

# The Starkville & Hattiesburg Heart Attack Studies

Reductions in Heart Attack Admissions Following the Implementation of Local Smoke-Free Ordinances

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Starkville implemented a comprehensive smoke-free ordinance that prohibited smoking inside of all indoor public places on May 20, 2006. Seven months later, Hattiesburg implemented a similar comprehensive ordinance on January 1, 2007.

Findings from controlled observational studies demonstrate that hospital admissions for heart attacks in both Starkville and Hattiesburg decreased substantially following the implementation of the smoke-free ordinances. Moreover, the observed decrease in these communities was much higher than that observed in control communities that did not have a smoke-free ordinance.

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## BACKGROUND

Over the past 20 years, approximately half of the States, and an additional 360 communities have prohibited smoking inside of bars and restaurants. After Helena, Montana enacted a smoke-free law, local cardiologists began to notice that they were treating fewer patients for heart attacks. The ensuing research led to more than a dozen scientific studies that have found a decrease in heart attack admissions following the implementation of a smoke-free law. Importantly, each of these studies has examined very different types of places, from small cities, to states, and even entire countries. Although the methods and the size of the heart attack reductions have varied across studies, the general finding of a reduction in heart attacks has remained consistent.

## PREVIOUS RESEARCH & EMERGING SCIENTIFIC CONSENSUS

In September of 2009, two independent meta-analyses concluded that heart attack admissions had dropped significantly following the implementation of smoke-free laws. One review published in *Circulation: The Journal of the American Heart Association*, concluded that heart attack admissions decreased, on average, by 17% the first year that a smoke-free law was in place, and that this benefit increases with time<sup>1</sup>. Independently, another study published in the *American Journal of Cardiology*, reviewed five of the seminal studies on the effects of smoking bans on risk for heart attack and reached a similar conclusion<sup>2</sup>. The authors stated, “When taken in the aggregate, these studies offer consistent evidence that smoking bans are associated with reduction in the risk for AMI (Acute Myocardial Infarction, AKA heart attacks) in the general public (p. 1423)<sup>2</sup>.”

In October 2009 at the request of the Centers for Disease Control and Prevention, the Institute of Medicine (IOM) released another review<sup>3</sup> that reached the same conclusion. “Consistent data confirms for the committee that smoking bans do, in fact, decrease the rate of heart attacks.” The IOM is an independent, nonprofit organization that works outside of the government. Their mission is to provide unbiased and authoritative advice to the federal government on policy matters pertaining to the health of the public. Given the mission of the IOM, this report essentially establishes a scientific consensus on the finding that smoking bans

“Starkville residents experienced a 27.7% reduction in heart attack admissions compared to the 14.8% reduction observed among those who did not live in Starkville, resulting in a cost savings of \$288,270.”

decrease the number of heart attacks.

These three reviews reveal the emerging scientific consensus concerning decreases in heart attack admissions following the implementation of smoke-free laws. It should be noted, however, that most of these studies provide indirect evidence of an association between tobacco smoke exposure and heart attack admissions<sup>4-13</sup>. Given the nature of retrospective research, reliable data on smoking status of heart attack victims were not available for these studies. Only two studies had the data necessary to demonstrate that hospital admissions decreased specifically for non-smokers<sup>14,15</sup>. For the majority of these studies, it is feasible that some of the observed decreases in heart attack admissions could have arisen from reductions in active smoking, rather than reduced exposure of non-smokers. However, air quality studies demonstrate that exposure to tobacco smoke substantially decreases following the implementation of a smoke-free law; and experimental studies of humans, animals, and cell cultures demonstrate that tobacco smoke exposure has short-term impacts on the cardiovascular system<sup>3</sup>. It is also important to note that the IOM committee “could not determine whether acute exposures were triggering acute coronary events, chronic exposures were causing chronic damage that eventually resulted in acute coronary events, or a combination of chronic damage and an acute-exposure trigger led to the increased risk of acute coronary events (p. 7)<sup>2</sup>.”

## METHODS

These studies applied a controlled observational approach to objectively examine the hypothesized impact of smoke-free laws on hospital admissions for heart attacks in Starkville and in Hattiesburg. The Starkville

Hattiesburg residents experienced a 13.4% reduction in heart attack admissions compared to the 3.8% reduction observed among those who did not live in Hattiesburg, resulting in a cost savings of \$2,367,909.”

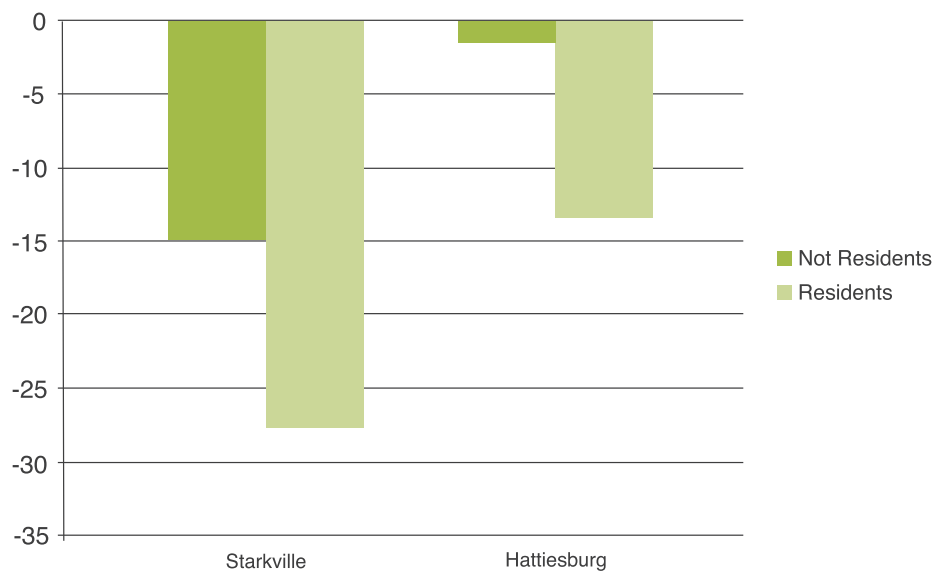
Study examined the number of heart attack admissions between July 29, 2004 and April 7, 2009; while the Hattiesburg Study examined admissions between April 21, 2005 and June 30, 2009. Each study compared the number of heart attack admissions among people living within the city limits to those living in the local hospital catchment area, but

outside of the city limits (and thus not protected by the smoke-free ordinance). This design provides a means to control for larger trends that might be occurring in Mississippi and that could be responsible for any observed decrease in hospital admissions for heart attacks.

Three hospitals participated in this study: Forrest General Hospital, Wesley Medical Center, and Oktibbeha County Hospital. The first two hospitals are located in Hattiesburg, Mississippi (Lamar and Forrest Counties) and the latter is located in Starkville, MS. Admission records for acute myocardial infarctions were obtained from these three hospitals. Each hospital provided the date of admission for patients with a primary diagnosis of acute myocardial infarction (ICD-9, 410) during the study period. Because data were not available for an equal number of days prior to and after the smoke-free ordinances were implemented, analyses compare the number of heart attacks after implementation to a standardized rate prior to implementation. The standardized rate is calculated by multiplying the number of heart attack admissions by the ratio of days post-implementation to pre-implementation during the study period.

1,049 heart attack admissions, compared to the standardized rate of 1,090 admissions prior to the implementation. Thus, Hattiesburg residents experienced a 13.4% reduction in heart attack admissions compared to the 3.8% reduction observed among those who did not live in Hattiesburg.

**Cost Savings** | It is possible to estimate the cost savings of these reductions in heart attack admissions by applying the methods used by a study of New York hospital admissions<sup>9</sup>. Previous research of in-hospital costs for acute myocardial infarction estimated the total median in-hospital costs to be \$14,772 (1998 dollars)<sup>16</sup>. Using this approach, the reductions in heart attack admissions resulted in cost savings of \$215,233 in Starkville and \$1,767,970 in Hattiesburg. The Bureau of Labor Statistics provides an inflation calculator<sup>17</sup> that can convert these figures to 2010 dollars. Using these estimates, the smoke-free ordinances were followed by



**RESULTS**

**Starkville** | During the 1,053 day period following the implementation of the smoke-free ordinance in Starkville, there were 38 heart attack admissions among Starkville residents, compared to the standardized rate of 52.57 admissions prior to the implementation. Outside of Starkville, there were 19 heart attack admissions, compared to the standardized rate of 22.30 admissions prior to the implementation. Thus, Starkville residents experienced a 27.7% reduction in heart attack admissions compared to the 14.8% reduction observed among those who did not live in Starkville.

**Hattiesburg** | During the 911 day period following the implementation of the smoke-free ordinance in Hattiesburg, there were 299 heart attack admissions among Hattiesburg residents, compared to the standardized rate of 345 admissions prior to the implementation. Outside of Hattiesburg, there were

cost savings of \$288,270 in Starkville and \$2,367,909 in Hattiesburg during the study period.

**CONCLUSIONS**

Consistent with previous research, residents of Starkville and Hattiesburg experienced reductions in heart attacks following the implementation of a smoke-free ordinance. Moreover, these reductions were greater than those observed in the control populations that did not live in a community with a smoke-free ordinance. These two studies, when considered in the context of 12 similar studies and the IOM Report, demonstrate that Mississippi could experience a substantial decrease in heart attacks, as well as substantial cost savings, if more communities and/or the state implemented smoke-free laws.

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