

Chapter 8

Cardiovascular Diseases

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Table 8.6S Detailed description of studies on smokefree laws and coronary events

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Acute myocardial infarction (AMI)—workplace-only laws					
Dautzenberg 2008	<ul style="list-style-type: none"> • AMI • <65 years of age • Effective February 1, 2007; restaurants, bars, and casinos added January 1, 2008 • January 2006–February 15, 2008 • France 	Partial law: Pre: 13 Post: 12.5	<ul style="list-style-type: none"> • Rate per 100,000 admissions 	<ul style="list-style-type: none"> • Partial law: 0.99 (0.94–1.04)^{ea} 	Smoking ended in public places in February 2007, but restaurants, bars, and casinos were given exceptions until January 2008; law permits ventilated smoking rooms under strict conditions; between January 2007 (before law) and January 2008 (after law), secondhand smoke exposure dropped from 57% to 14%; PM _{2.5} levels also dropped; also reported substantial drops in respiratory symptoms among hospitality workers
Villalbf et al. 2009	<ul style="list-style-type: none"> • AMI (ICD-9 410.x1) • >24 years of age • N = 13,317 • January 2004–December 2005 vs. January 2006–December 2006 • Barcelona, Spain 	Pre: 24 Post: 12	<ul style="list-style-type: none"> • Comparison of age- and gender-specific annual hospitalization rates 	<ul style="list-style-type: none"> • Female: .88 (0.84–0.92)^{ab} • Male: .87 (0.84–0.90)^{ab} • Adjusted rates (per 100,000 population) for men were 185.6 (179.2–192.1) in 2004, 175.0 (168.9–181.2) in 2005, and 156.4 (150.6–162.1) in 2006 (postlaw) • Adjusted rates for women were 81.2 (77.1–85.3) in 2004, 75.6 (71.7–79.6) in 2005, and 69.0 (65.3–72.7) in 2006 (postlaw) 	Law in workplaces, but not cafés, bars, restaurants, night clubs, or discotheques; antismoking legislation also included law on advertising and reduction in sales outlets; in men, the decline in 2006 (–10.68%) was much greater than in 2005 (–5.69%); in women, it was only slightly greater in 2006 (–8.76% vs. –6.85%); this decline was apparent in all age groups except men <45 years of age

Table 8.6S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Nairnan et al. 2010	<ul style="list-style-type: none"> AMI (ICD-9 410, ICD-10 I21) ≥45 years of age Effective May 2006 January 1996–May 2006 Toronto, Canada 	<p>Pre: 36 Postphase 1: 24</p>	<ul style="list-style-type: none"> ARIMA on crude rates of hospital admission Subgroup analyses by age, gender Comparison with Durham Region and Thunder Bay, 2 Ontario municipalities with no smokefree laws; no significant reductions were observed in control cities Smokefree legislation occurred in 3 phases: smokefree public places and workplaces in October 1999; smokefree restaurants, dinner theaters, and bowling centers except designated smoking rooms in June 2001; smokefree bars, billiard halls, bingo halls, casinos, racetracks except designated smoking rooms in June 2004 	<ul style="list-style-type: none"> Postphase 1 vs. prelaw: 1.03 (0.94–1.12)* 	<p>Legislation required all public places and workplaces to be smokefree and was implemented in 3 phases; the largest declines were seen after the phase of the law affecting restaurants came into effect, including a 17% (14%, 19%) decrease in AMI; crude rates of hospital admissions decreased 39% (38%, 40%) for cardiovascular conditions; no significant reductions were observed in number of hospital admissions attributable to control conditions (cholecystitis, appendicitis, bowel obstruction) in Toronto</p>
Shetty et al. 2010	<ul style="list-style-type: none"> AMI (ICD-9 and ICD-10) Nationwide inpatient sample: 673,631 Multiple cause of death dataset: 2,018,548 Medicare patients: 2,382,387 United States 		<ul style="list-style-type: none"> Region-level fixed effects multivariate linear regression model Stratified by age Regression model included hospital beds/person, county population, physicians/person, percent population in labor force, cigarette taxes Compared trends in regions where smoking laws were implemented with control regions having no laws 	<ul style="list-style-type: none"> Deaths in 18–64: 0.964 (0.904–1.025)* 	<p>Does not differentiate between weak and strong laws; assumes that county-level laws apply in cities and unincorporated places (varies by county), causing significant misclassification; no statistically significant reduction of hip fracture admissions (control condition); effective date varies; study uses American Nonsmokers' Rights Foundation smoking law database and national health outcomes datasets to analyze effect of smokefree laws in various places</p>

Table 8.6S Continued

Study	Design/population	Pre/post duration (months)	Measure/statistical method	Findings (95% CI)	Comments
Villalbi et al. 2011	<ul style="list-style-type: none"> • AMI deaths (ICD-10 CM 34+ years of age) • N = 90,382 • Effective January 1, 2006 • January 2005–December 2007 vs. January 2004–December 2005 • Spain 	Pre: 24 Post: 24	<ul style="list-style-type: none"> • Comparison of age- and sex-specific mortality rates • Poisson regression to calculate annual RR 	<ul style="list-style-type: none"> • First postlaw year: 0.90 (0.88–0.92) <ul style="list-style-type: none"> – Female: 0.90 (0.87–0.92) – Male: 0.90 (0.88–0.93) • Second postlaw year: 0.86 (0.84–0.88)* <ul style="list-style-type: none"> – Female: 0.86 (0.84–0.89) – Male: 0.86 (0.83–0.88) • Significant reduction in the RRs of AMI death in both men and women; magnitude of reduction appeared greater among the elderly 	Law in workplaces, but not cafes, bars, restaurants, night clubs, or discotheques; antismoking legislation also included law on advertising and reduction in sales outlets; a population-based surveillance system showed that the percentage of employed workers reporting smokefree jobs rose from 54% to 91% after implementation

Table 8.6S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
AMI—workplace and restaurant laws					
Seo and Torabi 2007	<ul style="list-style-type: none"> AMI (ICD-9 410), confirmed with troponin or CPK excluding past cardiac procedures, no cardiac risk factors (e.g., hypertension or hypercholesterolemia) N = 37 August 2001–May 2003 vs. August 2003–May 2005 (same months selected to control for seasonality) Effective August 1, 2003, bars added January 1, 2005 Monroe County, Indiana 	Pre: 22 Post: 22	<ul style="list-style-type: none"> Poisson test Comparison with Delaware County, Indiana (no law); no significant decrease in admissions observed in Delaware County 	<ul style="list-style-type: none"> 0.48 (0.24–0.96)* Decrease of 12 (from 17 to 5 [-21.29, -2.81]) in admissions in the number of nonsmoking patients from prelaw to postlaw period 	Public smoking law in effect for all restaurants, retail stores, and workplaces since August 2003; bar provisions only in effect since January 2005 (last 5 months of study period); there was a 69% reduction in AMIs (16 vs. 5) among documented nonsmokers before and after the law; no significant change in number of smokers admitted; the study is limited by unrealistically stringent exclusionary criteria and small sample
Nairman et al. 2010	<ul style="list-style-type: none"> AMI (ICD-9 410, ICD-10 I21) ≥45 years of age January 1996–May 2006 Effective May 2006 Smokefree legislation occurred in 3 phases: smokefree public places and workplaces in October 1999, smokefree restaurants, dinner theaters, and bowling centers except designated smoking rooms in June 2001, smokefree bars, billiard halls, bingo halls, casinos, racetracks except designated smoking rooms in June 2004 Toronto, Canada 	Pre: 36 Postphase 2: 36, not included in length of follow-up analysis because the prelaw period did not immediately precede the postlaw phase	<ul style="list-style-type: none"> ARIMA on crude rates of hospital admission Subgroup analyses by age, gender Comparison with Durham Region and Thunder Bay, 2 Ontario municipalities with no smokefree laws; no significant reductions were observed in control cities 	<ul style="list-style-type: none"> Phase 2 vs. prelaw: 0.99 (0.92–1.07)* 	Legislation required all public places and workplaces to be smokefree and was implemented in 3 phases; the largest declines were seen after the phase of the law affecting restaurants came into effect, including a 17% (14%, 19%) decrease in AMI; crude rates of hospital admissions decreased 39% (38%, 40%) for cardiovascular conditions; no significant reductions were observed in number of hospital admissions attributable to control conditions (cholecystitis, appendicitis, bowel obstruction) in Toronto

Table 8.6S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Hahn et al. 2011	<ul style="list-style-type: none"> • AMI (primary discharge diagnosis ICD-9 410) • ≥35 years of age • N = 2,692 • May 2004–December 2006 vs. January 2001–April 2004 • Effective April 27, 2004 • Lexington-Fayette County, Kentucky 	<p>Pre: 40 Post: 32</p>	<ul style="list-style-type: none"> • Age-adjusted rates for AMI hospitalizations; Poisson regression and first-order autoregressive time-series model • Age, gender, county-level smoking rate, secular trend, seasonal variation 	<ul style="list-style-type: none"> • Female: 0.77 (0.62–0.96)* • Male: 1.11 (0.91–1.36)* 	<p>Smokefree enclosed public places law prohibited smoking in restaurants, bars, bowling alleys, bingo halls, convenience stores, laundry facilities, and other businesses open to the public; buildings not open to the public, including government office buildings or workplaces, were excluded; manufacturing facilities were also excluded; rates for men and women were relatively stable during the 32-month postlaw period; there was a dramatic improvement in air quality in hospitality venues and immediate reduction in hair nicotine among bar and restaurant workers following implementation of the law; within 3 months of implementation, there was a 56% decline in hair nicotine; among AMI hospitalizations, there was an overrepresentation of women in the hospitality industry and a disproportionate number of men working in manufacturing facilities and government worksites not mandated by law; AMI prevalence and hospitalization rate for CVD showed a steady upward trend from 2001–2006 in Kentucky</p>

Table 8.6S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Hurt et al. 2011	<ul style="list-style-type: none"> AMI validated using biomarkers, cardiac pain, and Minnesota coding of the EKG October 2007–March 2009 vs. July 2000–December 2001 Effective January 1, 2002 (Ordinance 1: smokefree restaurants) Effective October 1, 2007 (Ordinance 2: smokefree workplaces) Olmsted County, Minnesota 	<p>Preordinance 1: 18 Postordinance 1: 18</p>	<ul style="list-style-type: none"> Age and gender-adjusted rate per 100,000; adjusted HR 	<ul style="list-style-type: none"> Ordinance 1 vs. no law: 0.90 (0.73–1.10)* 	<p>Law was initiated in 2 steps, smokefree restaurants in January 2002, and smokefree workplaces in 2007; AMI rate per 100,000 dropped from 212.3 to 168.7 following the restaurant law (HR = 0.99; 0.73, 1.10; $p = 0.30$) and from 130.0 to 102.9 following the workplace law (HR = 0.79; 0.63, 0.98; $p = 0.04$); during this period, the prevalence of hypertension, diabetes, hypercholesterolemia, and obesity either remained constant or increased while the prevalence of smoking among the adults declined by 23%.</p>
Sargent et al. 2012	<ul style="list-style-type: none"> Acute myocardial infarction (ICD-10 I21.0–I21.9) excluding recurrent AMI within 28 days of the initial event ≥30 years of age N = 39,224 January 2004–December 2008 Nationwide: September 1, 2007 Statewide: varies Germany 	<p>Pre: varies Post: 1</p>	<ul style="list-style-type: none"> Rate of hospitalization for AMI; logistic regression and interrupted time series linear regression model Confounders: age, gender, occupation 	<ul style="list-style-type: none"> 0.914 (0.878–0.950)* In the first year after implementation, 449 AMI hospitalizations were prevented 	<p>Legislation addressed smoking in federal buildings and the transportation system; private employers were allowed to introduce a total or partial smoking law in workplaces; states were permitted to decide how to limit smoking in the hospitality sector (hotels, restaurants, bars); nonsignificant trend toward decreasing rate of admissions after law; hospitality smoking laws were passed in all states and implemented between August 1, 2007 and July 1, 2008; most states continued to allow smoking in small bars without any food delivery and in separate rooms in large restaurants; a population-based survey revealed a significant decrease of cigarettes smoked in Germany after the law; hospital admissions for control condition fractures increased slightly from 65,100 in 2007 to 66,954 in 2009; bronchitis cases, which might be affected by smokefree laws, declined from 15,900 in 2007 to 15,391 in 2009; hospitalization costs for AMI decreased significantly by 20.1% (16.0–24.2%), or about €5.2 million</p>

Table 8.6S Continued

Study	Design/population	Pre/post/duration (months)	Measure/statistical method	Findings (95% CI)	Comments
AMI—workplace, restaurant, and bar laws					
Sargent et al. 2004	<ul style="list-style-type: none"> AMI (primary and secondary diagnoses of ICD-9 410, some validated with troponin or CPK) N = 304 December 1997–November 2003 Effective June 5, 2002–December 3, 2002 Helena, Montana 	Pre: same 6 months for 4 pre-years and 1 year after law suspended Post: 6	<ul style="list-style-type: none"> Number of admissions during 6-month period the law was in effect compared with the average for the same 6 months in other years by Poisson test Comparison with number of admissions from surrounding area (not covered by law). No significant change in control area outside Helena 	<ul style="list-style-type: none"> 0.60 (0.36–0.99)^{ec} Drop in number of admissions of -16 (-31.7, -0.03) from 40 cases to 24 	Law prohibited smoking in public and in workplaces but was suspended by a court order after 6 months; analysis did not consider fact that admissions were increasing with time, which biases comparison toward null
Barone-Adesi et al. 2006	<ul style="list-style-type: none"> AMI (primary discharge diagnosis ICD-9 410) and hospital deaths due to AMI N = 17,153 Compared October–December 2004 (before law) and February–June 2005 (after law) with same periods 1 year earlier Effective January 10, 2005 Piedmont, Italy 	Pre: 3 Post: 6	<ul style="list-style-type: none"> Age-standardized rates (using European standardized population) 	<ul style="list-style-type: none"> (0.97–1.06) <60 years: 0.89 (0.81–0.98)^a <ul style="list-style-type: none"> Female: 0.75 (0.58–0.96) Male: 0.91 (0.82–1.01) ≥60 years: 1.05 (1.00–1.11) <ul style="list-style-type: none"> Female: 1.05 (0.97–1.14) Male: 1.03 (0.96–1.11) 	See entry for Italy (4 regions); no changes from 1 year before for prelaw period; change compared with 1 year earlier for postlaw period; estimated that 1% out of the 11% reduction in AMI is attributable to reduced smoking among smokers rather than passive smoking
Heinz et al. 2007	<ul style="list-style-type: none"> AMI (primary diagnosis using ICD-9 classification) N = 1,197 July 1, 2004–June 30, 2005 vs. July 1, 2002–June 30, 2004 Effective July 1, 2004 Boise, Idaho 	Pre: 24 Post: 12	<ul style="list-style-type: none"> Poisson test Weather, outdoor air quality, time 	<ul style="list-style-type: none"> All patients: 0.82 (0.66–1.01)^{ed} Nonsmokers: 0.68 (0.53–0.87)^d Significant 32% decrease in MI rate among nonsmokers (p = 0.002) and nonsignificant 18% decrease in MI rate among all patients (p = 0.068) 	Law on smoking in public buildings, including restaurants; control condition (urinary tract infection) demonstrated nonsignificant increase during study period

Table 8.6S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Juster et al 2007	<ul style="list-style-type: none"> • AMI (primary diagnosis code ICD-9 410) • N = 462,396 • ≥35 years of age • January 1995–December 2004 • Effective July 24, 2003 • New York state 	<p>Pre: 99 Post: 21</p>	<ul style="list-style-type: none"> • Multiple regression time series • Age-adjusted (New York population in 2000) • Existence of strong local ordinances, time (linear secular trend), seasonality, county • Analyzed comprehensive laws (smoking prohibited in restaurants, bars, and other hospitality venues) vs. moderate laws (smoking permitting in hospitality venues) 	<ul style="list-style-type: none"> • In absence of preexisting local laws: 0.8/04 (0.7985–0.8023)[†] • In 2004, there were 3,813 fewer hospital admissions for AMI than expected in the absence of the comprehensive smoking law 	<p>July 2003 law prohibited smoking in all workplaces, including restaurants and bars; limited statewide restrictions since 1989 limited smoking in many public places, including schools, hospitals, public buildings, and retail stores; local laws varied by county; by 2002, 75% of New Yorkers were subject to strong local laws as well as limited restrictions at the state level implemented in 1989; authors performed analysis to compare effects assuming hypothetical case of no preexisting local laws; no sudden change with law; rate of decline in AMI admissions increased significantly over moderate or no local laws; enactment of a moderate smoking restriction in a county would reduce monthly trend rate in AMI hospital admissions by 0.15 per 100,000/month in that county, and a statewide comprehensive smoking law would reduce AMI hospitalizations by 0.32 per 100,000/month in all counties; after implementation of the state law, exposure to secondhand smoke declined by nearly 50%; saliva cotinine dropped from 0.078 to 0.041 ng/mL; direct health care cost savings of \$56 million in 2004</p>
Dautzenberg 2008	<ul style="list-style-type: none"> • AMI • <65 years of age • January 2006–February 15, 2008 • Effective February 1, 2007; restaurants, bars, and casinos added January 1, 2008 • France 	<p>Complete law: Pre: 24 Post: 1.5; not included in length of follow-up analysis because the prelaw period did not immediately precede the postlaw phase</p>	<ul style="list-style-type: none"> • Rate per 100,000 admissions 	<ul style="list-style-type: none"> • Complete law: 0.84 (0.77–0.92)^{‡§} 	<p>Smoking ended in public places in February 2007, but restaurants, bars, and casinos were given exceptions until January 2008; law permits ventilated smoking rooms under strict conditions; between January 2007 (before law) and January 2008 (after law), secondhand smoke exposure dropped from 57% to 14%; PM_{2.5} levels also dropped; also report substantial drops in respiratory symptoms among hospitality workers</p>

Table 8.6S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Lemstra et al. 2008	<ul style="list-style-type: none"> • AMI (ACD-I/I) • N = 1,689 • July 2004–June 2005 vs. July 2000–June 2004 • Effective July 1, 2004 • Saskatoon, Canada 	Pre: 48 Post: 12	<ul style="list-style-type: none"> • Incidence ratio and CI postlaw compared with prelaw • Age-standardized AMI incidence rate • Stratification was used to test for confounding by age, gender, and previous MI in the unadjusted rates, which were then directly age-standardized to the 2001 Canadian population 	<ul style="list-style-type: none"> • Age-adjusted: 0.87 (0.84–0.90)* • Age-standardized incidence rate fell from 176.1 (165.3–186.8) cases per 100,000 to 152.4 (135.3–169.3) cases per 100,000 	Citywide smoking law prohibited smoking or holding lighted tobacco products in any enclosed public area that is open to the public or to which the public is customarily admitted or invited; also applied to outdoor seating areas for restaurants and licensed premises; a previous bylaw prohibited smoking in enclosed government buildings only; 914 of 924 eligible business establishments were inspected by a public health inspector within the first 6 months of the law; only 13 required an initial warning for noncompliance; reinspection required the issuing of only 1 citation during the first year of the law; smoking prevalence in Saskatoon fell from 24.1% in 2003 (95% CI, 20.4–27.7%) to 18.2% in 2005 (15.7–20.9%); smoking in the rest of Saskatchewan Province (which includes Saskatoon) remained stable from 2003 to 2005 at 23.8% (22.6–25.3); 1 year after implementation (July 2005), 79% responded that the “smoking law was a good idea”

Table 8.6S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Vasselli et al. 2008	<ul style="list-style-type: none"> AMI (primary discharge diagnosis ICD-9 410) N = 7,305 40-64 years of age January 10-March 10, 2005 (after law) vs. January-March 2001-2004 (before law) Effective January 10, 2005 Italy (4 regions) 	Pre: 12 (over 4 years) Post: 2	<ul style="list-style-type: none"> Age-standardized rates (using European standard population) Comparison of observed rate after law with expected value based on linear secular trend for same months during the 4 years before the law went into effect Age, gender, region 	<ul style="list-style-type: none"> 0.86 (0.83-0.92)* <ul style="list-style-type: none"> - Female: 0.98 (0.87-1.11) - Male: 0.85 (0.81-0.91) 46-44: 0.98 (0.82-1.19) 45-49: 0.77 (0.68-0.89) 50-54: 0.74 (0.67-0.85) 55-59: 0.92 (0.84-1.02) 60-64: 0.99 (0.88-1.06) 	National law prohibited smoking in all indoor public places, including cafes, bars, restaurants, and discotheques; effect largest among young men and people 45-54 years of age; some regional variation; small decreases in smoking prevalence (30.0 to 29.3% in men and 22.5% to 22.1% in women) and consumption (16.7 to 16.3 cigarettes/day for men and 13.7 to 12.4 cigarettes/day for women) led to 7.6% decline in cigarette consumption; fewer than 100 violations in 6,000 checks by police; 90-95% reduction in air nicotine in pubs and discos; 8.9% decline in cigarette sales in 2005
CDC 2009b	<ul style="list-style-type: none"> AMI (primary diagnosis code ICD-9 410) N = 4,954 January 2005-June 2006 ("Phase II") vs. July 2003-December 2004 ("Phase I") vs. January 2002-June 2003 (prelaw) Effective July 1, 2003 Pueblo, Colorado 	Pre: 18 Post: 36	<ul style="list-style-type: none"> Comparison of rate ratios with χ^2 test Comparison with people living in surrounding Pueblo County (not covered by ordinance) and with nearby El Paso County (which did not have an ordinance); no significant change in surrounding area (1.03; 0.68-1.39) or El Paso County (0.95; 0.87-1.03) 	<ul style="list-style-type: none"> Phase II vs. prelaw: 0.59 (0.49-0.70)* <ul style="list-style-type: none"> - Female: 0.48 (0.36-0.60) - Male: 0.67 (0.52-0.82) Phase II vs. Phase I: 0.81 (0.67-0.96) 	Municipal ordinance ended smoking in enclosed workplaces, including all fatal restaurants and bars; assuming all fatal AMIs reached hospital reduced the risk estimate to 0.66 (0.55-0.77) from prelaw to Phase II; rate of AMI hospitalizations decreased from 257 per 100,000 person-years before law to 187 in Phase I and 152 in Phase II

Table 8.6S Continued

Study	Design/population	Pre/post/duration (months)	Measure/statistical method	Findings (95% CI)	Comments
Barnett et al. 2009	<ul style="list-style-type: none"> AMI (principal diagnosis code CD-10 I21.0-I22.9), excluding repeat admissions N = 3,079 ≥30 years of age February 2005–December 2006 vs. February 2003–December 2004 (bimonthly intervals) Effective December 2004 Christchurch, New Zealand 	Pre: 24 Post: 24	<ul style="list-style-type: none"> Poisson regression Gender, age, smoking status, neighborhood social deprivation 	<ul style="list-style-type: none"> 0.92 (0.86–0.99) <ul style="list-style-type: none"> Female: 0.94 (0.84–1.05) Male: 0.90 (0.82–0.99) 30–55: 1.15 (0.94–1.40)* 55–74: 0.86 (0.77–0.97)* ≥75: 0.89 (0.81–0.98) 	2004 law covered all workplaces, including bars and restaurants; earlier restrictions in 1990 prohibited smoking in most workplaces, public interiors (i.e. shops), and one-half of seating in restaurants; higher rates of AMI reduction observed in affluent neighborhoods
Gasparrini et al. 2009	<ul style="list-style-type: none"> AMI as principal discharge diagnosis (ICD-9 A10) or principal death diagnosis (ICD-9 410–414) N = 13,456 30–64 years of age January 2000–December 2004 vs. January 2005–December 2005 Effective January 10, 2005 Tuscany, Italy 	Pre: 48 Post: 12	<ul style="list-style-type: none"> Age-standardized rates of annual AMI episodes using European population as reference; Poisson regression analysis of the time series Age, gender, seasonality, and long-term trend 	<ul style="list-style-type: none"> Linear trend model: 0.95 (0.89–1.00)* <ul style="list-style-type: none"> Female: 0.94 (0.82–1.09) Male: 0.95 (0.89–1.01) Nonlinear trend model: 1.01 (0.93–1.10) <ul style="list-style-type: none"> Female: 1.05 (0.87–1.27) Male: 1.01 (0.92–1.10) 	See entry for Italy (4 regions)

Table 8.6S Continued

Study	Design/population	Pre/post/duration (months)	Measure/statistical method	Findings (95% CI)	Comments
Dove et al. 2010	<ul style="list-style-type: none"> Death due to AMI (ICD-10 I21) N = 26,982 ≥35 years of age July 2004–December 2006 vs. January 1999–June 2004 Effective July 5, 2004 Massachusetts 	Pre: 66 Post: 30	<ul style="list-style-type: none"> Daily number of deaths from AMI by city or town; Poisson regression Long-term trend, season, air particulate matter, influenza, city/town-specific demographic data, prior local smoking law, gender, age Separate analyses for cities and towns with prior comprehensive local laws vs. those without such prior laws 	<ul style="list-style-type: none"> No prior local law: 0.90 (0.86–0.95)* With prior local law: 1.01 (0.92–1.11) Effect of local law: 0.95 (0.86–1.05) Overall: 0.93 (0.89–0.97) <ul style="list-style-type: none"> Female: 0.90 (0.85–0.96) Male: 0.95 (0.89–1.01) 35–64: 0.92 (0.82–1.04) 65–74: 0.99 (0.89–1.11) ≥75: 0.91 (0.86–0.96) 	State law prohibited smoking in all workplaces, including restaurants and bars; prior to the statewide smoking law, about 25% of the Massachusetts population was covered by a local law; in cities and towns without prior local laws, there was a significant 9.2% decrease in AMI mortality; estimated 270 fewer AMI deaths per year associated with the state law; for cities and towns with no prior local laws, AMI mortality rates decreased by 1.6% (–4.0%, 7.0%) in the first 12 months and 18.6% (13.6%, 23.3%) thereafter
McMillen et al. 2010	<ul style="list-style-type: none"> AMI (primary diagnosis ICD-9 410) N = 1,754 January 1, 2007–June 30, 2009 vs. April 21, 2005–December 31, 2006 Effective January 1, 2007 Hattiesburg, Mississippi 	Pre: 20 Post: 30	<ul style="list-style-type: none"> AMI admissions/day compared with standardized rate prior to implementation Compared the number of heart attack admissions among people living outside of city limits and not protected by smokefree ordinance; a 3.8% reduction was observed in the Hattiesburg-adjacent control region compared to a 13.4% reduction in Hattiesburg 	<ul style="list-style-type: none"> 0.87 (0.74–1.01)^{†c} There were 299 heart attack admissions compared to a standardized rate of 345 admissions before law 	Smoking law in enclosed workplaces, including restaurants and bars; reductions in AMI admissions resulted in cost savings of \$2,367,909 in 2010 dollars

Table 8.6S Continued

Study	Design/population	Pre/post/duration (months)	Measure/statistical method	Findings (95% CI)	Comments
McMillen et al. 2010	<ul style="list-style-type: none"> • AMI (primary diagnosis ICD-9 410) • N = 100 • May 20, 2006–April 7, 2009 vs. July 29, 2004–May 19, 2006 • Effective May 20, 2006 • Starkville, Mississippi 	Pre: 22 Post: 35	<ul style="list-style-type: none"> • AMI admissions/day compared to standardized rate prior to implementation • Compared the number of heart attack admissions among people living outside of city limits and not protected by smokefree ordinance; a 14.8% reduction was observed in the Starkville-adjacent control region compared to a 27.7% reduction in Starkville 	<ul style="list-style-type: none"> • 0.72 (0.48–1.10)^{ac} • There were 38 heart attack admissions compared to a standardized rate of 52.57 admissions before law 	Smoking law in indoor public places, including restaurants and bars; reductions in AMI admissions resulted in cost savings of \$288,270 in 2010 dollars
Moraros et al. 2010	<ul style="list-style-type: none"> • AMI (primary discharge diagnosis ICD-9 410) • ≥18 years of age • N = 10,210 • January 2003–December 2004 vs. January 1999–September 2002 • Effective November 1, 2002 • Delaware 	Pre: 45 Post: 24	<ul style="list-style-type: none"> • Quarterly rates of events; Poisson regression • Seasonal effects • Compared with non-Delaware residents admitted in Delaware for AMI; AMI RR in non-Delaware residents was similar preordnance and postordnance period (0.98; 0.90, 1.08) 	<ul style="list-style-type: none"> • 0.91 (0.87, 0.95)^a • Estimated 169 AMI cases prevented in 2 year post-ordnance period 	Delaware Clean Indoor Air Act of 1994 became comprehensive in 2002 with an amendment to include all enclosed indoor areas accessible to the general public, including restaurants, bars, and casinos; a model including ordinance, season, and linear trend using preordnance and postordnance data showed that the linear trend is not significant ($p = 0.557$); Delaware Department of Public Health reported 99.6% compliance in bars and restaurants, and the Delaware Department of Labor reported 100% compliance in other workplaces in first year

Table 8.6S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Naiman et al. 2010	<ul style="list-style-type: none"> AMI (ICD-9 410, ICD-10 I21) ≥45 years of age January 1995–May 2006 Effective May 2006 Toronto, Canada 	<p>Pre: 36 Post phase 3: 36; not included in length of follow-up</p> <p>analysis because the prelaw period did not immediately precede the postlaw phase</p>	<ul style="list-style-type: none"> ARIMA on crude rates of hospital admission Subgroup analyses by age, gender Comparison with Durham Region and Thunder Bay, 2 Ontario municipalities with no smokefree laws; no significant reductions were observed in control cities 	<ul style="list-style-type: none"> Phase 3 vs. pre: 0.81 (0.75–0.88)^{a,c} 	<p>Legislation required all public places and workplaces to be smokefree and was implemented in 3 phases; the largest declines were seen after the phase of the law affecting restaurants came into effect, including a 17% (14%, 19%) decrease in AMI; crude rates of hospital admissions decreased 39% (38%, 40%) for cardiovascular conditions; no significant reductions were observed in number of hospital admissions attributable to control conditions (cholecystitis, appendicitis, bowel obstruction) in Toronto; smokefree legislation occurred in 3 phases: smokefree public places and workplaces in October 1999; smokefree restaurants, dinner theaters, and bowling centers except designated smoking rooms in June 2001; smokefree bars, billiard halls, bingo halls, casinos, racetracks except designated smoking rooms in June 2004</p>
Sims et al. 2010	<ul style="list-style-type: none"> AMI (primary diagnosis code ICD-10 I21) excluding repeat admissions within 28 days ≥18 years of age N = 342,361 July 2007–September 2008 vs. July 2002–May 2007 Effective July 1, 2007 England 	<p>Pre: 60 Post: 15</p>	<ul style="list-style-type: none"> Interrupted time series design with hospital episode statistics data; segmented Poisson regression Long-term trend, temporal fluctuations (temperature, week of year, holidays), population size Stratified by age and gender 	<ul style="list-style-type: none"> 0.98 (0.96–0.99)* <60 years: <ul style="list-style-type: none"> Female: 0.96 (0.92–1.03) Male: 0.97 (0.94–0.99) ≥60 years: <ul style="list-style-type: none"> Female: 0.96 (0.94–0.99) Male: 0.96 (0.95–0.99) About 1,600 emergency admissions for AMI prevented in 12 months 	<p>Law affected bars and restaurants most; some of these venues went smokefree before July 1 in preparation for the law, which may create a less marked decrease; no evidence of a change in the slope of the AMI trend line after the legislation; prior to the law, many public places and workplaces were already smokefree; in the year before implementation, 55% of employed adults already worked in smokefree environments; subgroup analysis shows significant 3.07% drop in admissions in 60+ group (p = 0.001) and 3.46% drop in men <60 (p <0.01)</p>

Table 8.6S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Barone-Adesi et al. 2011	<ul style="list-style-type: none"> AMI (ICD-9 410) Primary analysis was for ACEs (AMI and other acute and subacute IHD) N = 936,519 (all ACEs) January 2005–November 2006 vs. January 2002–December 2004 Effective January 10, 2005 Italy (20 regions) 	Pre: 36 Post: 24	<ul style="list-style-type: none"> Admission rates; Poisson test with mixed effect regression models with fixed coefficients describing the national trend and random coefficients describing region-specific deviations Seasonality, long term trends Separate analyses conducted based on age, gender 	<ul style="list-style-type: none"> <70 years: 0.97 (0.95–0.99)* – Female: 0.98 (0.94–1.02) – Male: 0.97 (0.95–0.99) ≥70 years: 1.01 (0.99–1.04) – Female: 1.02 (0.99–1.04) – Male: 1.00 (0.98–1.03) 	See entry for Italy (4 regions); the observed reduction was stable over the study period, similar in different geographic areas, and stronger among young people; no evidence of a gradual effect over time, as there was no change in the underlying trend in admissions for ACEs after law
Bonetti et al. 2011b	<ul style="list-style-type: none"> AMI (defined as detectable troponin in a clinical setting consistent w/ myocardial ischemia, identified by ICD-10 codes) undergoing coronary angiography (may be viewed as representative of overall incidence in the region) N = 842 March 2006–February 2008 vs. March 1, 2008 Effective March 2008–February 2010 Graubünden, Switzerland 	Pre: 24 Post: 24	<ul style="list-style-type: none"> AMI incidence Air quality (PM₁₀ and NO₂), sales of lipid lowering drugs Separate analyses based on resident status, gender, smoking status, medical history Compared with Lucerne, a nearby region without smokefree law; AMI incidence increased in Lucerne during the postlaw period in Graubünden 	<ul style="list-style-type: none"> 0.79 (0.69–0.90)^{aa} The number of AMI patients decreased 21% in the 2 years before vs. 2 years after law For each of the 4 years of the study, incidence rate of AMI was 89.4 (pre), 93.8 (pre), 69.8 (1 year post), and 68.8 (2 years post) per 100,000 residents 	Smoking law in public places, including cafes, bars, and restaurants; based on the large number of visitors, the population of the Canton of Graubünden may almost double during the holiday season, hence the resident vs. nonresident analysis; the most pronounced reduction in AMI was in patients with documented coronary artery disease; female AMI patients showed a more pronounced drop in the second year of the law compared to the first, while male patients experienced a diminished magnitude of decrease; changes in outdoor air pollution or use of lipid-lowering drugs (potential confounders) did not substantially contribute to the decrease in the incidence of AMI

Table 8.6S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Bruckman and Bennett 2011	<ul style="list-style-type: none"> AMI (principal discharge diagnosis ICD-9 410) January 2005–April 2007 vs. May 2007–December 2009 Effective May 2007 Ohio 	Pre: 28 Post: 32	<ul style="list-style-type: none"> Age- and gender-adjusted discharge rate per 1,000 (converted to per 100,000); mixed linear models with a varying covariance structure to determine if rates decreased yearly; spline polynomial functions to determine inflection point in monthly rate data Age, gender, linear trend, seasonality 	<ul style="list-style-type: none"> 0.96 (0.95–0.98)^{a,b} AMI discharge rates dropped from 198 per 100,000 in 2005 to 168 per 100,000 in 2009 	Law prohibits smoking in a public place or a place of employment; inflection point identified as June 2007, 1 month after implementation; average decrease in MI discharge of 7 per 100,000 each year from 2005 to 2009; conservative estimate of \$737,782 in hospital stay costs in first year after law (estimate does not account for physician fees); direct system savings of \$1.1 million from 69 cases prevented by smoking law
Bruntjes et al. 2011	<ul style="list-style-type: none"> AMI (primary diagnosis ICD-9 410) and biomarker confirmation (troponin I or CKMB) N = 706 January 2004–June 2006 vs. July 2002–November 2003 Effective December 2003 Greeley, Colorado 	Pre: 17 Post: 30	<ul style="list-style-type: none"> Population-adjusted monthly hospitalization rates; Poisson regression Seasonality (nonsignificant), linear trends (nonsignificant), smoking status, type of MI Compared with adjacent area immediately surrounding Greeley; a smaller, nonsignificant decrease was noted in the area immediately surrounding Greeley (0.83; 0.61, 1.14); comparison of RR reductions between Greeley and the control area was not significant (p = 0.48) 	<ul style="list-style-type: none"> 0.73 (0.59–0.90)^a 	Law prohibits smoking in all places of public assembly, including restaurants, bars, bowling alleys, bingo halls, and outdoor public gathering places where seating is provided; smoking law underwent various legal challenges through November 2004, during which compliance was variable; significant reductions in AMI among smokers (0.44; 0.29, 0.65); nonsignificant reduction among nonsmokers (0.86; 0.67, 1.09); smokers from control area also experienced a significant decrease (0.58; 0.35, 0.97) that was not significantly different from Greeley smokers (p = 0.38); reduction in events was similar in patients with STEMI (0.79; 0.34, 1.83) and NSTEMI (0.66; 0.37, 1.17); linear trends were tested and not significant
Di Valentino et al. 2011	<ul style="list-style-type: none"> ST-elevation myocardial infarction (ICD-10) N = 1,272 2007–2008 vs. 2004–2006 Effective April 2007 Canton Ticino, Switzerland 	Pre: 36 Post: 24	<ul style="list-style-type: none"> Comparison of annual frequency of hospitalizations due to STEMI 	<ul style="list-style-type: none"> 0.79 (0.70–0.88)^{a,b} 22.4% (p < .0001) and 20.6% (p < .0002) reduction in hospitalizations during first and second postlaw years, respectively 	Smokefree public places, including restaurants, bars, and discos; smoking rooms permitted; this study population overlaps with that of another study also conducted in Ticino examining rates of STEMI (a subset of Acute coronary syndrome) following the law

Table 8.6S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Herman et al. 2011	<ul style="list-style-type: none"> • AMI (primary diagnosis ICD-9 410.x0) • N = 5,025 (counties without previous laws) • May 2007–May 2008 vs. January 2004–April 2007 • Effective May 1, 2007 • Arizona 	Pre: 40 Post: 13	<ul style="list-style-type: none"> • Rate of admissions per 100,000 annually • Poisson regression • Seasonality, population, annual linear trend • Separate analyses for counties with preexisting smokefree laws vs. those without such laws 	<ul style="list-style-type: none"> • 0.84 (0.60–0.93)* • Estimated 159 fewer cases of hospital admissions (-13%) for AMI than expected for counties with no preexisting law 	Law ended smoking in all enclosed workplaces, including bars and restaurants; cost-savings analysis estimates \$16.8 million for AMI, unstable angina, acute stroke, and acute asthma in 13 months after law in non-law counties (\$7.2 million savings for AMI alone); no change in rates of control diseases (acute appendicitis, kidney stones, acute cholecystitis, and ulcers) pre- and postlaw
Hurt et al. 2011	<ul style="list-style-type: none"> • AMI validated using biomarkers, cardiac pain, and Minnesota coding of the ECG • October 2007–March 2009 vs. July 2000–December 2001 • Effective January 1, 2002 (Ordinance 1: smokefree restaurants) • Effective October 1, 2007 (Ordinance 2: smokefree workplaces) • Olmsted County, Minnesota 	Preordinance 2: 18 Postordinance 2: 18; not included in length of follow-up analysis because the prelaw period did not immediately precede the postlaw phase	<ul style="list-style-type: none"> • Age and gender-adjusted rate per 100,000; adjusted HR 	<ul style="list-style-type: none"> • Ordinance 2 vs. no law: 0.55 (0.44–0.68)* 	Although the law was initiated in 2 steps (smokefree restaurants in January 2002 and smokefree workplaces in 2007), this study was included in the meta-analysis because authors compared the period before any law to the period after full implementation, thus capturing the true effect of the law: AMI rate per 100,000 dropped from 212.3 to 168.7 following the restaurant law (HR 0.90; 0.73, 1.10; p = 0.20) and from 130.0 to 102.9 following the workplace law (0.79; 0.63, 0.98; p = 0.04); during this period, the prevalence of hypertension, diabetes, hypercholesterolemia, and obesity either remained constant or increased while the prevalence of smoking among the adults declined by 23%
North Carolina Tobacco Prevention and Control Branch 2011	<ul style="list-style-type: none"> • AMI (diagnosis code ICD-9 410.x1 to 410.x0) • N = 24,848 • ≥ 18 years of age • January 2010–December 2010 vs. January 2008–December 2009 • Effective January 1, 2010 • North Carolina 	Pre: 24 Post: 12	<ul style="list-style-type: none"> • Rate of emergency visits for AMI; Poisson regression • Age, gender, Christmas holidays, time, average weekly temperature, log-transformed weekly flu rates, week of year 	<ul style="list-style-type: none"> • 0.79 (0.75–0.83)* 	Law prohibits smoking in bars, restaurants, government buildings, and vehicles; projected cost savings \$3.3–4.8 million from AMIs prevented

Table 8.6S Continued

Study	Design/population	Pre/post/duration (months)	Measure/statistical method	Findings (95% CI)	Comments
Cronin et al. 2012	<ul style="list-style-type: none"> AMI, diagnosed in hospital by physician using troponin T or I, allowing repeat admissions Primary data set: N = 3,041 Secondary data set: N = 3,195 ≥18 years of age Primary data set: April 2004–March 2007 vs. March 2003–March 2004 Secondary data set: July 2003–March 2004 vs. April 2004–June 2007 Effective March 29, 2004 Cork and Kerry Counties, Ireland 	<p>Primary: Pre: 13 Post: 36</p> <p>Secondary: Pre: 9 Post: 39</p>	<ul style="list-style-type: none"> AMI admissions and rate per 100,000; Poisson regression Linear time trend Sensitivity analyses were undertaken by gender, smoking status, and type of acute coronary syndrome According to mortality data, there was no change in all cause mortality and overall 6.5% decrease in deaths from circulatory causes in Cork and Kerry counties, and so results were not attributable to changes in coronary death patterns outside of hospital 	<ul style="list-style-type: none"> All AMI: 0.84 (0.75–0.91)^{ab} NSTEMI: 0.80 (0.71–0.90)^b STEMI: 0.92 (0.78–1.07)^a Estimates derived from secondary data set 	<p>Primary analysis was for overall Acute coronary syndrome; see description of law in entry for Ireland; the first year's reduction in admissions for Acute coronary syndrome was due to fewer cases among men and current smokers; the third year's reduction in admissions for Acute coronary syndrome was due to fewer cases among men, current smokers, and never smokers; increased effect on Acute coronary syndrome over time evidenced by 12% decrease in year 1 and 13% decrease in year 3; this paper supersedes an abstract of the same study used in the 2009 meta-analysis</p>
Kent et al. 2012	<ul style="list-style-type: none"> AMI 20–70 years of age April 2004–March 2006 vs. April 2002–March 2004 Effective March 29, 2004 Ireland 	<p>Pre: 24 Post: 24</p>	<ul style="list-style-type: none"> Change in emergency hospital admissions for AMI Population, weather, pollution, and influenza Stratified by age and gender 	<ul style="list-style-type: none"> 0.89 (0.70–1.13)* 	<p>March 2004 law applied to workplaces (including bars and restaurants); prior to this law, smoking had been outlawed in public buildings, hospitals, public pharmacies, schools, banking halls, cinemas, restaurant kitchens, port of all restaurants, public transport aircraft and buses, and some trains; significant reduction in emergency cardiopulmonary admissions in the 2 years following the smoking law (RR: 0.87; 0.78–0.98)</p>

Table 8.6S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Sebrié et al. 2013	<ul style="list-style-type: none"> AMI (primary diagnosis code ICD-10 I21.0-I21.9); noncountry residents and patients with AMI after a coronary angioplasty or bypass, or as a complication of another disease (secondary diagnosis) were excluded N = 7,949 March 2006–February 2008 vs. March 2004–February 2006 Effective March 2006 Uruguay 	Pre: 24 Post: 24	<ul style="list-style-type: none"> Number of AMI hospitalizations per month; multiple linear regression and negative binomial regression Seasonal variation, population changes, time trend Stratified by public vs. private hospital, gender, age 	<ul style="list-style-type: none"> 0.81 (0.72–0.89)* 2 years after the smokefree policy adoption in enclosed public places and workplaces, hospital admissions for AMI were reduced by 22% Reductions in monthly AMI admissions between 15% and 22% were observed for private hospitals, men, women, and people 40–65 years of age and over 65; there was a nonsignificant trend toward fewer monthly AMIs in people under 40 	Law prohibited smoking in all indoor public places and workplaces including restaurants and bars; no evidence that overall effect grew or fell over time following the law; in public hospitals only, AMI trend increased before the law and decreased after the law; study covered 37 hospitals, capturing 79% of the Uruguayan population; air particulate matter (PM _{2.5}) decreased dramatically (210 to 18 µm/m ³) and adults reported decreased exposure to secondhand smoke 1 year after implementation, suggesting a high level of compliance

Table 8.6S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Acute coronary syndrome-workplace only laws					
Ferrante et al. 2012	<ul style="list-style-type: none"> Acute coronary syndrome (ICD-10 I20-I25) N = 3,307 ≥18 years of age October 2006-December 2008 vs. January 2004-September 2006 Effective October 2006 Buenos Aires, Argentina 	Pre: 33 Post: 15	<ul style="list-style-type: none"> Monthly age-adjusted admission rates; multiple linear regression analysis using standard methods for interrupted time series analysis Age, secular trends, seasonality 	<ul style="list-style-type: none"> 0.92 (0.87-0.97)^{a,b} 5.3% reduction in admissions in year before vs. year after law Implementation not significantly associated with immediate change: increase of 1.74 admissions per 100,000 (-1.42, 4.92) 	Law ended smoking in workplaces but allowed for designated smoking areas up to 30% in bars and restaurants if >100 m ² ; no significant change in trend after law; increase of 0.01 admissions per 100,000 per month (-0.12, 0.14); Buenos Aires served as a control for Santa Fe, to compare partial smoking laws with comprehensive smoking laws; data from Buenos Aires suggest the ineffectiveness of the implementation of partial smokefree legislation; nonsignificant decrease in smoking prevalence from 27.4% 1 year before law to 26.1% 3 years after law; self-reported secondhand smoke exposure decreased from 52.9% to 31.7%

Table 8.6S Continued

Study	Design/population	Prepostduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Acute coronary syndrome—workplace and restaurant laws					
Gupta et al. 2011	<ul style="list-style-type: none"> Acute coronary syndrome (primary diagnostic code ICD-9 410, 411.1, 411.81, 411.89, 413.0, 413.1, 413.9; an analysis performed for AMI yielded similar results that were not shown N = 14,245 ≥18 years of age January 2004–September 2008 vs. January 2000–December 2003 Effective January 1, 2004 Kanawha County, West Virginia 	Pre: 48 Post: 57	<ul style="list-style-type: none"> Age-adjusted Acute coronary syndrome hospital admission rates; Poisson regression Age, gender, year, season, tobacco use, diabetes 	<ul style="list-style-type: none"> 1.02 (0.92–1.12)* Age-adjusted Acute coronary syndrome hospitalization rates decreased 37% during entire study period; no additional significant change due to removal of smoking areas in restaurants after accounting for the sustainable decline of Acute coronary syndrome hospitalizations since the 2002 revision Stratification showed that the observed decline was significant only among nonsmokers 	<p>Effective May 22, 1995, a modest smoking regulation was enacted prohibiting smoking in all enclosed public places; restaurants were allowed to designate up to 50% of their seating capacity as smoking areas; on July 20, 2000 the law was modified to increase penalties for violations; on April 3, 2003, a revised regulation prohibited smoking in all restaurants and at most workites; however, to come into compliance, the regulation allowed several businesses an exemption until January 1, 2004; the likelihood of hospital admissions for Acute coronary syndrome was significantly lower among nonsmokers, people without diabetes, and women; incidence of hospital admissions for Acute coronary syndrome decreased significantly by 6% per year (CI 4–8%) throughout the study; among male smokers, there was a significant decline in time trend (7%; 0.4%, 12%) in admission rates after 2004; smoking rate decreased from 32% to 24% from 2002 to 2008, a nonsignificant change; in conjunction with steady tobacco sales, authors dismiss the notion that changes in Acute coronary syndrome can be attributed to a decline in smoking</p>

Table 8.6S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
ACE (acute coronary events)—workplace, restaurant, and bar laws					
Pell et al. 2008	<ul style="list-style-type: none"> Acute coronary syndrome (detectable troponin after emergency admission for chest pain, ICD-10 I21) N = 5,919 April 2006–March 2007 vs. June 2005–March 2006 April 2006 Scotland 	Pre: 10 Post: 10	<ul style="list-style-type: none"> χ^2 and test for trend Stratified on gender and age (men ≤ 55; women ≤ 65) Used data from England as historical control; admissions for Acute coronary syndrome in England dropped 4% during a similar period compared to 17% in Scotland 	<ul style="list-style-type: none"> 0.83 (0.82–0.84)* 	Legislation prohibited smoking in all enclosed public places; 17% drop overall, 14% among smokers, 19% among former smokers, 21% among nonsmokers; 67% of the decrease in Acute coronary syndrome involved nonsmokers; larger risk reductions in older people; decrease in monthly admissions became more pronounced over time after implementation of legislation ($p = 0.02$); percentage of people who had never smoked who reported no exposure to secondhand smoke increased from 57% to 78% ($p < 0.001$); there was a reduction in geometric mean serum cotinine from 0.68 to 0.56 ng/mL ($p < 0.001$)
Gudnason et al. 2009	<ul style="list-style-type: none"> Patients undergoing coronary angiography for Acute coronary syndrome, defined as clinical symptoms of unstable coronary artery disease (chest pain at rest) as well as at least one of the following: (1) elevated cardiac enzymes, (2) ischemic changes on the EKG at rest, or (3) an abnormal exercise stress test during the same unstable episode N = 535 June 2007–October 2007 vs. January 2007–May 2007 Effective June 1, 2007 Iceland 	Pre: 5 Post: 5	<ul style="list-style-type: none"> Comparison of Acute coronary syndrome incidence before vs. after smoking law 	<ul style="list-style-type: none"> 0.83 (0.68–1.02)*^c Number of events before vs. after law, given in PowerPoint presentation based on abstract (http://spo.escardio.org/escalides/view.aspx?cevtid=33&id=978) Nonsmokers demonstrated 21% reduction in Acute coronary syndrome incidence among men ($p < 0.05$) but no significant effect observed among women; in the total population, there was a nonsignificant trend of a 20% reduction in Acute coronary syndrome ($p = 0.08$) 	Legislation prohibited smoking in public places; initial analysis considered only nonsmoking patients; numbers for overall population obtained by personal communication with Dr. Gudnason

Table 8.6S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Di Valentino et al. 2010	<ul style="list-style-type: none"> Acute coronary syndrome (ICD-10) N = 2,426 2007–2008 vs. 2005–2006 April 2007 Canton Ticino, Switzerland 	Pre: 24 Post: 24	<ul style="list-style-type: none"> Comparison of annual frequency of hospitalizations due to Acute coronary syndrome 	<ul style="list-style-type: none"> 0.82 (0.76–0.89)^{ab} 15.5% (p < 0.001) and 14.7% (p < 0.001) reduction in hospitalizations during first and second postlaw years, respectively 	Smokefree public places, including restaurants, bars, and discos; smoking rooms permitted; this study population overlaps with that of another study also conducted in Ticino examining rates of STEMI (a subset of Acute coronary syndrome) following the law
Ferrante et al. 2012	<ul style="list-style-type: none"> Acute coronary syndrome (ICD-10 I20-I25) N = 2,889 ≥18 years of age August 2006–December 2008 vs. January 2004–July 2006 August 2006 Santa Fe, Argentina 	Pre: 31 Post: 17	<ul style="list-style-type: none"> Monthly age-adjusted admission rates; multiple linear regression analysis using standard methods for interrupted time series analysis Age, secular trends, seasonality 	<ul style="list-style-type: none"> 0.65 (0.59–0.70)^{aa} 20.8% reduction in admissions in year before vs. year after law Implementation resulted in immediate change of -2.5 admissions per 100,000 (-4.74, -0.26) 	100% smokefree law in all enclosed public places; law also ended tobacco ads, promotion, and sponsorship; persistent change after law of 0.26 fewer admissions per 100,000 per month (-0.39, -0.13); Buenos Aires served as a control for Santa Fe, to compare partial smoking laws with comprehensive smoking laws; data from Buenos Aires suggest the ineffectiveness of the implementation of partial smokefree legislation; high levels of compliance, per National Tobacco Control Program; nonsignificant decrease in smoking prevalence from 27.3% 1 year before law to 26.6% 3 years after law; self-reported secondhand smoke exposure decreased from 51.6% to 31.7%

Table 8.6S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
ACE (acute coronary events)—workplace, restaurant, and bar laws					
Cesaroni et al. 2008	<ul style="list-style-type: none"> • ACEs, including AMI (ICD-9 410) and "other acute and subacute forms of IHD" (ICD-9 411). Cases were included with principal diagnosis of AMI or secondary diagnosis of AMI when principal diagnosis indicated AMI complications (ICD-9 427.1, 427.41, 427.42, 427.5, 428.1, 429.5, 429.6, 429.71, 429.79, 429.81, 518.4, 780.2, 785.5, 414.10, 423.0) • Out-of-hospital deaths from IHDs (ICD-9 410-414) if no evidence of hospitalization for coronary causes in the previous 28 days or any cause in the last 2 days • N = 2,136 • 35–84 years of age • January 2005–December 2005 vs. January 2000–December 2004 • Effective January 10, 2005 • Rome, Italy 	Pre: 48 Post: 12	<ul style="list-style-type: none"> • Age standardized rates (based on European standard population) • Poisson regression on number of daily events after January 10, 2005, compared with before that date • Separate analyses done for out-of-hospital deaths and hospitalizations and an analysis of incident cases only • Age, gender, PM₁₀ air pollution, flu epidemics, holidays, temperature, secular trend, all-cause hospitalizations, SES 	<ul style="list-style-type: none"> • 35–64: 0.89 (0.85–0.93)* • 65–74: 0.92 (0.88–0.97) • 75–84: 1.02 (0.98–1.07) • Adjusted for time trends and all-cause hospitalization rates: <ul style="list-style-type: none"> – 35–64: 0.94 (0.88–1.01) – 65–74: 0.90 (0.84–0.96) 	See entry for Italy (4 regions); no effect in 75–84 year olds; protective effect of law seemed stronger in low SES areas; prevalence of smoking decreased from 34.9% to 30.5% in men and from 20.6% to 20.4% in women; cigarette sales decreased in Rome by 5.5% in 2005 compared to 2004; estimated reduction in coronary events attributable to changes in active smoking habits was <2%; concentrations of urinary cotinine among nonsmoking workers decreased from 17.8 to 5.5 mg/mL at 3 months postlaw and 3.7 mg/mL 12 months postlaw

Table 8.6S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Barone-Adesi et al. 2009	<ul style="list-style-type: none"> • ACE (ICD-9 410, 411) • January 2005–June 2007 vs. January 2001–December 2004 • Effective January 2005 • Piedmont, Italy 	Pre: 48 Post: 30	<ul style="list-style-type: none"> • Poisson regression; standard methods for interrupted time-series adopted to assess the role of immediate and gradual effects of the smokefree law • Long-term trends, seasonality, age, day of the week 	<ul style="list-style-type: none"> • <70: 0.94 (0.90–0.97)* • ≥70: 1.00 (0.97–1.03) • Weekends: 0.87 (0.80–0.93) • Weekdays: 0.96 (0.92–1.00) 	See entry for Italy (4 regions); the observed reduction in the number of admissions for ACEs started in the same month in which the law came into effect and remained evident for the entire study period; no change ($p = 0.51$) in the underlying trend was found; this study population overlaps with that of another study also conducted in Piedmont examining rates of AMI (a subset of ACE) following the Italian national law

Table 8.6S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
CHD—workplace, restaurant, and bar laws					
Barone-Adesi et al. 2011	<ul style="list-style-type: none"> • Non-AMI acute and subacute forms of CHD (ICD-9 411) • Primary analysis was for ACEs (AMI and other acute and subacute CHD) • N = 936,519 (all ACEs) • January 2005–November 2006 vs. January 2002–December 2004 • January 10, 2005 • Italy (20 regions) 	Pre: 36 Post: 24	<ul style="list-style-type: none"> • Admission rates; Poisson test with mixed effect regression models with fixed coefficients describing the national trend and random coefficients describing region-specific deviations • Seasonality, long-term trends • Separate analyses conducted based on age, gender 	<ul style="list-style-type: none"> • <70: 0.95 (0.93–0.98)* <ul style="list-style-type: none"> – Female: 0.92 (0.88–0.98) – Male: 0.96 (0.93–0.99) • ≥70: 0.98 (0.96–1.00) <ul style="list-style-type: none"> – Female: 0.98 (0.95–1.01) – Male: 0.97 (0.94–1.01) 	See entry for Italy (4 regions); the observed reduction was stable over the study period, similar in different geographic areas, and stronger among young people; no evidence of a gradual effect of the law, as there was no change in the underlying trend in admissions for ACEs after law

Source: Adapted from Tan and Glantz 2012 with permission from Wolters Kluwer Health, © 2012.

Note: Observed risk is presented as a risk ratio unless otherwise specified. If number of events is N/A, then events were recorded as rates and absolute counts are not available. ACE = acute coronary event; AMI = acute myocardial infarction; ARIMA = autoregressive integrated moving average;

CDC = Centers for Disease Control and Prevention; CHD = cardiovascular disease; EKG = electrocardiogram; HR = hazard ratio; ICD-10-CM = International Classification of Diseases-10-Clinical Modification; ng/mL = milligram per milliliter; ng/mL = nanogram per milliliter; NO_2 = nitrogen dioxide; person-years = the sum of the number of years that each member of a population has been smoking; $\text{PM}_{2.5}$ = particulate matter <2.5 micrometers in diameter; PM_{10} = particulate matter <10 micrometers in diameter;

RR = relative risk; SES = socioeconomic status; STEMI = ST segment elevation myocardial infarction; μm^3 = microgram per cubic meter;

^aRR and CI calculated using negative binomial regression with model including effect of law and seasonality (if applicable).

^bRR and CI calculated by Monte Carlo simulation run 100,000 times; rate ratio calculated by dividing postlaw rates with mean prelaw rates.

^cRR and CI calculated using number of events before vs. after law.

^dCI calculated from p-value presented in paper.

^eRR and CI computed using Poisson regression with model described in paper for counties with no prior law.

^fCI obtained from communication with author of paper.

*Estimate used in meta-analysis.

Table 8.7S Detailed description of studies on smokefree laws and cerebrovascular accidents

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Stroke-workplace only laws					
Dautzenberg 2008	<ul style="list-style-type: none"> Stroke <65 years of age January 2006–February 15, 2008 February 1, 2007; restaurants, bars, and casinos added effective January 1, 2008 France 	Partial law: Pre: 13 Post: 12.5	<ul style="list-style-type: none"> Rate per 100,000 admissions 	<ul style="list-style-type: none"> Partial law: 0.96 (0.8–1.03)⁹³ 	Smoking ended in public places in February 2007, but restaurants, bars, and casinos were given exceptions until January 2008; law permits ventilated smoking rooms under strict conditions; between January 2007 (before law) and January 2008 (after law), secondhand smoke exposure dropped from 57% to 14%; PM _{2.5} levels also dropped; also report substantial drops in respiratory symptoms among hospitality workers
Naiman et al. 2010	<ul style="list-style-type: none"> Stroke (ICD-9 433, 434, 435, 436; ICD-10 I63, I64, I65, I66, G45, G46) 45+ years of age January 1996–May 2006 Effective May 2006 Toronto, Canada 	Pre: 36 Post phase 1: 24	<ul style="list-style-type: none"> ARIMA on crude rates of hospital admission Subgroup analyses by age, gender Comparison with Durham Region and Thunder Bay, 2 Ontario municipalities with no smoke-free laws; no significant reductions were observed in control cities 	<ul style="list-style-type: none"> Phase 1 vs. prelaw: 0.91 (0.80–1.0)⁹⁴ 	Legislation required all public places and workplaces to be smokefree and was implemented in 3 phases; crude rates of hospital admissions decreased 39% (38%, 40%) for cardiovascular conditions; no significant reductions were observed in number of hospital admissions attributable to control conditions (cholecystitis, appendicitis, bowel obstruction) in Toronto; smokefree legislation occurred in 3 phases: smokefree public places and workplaces in October 1999; smokefree restaurants, dinner theaters, and bowling centers except designated smoking rooms in June 2001; smokefree bars, billiard halls, bingo halls, casinos, racetracks except designated smoking rooms in June 2004

Table 8.7S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Stroke-workplace and restaurant laws					
Naiman et al. 2010	<ul style="list-style-type: none"> Stroke (ICD-9 433, 434, 435, 436; ICD-10 I63, I64, I65, I66, G45, G46) ≥45 years of age January 1995–May 2006 Effective May 2006 Toronto, Canada 	<p>Pre: 36 Post phase 2: 36; not included in length of follow-up analysis because the prelaw period did not immediately precede the postlaw phase</p>	<ul style="list-style-type: none"> ARIMA on crude rates of hospital admission Subgroup analyses by age, gender Comparison with Durham Region and Thunder Bay, 2 Ontario municipalities with no smoke-free laws; no significant reductions were observed in control cities 	<ul style="list-style-type: none"> Phase 2 vs. pre: 0.7% (0.68–0.85)* 	<p>Legislation required all public places and workplaces to be smokefree and was implemented in 3 phases; crude rates of hospital admissions decreased 39% (38%, 40%) for cardiovascular conditions; no significant reductions were observed in number of hospital admissions attributable to control conditions (cholecystitis, appendicitis, bowel obstruction) in Toronto; smokefree legislation occurred in 3 phases: smokefree public places and workplaces in October 1999; smokefree restaurants, dinner theaters, and bowling centers except designated smoking rooms in June 2001; smokefree bars, billiard halls, bingo halls, casinos, racetracks except designated smoking rooms in June 2004</p>

Table 8.7S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Stroke-workplace, restaurant, and bar laws					
Juster et al. 2007	<ul style="list-style-type: none"> Stroke (primary diagnosis code ICD-9 410.00-410.99) N = 584,833 ≥35 years of age January 1995–December 2004 Effective July 24, 2003 New York state 	Post: 21 Pre: 99	<ul style="list-style-type: none"> Multiple regression time series Age-adjusted (New York population in 2000) Existence of strong local ordinance, time (linear secular trend), seasonality, county Analyzed comprehensive laws (smoking prohibited in restaurants, bars, and other hospitality venues) vs. moderate laws (smoking permitting in hospitality venues) 	<ul style="list-style-type: none"> No significant negative association between the stroke admission rate and moderate or comprehensive restrictions on smoking No estimate was available for stroke rates in places without local smokefree laws prior to the state law, and so this study was excluded from the analysis for stroke 	July 2003 law prohibited smoking in all workplaces including restaurants and bars; limited statewide restrictions since 1989 limited smoking in many public places, including schools, hospitals, public buildings, and retail stores; local laws varied by county; by 2002, 75% of New Yorkers were subject to strong local laws, as well as limited restrictions at the state level implemented in 1989; authors performed analysis to compare effects assuming hypothetical case of no pre-existing local laws; change in monthly admission trend rate not significantly different from null; after implementation of the state law, exposure to secondhand smoke declined by nearly 50%; saliva cotinine dropped from 0.078 to 0.041 ng/mL
Dautzenberg 2008	<ul style="list-style-type: none"> Stroke <66 years of age January 2006–February 15, 2008 Effective February 1 2007; restaurants, bars, and casinos added January 1, 2008 France 	Complete law: Pre: 24 Post: 1.5; not included in length of follow-up analysis because the prelaw period did not immediately precede the postlaw phase	<ul style="list-style-type: none"> Rate per 100,000 admissions 	<ul style="list-style-type: none"> Complete law: 0.83 (0.77–0.91)^a 	Smoking ended in public places in February 2007, but restaurants, bars, and casinos were given exceptions until January 2008; law permits ventilated smoking rooms under strict conditions; between January 2007 (before law) and January 2008 (after law), secondhand smoke exposure dropped from 57% to 14%; PM _{2.5} levels also dropped; also report substantial drops in respiratory symptoms among hospitality workers

Table 8.7S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Naiman et al. 2010	<ul style="list-style-type: none"> Stroke (ICD-9 433, 434, 435, 436; ICD-10 I63, I64, I65, I66, G45, G46) ≥45 years of age January 1996–May 2006 Effective May 2006 Toronto, Canada 	<p>Pre: 36 Post phase 3: 36; not included in length of follow- up analysis because the prelaw period did not immediately precede the postlaw phase</p>	<ul style="list-style-type: none"> ARIMA on crude rates of hospital admission Subgroup analyses by age, gender Comparison with Durham Region and Thunder Bay, 2 Ontario municipalities with no smokefree laws; no significant reductions were observed in control cities 	<ul style="list-style-type: none"> Phase 3 vs. pre: 0.63 (0.56–0.71)^{ab} 	<p>Legislation required all public places and workplaces to be smokefree and was implemented in 3 phases; crude rates of hospital admissions decreased 39% (38%, 40%) for cardiovascular conditions; no significant reductions were observed in number of hospital admissions attributable to control conditions (cholecystitis, appendicitis, bowel obstruction) in Toronto; smokefree legislation occurred in 3 phases: smokefree public places and workplaces in October 1999; smokefree restaurants, dinner theaters, and bowling centers except designated smoking rooms in June 2001; smokefree bars, billiard halls, bingo halls, casinos, racetracks except designated smoking rooms in June 2004</p>
Herman et al. 2011	<ul style="list-style-type: none"> Acute stroke (ICD-9 430–434, xx, 436.xx, 437.1x) N = 6,018 (countries without previous laws) May 2007–May 2008 vs. January 2004–April 2007 Effective May 1, 2007 Arizona 	<p>Pre: 40 Post: 13</p>	<ul style="list-style-type: none"> Rate of admissions per 100,000 annually Poisson regression Seasonality, population, annual linear trend Separate analyses for counties with pre-existing smokefree laws vs. those without such laws 	<ul style="list-style-type: none"> 0.86 (0.79–0.96)^{ac} 	<p>Law ended smoking in all enclosed workplaces, including bars and restaurants; cost-savings analysis estimates \$16.8 million in savings for AMI, unstable angina, acute stroke, and acute asthma in 13 months after law in non-law counties (\$4.9 million for acute stroke alone); no change in rates of control diseases (acute appendicitis, kidney stones, acute cholecystitis, and ulcers) pre- and postlaw</p>

Table 8.7S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Kent et al. 2012	<ul style="list-style-type: none"> • Stroke • 20–70 years of age • April 2001–March 2006 vs. April 2002–March 2004 • Effective March 29, 2004 • Ireland 	Pre: 24 Post: 24	<ul style="list-style-type: none"> • Change in emergency hospital admissions for stroke • Population, weather, pollution, and influenza • Stratified by age and gender 	<ul style="list-style-type: none"> • 0.93 (0.73–1.20)* 	March 2004 law applied to workplaces (including bars and restaurants); prior to this law, smoking had been outlawed in public buildings, hospitals, public pharmacies, schools, banking halls, cinemas, restaurant kitchens, part of all restaurants, public transport aircraft and buses, and some trains; significant reduction in emergency cardiopulmonary admissions in the 2 years following the smoking law (RR 0.87, 0.78–0.98)

Table 8.7S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
TIA—workplace, restaurant, and bar laws					
Kent et al. 2012	<ul style="list-style-type: none"> • TIA • 20–70 years of age • April 2004–March 2006 vs. April 2002–March 2004 • Effective March 29, 2004 • Ireland 	Pre: 24 Post: 24	<ul style="list-style-type: none"> • Change in emergency hospital admissions for transient ischemic attack • Population, weather, pollution, and influenza • Stratified by age and gender 	<ul style="list-style-type: none"> • 1.00 (0.70–1.42)* 	March 2004 law applied to workplaces (including bars and restaurants); prior to this law, smoking had been outlawed in public buildings, hospitals, public pharmacies, schools, lawking halls, cinemas, restaurant kitchens, part of all restaurants, public transport aircraft and buses, and some trains; significant reduction in emergency cardiopulmonary admissions in the 2 years following the smoking law (RR 0.87, 0.78–0.98)

Source: Tan and Glantz 2012.

Note: Observed risk is presented as a risk ratio unless otherwise specified. If number of events is N/A, then events were recorded as rates and absolute counts are not available. AMI = acute myocardial infarction; ARIMA = autoregressive integrated moving-average; CI = confidence interval; ICD = International Classification of Diseases; PM_{2.5} = particulate matter <2.5 micrometers in diameter; RR = relative risk; TIA = transient ischemic attack.

^aRR and CI calculated using negative binomial regression with model including effect of law and seasonality (if applicable)

^bRR and CI calculated using Poisson regression with model described in paper for counties with no prior law

*Estimate used in meta-analysis.

Table 8.8S Detailed description of studies on the relationship between smokefree laws and other heart disease

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Angina-workplace only laws					
Naiman et al. 2010	<ul style="list-style-type: none"> • Angina (ICD-9 411, 413; ICD-10 I20) • ≥45 years of age • January 1996-May 2006 • Effective May 2006 • Toronto, Canada 	Pre: 36 Post phase 1: 24	<ul style="list-style-type: none"> • ARIMA on crude rates of hospital admission • Subgroup analyses by age, gender • Comparison with Durham Region and Thunder Bay, 2 Ontario municipalities with no smokefree laws; no significant reductions were observed in control cities 	<ul style="list-style-type: none"> • Phase 1 vs. prelaw: 0.88 (0.69–1.14)^{aa} 	Legislation required all public places and workplaces to be smokefree and was implemented in 3 phases; crude rates of hospital admissions decreased 39% (38%, 40%) for cardiovascular conditions; no significant reductions were observed in number of hospital admissions attributable to control conditions (cholecystitis, appendicitis, bowel obstruction) in Toronto; smokefree legislation occurred in 3 phases: smokefree public places and workplaces in October 1999; smokefree restaurants, dinner theaters, and bowling centers except designated smoking rooms in June 2001; smokefree bars, billiard halls, bingo halls, casinos, racetracks except designated smoking rooms in June 2004

Table 8.8S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Angina—workplace and restaurant laws					
Naiman et al. 2010	<ul style="list-style-type: none"> Angina (ICD-9 411, 413; ICD-10 I20) ≥45 years of age January 1996–May 2006 Effective May 2006 Toronto, Canada 	<p>Pre: 36 Post phase 2: 36; not included in length of follow-up analysis because the prelaw period did not immediately precede the postlaw phase</p>	<ul style="list-style-type: none"> ARIMA on crude rates of hospital admission Subgroup analyses by age, gender Comparison with Durham Region and Thunder Bay, 2 Ontario municipalities with no smokefree laws; no significant reductions were observed in control cities 	<ul style="list-style-type: none"> Phase 2 vs. prelaw: 0.65 (0.52–0.82)^a 	<p>Legislation required all public places and workplaces to be smokefree and was implemented in 3 phases; crude rates of hospital admissions decreased 39% (38%, 40%) for cardiovascular conditions; no significant reductions were observed in number of hospital admissions attributable to control conditions (cholecystitis, appendicitis, bowel obstruction) in Toronto; smokefree legislation occurred in 3 phases: smokefree public places and workplaces in October 1999; smokefree restaurants, dinner theaters, and bowling centers except designated smoking rooms in June 2001; smokefree bars, billiard halls, bingo halls, casinos, racetracks except designated smoking rooms in June 2004</p>
Sargent et al. 2012	<ul style="list-style-type: none"> Stable or unstable angina pectoris (ICD-10 I20.0–I20.9) N = 39,224 ≥30 years of age January 2004–December 2008 Nationwide; effective September 1, 2007 Statewide; effective date varies Germany 	<p>Pre: varies Post: 12</p>	<ul style="list-style-type: none"> Rate of hospitalization for AMI; logistic regression and interrupted time series linear regression model Age, gender, occupation 	<ul style="list-style-type: none"> 0.87 (0.82–0.92)^a In the first year after implementation, 1431 angina hospitalizations were prevented 	<p>Legislation addressed smoking in federal buildings and the transportation system; private employers were allowed to introduce a total or partial smoking law in workplaces; states were permitted to decide how to limit smoking in the hospitality sector (hotels, restaurants, bars); hospitality smoking laws were passed in all states in implemented between August 1, 2007 and July 1, 2008; most states continued to allow smoking in small bars without any food delivery and in separate rooms in large restaurants; a population-based survey revealed a significant decrease in cigarettes smoked in Germany after the law; after the law, there was a significant downward trend, with slope resulting in a decline of 5.33 (7.18, 3.48) hospitalizations per month; hospital admissions for control condition fractures increased slightly from 65,100 in 2007 to 66,954 in 2009; bronchitis cases, which might be affected by smokefree laws, declined from 16,900 in 2007 to 15,391 in 2009; hospitalization costs for angina decreased significantly by 9.6 (2.5, 16.6%), or about €2.5 million</p>

Table 8.8S Continued

Study	Design/population	Pre/post duration (months)	Measure/statistical method	Findings (95% CI)	Comments
Angina—workplace, restaurant, and bar laws					
Naiman et al. 2010	<ul style="list-style-type: none"> Unstable angina (ICD9. 411.1x) N = 670 (countries without previous laws) May 2007–May 2008 vs. January 2004–April 2007 Effective May 1, 2007 Arizona 	Pre: 40 Post: 13	<ul style="list-style-type: none"> Rate of admissions per 100,000 annually Poisson regression Seasonality, population, annual linear trend Separate analyses for countries with preexisting smokefree laws vs. those without such laws 	<ul style="list-style-type: none"> 0.64 (0.46–0.88)^{ab} 	Law ended smoking in all enclosed workplaces including bars and restaurants; cost-savings analysis estimates \$16.8 million in savings for AMI, unstable angina, acute stroke, and acute asthma in 13 months after law in non-law counties (\$0.9 million for angina alone); no change in rates of control diseases (acute appendicitis, kidney stones, acute cholecystitis, and ulcers) pre- and postlaw
Naiman et al. 2010	<ul style="list-style-type: none"> Angina (ICD-9 411, 413; ICD-10 I20) >45 years of age January 1996–May 2006 Effective May 2006 Toronto, Canada 	Pre: 36 Post phase 3: 36; not included in length of follow-up analysis because the prelaw period did not immediately precede the postlaw phase	<ul style="list-style-type: none"> ARIMA on crude rates of hospital admission Subgroup analyses by age, gender Comparison with Durham Region and Thunder Bay, 2 Ontario municipalities with no smokefree laws; no significant reductions were observed in control cities 	<ul style="list-style-type: none"> Phase 3 vs. prelaw: 0.38 (0.30–0.48)^{ca} 	Legislation required all public places and workplaces to be smokefree and was implemented in 3 phases; crude rates of hospital admissions decreased 39% (38%, 40%) for cardiovascular conditions; no significant reductions were observed in number of hospital admissions attributable to control conditions (cholecystitis, appendicitis, bowel obstruction) in Toronto; smokefree legislation occurred in 3 phases: smokefree public places and workplaces in October 1999; smokefree restaurants, dinner theaters, and bowling centers except designated smoking rooms in June 2001; smokefree bars, billiard halls, bingo halls, casinos, racetracks except designated smoking rooms in June 2004

Table 8.88 Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Cronin et al. 2012	<ul style="list-style-type: none"> Unstable angina, diagnosed in hospital by physician using troponin T or I, allowing repeat admissions (primary analysis was for overall acute coronary syndrome) N = Primary data set: 1,236 N = Secondary data set: 1,314 ≥18 years of age Primary data set: April 2004–March 2007 vs. March 2003–March 2004 Secondary data set: July 2003–March 2004 vs. April 2004–June 2007 Effective March 29, 2004 Cork and Kerry counties, Ireland 	<p>Pre: 13 Post: 36</p> <p>Pre: 9 Post: 39</p>	<ul style="list-style-type: none"> Unstable angina admissions and rate per 100,000; Poisson regression Linear time trend Sensitivity analyses were undertaken by gender, smoking status, and type of Acute coronary syndrome 	<ul style="list-style-type: none"> 0.89 (0.75–1.06)^{ac} Estimates derived from secondary data set 	<p>See description of law in entry for Ireland; the first year's reduction in admissions for Acute coronary syndrome was due to fewer cases among men and current smokers; the third year's reduction in admissions for Acute coronary syndrome was due to fewer cases among men, current smokers, and never smokers; increased effect on Acute coronary syndrome over time evidenced by 12% decrease in year 1 and 13% decrease in year 3; this paper supersedes an abstract of the same study used in the 2009 meta-analysis; according to mortality data, there was no change in all-cause mortality and an overall 6.5% decrease in deaths from circulatory causes in Cork and Kerry counties, and so results were not attributable to changes in coronary death patterns outside of hospital</p>
Kent et al. 2012	<ul style="list-style-type: none"> Unstable angina 20–70 years of age April 2004–March 2006 vs. April 2002–March 2004 Effective March 29, 2004 Ireland 	<p>Pre: 24 Post: 24</p>	<ul style="list-style-type: none"> Change in emergency hospital admissions for unstable angina Population, weather, pollution, and influenza Stratified by age and gender 	<ul style="list-style-type: none"> 0.77 (0.61–0.96)^a 	<p>March 2004 law applied to workplaces (including bars and restaurants); prior to this law, smoking had been outlawed in public buildings, hospitals, public pharmacies, schools, banking halls, cinemas, restaurant kitchens, part of all restaurants, public transport aircraft and buses, and some trains; significant reduction in emergency cardiopulmonary admissions in the 2 years following the smoking law (RR 0.87, 0.78–0.98)</p>

Table 8.8S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
CHD—workplace and restaurant laws					
Khuder et al. 2007	<ul style="list-style-type: none"> • CHD (ICD-9 410-414, 428) • ≥18 years of age • January 1999–February 2002 vs. March 2002–June 2005 • Effective March 2002 • Bowling Green, Ohio 	Pre: 38 Post: 40	<ul style="list-style-type: none"> • Age-standardized rates • ARIMA • Ordinance effect assumed to start in October 2002 • Comparison with control community of Kent, Ohio (not covered by law); no significant change in Kent 	<ul style="list-style-type: none"> • 12 months postlaw: 0.61 (0.55–0.67) • 40 months postlaw: 0.53 (0.45–0.59)* 	Smoking was prohibited in all public places within the city, except for bars and restaurants with bars, provided that the bar area was isolated within a separate smoking room; smoking was allowed in bars and bowling alleys at the discretion of the owners; 39% reduction in CHD in 12 months and 47% reduction in 40 months; projected that 17% of reduction may be due to decreased secondhand smoke exposure, while the remaining 21% is due to decreased smoking prevalence and cigarette consumption; no differences in admissions for unspecified nonsmoking related conditions

Table 8.8S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
SCD—workplace and restaurant laws					
Hurt et al. 2011	<ul style="list-style-type: none"> • SCD defined as out-of-hospital deaths assigned to CHD (ICD-9 410-414) • October 2007–March 2009 vs. July 2000–December 2001 • Effective January 1, 2002 (Ordinance 1: smokefree restaurants) • Effective October 1, 2007 (Ordinance 2: smokefree workplaces) • Olmsted County, Minnesota 	<p>Pre ordinance 1: 18</p> <p>Post ordinance 1: 18</p>	<ul style="list-style-type: none"> • Age and gender-adjusted rate per 100,000; adjusted HR 	<ul style="list-style-type: none"> • Ordinance 1 vs. no law, HR: 0.72 (0.58–0.89)* 	<p>Although the law was initiated in 2 steps (smokefree restaurants in January 2002 and smokefree workplaces in 2007), this study was included in the meta-analysis because authors compared the period before any law to the period after full implementation, thus capturing the true effect of the law; SCD rate per 100,000 dropped from 152.5 to 112.2 following the restaurant law (HR 0.72, 0.58–0.89; $p < 0.01$) and from 78.0 to 76.6 following the workplace law (HR 0.99, 0.76–1.28; $p = 0.91$); during this period, the prevalence of hypertension, diabetes, hypercholesterolemia, and obesity either remained constant or increased while the prevalence of smoking among the adults declined by 23%</p>

Table 8.8S Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
SCD—workplace, restaurant, and bar laws					
Hurt et al. 2011 ⁵³	<ul style="list-style-type: none"> • SCD defined as out-of-hospital deaths assigned to CHD (ICD-9 410-414) • October 2007–March 2009 vs. July 2000–December 2001 • Effective January 1, 2002 (Ordinance 1: smokefree restaurants) • Effective October 1, 2007 (Ordinance 2: smokefree workplaces) • Olmsted County, Minnesota 	<ul style="list-style-type: none"> • Pre-ordinance 2: 18 • Post-ordinance 2: 18; not included in length of follow-up analysis because the prelaw period did not immediately precede the postlaw phase 	<ul style="list-style-type: none"> • Age and sex-adjusted rate per 100,000; adjusted HR 	<ul style="list-style-type: none"> • Ordinance 2 vs. no law, hazard ratio: 0.72 (0.58–0.89)* 	<p>Although the law was initiated in 2 steps (smokefree restaurants in January 2002 and smokefree workplaces in 2007), this study was included in the meta-analysis because authors compared the period before any law to the period after full implementation, thus capturing the true effect of the law; SCD rate per 100,000 dropped from 152.5 to 112.2 following the restaurant law (HR 0.72, 0.58–0.89; $p < 0.01$) and from 78.0 to 76.6 following the workplace law (HR 0.99; 0.76–1.28; $p = 0.91$); during this period, the prevalence of hypertension, diabetes, hypercholesterolemia, and obesity either remained constant or increased while the prevalence of smoking among the adults declined by 23%</p>

Source: Tan and Gilantiz 2012.

Note: Observed risk is presented as a risk ratio unless otherwise specified. If number of events is N/A, then events were recorded as rates and absolute counts are not available. AMI = acute myocardial infarction; ARIMA = autoregressive integrated moving-average; CHD = coronary heart disease;

CI = confidence interval; HR = hazard ratio; ICD = International Classification of Diseases; RR = relative risk; SCD = sudden cardiac death.

^aRR and CI calculated using number of events before vs. after law.

^bRR and CI computed using Poisson regression with model described in paper for counties with no prior law.

^cRR and CI calculated using negative binomial regression with model including effect of law and seasonality (if applicable).

*Estimate used in meta-analysis.

Table 8.6S Detailed description of studies on smokefree laws and coronary events—Part A: Acute myocardial infarction (AMI)—workplace-only laws

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Dautzenberg 2008	<ul style="list-style-type: none"> • AMI • <65 years of age • Effective February 1, 2007; restaurants, bars, and casinos added January 1, 2008 • January 2006–February 15, 2008 • France 	Partial law: Pre: 13 Post: 12.5	<ul style="list-style-type: none"> • Rate per 100,000 admissions 	<ul style="list-style-type: none"> • Partial law: 0.99 (0.94–1.04)*^a 	Smoking ended in public places in February 2007, but restaurants, bars, and casinos were given exceptions until January 2008; law permits ventilated smoking rooms under strict conditions; between January 2007 (before law) and January 2008 (after law), secondhand smoke exposure dropped from 57% to 14%; PM _{2.5} levels also dropped; also reported substantial drops in respiratory symptoms among hospitality workers
Villalbí et al. 2009	<ul style="list-style-type: none"> • AMI (<i>ICD-9</i> 410.x1) • >24 years of age • N = 13,317 • January 2004–December 2005 vs. January 2006–December 2006 • Barcelona, Spain 	Pre: 24 Post: 12	<ul style="list-style-type: none"> • Comparison of age- and gender-specific annual hospitalization rates 	<ul style="list-style-type: none"> • Female: .88 (0.84–0.92)*^b • Male: .87 (0.84–0.90)*^b • Adjusted rates (per 100,000 population) for men were 185.6 (179.2–192.1) in 2004, 175.0 (168.9–181.2) in 2005, and 156.4 (150.6–162.1) in 2006 (postlaw) • Adjusted rates for women were 81.2 (77.1–85.3) in 2004, 75.6 (71.7–79.6) in 2005, and 69.0 (65.3–72.7) in 2006 (postlaw) 	Law in workplaces, but not cafés, bars, restaurants, night clubs, or discotheques; antismoking legislation also included law on advertising and reduction in sales outlets; in men, the decline in 2006 (-10.68%) was much greater than in 2005 (-5.69%); in women, it was only slightly greater in 2006 (-8.76% vs. -6.85%); this decline was apparent in all age groups except men <45 years of age

Table 8.6S Part A—Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Naiman et al. 2010	<ul style="list-style-type: none"> • AMI (<i>ICD-9</i> 410, <i>ICD-10</i> I21) • ≥45 years of age • Effective May 2006 • January 1996–May 2006 • Toronto, Canada 	Pre: 36 Postphase 1: 24	<ul style="list-style-type: none"> • ARIMA on crude rates of hospital admission • Subgroup analyses by age, gender • Comparison with Durham Region and Thunder Bay, 2 Ontario municipalities with no smokefree laws; no significant reductions were observed in control cities • Smokefree legislation occurred in 3 phases: smokefree public places and workplaces in October 1999; smokefree restaurants, dinner theaters, and bowling centers except designated smoking rooms in June 2001; smokefree bars, billiard halls, bingo halls, casinos, racetracks except designated smoking rooms in June 2004 	• Postphase 1 vs. prelaw: 1.03 (0.94–1.12)*	Legislation required all public places and workplaces to be smokefree and was implemented in 3 phases; the largest declines were seen after the phase of the law affecting restaurants came into effect, including a 17% (14%, 19%) decrease in AMI; crude rates of hospital admissions decreased 39% (38%, 40%) for cardiovascular conditions; no significant reductions were observed in number of hospital admissions attributable to control conditions (cholecystitis, appendicitis, bowel obstruction) in Toronto
Shetty et al. 2010	<ul style="list-style-type: none"> • AMI (<i>ICD-9</i> and <i>ICD-10</i>) • Nationwide inpatient sample: 673,631 • Multiple cause of death dataset: 2,018,548 • Medicare patients: 2,382,387 • United States 		<ul style="list-style-type: none"> • Region-level fixed effects multivariate linear regression model • Stratified by age • Regression model included hospital beds/person, county population, physicians/person, percent population in labor force, cigarette taxes • Compared trends in regions where smoking laws were implemented with control regions having no laws 	• Deaths in 18–64: 0.964 (0.904–1.025)*	Does not differentiate between weak and strong laws; assumes that county-level laws apply in cities and unincorporated places (varies by county), causing significant misclassification; no statistically significant reduction of hip fracture admissions (control condition); effective date varies; study uses American Nonsmokers' Rights Foundation smoking law database and national health outcomes datasets to analyze effect of smokefree laws in various places

Table 8.6S Part A—Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Villalbí et al. 2011	<ul style="list-style-type: none"> • AMI deaths (<i>ICD-10</i> CM 055) • 34+ years of age • N = 90,382 • Effective January 1, 2006 • January 2006–December 2007 vs. January 2004–December 2005 • Spain 	Pre: 24 Post: 24	<ul style="list-style-type: none"> • Comparison of age- and sex-specific mortality rates • Poisson regression to calculate annual RR 	<ul style="list-style-type: none"> • First postlaw year: 0.90 (0.88–0.92) <ul style="list-style-type: none"> – Female: 0.90 (0.87–0.92) – Male: 0.90 (0.88–0.93) • Second postlaw year: 0.86 (0.84–0.88)* <ul style="list-style-type: none"> – Female: 0.86 (0.84–0.89) – Male: 0.86 (0.83–0.88) • Significant reduction in the RRs of AMI death in both men and women; magnitude of reduction appeared greater among the elderly 	Law in workplaces, but not cafes, bars, restaurants, night clubs, or discotheques; antismoking legislation also included law on advertising and reduction in sales outlets; a population-based surveillance system showed that the percentage of employed workers reporting smokefree jobs rose from 54% to 91% after implementation

Table 8.6S Detailed description of studies on smokefree laws and coronary events—Part B: AMI—workplace and restaurant laws

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Seo and Torabi 2007	<ul style="list-style-type: none"> • AMI (<i>ICD-9</i> 410), confirmed with troponin or CPK excluding past cardiac procedures, no cardiac risk factors (e.g., hypertension or hypercholesterolemia) • N = 37 • August 2001–May 2003 vs. August 2003–May 2005 (same months selected to control for seasonality) • Effective August 1, 2003, bars added January 1, 2005 • Monroe County, Indiana 	Pre: 22 Post: 22	<ul style="list-style-type: none"> • Poisson test • Comparison with Delaware County, Indiana (no law); no significant decrease in admissions observed in Delaware County 	<ul style="list-style-type: none"> • 0.48 (0.24–0.96)* • Decrease of 12 (from 17 to 5 [-21.29, -2.81]) in admissions in the number of nonsmoking patients from prelaw to postlaw period 	Public smoking law in effect for all restaurants, retail stores, and workplaces since August 2003; bar provisions only in effect since January 2005 (last 5 months of study period); there was a 69% reduction in AMIs (16 vs. 5) among documented nonsmokers before and after the law; no significant change in number of smokers admitted; the study is limited by unrealistically stringent exclusionary criteria and small sample
Naiman et al. 2010	<ul style="list-style-type: none"> • AMI (<i>ICD-9</i> 410, <i>ICD-10</i> I21) • ≥45 years of age • January 1996–May 2006 • Effective May 2006 • Smokefree legislation occurred in 3 phases: smokefree public places and workplaces in October 1999, smokefree restaurants, dinner theaters, and bowling centers except designated smoking rooms in June 2001, smokefree bars, billiard halls, bingo halls, casinos, racetracks except designated smoking rooms in June 2004 • Toronto, Canada 	<ul style="list-style-type: none"> • Pre: 36 • Postphase 2: 36, not included in length of follow-up analysis because the prelaw period did not immediately precede the postlaw phase 	<ul style="list-style-type: none"> • ARIMA on crude rates of hospital admission • Subgroup analyses by age, gender • Comparison with Durham Region and Thunder Bay, 2 Ontario municipalities with no smokefree laws; no significant reductions were observed in control cities 	<ul style="list-style-type: none"> • Phase 2 vs. prelaw: 0.99 (0.92–1.07)* 	Legislation required all public places and workplaces to be smokefree and was implemented in 3 phases; the largest declines were seen after the phase of the law affecting restaurants came into effect, including a 17% (14%, 19%) decrease in AMI; crude rates of hospital admissions decreased 39% (38%, 40%) for cardiovascular conditions; no significant reductions were observed in number of hospital admissions attributable to control conditions (cholecystitis, appendicitis, bowel obstruction) in Toronto

Table 8.6S Part B—Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Hahn et al. 2011	<ul style="list-style-type: none"> • AMI (primary discharge diagnosis <i>ICD-9</i> 410) • ≥35 years of age • N = 2,692 • May 2004–December 2006 vs. January 2001–April 2004 • Effective April 27, 2004 • Lexington-Fayette County, Kentucky 	Pre: 40 Post: 32	<ul style="list-style-type: none"> • Age-adjusted rates for AMI hospitalizations; Poisson regression and first-order autoregressive time-series model • Age, gender, county-level smoking rate, secular trend, seasonal variation 	<ul style="list-style-type: none"> • Female: 0.77 (0.62–0.96)* • Male: 1.11 (0.91–1.36)* 	Smokefree enclosed public places law prohibited smoking in restaurants, bars, bowling alleys, bingo halls, convenience stores, laundry facilities, and other businesses open to the public; buildings not open to the public, including government office buildings or workplaces, were excluded; manufacturing facilities were also excluded; rates for men and women were relatively stable during the 32-month postlaw period; there was a dramatic improvement in air quality in hospitality venues and immediate reduction in hair nicotine among bar and restaurant workers following implementation of the law; within 3 months of implementation, there was a 56% decline in hair nicotine; among AMI hospitalizations, there was an overrepresentation of women in the hospitality industry and a disproportionate number of men working in manufacturing facilities and government worksites not mandated by law; AMI prevalence and hospitalization rate for CVD showed a steady upward trend from 2001–2006 in Kentucky

Table 8.6S Part B—Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Hurt et al. 2011	<ul style="list-style-type: none"> • AMI validated using biomarkers, cardiac pain, and Minnesota coding of the EKG • October 2007–March 2009 vs. July 2000–December 2001 • Effective January 1, 2002 (Ordinance 1: smokefree restaurants) • Effective October 1, 2007 (Ordinance 2: smokefree workplaces) • Olmsted County, Minnesota 	Preordinance 1: 18 Postordinance 1: 18	<ul style="list-style-type: none"> • Age and gender-adjusted rate per 100,000; adjusted HR 	<ul style="list-style-type: none"> • Ordinance 1 vs. no law: 0.90 (0.73–1.10)* 	Law was initiated in 2 steps, smokefree restaurants in January 2002, and smokefree workplaces in 2007; AMI rate per 100,000 dropped from 212.3 to 168.7 following the restaurant law (HR = 0.90; 0.73, 1.10; p = 0.30) and from 130.0 to 102.9 following the workplace law (HR = 0.79; 0.63, 0.98; p = 0.04); during this period, the prevalence of hypertension, diabetes, hypercholesterolemia, and obesity either remained constant or increased while the prevalence of smoking among the adults declined by 23%
Sargent et al. 2012	<ul style="list-style-type: none"> • Acute myocardial infarction (<i>ICD-10</i> I21.0–I21.9) excluding recurrent AMI within 28 days of the initial event • ≥30 years of age • N = 39,224 • January 2004–December 2008 • Nationwide: September 1, 2007 • Statewide: varies • Germany 	Pre: varies Post: 1	<ul style="list-style-type: none"> • Rate of hospitalization for AMI; logistic regression and interrupted time series linear regression model • Confounders: age, gender, occupation 	<ul style="list-style-type: none"> • 0.914 (0.878–0.950)* • In the first year after implementation, 449 AMI hospitalizations were prevented 	Legislation addressed smoking in federal buildings and the transportation system; private employers were allowed to introduce a total or partial smoking law in workplaces; states were permitted to decide how to limit smoking in the hospitality sector (hotels, restaurants, bars); nonsignificant trend toward decreasing rate of admissions after law; hospitality smoking laws were passed in all states and implemented between August 1, 2007 and July 1, 2008; most states continued to allow smoking in small bars without any food delivery and in separate rooms in large restaurants; a population-based survey revealed a significant decrease of cigarettes smoked in Germany after the law; hospital admissions for control condition fractures increased slightly from 65,100 in 2007 to 66,954 in 2009; bronchitis cases, which might be affected by smokefree laws, declined from 16,900 in 2007 to 15,391 in 2009; hospitalization costs for AMI decreased significantly by 20.1% (16.0–24.2%), or about €5.2 million

Table 8.6S Detailed description of studies on smokefree laws and coronary events—Part C: AMI—workplace, restaurant, and bar laws

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Sargent et al. 2004	<ul style="list-style-type: none"> • AMI (primary and secondary diagnoses of <i>ICD-9</i> 410, some validated with troponin or CPK) • N = 304 • December 1997–November 2003 • Effective June 5, 2002–December 3, 2002 • Helena, Montana 	Pre: same 6 months for 4 pre-years and 1 year after law suspended Post: 6	<ul style="list-style-type: none"> • Number of admissions during 6-month period the law was in effect compared with the average for the same 6 months in other years by Poisson test • Comparison with number of admissions from surrounding area (not covered by law). No significant change in control area outside Helena 	<ul style="list-style-type: none"> • 0.60 (0.36–0.99)*^c • Drop in number of admissions of -16 (-31.7, -0.03) from 40 cases to 24 	Law prohibited smoking in public and in workplaces but was suspended by a court order after 6 months; analysis did not consider fact that admissions were increasing with time, which biases comparison toward null
Barone-Adesi et al. 2006	<ul style="list-style-type: none"> • AMI (primary discharge diagnosis <i>ICD-9</i> 410) and hospital deaths due to AMI • N = 17,153 • Compared October–December 2004 (before law) and February–June 2005 (after law) with same periods 1 year earlier • Effective January 10, 2005 • Piedmont, Italy 	Pre: 3 Post: 6	<ul style="list-style-type: none"> • Age-standardized rates (using European standardized population) 	<ul style="list-style-type: none"> • (0.97–1.06) • <60 years: 0.89 (0.81–0.98)* <ul style="list-style-type: none"> – Female: 0.75 (0.58–0.96) – Male: 0.91 (0.82–1.01) • ≥60 years: 1.05 (1.00–1.11) <ul style="list-style-type: none"> – Female: 1.05 (0.97–1.14) – Male: 1.03 (0.96–1.11) 	See entry for Italy (4 regions); no changes from 1 year before for prelaw period; change compared with 1 year earlier for postlaw period; estimated that 1% out of the 11% reduction in AMI is attributable to reduced smoking among smokers rather than passive smoking
Heinz et al. 2007	<ul style="list-style-type: none"> • AMI (primary diagnosis using <i>ICD-9</i> classification) • N = 1,197 • July 1, 2004–June 30, 2005 vs. July 1, 2002–June 30, 2004 • Effective July 1, 2004 • Boise, Idaho 	Pre: 24 Post: 12	<ul style="list-style-type: none"> • Poisson test • Weather, outdoor air quality, time 	<ul style="list-style-type: none"> • All patients: 0.82 (0.66–1.01)*^d • Nonsmokers: 0.68 (0.53–0.87)^d • Significant 32% decrease in MI rate among nonsmokers (p = 0.002) and nonsignificant 18% decrease in MI rate among all patients (p = 0.068) 	Law on smoking in public buildings, including restaurants; control condition (urinary tract infection) demonstrated nonsignificant increase during study period

Table 8.6S Part C—Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Juster et al. 2007	<ul style="list-style-type: none"> • AMI (primary diagnosis code <i>ICD-9</i> 410) • N = 462,396 • ≥35 years of age • January 1995–December 2004 • Effective July 24, 2003 • New York state 	Pre: 99 Post: 21	<ul style="list-style-type: none"> • Multiple regression time series • Age-adjusted (New York population in 2000) • Existence of strong local ordinance, time (linear secular trend), seasonality, county • Analyzed comprehensive laws (smoking prohibited in restaurants, bars, and other hospitality venues) vs. moderate laws (smoking permitting in hospitality venues) 	<ul style="list-style-type: none"> • In absence of preexisting local laws: 0.8004 (0.7985–0.8023)*^f • In 2004, there were 3,813 fewer hospital admissions for AMI than expected in the absence of the comprehensive smoking law 	July 2003 law prohibited smoking in all workplaces, including restaurants and bars; limited statewide restrictions since 1989 limited smoking in many public places, including schools, hospitals, public buildings, and retail stores; local laws varied by county; by 2002, 75% of New Yorkers were subject to strong local laws as well as limited restrictions at the state level implemented in 1989; authors performed analysis to compare effects assuming hypothetical case of no preexisting local laws; no sudden change with law; rate of decline in AMI admissions increased significantly over moderate or no local laws; enactment of a moderate smoking restriction in a county would reduce monthly trend rate in AMI hospital admissions by 0.15 per 100,000/month in that county, and a statewide comprehensive smoking law would reduce AMI hospitalizations by 0.32 per 100,000/ month in all counties; after implementation of the state law, exposure to secondhand smoke declined by nearly 50%; saliva cotinine dropped from 0.078 to 0.041 ng/mL; direct health care cost savings of \$56 million in 2004
Dautzenberg 2008	<ul style="list-style-type: none"> • AMI • <65 years of age • January 2006–February 15, 2008 • Effective February 1, 2007; restaurants, bars, and casinos added January 1, 2008 • France 	Complete law: Pre: 24 Post: 1.5; not included in length of follow-up analysis because the prelaw period did not immediately precede the postlaw phase	<ul style="list-style-type: none"> • Rate per 100,000 admissions 	<ul style="list-style-type: none"> • Complete law: 0.84 (0.77–0.92)*^a 	Smoking ended in public places in February 2007, but restaurants, bars, and casinos were given exceptions until January 2008; law permits ventilated smoking rooms under strict conditions; between January 2007 (before law) and January 2008 (after law), secondhand smoke exposure dropped from 57% to 14%; PM _{2.5} levels also dropped; also report substantial drops in respiratory symptoms among hospitality workers

Table 8.6S Part C—Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Lemstra et al. 2008	<ul style="list-style-type: none"> • AMI (<i>ICD-10</i>) • N = 1,689 • July 2004–June 2005 vs. July 2000–June 2004 • Effective July 1, 2004 • Saskatoon, Canada 	Pre: 48 Post: 12	<ul style="list-style-type: none"> • Incidence ratio and CI postlaw compared with prelaw • Age-standardized AMI incidence rate • Stratification was used to test for confounding by age, gender, and previous MI in the unadjusted rates, which were then directly age-standardized to the 2001 Canadian population 	<ul style="list-style-type: none"> • Age-adjusted: 0.87 (0.84–0.90)* • Age-standardized incidence rate fell from 176.1 (165.3–186.8) cases per 100,000 to 152.4 (135.3–169.3) cases per 100,000 	Citywide smoking law prohibited smoking or holding lighted tobacco products in any enclosed public area that is open to the public or to which the public is customarily admitted or invited; also applied to outdoor seating areas for restaurants and licensed premises; a previous bylaw prohibited smoking in enclosed government buildings only; 914 of 924 eligible business establishments were inspected by a public health inspector within the first 6 months of the law; only 13 required an initial warning for noncompliance; reinspection required the issuing of only 1 citation during the first year of the law; smoking prevalence in Saskatoon fell from 24.1% in 2003 (95% CI, 20.4–27.7%) to 18.2% in 2005 (15.7–20.9%); smoking in the rest of Saskatchewan Province (which includes Saskatoon) remained stable from 2003 to 2005 at 23.8% (22.6–25.3); 1 year after implementation (July 2005), 79% responded that the “smoking law was a good idea”

Table 8.6S Part C—Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Vasselli et al. 2008	<ul style="list-style-type: none"> • AMI (primary discharge diagnosis <i>ICD-9</i> 410) • N = 7,305 • 40–64 years of age • January 10–March 10, 2005 (after law) vs. January–March 2001–2004 (before law) • Effective January 10, 2005 • Italy (4 regions) 	Pre: 12 (over 4 years) Post: 2	<ul style="list-style-type: none"> • Age-standardized rates (using European standard population) • Comparison of observed rate after law with expected value based on linear secular trend for same months during the 4 years before the law went into effect • Age, gender, region 	<ul style="list-style-type: none"> • 0.86 (0.83–0.92)* <ul style="list-style-type: none"> – Female: 0.98 (0.87–1.11) – Male: 0.85 (0.81–0.91) • 40–44: 0.98 (0.82–1.19) • 45–49: 0.77 (0.68–0.89) • 50–54: 0.74 (0.67–0.85) • 55–59: 0.92 (0.84–1.02) • 60–64: 0.99 (0.88–1.06) 	National law prohibited smoking in all indoor public places, including cafes, bars, restaurants, and discotheques; effect largest among young men and people 45–54 years of age; some regional variation; small decreases in smoking prevalence (30.0 to 29.3% in men and 22.5% to 22.1% in women) and consumption (16.7 to 16.3 cigarettes/day for men and 13.7 to 12.4 cigarettes/day for women) led to 7.6% decline in cigarette consumption; fewer than 100 violations in 6,000 checks by police; 90–95% reduction in air nicotine in pubs and discos; 8.9% decline in cigarette sales in 2005
CDC 2009b	<ul style="list-style-type: none"> • AMI (primary diagnosis code <i>ICD-9</i> 410) • N = 4,954 • January 2005–June 2006 (“Phase II”) vs. July 2003–December 2004 (“Phase I”) vs. January 2002–June 2003 (prelaw) • Effective July 1, 2003 • Pueblo, Colorado 	Pre: 18 Post: 36	<ul style="list-style-type: none"> • Comparison of rate ratios with χ^2 test • Comparison with people living in surrounding Pueblo County (not covered by ordinance) and with nearby El Paso County (which did not have an ordinance); no significant change in surrounding area (1.03; 0.68–1.39) or El Paso County (0.95; 0.87–1.03) 	<ul style="list-style-type: none"> • Phase II vs. prelaw: 0.59 (0.49–0.70)* <ul style="list-style-type: none"> – Female: 0.48 (0.36–0.60) – Male: 0.67 (0.52–0.82) • Phase II vs. Phase I: 0.81 (0.67–0.96) 	Municipal ordinance ended smoking in enclosed workplaces, including restaurants and bars; assuming all fatal AMIs reached hospital reduced the risk estimate to 0.66 (0.55–0.77) from prelaw to Phase II; rate of AMI hospitalizations decreased from 257 per 100,000 person-years before law to 187 in Phase I and 152 in Phase II

Table 8.6S Part C—Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Barnett et al. 2009	<ul style="list-style-type: none"> • AMI (principal diagnosis code CD-10 I21.0-I22.9), excluding repeat admissions • N = 3,079 • ≥30 years of age • February 2005–December 2006 vs. February 2003–December 2004 (bimonthly intervals) • Effective December 2004 • Christchurch, New Zealand 	Pre: 24 Post: 24	<ul style="list-style-type: none"> • Poisson regression • Gender, age, smoking status, neighborhood social deprivation 	<ul style="list-style-type: none"> • 0.92 (0.86–0.99) <ul style="list-style-type: none"> – Female: 0.94 (0.84–1.05) – Male: 0.90 (0.82–0.99) • 30–55: 1.15 (0.94–1.40)* • 55–74: 0.86 (0.77–0.97)* • ≥75: 0.89 (0.81–0.98) 	2004 law covered all workplaces, including bars and restaurants; earlier restrictions in 1990 prohibited smoking in most workplaces, public interiors (i.e. shops), and one-half of seating in restaurants; higher rates of AMI reduction observed in affluent neighborhoods
Gasparrini et al. 2009	<ul style="list-style-type: none"> • AMI as principal discharge diagnosis (<i>ICD-9</i> 410) or principal death diagnosis (<i>ICD-9</i> 410-414) • N = 13,456 • 30–64 years of age • January 2000–December 2004 vs. January 2005–December 2005 • Effective January 10, 2005 • Tuscany, Italy 	Pre: 48 Post: 12	<ul style="list-style-type: none"> • Age-standardized rates of annual AMI episodes using European population as reference; Poisson regression analysis of the time series • Age, gender, seasonality, and long-term trend 	<ul style="list-style-type: none"> • Linear trend model: 0.95 (0.89–1.00)* <ul style="list-style-type: none"> – Female: 0.94 (0.82–1.09) – Male: 0.95 (0.89–1.01) • Nonlinear trend model: 1.01 (0.93–1.10) <ul style="list-style-type: none"> – Female: 1.05 (0.87–1.27) – Male: 1.01 (0.92–1.10) 	See entry for Italy (4 regions)

Table 8.6S Part C—Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Dove et al. 2010	<ul style="list-style-type: none"> • Death due to AMI (<i>ICD-10 I21</i>) • N = 26,982 • ≥35 years of age • July 2004–December 2006 vs. January 1999–June 2004 • Effective July 5, 2004 • Massachusetts 	Pre: 66 Post: 30	<ul style="list-style-type: none"> • Daily number of deaths from AMI by city or town; Poisson regression • Long-term trend, season, air particulate matter, influenza, city/town-specific demographic data, prior local smoking law, gender, age • Separate analyses for cities and towns with prior comprehensive local laws vs. those without such prior laws 	<ul style="list-style-type: none"> • No prior local law: 0.90 (0.86–0.95)* • With prior local law: 1.01 (0.92–1.11) • Effect of local law: 0.95 (0.86–1.05) • Overall: 0.93 (0.89–0.97) <ul style="list-style-type: none"> – Female: 0.90 (0.85–0.96) – Male: 0.95 (0.89–1.01) – 35–64: 0.92 (0.82–1.04) – 65–74: 0.99 (0.89–1.11) – ≥75: 0.91 (0.86–0.96) 	State law prohibited smoking in all workplaces, including restaurants and bars; prior to the statewide smoking law, about 25% of the Massachusetts population was covered by a local law; in cities and towns without prior local laws, there was a significant 9.2% decrease in AMI mortality; estimated 270 fewer AMI deaths per year associated with the state law; for cities and towns with no prior local laws, AMI mortality rates decreased by 1.6% (-4.0%, 7.0%) in the first 12 months and 18.6% (13.6%, 23.3%) thereafter
McMillen et al. 2010	<ul style="list-style-type: none"> • AMI (primary diagnosis <i>ICD-9 410</i>) • N = 1,754 • January 1, 2007–June 30, 2009 vs. April 21, 2005–December 31, 2006 • Effective January 1, 2007 • Hattiesburg, Mississippi 	Pre: 20 Post: 30	<ul style="list-style-type: none"> • AMI admissions/day compared with standardized rate prior to implementation • Compared the number of heart attack admissions among people living outside of city limits and not protected by smokefree ordinance; a 3.8% reduction was observed in the Hattiesburg-adjacent control region compared to a 13.4% reduction in Hattiesburg 	<ul style="list-style-type: none"> • 0.87 (0.74–1.01)*^c • There were 299 heart attack admissions compared to a standardized rate of 345 admissions before law 	Smoking law in enclosed workplaces, including restaurants and bars; reductions in AMI admissions resulted in cost savings of \$2,367,909 in 2010 dollars

Table 8.6S Part C—Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
McMillen et al. 2010	<ul style="list-style-type: none"> • AMI (primary diagnosis ICD-9 410) • N = 100 • May 20, 2006–April 7, 2009 vs. July 29, 2004–May 19, 2006 • Effective May 20, 2006 • Starkville, Mississippi 	Pre: 22 Post: 35	<ul style="list-style-type: none"> • AMI admissions/day compared to standardized rate prior to implementation • Compared the number of heart attack admissions among people living outside of city limits and not protected by smokefree ordinance; a 14.8% reduction was observed in the Starkville-adjacent control region compared to a 27.7% reduction in Starkville 	<ul style="list-style-type: none"> • 0.72 (0.48–1.10)*^c • There were 38 heart attack admissions compared to a standardized rate of 52.57 admissions before law 	Smoking law in indoor public places, including restaurants and bars; reductions in AMI admissions resulted in cost savings of \$288,270 in 2010 dollars
Moraros et al. 2010	<ul style="list-style-type: none"> • AMI (primary discharge diagnosis ICD-9 410) • ≥18 years of age • N = 10,210 • January 2003–December 2004 vs. January 1999–September 2002 • Effective November 1, 2002 • Delaware 	Pre: 45 Post: 24	<ul style="list-style-type: none"> • Quarterly rates of events; Poisson regression • Seasonal effects • Compared with non-Delaware residents admitted in Delaware for AMI; AMI RR in non-Delaware residents was similar preordinance and postordinance period (0.98; 0.90, 1.08) 	<ul style="list-style-type: none"> • 0.91 (0.87, 0.95)* • Estimated 169 AMI cases prevented in 2 year post-ordinance period 	<i>Delaware Clean Indoor Air Act of 1994 became comprehensive in 2002 with an amendment to include all enclosed indoor areas accessible to the general public, including restaurants, bars, and casinos; a model including ordinance, season, and linear trend using preordinance and postordinance data showed that the linear trend is not significant (p = 0.557); Delaware Department of Public Health reported 99.6% compliance in bars and restaurants, and the Delaware Department of Labor reported 100% compliance in other workplaces in first year</i>

Table 8.6S Part C—Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Naiman et al. 2010	<ul style="list-style-type: none"> • AMI (<i>ICD-9</i> 410, <i>ICD-10</i> I21) • ≥45 years of age • January 1996–May 2006 • Effective May 2006 • Toronto, Canada 	Pre: 36 Post phase 3: 36; not included in length of follow-up analysis because the prelaw period did not immediately precede the postlaw phase	<ul style="list-style-type: none"> • ARIMA on crude rates of hospital admission • Subgroup analyses by age, gender • Comparison with Durham Region and Thunder Bay, 2 Ontario municipalities with no smokefree laws; no significant reductions were observed in control cities 	<ul style="list-style-type: none"> • Phase 3 vs. pre: 0.81 (0.75–0.88)*^c 	Legislation required all public places and workplaces to be smokefree and was implemented in 3 phases; the largest declines were seen after the phase of the law affecting restaurants came into effect, including a 17% (14%, 19%) decrease in AMI; crude rates of hospital admissions decreased 39% (38%, 40%) for cardiovascular conditions; no significant reductions were observed in number of hospital admissions attributable to control conditions (cholecystitis, appendicitis, bowel obstruction) in Toronto; smokefree legislation occurred in 3 phases: smokefree public places and workplaces in October 1999; smokefree restaurants, dinner theaters, and bowling centers except designated smoking rooms in June 2001; smokefree bars, billiard halls, bingo halls, casinos, racetracks except designated smoking rooms in June 2004
Sims et al. 2010	<ul style="list-style-type: none"> • AMI (primary diagnosis code <i>ICD-10</i> I21) excluding repeat admissions within 28 days • ≥18 years of age • N = 342,361 • July 2007–September 2008 vs. July 2002–May 2007 • Effective July 1, 2007 • England 	Pre: 60 Post: 15	<ul style="list-style-type: none"> • Interrupted time series design with hospital episode statistics data; segmented Poisson regression • Long-term trend, temporal fluctuations (temperature, week of year, holidays), population size • Stratified by age and gender 	<ul style="list-style-type: none"> • 0.98 (0.96–0.99)* • <60 years: <ul style="list-style-type: none"> – Female: 0.98 (0.92–1.03) – Male: 0.97 (0.94–0.99) • ≥60 years: <ul style="list-style-type: none"> – Female: 0.96 (0.94–0.99) – Male: 0.96 (0.95–0.99) • About 1,600 emergency admissions for AMI prevented in 12 months 	Law affected bars and restaurants most; some of these venues went smokefree before July 1 in preparation for the law, which may create a less marked decrease; no evidence of a change in the slope of the AMI trend line after the legislation; prior to the law, many public places and workplaces were already smokefree; in the year before implementation, 55% of employed adults already worked in smokefree environments; subgroup analysis shows significant 3.07% drop in admissions in 60+ group (p = 0.001) and 3.46% drop in men <60 (p <0.01)

Table 8.6S Part C—Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Barone-Adesi et al. 2011	<ul style="list-style-type: none"> • AMI (<i>ICD-9</i> 410) • Primary analysis was for ACEs (AMI and other acute and subacute IHD) • N = 936,519 (all ACEs) • January 2005–November 2006 vs. January 2002–December 2004 • Effective January 10, 2005 • Italy (20 regions) 	Pre: 36 Post: 24	<ul style="list-style-type: none"> • Admission rates; Poisson test with mixed effect regression models with fixed coefficients describing the national trend and random coefficients describing region-specific deviations • Seasonality, long term trends • Separate analyses conducted based on age, gender 	<ul style="list-style-type: none"> • <70 years: 0.97 (0.95–0.99)* <ul style="list-style-type: none"> – Female: 0.98 (0.94–1.02) – Male: 0.97 (0.95–0.99) • ≥70 years: 1.01 (0.99–1.04) <ul style="list-style-type: none"> – Female: 1.02 (0.99–1.04) – Male: 1.00 (0.98–1.03) 	See entry for Italy (4 regions); the observed reduction was stable over the study period, similar in different geographic areas, and stronger among young people; no evidence of a gradual effect over time, as there was no change in the underlying trend in admissions for ACEs after law
Bonetti et al. 2011b	<ul style="list-style-type: none"> • AMI (defined as detectable troponin in a clinical setting consistent w/ myocardial ischemia, identified by <i>ICD-10</i> codes) undergoing coronary angiography (may be viewed as representative of overall incidence in the region) • N = 842 • March 2006–February 2008 vs. March 1, 2008 • Effective March 2008–February 2010 • Graubünden, Switzerland 	Pre: 24 Post: 24	<ul style="list-style-type: none"> • AMI incidence • Air quality (PM₁₀ and NO₂), sales of lipid lowering drugs • Separate analyses based on resident status, gender, smoking status, medical history • Compared with Lucerne, a nearby region without smokefree law; AMI incidence increased in Lucerne during the postlaw period in Graubünden 	<ul style="list-style-type: none"> • 0.79 (0.69–0.90)*^a • The number of AMI patients decreased 21% in the 2 years before vs. 2 years after law • For each of the 4 years of the study, incidence rate of AMI was 89.4 (pre), 93.8 (pre), 69.8 (1 year post), and 68.8 (2 years post) per 100,000 residents 	Smoking law in public places, including cafes, bars, and restaurants; based on the large number of visitors, the population of the Canton of Graubünden may almost double during the holiday season, hence the resident vs. nonresident analysis; the most pronounced reduction in AMI was in patients with documented coronary artery disease; female AMI patients showed a more pronounced drop in the second year of the law compared to the first, while male patients experienced a diminished magnitude of decrease; changes in outdoor air pollution or use of lipid-lowering drugs (potential confounders) did not substantially contribute to the decrease in the incidence of AMI

Table 8.6S Part C—Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Bruckman and Bennett 2011	<ul style="list-style-type: none"> • AMI (principal discharge diagnosis <i>ICD-9</i> 410) • January 2005–April 2007 vs. May 2007–December 2009 • Effective May 2007 • Ohio 	Pre: 28 Post: 32	<ul style="list-style-type: none"> • Age- and gender-adjusted discharge rate per 1,000 (converted to per 100,000); mixed linear models with a varying covariance structure to determine if rates decreased yearly; spline polynomial functions to determine inflection point in monthly rate data • Age, gender, linear trend, seasonality 	<ul style="list-style-type: none"> • 0.96 (0.95–0.98)*^a • AMI discharge rates dropped from 198 per 100,000 in 2005 to 168 per 100,000 in 2009 	Law prohibits smoking in a public place or a place of employment; inflection point identified as June 2007, 1 month after implementation; average decrease in MI discharge of 7 per 100,000 each year from 2005 to 2009; conservative estimate of \$737,782 in hospital stay costs in first year after law (estimate does not account for physician fees); direct system savings of \$1.1 million from 69 cases prevented by smoking law
Bruintjes et al. 2011	<ul style="list-style-type: none"> • AMI (primary diagnosis <i>ICD-9</i> 410) and biomarker confirmation (troponin I or CKMB) • N = 706 • January 2004–June 2006 vs. July 2002–November 2003 • Effective December 2003 • Greeley, Colorado 	Pre: 17 Post: 30	<ul style="list-style-type: none"> • Population-adjusted monthly hospitalization rates; Poisson regression • Seasonality (nonsignificant), linear trends (nonsignificant), smoking status, type of MI • Compared with adjacent area immediately surrounding Greeley; a smaller, nonsignificant decrease was noted in the area immediately surrounding Greeley (0.83; 0.61, 1.14); comparison of RR reductions between Greeley and the control area was not significant (p = 0.48) 	<ul style="list-style-type: none"> • 0.73 (0.59–0.90)* 	Law prohibits smoking in all places of public assembly, including restaurants, bars, bowling alleys, bingo halls, and outdoor public gathering places where seating is provided; smoking law underwent various legal challenges through November 2004, during which compliance was variable; significant reductions in AMI among smokers (0.44; 0.29, 0.65); nonsignificant reduction among nonsmokers (0.86; 0.67, 1.09); smokers from control area also experienced a significant decrease (0.58; 0.35, 0.97) that was not significantly different from Greeley smokers (p = 0.38); reduction in events was similar in patients with STEMI (0.79; 0.34, 1.83) and NSTEMI (0.66; 0.37, 1.17); linear trends were tested and not significant
Di Valentino et al. 2011	<ul style="list-style-type: none"> • ST-elevation myocardial infarction (<i>ICD-10</i>) • N = 1,272 • 2007–2008 vs. 2004–2006 • Effective April 2007 • Canton Ticino, Switzerland 	Pre: 36 Post: 24	<ul style="list-style-type: none"> • Comparison of annual frequency of hospitalizations due to STEMI 	<ul style="list-style-type: none"> • 0.79 (0.70–0.88)*^b • 22.4% (p <.0001) and 20.6% (P <.0002) reduction in hospitalizations during first and second postlaw years, respectively 	Smokefree public places, including restaurants, bars, and discos; smoking rooms permitted; this study population overlaps with that of another study also conducted in Ticino examining rates of STEMI (a subset of Acute coronary syndrome) following the law

Table 8.6S Part C—Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Herman et al. 2011	<ul style="list-style-type: none"> • AMI (primary diagnosis ICD-9 410.x0) • N = 5,025 (counties without previous laws) • May 2007–May 2008 vs. January 2004–April 2007 • Effective May 1, 2007 • Arizona 	Pre: 40 Post: 13	<ul style="list-style-type: none"> • Rate of admissions per 100,000 annually • Poisson regression • Seasonality, population, annual linear trend • Separate analyses for counties with preexisting smokefree laws vs. those without such laws 	<ul style="list-style-type: none"> • 0.84 (0.60–0.93)*^e • Estimated 159 fewer cases of hospital admissions (-13%) for AMI than expected for counties with no preexisting law 	Law ended smoking in all enclosed workplaces, including bars and restaurants; cost-savings analysis estimates \$16.8 million for AMI, unstable angina, acute stroke, and acute asthma in 13 months after law in non-law counties (\$7.2 million savings for AMI alone); no change in rates of control diseases (acute appendicitis, kidney stones, acute cholecystitis, and ulcers) pre- and postlaw
Hurt et al. 2011	<ul style="list-style-type: none"> • AMI validated using biomarkers, cardiac pain, and Minnesota coding of the ECG • October 2007–March 2009 vs. July 2000–December 2001 • Effective January 1, 2002 (Ordinance 1: smokefree restaurants) • Effective October 1, 2007 (Ordinance 2: smokefree workplaces) • Olmsted County, Minnesota 	Preordinance 2: 18 Postordinance 2: 18; not included in length of follow-up analysis because the prelaw period did not immediately precede the postlaw phase	<ul style="list-style-type: none"> • Age and gender-adjusted rate per 100,000; adjusted HR 	<ul style="list-style-type: none"> • Ordinance 2 vs. no law: 0.55 (0.44–0.68)* 	Although the law was initiated in 2 steps (smokefree restaurants in January 2002 and smokefree workplaces in 2007), this study was included in the meta-analysis because authors compared the period before any law to the period after full implementation, thus capturing the true effect of the law; AMI rate per 100,000 dropped from 212.3 to 168.7 following the restaurant law (HR 0.90; 0.73, 1.10; p = 0.30) and from 130.0 to 102.9 following the workplace law (0.79; 0.63, 0.98; p = 0.04); during this period, the prevalence of hypertension, diabetes, hypercholesterolemia, and obesity either remained constant or increased while the prevalence of smoking among the adults declined by 23%
North Carolina Tobacco Prevention and Control Branch 2011	<ul style="list-style-type: none"> • AMI (diagnosis code ICD-9 410.x1 to 410.x0) • N = 24,848 • ≥18 years of age • January 2010–December 2010 vs. January 2008–December 2009 • Effective January 1, 2010 • North Carolina 	Pre: 24 Post: 12	<ul style="list-style-type: none"> • Rate of emergency visits for AMI; Poisson regression • Age, gender, Christmas holidays, time, average weekly temperature, log-transformed weekly flu rates, week of year 	<ul style="list-style-type: none"> • 0.79 (0.75–0.83)* 	Law prohibits smoking in bars, restaurants, government buildings, and vehicles; projected cost savings \$3.3–4.8 million from AMIs prevented

Table 8.6S Part C—Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Cronin et al. 2012	<ul style="list-style-type: none"> • AMI, diagnosed in hospital by physician using troponin T or I, allowing repeat admissions • Primary data set: N = 3,041 • Secondary data set: N = 3,195 • ≥18 years of age • Primary data set: April 2004–March 2007 vs. March 2003–March 2004 • Secondary data set: July 2003–March 2004 vs. April 2004–June 2007 • Effective March 29, 2004 • Cork and Kerry Counties, Ireland 	Primary: Pre: 13 Post: 36 Secondary: Pre: 9 Post: 39	<ul style="list-style-type: none"> • AMI admissions and rate per 100,000; Poisson regression • Linear time trend • Sensitivity analyses were undertaken by gender, smoking status, and type of Acute coronary syndrome • According to mortality data, there was no change in all cause mortality and overall 6.5% decrease in deaths from circulatory causes in Cork and Kerry counties, and so results were not attributable to changes in coronary death patterns outside of hospital 	<ul style="list-style-type: none"> • All AMI: 0.84 (0.76–0.91)^{*b} • NSTEMI: 0.80 (0.71–0.90)^b • STEMI: 0.92 (0.78–1.07)^a • Estimates derived from secondary data set 	Primary analysis was for overall Acute coronary syndrome; see description of law in entry for Ireland; the first year's reduction in admissions for Acute coronary syndrome was due to fewer cases among men and current smokers; the third year's reduction in admissions for Acute coronary syndrome was due to fewer cases among men, current smokers, and never smokers; increased effect on Acute coronary syndrome over time evidenced by 12% decrease in year 1 and 13% decrease in year 3; this paper supersedes an abstract of the same study used in the 2009 meta-analysis
Kent et al. 2012	<ul style="list-style-type: none"> • AMI • 20–70 years of age • April 2004–March 2006 vs. April 2002–March 2004 • Effective March 29, 2004 • Ireland 	Pre: 24 Post: 24	<ul style="list-style-type: none"> • Change in emergency hospital admissions for AMI • Population, weather, pollution, and influenza • Stratified by age and gender 	<ul style="list-style-type: none"> • 0.89 (0.70–1.13)[*] 	March 2004 law applied to workplaces (including bars and restaurants); prior to this law, smoking had been outlawed in public buildings, hospitals, public pharmacies, schools, banking halls, cinemas, restaurant kitchens, part of all restaurants, public transport aircraft and buses, and some trains; significant reduction in emergency cardiopulmonary admissions in the 2 years following the smoking law (RR: 0.87; 0.78–0.98)

Table 8.6S Part C—Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Sebrié et al. 2013	<ul style="list-style-type: none"> • AMI (primary diagnosis code <i>ICD-10</i> I21.0-I21.9); noncountry residents and patients with AMI after a coronary angioplasty or bypass, or as a complication of another disease (secondary diagnosis) were excluded • N = 7,949 • March 2006–February 2008 vs. March 2004–February 2006 • Effective March 2006 • Uruguay 	Pre: 24 Post: 24	<ul style="list-style-type: none"> • Number of AMI hospitalizations per month; multiple linear regression and negative binomial regression • Seasonal variation, population changes, time trend • Stratified by public vs. private hospital, gender, age 	<ul style="list-style-type: none"> • 0.81 (0.72–0.89)* • 2 years after the smokefree policy adoption in enclosed public places and workplaces, hospital admissions for AMI were reduced by 22% • Reductions in monthly AMI admissions between 15% and 22% were observed for private hospitals, men, women, and people 40–65 years of age and over 65; there was a nonsignificant trend toward fewer monthly AMIs in people under 40 	Law prohibited smoking in all indoor public places and workplaces including restaurants and bars; no evidence that overall effect grew or fell over time following the law; in public hospitals only, AMI trend increased before the law and decreased after the law; study covered 37 hospitals, capturing 79% of the Uruguay population; air particulate matter (PM _{2.5}) decreased dramatically (210 to 18 µm/m ³) and adults reported decreased exposure to secondhand smoke 1 year after implementation, suggesting a high level of compliance

Table 8.6S Detailed description of studies on smokefree laws and coronary events—Part D: Acute coronary syndrome—workplace only laws

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Ferrante et al. 2012	<ul style="list-style-type: none"> • Acute coronary syndrome (<i>ICD-10</i> I20–I25) • N = 3,307 • ≥18 years of age • October 2006–December 2008 vs. January 2004–September 2006 • Effective October 2006 • Buenos Aires, Argentina 	Pre: 33 Post: 15	<ul style="list-style-type: none"> • Monthly age-adjusted admission rates; multiple linear regression analysis using standard methods for interrupted time series analysis • Age, secular trends, seasonality 	<ul style="list-style-type: none"> • 0.92 (0.87–0.97)*^a • 5.3% reduction in admissions in year before vs. year after law • Implementation not significantly associated with immediate change: increase of 1.74 admissions per 100,000 (-1.42, 4.92) 	Law ended smoking in workplaces but allowed for designated smoking areas up to 30% in bars and restaurants if >100 m ² ; no significant change in trend after law: increase of 0.01 admissions per 100,000 per month (-0.12, 0.14); Buenos Aires served as a control for Santa Fe, to compare partial smoking laws with comprehensive smoking laws; data from Buenos Aires suggest the ineffectiveness of the implementation of partial smokefree legislation; nonsignificant decrease in smoking prevalence from 27.4% 1 year before law to 26.1% 3 years after law; self-reported secondhand smoke exposure decreased from 52.9% to 31.7%

Table 8.6S Detailed description of studies on smokefree laws and coronary events—Part E: Acute coronary syndrome—workplace and restaurant laws

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Gupta et al. 2011	<ul style="list-style-type: none"> Acute coronary syndrome (primary diagnostic code <i>ICD-9</i> 410, 411.1, 411.81, 411.89, 413.0, 413.1, 413.9; an analysis performed for AMI yielded similar results that were not shown N = 14,245 ≥18 years of age January 2004–September 2008 vs. January 2000–December 2003 Effective January 1, 2004 Kanawha County, West Virginia 	Pre: 48 Post: 57	<ul style="list-style-type: none"> Age-adjusted Acute coronary syndrome hospital admission rates; Poisson regression Age, gender, year, season, tobacco use, diabetes 	<ul style="list-style-type: none"> 1.02 (0.92–1.12)* Age-adjusted Acute coronary syndrome hospitalization rates decreased 37% during entire study period; no additional significant change due to removal of smoking areas in restaurants after accounting for the sustainable decline of Acute coronary syndrome hospitalizations since the 2002 revision Stratification showed that the observed decline was significant only among nonsmokers 	Effective May 22, 1995, a modest smoking regulation was enacted prohibiting smoking in all enclosed public places; restaurants were allowed to designate up to 50% of their seating capacity as smoking areas; on July 20, 2000 the law was modified to increase penalties for violations; on April 3, 2003, a revised regulation prohibited smoking in all restaurants and at most worksites; however, to come into compliance, the regulation allowed several businesses an exemption until January 1, 2004; the likelihood of hospital admissions for Acute coronary syndrome was significantly lower among nonsmokers, people without diabetes, and women; incidence of hospital admissions for Acute coronary syndrome decreased significantly by 6% per year (CI 4–8%) throughout the study; among male smokers, there was a significant decline in time trend (7%; 0.4%, 12%) in admission rates after 2004; smoking rate decreased from 32% to 24% from 2002 to 2008, a nonsignificant change; in conjunction with steady tobacco sales, authors dismiss the notion that changes in Acute coronary syndrome can be attributed to a decline in smoking

Table 8.6S Detailed description of studies on smokefree laws and coronary events—Part F: ACE (acute coronary events)—workplace, restaurant, and bar laws

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Pell et al. 2008	<ul style="list-style-type: none"> Acute coronary syndrome (detectable troponin after emergency admission for chest pain, <i>ICD-10</i> I21) N = 5,919 April 2006–March 2007 vs. June 2005–March 2006 April 2006 Scotland 	Pre: 10 Post: 10	<ul style="list-style-type: none"> χ^2 and test for trend Stratified on gender and age (men ≤ 55; women ≤ 65) Used data from England as historical control; admissions for Acute coronary syndrome in England dropped 4% during a similar period compared to 17% in Scotland 	<ul style="list-style-type: none"> 0.83 (0.82–0.84)* 	Legislation prohibited smoking in all enclosed public places; 17% drop overall, 14% among smokers, 19% among former smokers, 21% among nonsmokers; 67% of the decrease in Acute coronary syndrome involved nonsmokers; larger risk reductions in older people; decrease in monthly admissions became more pronounced over time after implementation of legislation ($p = 0.02$); percentage of people who had never smoked who reported no exposure to secondhand smoke increased from 57% to 78% ($p < 0.001$); there was a reduction in geometric mean serum cotinine from 0.68 to 0.56 ng/mL ($p < 0.001$)
Gudnason et al. 2009	<ul style="list-style-type: none"> Patients undergoing coronary angiography for Acute coronary syndrome, defined as clinical symptoms of unstable coronary artery disease (chest pain at rest) as well as at least one of the following: (1) elevated cardiac enzymes, (2) ischemic changes on the EKG at rest, or (3) an abnormal exercise stress test during the same unstable episode N = 535 June 2007–October 2007 vs. January 2007–May 2007 Effective June 1, 2007 Iceland 	Pre: 5 Post: 5	<ul style="list-style-type: none"> Comparison of Acute coronary syndrome incidence before vs. after smoking law 	<ul style="list-style-type: none"> 0.83 (0.68–1.02)*^c Number of events before vs. after law, given in PowerPoint presentation based on abstract (http://spo.escardio.org/eslides/view.aspx?eevtid=33&id=978) Nonsmokers demonstrated 21% reduction in Acute coronary syndrome incidence among men ($p < 0.05$) but no significant effect observed among women; in the total population, there was a nonsignificant trend of a 20% reduction in Acute coronary syndrome ($p = 0.08$) 	Legislation prohibited smoking in public places; initial analysis considered only nonsmoking patients; numbers for overall population obtained by personal communication with Dr. Gudnason

Table 8.6S Part F—Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Di Valentino et al. 2010	<ul style="list-style-type: none"> • Acute coronary syndrome (<i>ICD-10</i>) • N = 2,426 • 2007–2008 vs. 2005–2006 • April 2007 • Canton Ticino, Switzerland 	Pre: 24 Post: 24	<ul style="list-style-type: none"> • Comparison of annual frequency of hospitalizations due to Acute coronary syndrome 	<ul style="list-style-type: none"> • 0.82 (0.76–0.89)^{*b} • 15.5% (p <0.001) and 14.7% (p <0.001) reduction in hospitalizations during first and second postlaw years, respectively 	Smokefree public places, including restaurants, bars, and discos; smoking rooms permitted; this study population overlaps with that of another study also conducted in Ticino examining rates of STEMI (a subset of Acute coronary syndrome) following the law
Ferrante et al. 2012	<ul style="list-style-type: none"> • Acute coronary syndrome (<i>ICD-10</i> I20-I25) • N = 2,889 • ≥18 years of age • August 2006–December 2008 vs. January 2004–July 2006 • August 2006 • Santa Fe, Argentina 	Pre: 31 Post: 17	<ul style="list-style-type: none"> • Monthly age-adjusted admission rates; multiple linear regression analysis using standard methods for interrupted time series analysis • Age, secular trends, seasonality 	<ul style="list-style-type: none"> • 0.65 (0.59–0.70)^{*a} • 20.8% reduction in admissions in year before vs. year after law • Implementation resulted in immediate change of -2.5 admissions per 100,000 (-4.74, -0.26) 	100% smokefree law in all enclosed public places; law also ended tobacco ads, promotion, and sponsorship; persistent change after law of 0.26 fewer admissions per 100,000 per month (-0.39, -0.13); Buenos Aires served as a control for Santa Fe, to compare partial smoking laws with comprehensive smoking laws; data from Buenos Aires suggest the ineffectiveness of the implementation of partial smokefree legislation; high levels of compliance, per National Tobacco Control Program; nonsignificant decrease in smoking prevalence from 27.3% 1 year before law to 26.6% 3 years after law; self-reported secondhand smoke exposure decreased from 51.6% to 31.7%

Table 8.6S Detailed description of studies on smokefree laws and coronary events—Part G: ACE (acute coronary events)—workplace, restaurant, and bar laws

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Cesaroni et al. 2008	<ul style="list-style-type: none"> • ACEs, including AMI (ICD-9 410) and “other acute and subacute forms of IHD” (ICD-9 411). Cases were included with principal diagnosis of AMI or secondary diagnosis of AMI when principal diagnosis indicated AMI complications (ICD-9 427.1, 427.41, 427.42, 427.5, 428.1, 429.5, 429.6, 429.71, 429.79, 429.81, 518.4, 780.2, 785.5, 414.10, 423.0) • Out-of-hospital deaths from IHDs (ICD-9 410-414) if no evidence of hospitalization for coronary causes in the previous 28 days or any cause in the last 2 days • N = 2,136 • 35–84 years of age • January 2005–December 2005 vs. January 2000–December 2004 • Effective January 10, 2005 • Rome, Italy 	Pre: 48 Post: 12	<ul style="list-style-type: none"> • Age standardized rates (based on European standard population) • Poisson regression on number of daily events after January 10, 2005, compared with before that date • Separate analyses done for out-of-hospital deaths and hospitalizations and an analysis of incident cases only • Age, gender, PM₁₀ air pollution, flu epidemics, holidays, temperature, secular trend, all-cause hospitalizations, SES 	<ul style="list-style-type: none"> • 35–64: 0.89 (0.85–0.93)* • 65–74: 0.92 (0.88–0.97) • 75–84: 1.02 (0.98–1.07) • Adjusted for time trends and all-cause hospitalization rates: <ul style="list-style-type: none"> – 35–64: 0.94 (0.88–1.01) – 65–74: 0.90 (0.84–0.96) 	See entry for Italy (4 regions); no effect in 75–84 year olds; protective effect of law seemed stronger in low SES areas; prevalence of smoking decreased from 34.9% to 30.5% in men and from 20.6% to 20.4% in women; cigarette sales decreased in Rome by 5.5% in 2005 compared to 2004; estimated reduction in coronary events attributable to changes in active smoking habits was <2%; concentrations of urinary cotinine among nonsmoking workers decreased from 17.8 to 5.5 mg/mL at 3 months postlaw and 3.7 mg/mL 12 months postlaw

Table 8.6S Part G—Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Barone-Adesi et al. 2009	<ul style="list-style-type: none"> • ACE (ICD-9 410, 411) • January 2005–June 2007 vs. January 2001–December 2004 • Effective January 2005 • Piedmont, Italy 	Pre: 48 Post: 30	<ul style="list-style-type: none"> • Poisson regression; standard methods for interrupted time-series adopted to assess the role of immediate and gradual effects of the smokefree law • Long-term trends, seasonality, age, day of the week 	<ul style="list-style-type: none"> • <70: 0.94 (0.90–0.97)* • ≥70: 1.00 (0.97–1.03) • Weekends: 0.87 (0.80–0.93) • Weekdays: 0.96 (0.92–1.00) 	See entry for Italy (4 regions); the observed reduction in the number of admissions for ACEs started in the same month in which the law came into effect and remained evident for the entire study period; no change ($p = 0.51$) in the underlying trend was found; this study population overlaps with that of another study also conducted in Piedmont examining rates of AMI (a subset of ACE) following the Italian national law

Table 8.6S Detailed description of studies on smokefree laws and coronary events—Part H: CHD—workplace, restaurant, and bar laws

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Barone-Adesi et al. 2011	<ul style="list-style-type: none"> • Non-AMI acute and subacute forms of CHD (ICD-9 411) • Primary analysis was for ACEs (AMI and other acute and subacute CHD) • N = 936,519 (all ACEs) • January 2005–November 2006 vs. January 2002–December 2004 • January 10, 2005 • Italy (20 regions) 	Pre: 36 Post: 24	<ul style="list-style-type: none"> • Admission rates; Poisson test with mixed effect regression models with fixed coefficients describing the national trend and random coefficients describing region-specific deviations • Seasonality, long-term trends • Separate analyses conducted based on age, gender 	<ul style="list-style-type: none"> • <70: 0.95 (0.93–0.98)* <ul style="list-style-type: none"> – Female: 0.92 (0.88–0.98) – Male: 0.96 (0.93–0.99) • ≥70: 0.98 (0.96–1.00) <ul style="list-style-type: none"> – Female: 0.98 (0.95–1.01) – Male: 0.97 (0.94–1.01) 	See entry for Italy (4 regions); the observed reduction was stable over the study period, similar in different geographic areas, and stronger among young people; no evidence of a gradual effect of the law, as there was no change in the underlying trend in admissions for ACEs after law

Source: Adapted from Tan and Glantz 2012 with permission from Wolters Kluwer Health, © 2012.

Note: Observed risk is presented as a risk ratio unless otherwise specified. If number of events is N/A, then events were recorded as rates and absolute counts are not available. **ACE** = acute coronary event; **AMI** = acute myocardial infarction; **ARIMA** = autoregressive integrated moving average; **CDC** = Centers for Disease Control and Prevention; **CHD** = coronary heart disease; **CI** = confidence interval; **CKMB** = creatine kinase muscle-brain isoenzyme; **CPK** = creatine phosphokinase; **CVD** = cardiovascular disease; **EKG** = electrocardiogram; **HR** = hazard ratio; **ICD-10-CM** = International Classification of Diseases-10-Clinical Modification; **mg/mL** = milligram per milliliter; **ng/mL** = nanogram per milliliter; **NO₂** = nitrogen dioxide; **person-years** = the sum of the number of years that each member of a population has been smoking; **PM_{2.5}** = particulate matter <2.5 micrometers in diameter; **PM₁₀** = particulate matter <10 micrometers in diameter; **RR** = relative risk; **SES** = socioeconomic status; **STEMI** = ST segment elevation myocardial infarction; **µm/m³** = microgram per cubic meter.

^aRR and CI calculated using negative binomial regression with model including effect of law and seasonality (if applicable).

^bRR and CI calculated by Monte Carlo simulation run 100,000 times; rate ratio calculated by dividing postlaw rates with mean prelaw rates.

^cRR and CI calculating using number of events before vs. after law.

^dCI calculated from p-value presented in paper.

^eRR and CI computed using Poisson regression with model described in paper for counties with no prior law.

^fCI obtained from communication with author of paper.

*Estimate used in meta-analysis.

Table 8.7S Detailed description of studies on smokefree laws and cerebrovascular accidents—Part A: Stroke—workplace only laws

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Dautzenberg 2008	<ul style="list-style-type: none"> Stroke <66 years of age January 2006–February 15, 2008 February 1, 2007; restaurants, bars, and casinos added effective January 1, 2008 France 	Partial law: Pre: 13 Post: 12.5	<ul style="list-style-type: none"> Rate per 100,000 admissions 	<ul style="list-style-type: none"> Partial law: 0.96 (0.8–1.03)^{*a} 	Smoking ended in public places in February 2007, but restaurants, bars, and casinos were given exceptions until January 2008; law permits ventilated smoking rooms under strict conditions; between January 2007 (before law) and January 2008 (after law), secondhand smoke exposure dropped from 57% to 14%; PM _{2.5} levels also dropped; also report substantial drops in respiratory symptoms among hospitality workers
Naiman et al. 2010	<ul style="list-style-type: none"> Stroke (<i>ICD-9</i> 433, 434, 435, 436; <i>ICD-10</i> I63, I64, I65, I66, G45, G46) 45+ years of age January 1996–May 2006 Effective May 2006 Toronto, Canada 	Pre: 36 Post phase 1: 24	<ul style="list-style-type: none"> ARIMA on crude rates of hospital admission Subgroup analyses by age, gender Comparison with Durham Region and Thunder Bay, 2 Ontario municipalities with no smokefree laws; no significant reductions were observed in control cities 	<ul style="list-style-type: none"> Phase 1 vs. prelaw: 0.91 (0.80–1.0)[*] 	Legislation required all public places and workplaces to be smokefree and was implemented in 3 phases; crude rates of hospital admissions decreased 39% (38%, 40%) for cardiovascular conditions; no significant reductions were observed in number of hospital admissions attributable to control conditions (cholecystitis, appendicitis, bowel obstruction) in Toronto; smokefree legislation occurred in 3 phases: smokefree public places and workplaces in October 1999; smokefree restaurants, dinner theaters, and bowling centers except designated smoking rooms in June 2001; smokefree bars, billiard halls, bingo halls, casinos, racetracks except designated smoking rooms in June 2004

Table 8.7S Detailed description of studies on smokefree laws and cerebrovascular accidents—Part B: Stroke—workplace and restaurant laws

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Naiman et al. 2010	<ul style="list-style-type: none"> Stroke (<i>ICD-9</i> 433, 434, 435, 436; <i>ICD-10</i> I63, I64, I65, I66, G45, G46) ≥45 years of age January 1996–May 2006 Effective May 2006 Toronto, Canada 	Pre: 36 Post phase 2: 36; not included in length of follow-up analysis because the prelaw period did not immediately precede the postlaw phase	<ul style="list-style-type: none"> ARIMA on crude rates of hospital admission Subgroup analyses by age, gender Comparison with Durham Region and Thunder Bay, 2 Ontario municipalities with no smokefree laws; no significant reductions were observed in control cities 	<ul style="list-style-type: none"> Phase 2 vs. pre: 0.76 (0.68–0.85)* 	Legislation required all public places and workplaces to be smokefree and was implemented in 3 phases; crude rates of hospital admissions decreased 39% (38%, 40%) for cardiovascular conditions; no significant reductions were observed in number of hospital admissions attributable to control conditions (cholecystitis, appendicitis, bowel obstruction) in Toronto; smokefree legislation occurred in 3 phases: smokefree public places and workplaces in October 1999; smokefree restaurants, dinner theaters, and bowling centers except designated smoking rooms in June 2001; smokefree bars, billiard halls, bingo halls, casinos, racetracks except designated smoking rooms in June 2004

Table 8.7S Detailed description of studies on smokefree laws and cerebrovascular accidents—Part C: Stroke—workplace, restaurant, and bar laws

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Juster et al. 2007	<ul style="list-style-type: none"> Stroke (primary diagnosis code ICD-9 410.00-410.99) N = 584,833 ≥35 years of age January 1995–December 2004 Effective July 24, 2003 New York state 	Post: 21 Pre: 99	<ul style="list-style-type: none"> Multiple regression time series Age-adjusted (New York population in 2000) Existence of strong local ordinance, time (linear secular trend), seasonality, county Analyzed comprehensive laws (smoking prohibited in restaurants, bars, and other hospitality venues) vs. moderate laws (smoking permitting in hospitality venues) 	<ul style="list-style-type: none"> No significant negative association between the stroke admission rate and moderate or comprehensive restrictions on smoking No estimate was available for stroke rates in places without local smokefree laws prior to the state law, and so this study was excluded from the analysis for stroke 	July 2003 law prohibited smoking in all workplaces including restaurants and bars; limited statewide restrictions since 1989 limited smoking in many public places, including schools, hospitals, public buildings, and retail stores; local laws varied by county; by 2002, 75% of New Yorkers were subject to strong local laws, as well as limited restrictions at the state level implemented in 1989; authors performed analysis to compare effects assuming hypothetical case of no pre-existing local laws; change in monthly admission trend rate not significantly different from null; after implementation of the state law, exposure to secondhand smoke declined by nearly 50%; saliva cotinine dropped from 0.078 to 0.041 ng/mL
Dautzenberg 2008	<ul style="list-style-type: none"> Stroke <66 years of age January 2006–February 15, 2008 Effective February 1 2007; restaurants, bars, and casinos added January 1, 2008 France 	Complete law: Pre: 24 Post: 1.5; not included in length of follow-up analysis because the prelaw period did not immediately precede the postlaw phase	<ul style="list-style-type: none"> Rate per 100,000 admissions 	<ul style="list-style-type: none"> Complete law: 0.83 (0.77–0.91)^{*a} 	Smoking ended in public places in February 2007, but restaurants, bars, and casinos were given exceptions until January 2008; law permits ventilated smoking rooms under strict conditions; between January 2007 (before law) and January 2008 (after law), secondhand smoke exposure dropped from 57% to 14%; PM _{2.5} levels also dropped; also report substantial drops in respiratory symptoms among hospitality workers

Table 8.7S Part C—Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Naiman et al. 2010	<ul style="list-style-type: none"> Stroke (<i>ICD-9</i> 433, 434, 435, 436; <i>ICD-10</i> I63, I64, I65, I66, G45, G46) ≥45 years of age January 1996–May 2006 Effective May 2006 Toronto, Canada 	Pre: 36 Post phase 3: 36; not included in length of follow-up analysis because the prelaw period did not immediately precede the postlaw phase	<ul style="list-style-type: none"> ARIMA on crude rates of hospital admission Subgroup analyses by age, gender Comparison with Durham Region and Thunder Bay, 2 Ontario municipalities with no smokefree laws; no significant reductions were observed in control cities 	• Phase 3 vs. pre: 0.63 (0.56–0.71) ^{*b}	Legislation required all public places and workplaces to be smokefree and was implemented in 3 phases; crude rates of hospital admissions decreased 39% (38%, 40%) for cardiovascular conditions; no significant reductions were observed in number of hospital admissions attributable to control conditions (cholecystitis, appendicitis, bowel obstruction) in Toronto; smokefree legislation occurred in 3 phases: smokefree public places and workplaces in October 1999; smokefree restaurants, dinner theaters, and bowling centers except designated smoking rooms in June 2001; smokefree bars, billiard halls, bingo halls, casinos, racetracks except designated smoking rooms in June 2004
Herman et al. 2011	<ul style="list-style-type: none"> Acute stroke (<i>ICD-9</i> 430-434.xx, 436.xx, 437.1x) N = 6,018 (counties without previous laws) May 2007–May 2008 vs. January 2004–April 2007 Effective May 1, 2007 Arizona 	Pre: 40 Post: 13	<ul style="list-style-type: none"> Rate of admissions per 100,000 annually Poisson regression Seasonality, population, annual linear trend Separate analyses for counties with preexisting smokefree laws vs. those without such laws 	• 0.86 (0.79–0.96) ^{*c}	Law ended smoking in all enclosed workplaces, including bars and restaurants; cost-savings analysis estimates \$16.8 million in savings for AMI, unstable angina, acute stroke, and acute asthma in 13 months after law in non-law counties (\$4.9 million for acute stroke alone); no change in rates of control diseases (acute appendicitis, kidney stones, acute cholecystitis, and ulcers) pre- and postlaw

Table 8.7S Part C—Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Kent et al. 2012	<ul style="list-style-type: none"> • Stroke • 20–70 years of age • April 2004–March 2006 vs. April 2002–March 2004 • Effective March 29, 2004 • Ireland 	Pre: 24 Post: 24	<ul style="list-style-type: none"> • Change in emergency hospital admissions for stroke • Population, weather, pollution, and influenza • Stratified by age and gender 	• 0.93 (0.73–1.20)*	March 2004 law applied to workplaces (including bars and restaurants); prior to this law, smoking had been outlawed in public buildings, hospitals, public pharmacies, schools, banking halls, cinemas, restaurant kitchens, part of all restaurants, public transport aircraft and buses, and some trains; significant reduction in emergency cardiopulmonary admissions in the 2 years following the smoking law (RR 0.87, 0.78–0.98)

Table 8.7S Detailed description of studies on smokefree laws and cerebrovascular accidents—Part D: TIA—workplace, restaurant, and bar laws

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
<ul style="list-style-type: none"> • TIA • 20–70 years of age • April 2004–March 2006 vs. April 2002–March 2004 • Effective March 29, 2004 • Ireland 	Pre: 24 Post: 24	<ul style="list-style-type: none"> • Change in emergency hospital admissions for transient ischemic attack • Population, weather, pollution, and influenza • Stratified by age and gender 	<ul style="list-style-type: none"> • 1.00 (0.70–1.42)* 	March 2004 law applied to workplaces (including bars and restaurants); prior to this law, smoking had been outlawed in public buildings, hospitals, public pharmacies, schools, lawking halls, cinemas, restaurant kitchens, part of all restaurants, public transport aircraft and buses, and some trains; significant reduction in emergency cardiopulmonary admissions in the 2 years following the smoking law (RR 0.87, 0.78–0.98)	March 2004 law applied to workplaces (including bars and restaurants); prior to this law, smoking had been outlawed in public buildings, hospitals, public pharmacies, schools, banking halls, cinemas, restaurant kitchens, part of all restaurants, public transport aircraft and buses, and some trains; significant reduction in emergency cardiopulmonary admissions in the 2 years following the smoking law (RR 0.87, 0.78–0.98)

Source: Tan and Glantz 2012.

Note: Observed risk is presented as a risk ratio unless otherwise specified. If number of events is N/A, then events were recorded as rates and absolute counts are not available. **AMI** = acute myocardial infarction; **ARIMA** = autoregressive integrated moving-average; **CI** = confidence interval; **ICD** = International Classification of Diseases; **PM_{2.5}** = particulate matter <2.5 micrometers in diameter; **RR** = relative risk; **TIA** = transient ischemic attack.

^aRR and CI calculated using negative binomial regression with model including effect of law and seasonality (if applicable)

^bRR and CI calculated using number of events before vs. after law

^cRR and CI computed using Poisson regression with model described in paper for counties with no prior law

*Estimate used in meta-analysis.

Table 8.8S Detailed description of studies on the relationship between smokefree laws and other heart disease—Part A: Angina—workplace only laws

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Naiman et al. 2010	<ul style="list-style-type: none"> • Angina (<i>ICD-9</i> 411, 413; <i>ICD-10</i> I20) • ≥45 years of age • January 1996-May 2006 • Effective May 2006 • Toronto, Canada 	Pre: 36 Post phase 1: 24	<ul style="list-style-type: none"> • ARIMA on crude rates of hospital admission • Subgroup analyses by age, gender • Comparison with Durham Region and Thunder Bay, 2 Ontario municipalities with no smokefree laws; no significant reductions were observed in control cities 	<ul style="list-style-type: none"> • Phase 1 vs. prelaw: 0.88 (0.69–1.14)*^a 	Legislation required all public places and workplaces to be smokefree and was implemented in 3 phases; crude rates of hospital admissions decreased 39% (38%, 40%) for cardiovascular conditions; no significant reductions were observed in number of hospital admissions attributable to control conditions (cholecystitis, appendicitis, bowel obstruction) in Toronto; smokefree legislation occurred in 3 phases: smokefree public places and workplaces in October 1999; smokefree restaurants, dinner theaters, and bowling centers except designated smoking rooms in June 2001; smokefree bars, billiard halls, bingo halls, casinos, racetracks except designated smoking rooms in June 2004

Table 8.8S Detailed description of studies on the relationship between smokefree laws and other heart disease—Part B: Angina—workplace and restaurant laws

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Naiman et al. 2010	<ul style="list-style-type: none"> • Angina (<i>ICD-9</i> 411, 413; <i>ICD-10</i> I20) • ≥45 years of age • January 1996–May 2006 • Effective May 2006 • Toronto, Canada 	Pre: 36 Post phase 2: 36; not included in length of follow-up analysis because the prelaw period did not immediately precede the postlaw phase	<ul style="list-style-type: none"> • ARIMA on crude rates of hospital admission • Subgroup analyses by age, gender • Comparison with Durham Region and Thunder Bay, 2 Ontario municipalities with no smokefree laws; no significant reductions were observed in control cities 	<ul style="list-style-type: none"> • Phase 2 vs. prelaw: 0.65 (0.52–0.82)*^a 	Legislation required all public places and workplaces to be smokefree and was implemented in 3 phases; crude rates of hospital admissions decreased 39% (38%, 40%) for cardiovascular conditions; no significant reductions were observed in number of hospital admissions attributable to control conditions (cholecystitis, appendicitis, bowel obstruction) in Toronto; smokefree legislation occurred in 3 phases: smokefree public places and workplaces in October 1999; smokefree restaurants, dinner theaters, and bowling centers except designated smoking rooms in June 2001; smokefree bars, billiard halls, bingo halls, casinos, racetracks except designated smoking rooms in June 2004
Sargent et al. 2012	<ul style="list-style-type: none"> • Stable or unstable angina pectoris (<i>ICD-10</i> I20.0–I20.9) • N = 39,224 • ≥30 years of age • January 2004–December 2008 • Nationwide: effective September 1, 2007 • Statewide: effective date varies • Germany 	Pre: varies Post: 12	<ul style="list-style-type: none"> • Rate of hospitalization for AMI; logistic regression and interrupted time series linear regression model • Age, gender, occupation 	<ul style="list-style-type: none"> • 0.87 (0.82–0.92)* • In the first year after implementation, 1431 angina hospitalizations were prevented 	Legislation addressed smoking in federal buildings and the transportation system; private employers were allowed to introduce a total or partial smoking law in workplaces; states were permitted to decide how to limit smoking in the hospitality sector (hotels, restaurants, bars); hospitality smoking laws were passed in all states in implemented between August 1, 2007 and July 1, 2008; most states continued to allow smoking in small bars without any food delivery and in separate rooms in large restaurants; a population-based survey revealed a significant decrease in cigarettes smoked in Germany after the law; after the law, there was a significant downward trend, with slope resulting in a decline of 5.33 (7.18, 3.48) hospitalizations per month; hospital admissions for control condition fractures increased slightly from 65,100 in 2007 to 66,954 in 2009; bronchitis cases, which might be affected by smokefree laws, declined from 16,900 in 2007 to 15,391 in 2009; hospitalization costs for angina decreased significantly by 9.6 (2.5, 16.6%), or about €2.5 million

Table 8.8S Detailed description of studies on the relationship between smokefree laws and other heart disease—Part C: Angina—workplace, restaurant, and bar laws

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Naiman et al. 2010	<ul style="list-style-type: none"> • Unstable angina (ICD9-411.1x) • N = 670 (counties without previous laws) • May 2007–May 2008 vs. January 2004–April 2007 • Effective May 1, 2007 • Arizona 	Pre: 40 Post: 13	<ul style="list-style-type: none"> • Rate of admissions per 100,000 annually • Poisson regression • Seasonality, population, annual linear trend • Separate analyses for counties with preexisting smokefree laws vs. those without such laws 	• 0.64 (0.46–0.88)* ^b	Law ended smoking in all enclosed workplaces including bars and restaurants; cost-savings analysis estimates \$16.8 million in savings for AMI, unstable angina, acute stroke, and acute asthma in 13 months after law in non-law counties (\$0.9 million for angina alone); no change in rates of control diseases (acute appendicitis, kidney stones, acute cholecystitis, and ulcers) pre- and postlaw
Naiman et al. 2010	<ul style="list-style-type: none"> • Angina (<i>ICD-9</i> 411, 413; <i>ICD-10</i> I20) • ≥45 years of age • January 1996–May 2006 • Effective May 2006 • Toronto, Canada 	Pre: 36 Post phase 3: 36; not included in length of follow-up analysis because the prelaw period did not immediately precede the postlaw phase	<ul style="list-style-type: none"> • ARIMA on crude rates of hospital admission • Subgroup analyses by age, gender • Comparison with Durham Region and Thunder Bay, 2 Ontario municipalities with no smokefree laws; no significant reductions were observed in control cities 	• Phase 3 vs. prelaw: 0.38 (0.30–0.48)* ^a	Legislation required all public places and workplaces to be smokefree and was implemented in 3 phases; crude rates of hospital admissions decreased 39% (38%, 40%) for cardiovascular conditions; no significant reductions were observed in number of hospital admissions attributable to control conditions (cholecystitis, appendicitis, bowel obstruction) in Toronto; smokefree legislation occurred in 3 phases: smokefree public places and workplaces in October 1999; smokefree restaurants, dinner theaters, and bowling centers except designated smoking rooms in June 2001; smokefree bars, billiard halls, bingo halls, casinos, racetracks except designated smoking rooms in June 2004

Table 8.8S Part C—Continued

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Cronin et al. 2012	<ul style="list-style-type: none"> Unstable angina, diagnosed in hospital by physician using troponin T or I, allowing repeat admissions (primary analysis was for overall acute coronary syndrome) N = Primary data set: 1,236 N = Secondary data set: 1,314 ≥18 years of age Primary data set: April 2004–March 2007 vs. March 2003–March 2004 Secondary data set: July 2003–March 2004 vs. April 2004–June 2007 Effective March 29, 2004 Cork and Kerry counties, Ireland 	Pre: 13 Post: 36 Pre: 9 Post: 39	<ul style="list-style-type: none"> Unstable angina admissions and rate per 100,000; Poisson regression Linear time trend Sensitivity analyses were undertaken by gender, smoking status, and type of Acute coronary syndrome 	<ul style="list-style-type: none"> 0.89 (0.75–1.06)*^c Estimates derived from secondary data set 	See description of law in entry for Ireland; the first year's reduction in admissions for Acute coronary syndrome was due to fewer cases among men and current smokers; the third year's reduction in admissions for Acute coronary syndrome was due to fewer cases among men, current smokers, and never smokers; increased effect on Acute coronary syndrome over time evidenced by 12% decrease in year 1 and 13% decrease in year 3; this paper supersedes an abstract of the same study used in the 2009 meta-analysis; according to mortality data, there was no change in all-cause mortality and an overall 6.5% decrease in deaths from circulatory causes in Cork and Kerry counties, and so results were not attributable to changes in coronary death patterns outside of hospital
Kent et al. 2012	<ul style="list-style-type: none"> Unstable angina 20–70 years of age April 2004–March 2006 vs. April 2002–March 2004 Effective March 29, 2004 Ireland 	Pre: 24 Post: 24	<ul style="list-style-type: none"> Change in emergency hospital admissions for unstable angina Population, weather, pollution, and influenza Stratified by age and gender 	<ul style="list-style-type: none"> 0.77 (0.61–0.96)* 	March 2004 law applied to workplaces (including bars and restaurants); prior to this law, smoking had been outlawed in public buildings, hospitals, public pharmacies, schools, banking halls, cinemas, restaurant kitchens, part of all restaurants, public transport aircraft and buses, and some trains; significant reduction in emergency cardiopulmonary admissions in the 2 years following the smoking law (RR 0.87, 0.78–0.98)

Table 8.8S Detailed description of studies on the relationship between smokefree laws and other heart disease—Part D: CHD—workplace and restaurant laws

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Khuder et al. 2007	<ul style="list-style-type: none"> • CHD (ICD-9 410-414, 428) • ≥18 years of age • January 1999–February 2002 vs. March 2002–June 2005 • Effective March 2002 • Bowling Green, Ohio 	Pre: 38 Post: 40	<ul style="list-style-type: none"> • Age-standardized rates • ARIMA • Ordinance effect assumed to start in October 2002 • Comparison with control community of Kent, Ohio (not covered by law); no significant change in Kent 	<ul style="list-style-type: none"> • 12 months postlaw: 0.61 (0.55–0.67) • 40 months postlaw: 0.53 (0.45–0.59)* 	Smoking was prohibited in all public places within the city, except for bars and restaurants with bars, provided that the bar area was isolated within a separate smoking room; smoking was allowed in bars and bowling alleys at the discretion of the owners; 39% reduction in CHD in 12 months and 47% reduction in 40 months; projected that 17% of reduction may be due to decreased secondhand smoke exposure, while the remaining 21% is due to decreased smoking prevalence and cigarette consumption; no differences in admissions for unspecified nonsmoking related conditions

Table 8.8S Detailed description of studies on the relationship between smokefree laws and other heart disease—Part E: SCD—workplace and restaurant laws

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Hurt et al. 2011	<ul style="list-style-type: none"> • SCD defined as out-of-hospital deaths assigned to CHD (ICD-9 410-414) • October 2007–March 2009 vs. July 2000–December 2001 • Effective January 1, 2002 (Ordinance 1: smokefree restaurants) • Effective October 1, 2007 (Ordinance 2: smokefree workplaces) • Olmsted County, Minnesota 	Pre ordinance 1: 18 Post ordinance 1: 18	<ul style="list-style-type: none"> • Age and gender-adjusted rate per 100,000; adjusted HR 	<ul style="list-style-type: none"> • Ordinance 1 vs. no law, HR: 0.72 (0.58–0.89)* 	Although the law was initiated in 2 steps (smokefree restaurants in January 2002 and smokefree workplaces in 2007), this study was included in the meta-analysis because authors compared the period before any law to the period after full implementation, thus capturing the true effect of the law; SCD rate per 100,000 dropped from 152.5 to 112.2 following the restaurant law (HR 0.72, 0.58–0.89; $p < 0.01$) and from 78.0 to 76.6 following the workplace law (HR 0.99, 0.76–1.28; $p = 0.91$); during this period, the prevalence of hypertension, diabetes, hypercholesterolemia, and obesity either remained constant or increased while the prevalence of smoking among the adults declined by 23%

Table 8.8S Detailed description of studies on the relationship between smokefree laws and other heart disease—Part F: SCD—workplace, restaurant, and bar laws

Study	Design/population	Pre/postduration (months)	Measure/statistical method	Findings (95% CI)	Comments
Hurt et al. 2011 ⁵³	<ul style="list-style-type: none"> • SCD defined as out-of-hospital deaths assigned to CHD (ICD-9 410-414) • October 2007–March 2009 vs. July 2000–December 2001 • Effective January 1, 2002 (Ordinance 1: smokefree restaurants) • Effective October 1, 2007 (Ordinance 2: smokefree workplaces) • Olmsted County, Minnesota 	Pre-ordinance 2: 18 Post-ordinance 2: 18; not included in length of follow-up analysis because the prelaw period did not immediately precede the postlaw phase	<ul style="list-style-type: none"> • Age and sex-adjusted rate per 100,000; adjusted HR 	<ul style="list-style-type: none"> • Ordinance 2 vs. no law, hazard ratio: 0.72 (0.58–0.89)* 	Although the law was initiated in 2 steps (smokefree restaurants in January 2002 and smokefree workplaces in 2007), this study was included in the meta-analysis because authors compared the period before any law to the period after full implementation, thus capturing the true effect of the law; SCD rate per 100,000 dropped from 152.5 to 112.2 following the restaurant law (HR 0.72, 0.58–0.89; $p < 0.01$) and from 78.0 to 76.6 following the workplace law (HR 0.99; 0.76–1.28; $p = 0.91$); during this period, the prevalence of hypertension, diabetes, hypercholesterolemia, and obesity either remained constant or increased while the prevalence of smoking among the adults declined by 23%

Source: Tan and Glantz 2012.

Note: Observed risk is presented as a risk ratio unless otherwise specified. If number of events is N/A, then events were recorded as rates and absolute counts are not available. **AMI** = acute myocardial infarction; **ARIMA** = autoregressive integrated moving-average; **CHD** = coronary heart disease;

CI = confidence interval; **HR** = hazard ratio; **ICD** = International Classification of Diseases; **RR** = relative risk; **SCD** = sudden cardiac death.

^aRR and CI calculated using number of events before vs. after law.

^bRR and CI computed using Poisson regression with model described in paper for counties with no prior law.

^cRR and CI calculated using negative binomial regression with model including effect of law and seasonality (if applicable).

*Estimate used in meta-analysis.

