

gOPINION

EDITORIAL VIEWPOINT

Smoke-Free Air: An Important Strategy to Reduce Heart Attacks

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In September 2011, the United Nations held a high-level meeting (heads of state) at which it was concluded that the global burden of noncommunicable diseases posed a threat to development and that reducing tobacco use (together with unhealthy diet, physical inactivity, and harmful use of alcohol) was key to reducing the growing global burden of heart and other noncommunicable diseases [1]. Although it is widely accepted that tobacco is responsible for a significant disease burden and that reducing tobacco use will reduce these diseases [2], it is less well-appreciated that reducing exposure to secondhand tobacco smoke produces large and rapid reductions in heart disease-related events, including hospitalization for acute myocardial infarction (AMI) [3].

Secondhand smoke (SHS) is a combination of the sidestream smoke from the lit end of a burning cigarette and smoke exhaled by smokers. It is a complex mixture of particles and gases, many of which are cardiac toxicants or irritants. SHS is rich in very fine respiratory suspended particulates that promote atherosclerosis and trigger heart attacks [4], so it is not surprising that, in 2005, the California Environmental Protection Agency [5] and, in 2006, the U.S. Surgeon General concluded that SHS causes coronary heart disease morbidity and mortality [6], with exposure being associated with a 25–30% increased risk. This finding is consistent with the fact that involuntary smokers experience oxidative stress, systemic inflammation, abnormal platelet activation and thrombosis, vascular endothelial dysfunction, and a lowered high-density lipoprotein/low-density lipoprotein ratio, and

hyperlipidemia, all of which contribute to atherosclerosis, as well as autonomic abnormalities of the heart and vasculature that may trigger a cardiac event [7,8]. Even though SHS is richer in many toxins than mainstream smoke, which is inhaled by smokers [9], it is more diluted so involuntary smokers are exposed to substantially smaller doses of these toxins than active smokers are. As a result, the 25–30% increase in risk of a cardiac event in involuntary smokers may seem large (compared with the risk of active smoking of 39% for 1 cigarette/day and 78% for 20 cigarettes/day [10]). The explanation for these findings is that the response of the cardiovascular system to the toxins in tobacco smoke is highly nonlinear, with large incremental effects at low doses that tend to saturate at higher levels of exposure [4,7,8,11].

IMMEDIATE CARDIOVASCULAR BENEFITS OF COMPREHENSIVE LAWS

Given what we know about the biology, we would expect that policies that eliminate SHS exposure should have a substantial effect on cardiac events, something first observed in Helena, Montana (USA), where there was a substantial drop in hospital admissions for AMI following implementation of a comprehensive (workplaces, restaurants, and bars) 100% smoke-free law [12]. By 2009, this literature had grown to 13 studies, which were the subject of 2 meta-analyses [13,14], which concluded that there was a 14–17% reduction in hospital admissions for AMIs 1 year after implementing

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comprehensive smoke-free laws. The following year, another meta-analysis [15] found a 10% reduction in an expanded set of cardiac outcomes (AMI, acute coronary syndrome, coronary heart disease, and ischemic heart disease). Since then, the evidence that comprehensive smoke-free laws are followed by reductions in AMIs has continued to accumulate rapidly.

There have also been similar studies of the effects of these laws on hospital admissions for other cardiac outcomes—angina [16–20], acute coronary syndrome [21–24], acute coronary events [25], ischemic heart disease [26], coronary heart disease [27], and sudden cardiac death [28]—which also show immediate reductions in events.

Not surprisingly, the tobacco companies have mounted a campaign to undermine the evidence linking smoking and SHS to heart disease. They conducted early experiments examining these links, and when results showed positive results unfavorable to the tobacco companies, they disputed and ultimately defunded the research; more recently, large studies examining SHS exposure and cardiovascular disease have presented findings that are negative or suggest a lower magnitude of effect due to misclassification [29]. Consistent with this pattern of behavior, a 2011 meta-analysis by a long-time tobacco industry consultant [30], funded by Japan Tobacco International, estimated a smaller effect, but even he could not deny that SHS is associated with a reduction in AMI. (Studies funded by the tobacco industry consistently find smaller or no risks associated with SHS [31].)

CONCLUSIONS

As of 2004, an estimated 40% of children, 33% of nonsmoking men, and 35% of nonsmoking women were exposed to SHS globally [32]. Six hundred thousand deaths worldwide per year are attributable to SHS, translating to 10.9 million disability-adjusted life-years lost [32].

Comprehensive smoke-free laws that prohibit smoking in workplaces, restaurants, bars, and casinos represent an opportunity to protect the public health by reducing the risk of cardiovascular disease and other SHS-related diseases. When laws are not comprehensive and permit smoking in any public place, such as bars or casinos, or in some sections of an otherwise smoke-free establishment, they are less effective. For example, workplace policies that permit smoking in some areas are about half as effective in reducing consumption and smoking prevalence as fully smoke-free workplace policies [33]. The people who work and play in these settings are deprived of the full cardiovascular benefits of a smoke-free environment [34]; therefore, exceptions or loopholes in smoke-free laws raise an issue of justice in public health ethics.

As of 2009, 89% of the world's population lived without comprehensive smoke-free laws [35]. Although there has been progress since then, much remains to be done. The World Health Organization Framework Convention on Tobacco Control [36], which had 174 parties as of January 2012, commits parties to implementing smoke-free legislation:

Each Party shall adopt and implement in areas of existing national jurisdiction as determined by national law and actively promote at other jurisdictional levels the adoption and implementation of effective legislative, executive, administrative, and/or other measures, providing for protection from exposure to tobacco smoke in indoor workplaces, public transport, indoor public places, and, as appropriate, other public places. (Article 8) [36]

Strongly enforced, comprehensive smoke-free legislation will prevent morbidity and mortality associated with SHS, and countries that have not already implemented such policies should consider doing so for the protection and well-being of their citizens.

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