand smoke was reducing the number of smokers," said Lynn Hildemann, a professor of environmental engineering and science at Stanford and the principal investigator for the study.

"The fewer smokers, the less polluted the air. If you switch to a nonsmoking casino, your exposure to harmful fine particulate matter levels indoors will be reduced by 90 percent, and your exposure to carcinogenic PPAH levels will decrease by 80 percent."



James Repace, visiting assistant professor at Tufts University, and John Moye, professor at University of Nevada, Reno, who helped measure the smoke in casinos.

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Unfortunately, smoke-free casinos are rare. In the United States, 88 percent of commercial casinos and nearly 100 percent of tribal casinos allow smoking.

Those patrons who seek refuge in nonsmoking areas attached to the smoking casinos – such as restaurants, where children are found – find scant protection. Unless these areas are completely sealed off from the casino, with closed doors and a separate ventilation system, the researchers found that secondhand smoke seeps in, resulting in pollution levels seven times as high as outdoors.

In contrast, the three smoke-free casinos surveyed had pollution levels as low as the outdoors. In more than nine-of-ten smoking casinos in the survey, the indoor pollution levels exceeded the World Health Organization standard for fine particulate matter.

"Casino patrons are gambling not only with their money, but with their health, and the odds are stacked against them," said Hildemann. "Casinos have always been huge draws, but in recent years we've seen an increase of family activities tied to casinos. So in addition to seniors, the health risks are starting to reach new, more vulnerable populations, particularly children."

The pervasive secondhand smoke indoors poses an even graver health threat to casino workers. In the new study, using published data measuring the levels of cotinine, a biomarker of tobacco that shows up in human tissue, Hildemann and colleagues added to earlier results and found amounts of cotinine in casino dealers who are nonsmokers were higher than in 95 percent of the nonsmoking U.S. population. Nevada casino dealers have triple the asthma rates of the general state population.

"Cotinine levels in these nonsmoking workers – who were exposed only while at work – significantly increased between the beginning and the end of their work shift. Similar results have been found in casino patrons with shorter exposures. This is clearly due to secondhand smoke in the casino," said James Repace, a biophysicist and visiting assistant clinical professor at Tufts University School of Medicine.

The study was funded by the Flight Attendant Medical Research Institute.

*Andrew Myers is associate director of communications at the School of Engineering.*

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