



## **ACTION ON SMOKING AND HEALTH**

701 4th Street NW • Washington DC 20001 • (202) 659-4310

<http://ash.org>

### **How As Little As 30 Minutes of Exposure to Secondhand Tobacco Smoke Can Kill You**

#### **How ASH's Widely Reported Warnings to the Public About a Heart Attack From Only 30 Minutes Exposure to Tobacco Smoke Have Been Vindicated By Real World Studies, Including Long Term Ones, And by a Major Report by the U.S. Surgeon General**

**Action on Smoking and Health (ASH)** was apparently the first and most frequently-quoted antismoking organization to warn the public that as little as 30 minutes of exposure to even small amounts of drifting secondhand tobacco smoke can increase a nonsmokers' risk of a heart attack virtually to that of a smoker, and can trigger a (sometimes fatal) heart attack.

ASH's original report has now been further validated by studies showing a dramatic decline in heart attacks in more than a dozen different venues in which smoking in public places was banned, and by a recent report by the **U.S. Surgeon General** which made it clear that there is no safe lower level of exposure to the thousands of toxins (including many cancer-causing chemicals) in secondhand tobacco smoke, and that even brief exposure to minute amounts causes immediate damage to the bodies of nonsmokers that can lead to serious illness and thousands of deaths.

This document, based upon numerous reports and studies – many of which have clickable links in the footnotes – explains just how dangerous secondhand tobacco smoke can be, especially for older Americans, those with a wide variety of pre-existing medical conditions, and those at elevated risk of heart attack, including men over 40, post-menopausal women, anyone who is obese or gets insufficient exercise, anyone with diabetes or a variety of other medical problems, anyone with a personal or family history of heart or other cardiovascular problems, etc.

#### **THE ORIGINAL STUDIES**

This warning about how even brief exposure to small amounts of tobacco smoke can trigger a fatal heart attack, now widely adopted and promulgated by many medical and antismoking organizations, was originally based in large part on an article in *Circulation magazine* entitled “**Cardiovascular Effects of Secondhand Smoke – Nearly as Large as Smoking**” which reported: “*the effects of even **brief (minutes to hours)** passive smoking are often nearly as large (**averaging 80% to 90%**) as chronic active smoking.*”<sup>{1}</sup> [emphasis added].

ASH's warning was also based upon other medical reports. For example, an article entitled “**Second-hand Smoke – License to Kill Due to Expire**” in *Neplurology Dialysis Transplantation* said: “*While the dose of smoke delivered to passive smokers is approximately 100 times smaller than that delivered to an active smoker, the effects of even **brief (minutes to hours)** passive smoking are often nearly as large (**averaging 80–90%**) as chronic active smoking.*”<sup>{2}</sup> [emphasis added].

Another article in *Circulation* entitled “**Exposure to Secondhand Smoke and Biomarkers of Cardiovascular Disease Risk in Never-smoking Adults**” warned that: *“Passive smokers appear to have disproportionately increased levels of 2 biomarkers of cardiovascular disease risk, fibrinogen and homocysteine. This finding provides further evidence to suggest that low-level exposure to secondhand smoke has a clinically important effect on susceptibility to cardiovascular disease.”*<sup>{3}</sup>

ASH's warning was also based on an even clearer and more dramatic pronouncement and warning to the public by the **U.S. Centers for Disease Control [CDC]**:

*“Could eating in a smoky restaurant precipitate an acute myocardial infarction in a non-smoker? . . . , a growing body of scientific data suggests that this is possible . . . laboratory data suggest that even 30 minutes of exposure to a typical dose of secondhand smoke induces changes in arterial endothelial function in exposed non-smokers of a magnitude similar to those measured in active smokers.”* “**How Acute and Reversible are the Cardiovascular Risks of Secondhand Smoke?**,” *British Medical Journal*, [emphasis added].<sup>{4}</sup>

Indeed, the **U.S. Surgeon General**, in his report entitled “**SECONDHAND SMOKE, WHAT IT MEANS TO YOU**,”<sup>{5}</sup> has concluded and warned the public in no uncertain terms that:

- *“It hurts you. It doesn’t take much. It doesn’t take long.”*
- *“There is **no safe amount of secondhand tobacco smoke**. Breathing even a little secondhand smoke can be dangerous.”*
- *“People who have heart disease should be very careful not to go where they will be around secondhand smoke.”*
- *“The bottom line is that **breathing secondhand smoke makes it more likely that you will get heart disease, have a heart attack, and die early.**”*
- *Even a **short time in a smoky room** causes your blood platelets to stick together. Secondhand smoke also damages the lining of your blood vessels. In your heart, **these bad changes can cause a deadly heart attack.*** [emphasis added]

## SUBSEQUENT STUDIES

Now a number of major studies – in **Arizona, Bowling Green [OH], Helena [MT], England, Indiana, Ireland, New York State, Piedmont [Italy], Pueblo [CO], Rome [Italy], Saskatoon [Canada], and Scotland** – have consistently shown a major decrease in hospital admissions for heart attacks after smokefree laws went into effect, and, at least in the case of **Helena**, a dramatic re-increase in heart attack admissions after the ban was dropped. This is very compelling real-world proof that even brief exposure to secondhand tobacco smoke can and does trigger heart attacks, and also of the enormous saving in both lives and health care costs from smoking bans.

For example, the recent study from **New York** shows that the decline was equivalent to 3,813 fewer hospital admissions for heart attacks. At an average cost of \$14,772 for each heart-attack admission, the total savings is about \$56.3 million – a saving achieved at virtually no cost. A similar study in Arizona found an estimated savings in hospital costs from these declines of \$16.8 million.<sup>{6}</sup>

An even more recent study in **Indiana** found:<sup>{7}</sup>

*People with no risk factors for heart disease can still experience heart attacks. An **Indiana University** study found that after a countywide smoking ban was implemented, hospital admissions for such heart attacks dropped 70 percent for non-smokers – but not for smokers. . . . Exposure to second-hand smoke **for just 30 minutes can rapidly increase a person's risk for heart attack, even if they have no risk factors.** The smoke, which contains carbon monoxide, causes blood vessels to constrict and reduces the amount of oxygen that can be transported in the blood. [emphasis added]*

## HOW AND WHY IT HAPPENS

To make it clear how even brief exposure to secondhand tobacco smoke can cause fatal heart attacks, a researcher explained: <sup>{8}</sup>

*When substances in smoke enter the bloodstream, they can throw off the delicate balance of chemistry in the small blood vessels, said Dr. Stephen J. Jay, a professor of medicine and public health at the Indiana University School of Medicine. That can cause a person's platelets to grow sticky and clump together, creating a blockage that can result in a **heart attack or stroke.***

*"This is **surprising to a lot of people** who generally think that smoking is something that causes disease 30 or 40 years down the pike," Jay said. "What people don't understand is that if you look at active smoking as well as passive smoking in population studies, you can see that exposure to smoke, active **or passive, is perfectly capable of killing you now.** [emphasis added]*

Another very important factor to emerge from the **Indiana** study is that the effects of smoking bans on reducing heart attacks occur primarily in nonsmokers rather than smokers. Therefore, it appears not only that nonsmokers are the primary beneficiaries of smoking bans (in terms of reducing heart attacks), but that the reduction in overall heart attacks is an even stronger vindication of ASH's warning than initially thought. See: "**Non-smokers the Big winners when it comes to smoking bans,**" *News-Medical.Net* <sup>{9}</sup>:

*Their study suggests that the major benefit of the ban on smoking in public places is being seen in nonsmokers. The researchers from Indiana University say **even those with no risk factors for heart disease can still experience heart attacks** but after a countywide smoking ban was implemented, hospital admissions for such heart attacks **dropped 70 percent** for non-smokers, but not for smokers.*

*Dong-Chul Seo, lead author and an assistant professor in IU Bloomington's Department of Applied Health Science, says heart attack admissions for smokers saw no similar decline during the study, so the benefits of the ban appear to come more from the reduced exposure to second-hand smoke among non-smokers than from reduced consumption of tobacco among smokers. . . .*

***Experts say exposure to second-hand smoke for just 30 minutes can rapidly increase a person's risk for heart attack, even if they have no risk factors because the smoke,** which contains carbon monoxide, causes blood vessels to constrict and reduces the amount of oxygen that can be transported in the blood. The researchers say it is of concern that about half of all non-smoking Americans are regularly exposed to second-hand smoke, even though more than 500 municipalities nationwide have adopted some form of a smoking ban in public places. [emphasis added]*

These studies of actual heart attacks are important because some columnists, and others who have themselves not done any experiments regarding the effects of secondhand smoke on the heart and circulatory systems, have tended to dismiss these claims as only theoretical, or otherwise not substantiated. But the heart attacks in these studies were all real – not theoretical or just estimates – and they provide very dramatic real-world proof of how dangerous even very brief exposure to even small amounts of secondhand tobacco smoke can be.

Indeed, as **Professor (of Cardiology) Stanton A. Glantz**, one of the leading researchers in the area – and one who has done and published actual peer-reviewed articles about his experiments regarding this risk – has summarized it, citing four different studies: <sup>{10}</sup>

*"There is strong and convincing evidence, from a wide variety of studies, that **even brief exposure to secondhand smoke** leads to blood and blood vessels behaving **similar to that observed in chronic smokers**. While 30 minutes of SHS exposure does not precipitate a heart attack in every nonsmoker, it does, among other things, activate platelets and depress function of the vascular endothelium (the lining of arteries) in a way that is known to trigger a heart attack in people at risk. These are precisely the immediate effects that anti-platelet drugs like aspirin are designed to prevent."* [emphasis added]

Subsequently, **Professor of Cardiology Stanton Glantz** also reported that: <sup>{11}</sup>

*"Breathing secondhand smoke **for just thirty minutes** affects blood and blood vessels, including the vital coronary arteries, **as much as being a smoker**. Two hours of secondhand smoke exposure compromises control of the heart beat, boosting the risk of irregular beats (and **sudden death**) or a heart attack. Because of these effects, **someone in a restaurant** who is at risk of a heart attack when secondhand smoke is in the air **will be more likely to have a heart attack**." [emphasis added]*

**Prof. Glantz** has also explained that there are several different cardiovascular effects which may be involved, but that the one reported by **Dr. Otsuka** in his study <sup>{12}</sup> is probably not the most important (as some have suggested) in arguing against possibility of short term exposure to secondhand tobacco smoke causing a fatal heart attack:

*Tobacco smoke has both short term (acute) and long term (chronic) effects. The long term effects, mostly related to oxidant loads and effects on LDL cholesterol, play a role in the slow development of atherosclerosis. The immediate physical damage that activated platelets (activated by SHS) do to the lining of the coronary arteries (the vascular endothelium) is important to allowing the atherosclerotic process to begin. The changes in endothelial reactivity that Otsuka (and lots of others) are probably not central to this process.*

*The effects that Otsuka and many others have documented relate to the acute changes in vascular function which are probably more important in terms of what SHS [second hand smoke] does in terms of causing heart disease. The **immediate effects (within minutes)** on platelet activation and endothelial function (Otsuka deals with endothelial function) are associated with thrombus formation and **cute plaque rupture** as well as the ability of arteries to respond to these insults.*

*It is **these immediate effects that are associated with increased short term risk of heart attacks due to both secondhand smoke exposure and air pollution**. (It is why, in particular, there are more heart attacks on polluted days.) It is **precisely the "measurable effects on the lining of coronary***

*arteries" that can trigger heart attacks.*

*The underlying biology that supports these conclusions is extensive and forms the basis for much of what is done to treat and prevent heart attacks (such as taking aspirin or other anti-platelet agents). [emphasis added] {13}*

## ADDITIONAL EVIDENCE

Very early in 2009, the **Centers for Disease Control [CDC]** issued a report summarizing the now-overwhelming evidence that banning smoking in public places like restaurants results in an sharp and immediate reduction in the number of myocardial infarctions [heart attacks]. {14}

Although some of the reduction results because smokers – unable to smoke in their favorite restaurants, and motivated to quit and thereby reduce the risk they create for themselves – reduce their smoking, the evidence is clear that most of the decline in heart attacks occurs because the risk that smokers created for nonsmokers is removed, and nonsmokers are therefore less likely to suffer heart attacks in public places.

The report notes that at least nine different studies in different geographical locations and under somewhat different conditions have found the same effect – thereby undercutting arguments that the results found in any one study are unreliable because of alleged defects in study methodology.

Even more important, this 2009 study shows that the effect continues; in this case over a second 18-month period in **Pueblo, Colorado**. Below are excerpts from this very persuasive report. {15}

*Exposure to secondhand smoke (SHS) has immediate adverse cardiovascular effects, and prolonged exposure can cause coronary heart disease . Nine studies have reported that laws making indoor workplaces and public places smoke-free were associated with rapid, sizeable reductions in hospitalizations for acute myocardial infarction (AMI). {16}*

*This report extends that analysis for an additional 18 months through June 30, 2006 (the Phase II post-implementation period). The rate of AMI hospitalizations among city residents continued to decrease to 152 per 100,000 person-years, a decline of 19% and 41% from the Phase I post-implementation and pre-implementation period, respectively. No significant changes were observed in two comparison areas.*

*These findings suggest that smoke-free policies can result in reductions in AMI hospitalizations that are sustained over a 3-year period and that these policies are important in preventing morbidity and mortality associated with heart disease. This effect likely is mediated through reduced SHS exposure among nonsmokers and reduced smoking, with the former making the larger contribution. [emphasis added]*

The following conclusions also appeared in the Editorial Note accompany the article: {17}

*Evidence from animal and human studies indicates that SHS exposure can produce rapid adverse effects on the functioning of the heart, blood, and vascular systems that increase the risk for a*

*cardiac event. Relevant mechanisms include effects on platelet function, endothelial function, and inflammation. Epidemiologic and laboratory data indicate that the **risk for heart disease and AMI increase rapidly with relatively small doses of tobacco smoke**, such as those received from SHS, and then continue to increase more slowly with larger doses.*

***Eliminating smoking in indoor spaces is the only way to fully protect nonsmokers from SHS.** . Compliance with smoke-free laws typically reaches high levels rapidly and then increases further over time. In addition, smoke-free laws are associated with increased adoption of no-smoking rules in private homes.*

*In addition to the previous study conducted in the city of Pueblo, eight other published studies have reported that smoke-free laws were associated with rapid, sizeable reductions in hospitalizations for . The current study **adds to the previous evidence by documenting this effect in a relatively large population and by demonstrating that the effect was sustained over an extended period.***

*The findings described in this report suggest that the initial decrease in AMI hospitalizations observed immediately after the implementation of comprehensive smoke-free laws continued over time. **These findings provide support for considering smoke-free policies an important component of interventions to prevent heart disease morbidity and mortality.** [emphasis added]*

## **THE WARNING IS VALID, DESPITE DETRACTORS**

Fortunately, more than 100 other independent medical and antismoking organizations have so far followed the initial warning by ASH, and are now warning their members, the public, legislators, regulators, and others about how as little as 30 minutes exposure to tobacco smoke can trigger a fatal heart attack.

In most cases these organizations issued their own similarly-worded warnings only after independently reviewing the underlying evidence – often with the assistance of their own expert scientific and medical advisors – and concluding, even though the warnings were very dramatic and may be very difficult for some people to accept, that they are fully warranted, appropriate, and necessary.

This shows that despite a few deniers – just like those who still deny that the HIV virus causes AIDS, that Americans ever landed on the moon, or that smoking (active or passive) causes cancer – there is strong and now an overwhelming consensus in the scientific and medical communities that brief exposure to secondhand tobacco smoke causes heart attack deaths.

These independent organizations have not been deterred by the underhanded efforts of big tobacco, those affiliated with it, and others to distort and misrepresent the evidence about the adverse effects of secondhand tobacco smoke on cardiovascular diseases, nitpick the precise wording of the warnings, point out alleged loopholes or problems with the studies, or attack the researchers for bias, just as the tobacco industry did unsuccessfully in the past in trying to persuade the public that secondhand tobacco smoke didn't cause lung cancer in nonsmokers, or even that smoking itself didn't cause heart attacks or lung cancer in smokers.

For a recent study documenting how big tobacco and those in league with it try to misrepresent and distort the facts and public opinion about how secondhand smoke causes heart attacks, see: **“TOBACCO INDUSTRY DECEIT**

**CLAIMED – Study Says Firms Tried to Suppress Dangers of Secondhand Smoke,” *Sacramento Bee* [10/16/07]; “UC Study Uncovers Tobacco Industry Efforts to Undermine Secondhand Smoke Link to Cardiovascular Disease” [10/15/07], *Circulation*,<sup>{18}</sup>, Tobacco Industry Efforts Undermining Evidence Linking Secondhand Smoke With Cardiovascular Disease, *Circulation*<sup>{19}</sup>**

## **MORE RECENT REPORTS**

A study in September 2009 shows a 10% drop in heart attacks in **England** a year after a comprehensive smoking ban was introduced, with a corresponding reduction in heart attack rates of 14% in **Scotland**, where the ban was introduced a year earlier.<sup>{20}</sup> Meanwhile, a nationwide smoking ban in **Ireland’s** public places resulted in a very significant 21% reduction in acute coronary syndrome (ACS) among nonsmoking men in the 5 months after the ban was introduced.<sup>{21}</sup> Similar reductions were also found in **Piedmont, Italy**,<sup>{22}</sup> **Bowling Green, Ohio**,<sup>{23}</sup> **Rome Italy**,<sup>{24}</sup> and **Saskatoon, Canada**,<sup>{25}</sup> and more recently in **Arizona** and **Wisconsin** (bar tenders).<sup>{26}</sup>

A recent report from the **U.S. Surgeon General** did not mince any words about the dangers of exposure to even minute amounts of secondhand tobacco smoke: "**every inhalation of tobacco smoke** exposes our children, our families, and our loved ones to dangerous chemicals that can damage their bodies and result in **life-threatening diseases such as cancer and heart disease.**" "The immediate effects of even short exposures to secondhand smoke on some functions of the circulatory system appear to be **as large as those seen in association with active smoking** of one pack of cigarettes per day. . . . Low levels of exposure, including exposures to secondhand tobacco smoke, lead to a rapid and sharp increase in endothelial dysfunction and inflammation, which are implicated in acute cardiovascular events [e.g., heart attacks] and thrombosis."<sup>{27}</sup> [emphasis added]

## **CONCLUSION**

In view of all of this evidence from a wide variety of sources, including the federal government, all nonsmokers should avoid to the extent possible even brief exposure to drifting tobacco smoke in restaurants, bars, and other public places since it dramatically increases their risk of suffering a heart attack – possibly a fatal heart attack – triggered by the inhalation.

This is especially true for all those already at increased risk for heart attacks, including all men over 40, post-menopausal women, anyone who is obese or gets insufficient exercise, anyone with diabetes or a variety of other medical problems, anyone with a personal or family history of heart or other cardiovascular problems, etc.

Since many people may have a compromised cardiovascular system – or other heart and circulatory problems – and not be aware of it, everyone should heed all of these warnings, even if the warnings are targeted especially to those with heart problems.

1. *Circulation*. 2005;111:2684-2698 <http://www.circ.ahajournals.org/cgi/content/abstract/111/20/2684>.
2. *Nephrology Dialysis Transplantation* 2007 22(6):1508-1511; doi:10.1093/ndt/gfm046 {<http://ndt.oxfordjournals.org/cgi/content/full/22/6/1508>}
3. *Circulation*. 2007;115:990-995. <http://circ.ahajournals.org/cgi/content/abstract/115/8/990>

4. **BMJ** 2004;328(7446):980 (24 April), doi:10.1136/bmj.328.7446.980  
<http://www.bmj.com/cgi/content/full/328/7446/980?ck=nck>
5. The Health Consequences of Involuntary Exposure to Tobacco Smoke [2006]  
<http://www.surgeongeneral.gov/library/secondhandsmoke/secondhandsmoke.pdf>
6. Ramirez, Report Says Smoking Ban Helps to Cut Heart Attacks, *New York Times* [09/28/07],  
[http://www.nytimes.com/2007/09/28/health/28heart.html?\\_r=2&adxnml=1&oref=slogin&adxnmlx=1195146910-7fciz/qe9wWwlebihg4](http://www.nytimes.com/2007/09/28/health/28heart.html?_r=2&adxnml=1&oref=slogin&adxnmlx=1195146910-7fciz/qe9wWwlebihg4); Herman, P.M.; Walsh, M.E., "Hospital Admissions for Acute Myocardial Infarction, Angina, Stroke, and Asthma after Implementation of Arizona's Comprehensive Statewide Smoking Ban," *American Journal of Public Health* 101(3): 491–496, March 2011,  
<http://ajph.aphapublications.org/cgi/content/abstract/101/3/491>
7. Heart Attacks in Nonsmokers Decreased With Smoking Ban, *Newswise* [11/19/07]  
<http://www.newswise.com/articles/view/535443/>
8. Ibid.
9. [11/22/07] <http://www.news-medical.net/?id=32827>
10. Non-published email, citing the following published studies:
- A. Barnoya J, Glantz SA. Cardiovascular Effects of Secondhand Smoke: Nearly as Large as Smoking. *Circulation*  
<http://circ.ahajournals.org/cgi/content/abstract/111/20/2684>
  - B. Pechacek TF, Babb S. How Acute and Reversible Are the Cardiovascular Risks of Secondhand Smoke? *BMJ*  
<http://www.bmj.com/cgi/content/full/bmj;328/7446/980>
  - C. Raupach T, Schafer K, Konstantinides S, Andreas S., Secondhand Smoke as an Acute Threat for the Cardiovascular System: a Change in Paradigm. *European Heart Journal*  
<http://eurheartj.oxfordjournals.org/cgi/content/abstract/27/4/386>
  - D. Venn A, Britton J. Exposure to secondhand smoke and biomarkers of cardiovascular disease risk in never-smoking adults. *Circulation*  
<http://www.circ.ahajournals.org/cgi/content/abstract/CIRCULATIONAHA.106.648469v1>
11. Non-published email.
12. See “Acute Effects of Passive Smoking on the Coronary Circulation in Healthy Young Adults,” Otsuka R, Watanabe H, Hirata K, et al. *JAMA*. 2001;286:436-441 <http://burningissues.org/smoke-circulation.html>
13. For more information, see generally: <http://www.no-smoke.org/pdf/SHSBibliography.pdf>, and <http://no-smoke.org/document.php?id=215>
14. “A heart attack, known in medicine as an (acute) myocardial infarction (AMI or MI), occurs when the blood supply to part of the heart is interrupted. ...” [http://en.wikipedia.org/wiki/Myocardial\\_infarction](http://en.wikipedia.org/wiki/Myocardial_infarction)
15. Smoke-free Policy Leads to Dramatic, Sustained Drop in Heart Attack Hospitalizations in Pueblo, Colorado [12/31/08] <http://www.cdc.gov/media/pressrel/2008/r081231.htm>
16. ■ Glantz S. Meta-analysis of the Effects of Smokefree Laws on Acute Myocardial Infarction: an Update. *Prev Med* 2008;47:452--3; ■ Bartecchi C, Alsever RN, Nevin-Woods C, et al. Reduction in the Incidence of Acute Myocardial Infarction Associated with a Citywide Smoking Ordinance. *Circulation* 2006;114:1490--6.; ■ Barone-Adesi F, Vizzini L, Merletti F, Richiardi L. Short-term Effects of Italian Smoking Regulation on Rates of

Hospital Admission for Acute Myocardial Infarction. *Eur Heart J* 2006;20:2468--72; ■ Juster HR, Loomis BR, Hinman TM, et al. Declines in Hospital Admissions for Acute Myocardial Infarction in New York State after Implementation of a Comprehensive Smoking Ban. *Am J Public Health* 2007;97:2035--9; ■ Seo D-C, Torabi MR. Reduced Admissions for Acute Myocardial Infarction Associated with a Public Smoking Ban: Matched Controlled Study. *J Drug Educ* 2007;37:217--26; ■ Pell JP, Haw S, Cobbe S, et Al. Smoke-free Legislation and Hospitalizations for Acute Coronary Syndrome. *N Engl J Med* 2008;359:482--91.

17. Reduced Hospitalizations for Acute Myocardial Infarction After Implementation of a Smoke-Free Ordinance --- City of Pueblo, Colorado, 2002--2006, *MMWR*, <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5751a1.htm>

18. *Circulation* 2007 116:1845-1854 <http://pub.ucsf.edu/today/cache/feature/200710156.html>

19. *Circulation*. 2007;116:1845-1854.

<http://circ.ahajournals.org/cgi/content/full/116/16/1845?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&fulltext=Terry+Pechacek+&searchid=1&FIRSTINDEX=0&resourcetype=HWCIT>

20. Smoking Ban Slashes Heart Attack Rate, *Nursing in Practice*,

<http://www.nursinginpractice.com/default.asp?title=Smokingbanslashesheartattackrate&page=article.display&article.id=18433>

21. <http://www.theheart.org/article/1002261.do>

22. Barone-Adesi F, Vizzini L, Merletti F, Richiardi L. Short-term Effects of Italian Smoking Regulation on Rates of Hospital Admission for Acute Myocardial Infarction. *Eur. Heart J* 2006;27(20):2468--2472. [PubMed: 16940340]

23. Khuder SA, Milz S, Jordan T, Price J, Silvestri K, Butler P. The impact of a smoking ban on hospital admissions for coronary heart disease. *Prev. Med* 2007;45(1):3--8. [PubMed: 17482249]

24. Cesaroni G, Forastiere F, Agabiti N, Valente P, Zuccaro P, Perucci CA. Effect of the Italian smoking ban on population rates of acute coronary events. *Circulation* 2008;117(9):1183--1188. [PubMed:18268149]

25. Lemstra M, Neudorf C, Opondo J. Implications of a public smoking ban. *Can. J. Pub. Health* 2008;99(1):62--65. [PubMed: 18435394]

26. Herman, P.M.; Walsh, M.E., "Hospital admissions for acute myocardial infarction, angina, stroke, and asthma after implementation of Arizona's comprehensive statewide smoking ban," *American Journal of Public Health* 101(3): 491--496, March 2011, <http://ajph.aphapublications.org/cgi/content/abstract/101/3/491>; Palmersheim, K.A.; Pfister, K.P.; Glysch, R.L., "The impact of Wisconsin's statewide smoke-free law on bartender health and attitudes," University of Wisconsin, Milwaukee, Center for Urban Initiatives and Research, [2011] [http://www4.uwm.edu/cuir/research/upload/WI\\_Bartender\\_Study\\_2010.pdf](http://www4.uwm.edu/cuir/research/upload/WI_Bartender_Study_2010.pdf)

27. <http://www.surgeongeneral.gov/library/tobaccosmoke/report/executivesummary.pdf>