

Smokefree Legislation

A Review of Health and Economic Outcomes Research

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Context: Smokefree legislation is a powerful public health intervention. Despite progress in smoke-free legislation, over half of U.S. adults remain unprotected by comprehensive smokefree legislation.

Evidence acquisition: This paper reviews the scientific literature on health and economic outcome studies of smokefree legislation from the past decade, 2000 to early 2010, using MEDLINE and key search terms: *smoking*, *smoking cessation*, *smoking/legislation* and *jurisprudence*, *smoking cessation/legislation* and *jurisprudence*, and *health policy*.

Evidence synthesis: There is a wealth of research showing the health benefits to entire populations when communities implement comprehensive smokefree laws and/or regulations. These laws improve the health of hospitality workers and the general population by improving indoor air quality, reducing acute myocardial infarctions and asthma exacerbations, and improving infant and birth outcomes. Some studies report reduced smoking prevalence and cigarette consumption and improved cessation outcomes after smokefree legislation. In addition to the health benefits, economic studies confirm that smokefree laws do not adversely affect business revenues or operating costs.

Conclusions: While there is an abundance of smokefree policy outcomes research showing both the health and economic impacts of smokefree legislation, these outcomes may have more to do with implementation effectiveness than adoption, especially among subpopulations. An emerging body of literature documents not only that disparities in health protections remain among subpopulations, but that health outcomes of smokefree legislation may vary by gender, race/ethnicity, SES, and age. Further research is needed on implementation effectiveness of smokefree legislation and differential effects on subpopulations.

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Introduction

Smokefree legislation is a powerful public health intervention.¹ There is a wealth of research showing the health benefits to entire populations when communities implement smokefree laws and/or regulations. Exposure to secondhand smoke (SHS) decreases, indoor air quality improves, workers are protected, adult and youth smoking levels decrease, smokers are more likely to quit, acute myocardial infarctions (AMI) and asthma exacerbations decline, and infant/birth outcomes may improve. In addition to health benefits, economic studies

confirm that smokefree laws do not hurt business revenues or operating costs.

Smokefree laws reduce exposure to SHS. After Scotland's smokefree legislation was implemented, there was a 39% reduction in salivary cotinine among nonsmoking primary schoolchildren, especially among those with nonsmoking parents,² and a similar reduction in adults.³ Similarly, adults in Spain self-reported an overall 22% reduction in exposure to SHS following their smokefree law, with the greatest reductions in the workplace.⁴ A New Zealand study recruited volunteer patrons and measured salivary cotinine before and after a 3-hour visit to a bar, and reported a 90% reduction after the smokefree legislation.⁵ Further, the more extensive the smokefree law, the lower the serum cotinine among nonsmoking adults.⁶ Massachusetts adults living in a town with strong restaurant and bar smoking restrictions self-reported lower exposure to SHS compared to those living in towns that allowed smoking in restaurants and bars.⁷

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Table 1. Number of smokefree laws or regulations as of July 5, 2010^{8,9,136}

Level	Workplaces AND restaurants AND bars	Workplaces and/or restaurants and/or bars	Restaurants and bars
Local	405	880	550
State	22	35	28
Nation	18	44	29

Despite a global trend to adopt smokefree legislation, it is estimated that 53% of Americans remain unprotected by comprehensive smokefree workplace laws that include restaurants and bars.⁸ As of July 5, 2010, there were 3161 U.S. municipalities and 39 states that had laws or regulations restricting where smoking is allowed; however, only 405 municipalities and 22 states had comprehensive protection (Table 1).⁹ There is much work to do in protecting the entire population from SHS exposure. An emerging body of literature documents not only that disparities in health protections remain among subpopulations, but also that health outcomes of smokefree legislation may vary by gender, race/ethnicity, SES, and age.

The purpose of this paper is to review the research on the health and economic outcomes of smokefree legislation. Other reviews have examined the effects of voluntary or private sector policies on smoking prevalence and cessation behaviors.¹⁰ The focus of this review is to summarize the outcomes research related to smokefree public policy interventions over the past 10 years, from 2000 through early 2010. The search was conducted using MEDLINE and the following search terms: *smoking, smoking cessation, smoking/legislation and jurisprudence, smoking cessation/legislation and jurisprudence, and health policy*. The paper is organized based on outcomes related to health (worker and population health), air quality, smoking prevalence and cessation, economics, and subpopulations.

Health Outcomes

There is a wealth of health outcomes research showing that hospitality workers are immediately protected when smokefree legislation takes effect. There also is an abundance of research demonstrating that smokefree legislation protects entire populations from AMIs, asthma, and other health conditions.

Worker Health

Studies of Canadian, Scottish, Irish, Italian, Norwegian, New York, and Lexington, Kentucky, hospitality workers before and after smokefree laws have shown significant

reductions in self-reported exposure to secondhand smoke (SHS), as well as declines in respiratory/sensory symptoms^{11,12} and biomarkers for SHS exposure (salivary cotinine,^{13–18} urinary cotinine,^{19–21} serum cotinine,²² hair nicotine,²³ forced expiratory volume,^{22,24} and exhaled nitric oxide²²). Benefits are reported for both smoking and nonsmoking workers. A study of Scottish bar workers with asthma demonstrated improvements in airway inflammation (exhaled nitric oxide dropped from 34.3 parts per billion [ppb] to 27.4 ppb) and in self-reported quality of life 1 month after implementation of a smokefree law.²² Another study showed a larger decrease in lung function from the beginning to the end of a work shift among bar and restaurant workers before smokefree legislation was implemented in Norway, compared to after implementation.²⁴

The degree of worker health protections from smoke-free legislation depends on the strength of the policy. The 2006 legislation in Spain affected all enclosed workplaces, but strength of policy varied based on the business owner's decision to totally restrict, partially restrict, or not restrict smoking. Nonsmoking hospitality workers in venues that allowed smoking did not show declines in salivary cotinine or self-reported respiratory symptoms; whereas, their counterparts in venues that were covered by the legislation demonstrated striking reductions in these outcomes.²⁵ Similarly, nonsmoking bar and restaurant workers in smokefree Oregon communities had lower levels of tobacco-specific carcinogens compared to those where smoking was allowed; urinary 4-(Methylnitrosamino)-1-(3-pyridyl)-1-butanol (NNAL) levels among exposed workers increased by 6% for every hour worked in a place where smoking was allowed.²⁶

Population Health

There is a wealth of research showing that smokefree legislation reduces AMIs,^{27,28,29} and emerging science reveals positive effects on asthma and birth outcomes. There have been several recently published reviews of multiple AMI outcome studies, showing variation in the estimated immediate and long-term reductions in AMIs after smokefree laws are implemented. One systematic review and meta-analysis in the *Journal of the American College of Cardiology* reviewed 11 studies from ten locations worldwide and reported a 17% overall decline in AMIs after smokefree legislation, especially among younger and nonsmoking populations.²⁸ The authors report an incremental decline of 26% each year after implementation. Another meta-analysis of 12 studies/reports published in *Circulation* estimated that communities experience a 15% drop in heart attacks during the first year of smokefree legislation, with continued decline of 36% in 3 years.³⁰ Using simulation, one study predicts an imme-

diate and significant 5%–15% reduction in AMI after smokefree legislation.³¹

First to observe a reduction in AMIs in Helena, Montana, was Sargent et al.,³² who reported a drop from an average of 40 AMI admissions during the same months in the years before the comprehensive local smoke-free law to 24 admissions for AMI in the 6 months after implementation of the law. Other studies of municipal smokefree laws using matched control designs have reported significant declines in AMIs and coronary heart disease.^{33,34} In New York state, there was an 8% decline in AMIs, controlling for pre-existing smoking restrictions, seasonal trends, county differences, and secular trends.³⁵ This same study examined the impact of smokefree legislation on stroke and did not find an effect. Reductions in AMIs are not only observed immediately but also have been sustained over time. Over a 3-year period, AMIs in Pueblo, Colorado, continued to decline post-law; 27% in the first 18 months after the law went into effect and 41% from pre- to 36 months post-law.³⁶

A few studies have evaluated whether smokefree laws have differential effects on AMIs based on sociodemographic characteristics and smoking status. Three studies in Italy reported differences in effects by gender, age, and SES following the 2005 indoor public places law. AMIs declined after smokefree legislation among only middle-aged men.³⁷ Another study in Rome revealed substantial reductions in acute coronary events among adults aged ≥ 35 years, controlling for outdoor air pollution, temperature, influenza epidemics, time trends, and total hospitalization rates: an 11.2% decline in those aged 35–64 years and 7.9% among those aged 65–74 years, with no declines in the very elderly population.³⁸ The authors report a greater effect among men and those of lower SES. Another Italian study reported a decline in AMIs among only those aged ≤ 60 years.³⁹ In addition to differences in outcomes by sociodemographic factors, a study of acute coronary events in Scotland examined effects by smoking status, showing an overall decline of 17% after the national smokefree legislation (14% decline among smokers, 19% former smokers, and 21% never-smokers).⁴⁰ These studies suggest that smokefree legislation may have greater effects on AMIs experienced by men and younger populations, and that smokefree legislation may reduce AMIs regardless of smoking status.

In addition to the evidence on AMIs and smokefree laws, there is emerging research on the effects of these laws on population indicators of asthma. Emergency department (ED) visits for asthma declined 22% from pre- to post-law in Lexington, Kentucky, adjusting for seasonality, secular trends, and demographic characteristics.⁴¹ There were fewer ED visits for asthma among both chil-

dren and adults, with a more pronounced decline among adults (18% decline for those aged ≤ 19 years; 24% aged ≥ 20 years). Consistent with this population-based study, a convenience sample of 96 patients with asthma in Portugal reported positive improvements in asthma management (i.e., daily life activities, symptoms, and medication use).⁴² Of those who reported positive changes, nearly all were no longer exposed to SHS after the smokefree legislation.

There also is emerging science on infant and birth outcomes and smokefree legislation. An analysis of the 1973–2003 Multiple Cause of Death Files from the National Center for Health Statistics reported a significant association between smokefree laws and Sudden Infant Death Syndrome (SIDS); smokefree restaurants and bar laws were associated with four fewer SIDS deaths on average per year.⁴³ In regard to birth outcomes, there was a 25% decline in risk for preterm birth and a 12% decrease in maternal smoking 1 year after Ireland's law.⁴⁴ Interestingly, there was an increase in low birth weight (LBW) risk during this time period; the authors point to secular trends that might account for this increase in LBW in industrialized nations and call for further studies on smokefree laws and low birth weight. Enacting comprehensive smokefree laws that cover all places of employment and strengthening existing partial laws may extend protection against AMIs, asthma, and adverse infant/birth outcomes.

Air Quality Outcomes

There is an abundance of air quality monitoring research in the U.S. and worldwide, revealing that comprehensive smokefree legislation substantially improves air quality in indoor work environments, and the effects are immediate in reducing fine particle air pollution. A 32-country study of indoor air pollution revealed that countries with national smokefree indoor public places legislation had lower fine particle air pollution levels than those without restrictions.⁴⁵ Another air quality study in 128 Irish pubs in 15 countries revealed that fine particle air pollution was 93% lower in places where smoking was not permitted, compared to places that allowed smoking.⁴⁶

Declines in fine particle indoor air pollution ranging from 71% to 99% have been demonstrated after local, state, or national smokefree legislation in Lexington KY⁴⁷; Boston⁴⁸; Austin TX⁴⁹; New York,⁵⁰ Minneapolis,⁵¹ Massachusetts,⁵² Delaware,⁵³ Hawaii,⁵⁴ Scotland,⁵⁵ Ireland,¹⁷ England,¹⁸ Finland,⁵⁶ and Italy.¹⁹ In evaluating New Zealand's smokefree law, levels of fine particle air pollution (PM_{2.5}) were low but they were elevated in partly enclosed outdoor dining areas attached to smoke-

free venues.⁵⁷ In this issue of the *American Journal of Preventive Medicine*, Bohac et al.⁵¹ report an increase in the ratio of outdoor to indoor PM_{2.5} after smokefree legislation was implemented in the Minneapolis metro area.

While most air quality studies measure fine particle air pollution (PM_{2.5}), some researchers measure carcinogens²⁶ or use passive samplers to measure nicotine and/or 3-ethenylpyridine (3-EP) as a tobacco-specific vapor-phase indicator.^{56,58} One advantage of 3-EP may be the ability to detect exposures at very low levels of SHS, especially when smoke drifts into nonsmoking areas.⁵⁸ One Irish study measured known carcinogens from SHS in pubs and found a 91%–95% reduction in the average doses of benzene and 1,3-butadiene after smokefree legislation.⁵⁹

Some air quality studies have examined the effects of time since implementation on indoor air quality. Two months after Scotland's smokefree enclosed public places law, there was a significant decline in PM_{2.5}.⁵⁵ Even more immediate effects were noted following Georgetown, Kentucky's smokefree law. Average levels of indoor air pollution dropped from 86 $\mu\text{g}/\text{m}^3$ to 20 $\mu\text{g}/\text{m}^3$ within 1 day of implementation.⁶⁰

Several studies examined strength of law and indoor air quality. After a smokefree law with substantial exemptions was implemented in Louisville, Kentucky, the average PM_{2.5} rose slightly to 338 $\mu\text{g}/\text{m}^3$.⁶¹ After the law was strengthened including all workplaces and bars, the average PM_{2.5} level dropped substantially to 9 $\mu\text{g}/\text{m}^3$.³ A study of nine Kentucky communities revealed that only comprehensive smokefree laws protect workers and patrons from fine particle indoor air pollution.⁶² Similarly, airborne nicotine concentrations were significantly reduced in a wide range of Spanish establishments that became smokefree as a result of legislation, while dangerous levels remained in venues not covered by the law.⁶³ A study of 16 Nevada casinos reported that the PM_{2.5} levels were substantially higher in the gaming areas (smoking allowed by law) compared to those in the restaurants (smoking prohibited).⁶⁴ Further, there was a strong correlation between levels of PM_{2.5} in nonsmoking restaurants and gaming areas ($r=0.71$; $p=0.005$), showing a lack of protection from SHS with partial smokefree legislation.

Some studies have translated air quality measurements into estimates of excess lifetime lung cancer mortality risk. One study compared airborne nicotine measurements in Italy (smokefree law) and Austria (no smokefree law). Air nicotine levels improved and lung cancer mortality risk declined in Italy 2 years after the smokefree law; whereas, these indicators were stable in Austria over the same time period.⁶⁵

Smoking Prevalence and Cessation Outcomes

While there is a wealth of cessation outcomes research related to smokefree legislation, there is less research on population-level smoking prevalence. The literature on smoking prevalence outcomes and smokefree laws is mixed.

Prevalence

It is widely known that voluntary, or private sector, smokefree policies reduce tobacco consumption and smoking prevalence,¹⁰ but far less is understood about the effects of smokefree laws on smoking prevalence in the general population. There is some evidence that declines in smoking may occur immediately after these laws go into effect, but these declines may not be sustained over time.

Population-based studies and those with workers demonstrate that clean indoor air laws reduce adult smoking prevalence and/or cigarette consumption.⁶⁶ In an analysis of the Current Population Survey Tobacco Use Supplement, 1992–2002, strong state smokefree laws were estimated to decrease adult smoking prevalence by 11%, with greater effects for men/boys and those aged 25–39 years.⁶⁷ In a secondary analysis of Behavioral Risk Factor Surveillance System data, there was a 31.9% decline in adult smoking after a smokefree law in Lexington–Fayette County, Kentucky, compared to 30 control counties without a law, controlling for seasonality, time trend, age, gender, ethnicity, education, marital status, and income.⁶⁸ There were an estimated 16,500 fewer smokers in Fayette County, resulting in an estimated \$21 million per year in healthcare cost savings. Similarly, a study of Italy's smokefree law showed significant reductions in consumption as measured by cigarette sales and self-reported smoking.⁶⁹

A longitudinal survey of adults in Finland also revealed a significant decline in adult smoking prevalence among employed men and women after the 1995 smokefree workplace law (designated smoking rooms allowed), controlling for demographics, ever-smoking, and changes in GNP and the price of tobacco.⁷⁰ Smoking prevalence and tobacco consumption declined in Finland after the smokefree law, but long-term (3 years post-law) reductions were confined to men.⁷¹ Two studies reported declines in consumption by workers following smokefree laws. A study of restaurant and bar workers in Norway revealed immediate and sustained declines in frequency and duration of smoking after smokefree legislation.⁷² Irish bar workers showed a significant decline in cigarettes smoked per day but a nonsignificant reduction in smoking prevalence 1 year post-law.⁷³

By contrast, several studies report no effects of smoke-free laws on smoking prevalence. Based on data from the Tobacco Use Supplement of the Current Population Survey from 1992 to 1999, clean indoor air restrictions were not associated with adult smoking prevalence, but they were related to reduced cigarette consumption.⁷⁴ Similarly, a prospective mailed survey of randomly selected patients from general practitioners' practices in one English town reported no change in adult smoking prevalence, but tobacco consumption declined 3 months post-smokefree law.⁷⁵ In a time-series analysis of the effect of tobacco control policies from 1995 to 2006, smokefree restaurant laws had no effect on smoking prevalence in Australia.⁷⁶ Similarly, per capita tobacco consumption did not decline in New Zealand after the 2004 smokefree legislation.⁷⁷

Studies on youth and young adults and smokefree legislation consistently show that these laws change social norms, discouraging youth smoking uptake and established smoking. Youth who live in smokefree communities are less likely to be daily smokers⁷⁸ and to become established smokers⁷⁹ than those who live in places that allow smoking. Further, smokefree laws encourage youth tobacco prevention and positively affect social norms related to tobacco use.⁸⁰ In a cross-sectional survey of U.S. high school students, living in a smokefree community was associated with lower 30-day smoking prevalence and an earlier stage of smoking uptake, meaning youth may be less likely to become established smokers when living in a smokefree community.⁸¹ In this issue, Bernat et al.⁸² report a significant decline in young adults' perceived opportunities to smoke in restaurants and bars/clubs after Minnesota's statewide smokefree law, regardless of whether the participant had lived in a community with a local law. State smokefree laws may provide additional protections in communities with existing local laws.

Smoking Cessation

The research literature is mixed on the effects of smokefree legislation on smoking cessation among adults. Some studies report increased interest in quitting and reduced consumption following smokefree laws, but these behaviors may not lead to successful cessation in the long term. Some studies indicate that there may be a delayed effect on cessation; the longer a smokefree law is in place, the more likely smokers may be to quit.

Seven studies reported positive effects of smokefree legislation on attempts to quit and/or cessation outcomes. Young U.S. adults living in states with smokefree private worksite laws were 4.6% more likely to quit smoking than those in states without these laws.⁸³ Similarly, smokers in communities with strong smokefree restaurant

laws are more likely to attempt to quit smoking and have more negative perceptions of smoking.⁸⁹ In California, smokers in communities with comprehensive smokefree workplace ordinances were more likely to self-report that they quit within 6 months of the survey than those who live in communities with no smokefree laws.⁸⁴ In Ireland, 46% of smokers reported that the smokefree law had prompted them to attempt to quit.⁸⁵ Researchers studied the effect of Italy's smokefree law on efficacy of smoking cessation treatments. The smokefree law was associated with increased 12-month abstinence levels and motivation to quit,⁸⁶ and an 8% decrease in cigarette consumption within about 3 months post-law.⁸⁷ In New Zealand, monthly calls to the quitline⁷⁷ and provision of NRT vouchers increased significantly in the 12 months after implementation of smokefree legislation, controlling for quitline advertising expenditures, print media coverage, and other smoking-related advertising expenditures.⁸⁸

Three studies reported that positive effects of smokefree laws on cessation outcomes may be short-lived, and one suggested there may be a delayed effect of smokefree laws on smoking cessation. A longitudinal survey of Scottish adults from 1998 to 2007 showed increased quit rates in the 3 months prior to the introduction of the national smokefree law in 2006; quit rates immediately after and in the subsequent year were similar to the gradual trend in quit rates over the study period.⁹⁰ These results were consistent with a study of nicotine replacement therapy (NRT) sales in Scotland compared to the rest of the UK. Sales of NRT increased in the 6 months prior to and during the first few months of implementation, but increased sales were not sustained beyond the first few months.⁹¹ Similarly, a study of smokefree workplace and public places legislation in Hong Kong reported that calls to the telephone quitline for smoking cessation assistance increased by 26% in the short term, but the number of calls per week returned to baseline within 6 months in the absence of a sustained publicity campaign.⁹² By contrast, in a study of current and former smokers living in four Kentucky communities with comprehensive smokefree laws, those in communities with more established laws (18 and 36 months) were more likely to be former smokers and report a longer time since smoking their last cigarette, compared with those living in communities with relatively new smokefree laws (6–8 months).⁹³ Compared with the 6- to 8-month group, those in the 36-month group were more likely to have tried to quit since the law took effect. These findings suggest there may be a delayed effect of smokefree legislation on smoking cessation.

On the contrary, three studies reported that smokefree legislation was not associated with cessation outcomes.

Biener and colleagues⁹⁴ studied policy predictors of cessation over a 2-year period in Massachusetts and did not find an association between municipal smokefree legislation and individual quit attempts or cessation. These findings were counter to an earlier study by the same authors, finding that strong smokefree laws were associated with strong antismoking norms.⁹⁵ Similar to the most recent Biener et al. study, Scotland's smokefree legislation did not affect self-reported quitting compared to the remaining areas of the United Kingdom that did not have smokefree laws.⁹⁶ In a Canadian study, living in a municipality with a strong smokefree bylaw was not associated with being a former smoker.⁹⁷ There may be factors other than policy change that affect antismoking norms, resulting in smoking cessation.

Economic Outcomes

There is clear evidence that smokefree legislation does not hurt restaurant or bar businesses, and in some cases business may improve. There have been several published reviews of the economics of smokefree laws.^{98,99} In the 1990s, there were multiple economic impact studies published, including an analysis of taxable sales receipts after New York City's 1995 Smoke-Free Air Act.¹⁰⁰ More recently, Hyland and Tuk report an 18% increase in per capita employment after New York City's law.¹⁰⁵ In this issue, Collins et al.¹⁰¹ analyze bar and restaurant revenues before and after smokefree legislation, comparing locales with partial, comprehensive, and no local laws in ten Minnesota communities. Regardless of the strength of law, there was no negative impact on total or alcohol revenues, and communities with some type of smokefree law tend to have higher total and liquor sales revenues than those without a law.

Most of the economic impact studies have evaluated revenues and/or employment in the hospitality industry before and after smokefree legislation. Consistent with earlier economic impact studies, a Canadian study of retail sales tax data found no adverse effects on business after Ottawa's smokefree law went into effect in 2001.¹⁰² Similarly, an analysis of California tax revenue data from 1990–2002 showed that restaurant and bar revenues increased, respectively, after the 1995 smokefree restaurant law and the 1998 smokefree bar law.¹⁰³ In this issue, Klein et al.¹⁰⁴ report no significant changes in bar or restaurant employment in rural and urban regions after Minnesota's statewide smokefree law. Even in Lexington, Kentucky, located in a tobacco-producing state with higher-than-average smoking levels, there was no economic harm after a 2004 smokefree law,¹⁰⁶ similar to other published studies.^{107,108} No rela-

tionship was observed between the law and employment in contiguous counties nor between the smokefree law and business openings or closures in alcohol-serving and non-alcohol-serving businesses.¹⁰⁶

Three studies examined economic indicators other than revenues and employment. A study of one national restaurant chain's 23 Arizona restaurants showed that municipal smokefree laws did not have a significant effect on the probability of employee separation in the years after implementation.¹⁰⁹ It was expected that training costs associated with employee turnover would not rise for full-service restaurants in municipalities that enact smokefree laws. Similar findings were reported in South Australia.¹¹⁰ Further, a study of sale prices of bars located in smokefree communities reported no difference in the sale price based on whether or not the community was smokefree.¹¹¹

Given the reluctance of some policymakers to include gaming facilities in smokefree laws, several studies have examined the effects of these laws on gaming revenues. Smokefree ordinances were not associated with profits from charitable games in Massachusetts, and any decrease in revenues began before the implementation of these laws.¹¹² Similarly, there was no significant relationship between smokefree laws and charitable gaming revenues in smokefree Kentucky communities compared to counties without laws, controlling for economic variables, county-specific effects, and time trends.¹¹³ In Victoria, Australia, researchers showed a slowing of previous gambling losses after smokefree legislation.¹¹⁴ Gaming revenues did not decline in Delaware after their statewide smokefree law went into effect.^{115,116} Pakko, an economist and known libertarian activist, refuted the Delaware findings in a published letter to the editor, claiming a 13% revenue loss in Delaware's video lottery terminals after the state smokefree law.¹¹⁷ In response, the authors state that Pakko failed to adequately specify his statistical model. In an analysis of 97 economic studies of smokefree laws published and unpublished before August 2002, all of those reporting a negative impact were supported by the tobacco industry.⁹⁹

Subpopulations

Exposure to SHS varies by occupation type, gender, SES, race/ethnicity, and age,¹¹⁸ and smokefree legislation may have a differential impact on subpopulations such as low-SES groups.¹¹⁹ Ten years prior to the statewide Massachusetts smokefree law, there was a documented disparity in health protections, with populations that had low education levels less likely to live in a locale covered by smokefree restaurant regulations.¹²⁰ One Swedish study revealed that gaming workers (i.e., bingo and casino)

were more protected by smokefree legislation than bar and restaurant workers, as evidenced by higher pre-ban airborne nicotine levels.¹²¹

While the health outcomes of smokefree policies are well documented in the general population,^{1,27} there is emerging research suggesting that gender and SES may be important considerations in studying the outcomes of smokefree legislation. Low-income women may be exposed to SHS at work in smokefree communities where adherence is not uniform.¹²² While there is little evidence that smokefree policies contribute to greater home exposure,¹²³ a focus-group study with pregnant women in China reported increased self-reported home exposure to SHS and diminished air quality after a smokefree public places law.¹²⁴ However, a study in Ireland did not show increases in home smoking after the nationwide smoke-free legislation in March 2004.¹²⁵ Greaves et al.¹¹⁸ call for a framework that is sensitive to sex, gender, and economic issues when developing and evaluating smokefree policies. Tobacco control policy development might be integrated with economic and social policies (i.e., child care and housing).

Consideration of race/ethnicity is another important factor in smokefree outcomes research. Analysis of smoking among pregnant women in New York City over time revealed an absolute reduction in smoking prevalence following tobacco control policies including smokefree legislation.¹²⁶ However, similar reductions were not seen in African American and Puerto Rican women, reflecting a disparity in the effects of tobacco control legislation on prenatal smoking. In a population-based study of serum cotinine, certain groups (i.e., low-income and Asians) continue to be exposed to SHS in New York City, despite its comprehensive smokefree law.¹²⁷ Similarly, an analysis of NHANES III data from 1988–2002 showed that blue collar workers, non-Hispanic black men, manufacturing and construction workers, and those working in the service sector have the highest serum cotinine levels of all worker groups.¹²⁸ Research on smoking-related stigma may help understand disparities and smokefree legislation. In a study with current and former smokers in New York City, blacks and Latinos perceived less smoking-related stigma than Caucasians.¹²⁹

Age is another consideration when studying the effects of smokefree legislation. While smoking levels declined in the general adult population following Colorado's smokefree legislation, smoking among people aged ≥ 50 years did not decrease.¹³⁰ In-depth interviews with Scottish bar workers revealed that older men may have the most difficulty adjusting to smokefree legislation, and that this group may experience social isolation since they may be less comfortable going outside to smoke.¹³¹

Conclusion

Research from 2000 to early 2010 provides evidence that smokefree legislation has a myriad of public health benefits and does not harm business. Despite decades of progress in protecting the public from SHS in workplaces and public places, vulnerable populations remain disproportionately affected by tobacco consumption, SHS exposure, and smoking-attributable disease and premature death. There is a need for research on the differential effects of smokefree legislation on subpopulations who may be disproportionately affected by tobacco use (i.e., low SES, racial/ethnic groups, casino workers, youth, women, and individuals with mental illness and substance use disorders).¹¹⁹

Policies are effective only if implemented properly.¹³² While there is an abundance of smokefree policy outcomes research showing both the health and economic impacts of smokefree legislation, implementation of these policies may be variable, and results could reflect implementation effectiveness rather than the impact of the policies themselves.¹³³ This is particularly true for subpopulations.¹¹⁷ Yet there is little research testing the effects of smokefree policy implementation interventions.^{132,134,135}

Priorities for future research include the effects of smokefree laws on: (1) population and worker health indicators such as asthma and COPD; (2) outdoor tobacco smoke exposure; (3) air pollution, considering strength of and time since smokefree legislation; (4) smoking prevalence and smoking cessation, especially in vulnerable populations including racial/ethnic minorities and those living in rural communities, considering strength of and time since law; (5) cross-border economic effects of smokefree laws, considering community-level socioeconomic variation; and (6) low-income populations, women, racial/ethnic minorities, and older adults. This research evidence is critically important for health advocates, responsible for translating and disseminating science to policymakers. Funding agencies need to target these research priorities in order to provide a science base for smokefree legislation that protects everyone from the dangers of secondhand smoke.

In the decade from 2000 to early 2010, there has been an explosion of smokefree policy outcomes research that has been instrumental as health policy professionals and public health leaders have successfully advocated for smokefree legislation. Smokefree laws improve the health of hospitality workers and the general population by improving indoor air quality, reducing AMIs and asthma exacerbations, and possibly improving infant and birth outcomes. Some studies report the reduction in smoking prevalence and cigarette consumption, and improved

cessation outcomes after smokefree legislation. In addition to health outcomes, smokefree legislation does not harm business revenues or employment, and there are a few studies showing no negative effects on business operating costs. Smokefree legislation is a powerful public health intervention that has the potential to contribute to lasting reductions in the health and economic burden from tobacco use.

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