Published in final edited form as:

Clin Res Cardiol. 2012 March ; 101(3): 227–235. doi:10.1007/s00392-011-0385-1.

Smoking restrictions and hospitalization for acute coronary events in Germany

James D. Sargent,

Department of Pediatrics, Dartmouth Medical School, Lebanon, NH, USA

Eugene Demidenko,

Department of Community & Family Medicine, Dartmouth Medical School, Lebanon, NH, USA

David J. Malenka,

Dartmouth-Hitchcock Medical Center, Cardiology, Lebanon, NH, USA

Zhongze Li,

Biostatistical Shared Services, Norris Cotton Cancer Center, Lebanon, NH, USA

Helmut Gohlke, and

Herz-Zentrum, Bad Krozingen, Germany

Reiner Hanewinkel

Institut für Therapie- und Gesundheitsforschung (IFT-Nord), Harmsstrasse 2, 24114 Kiel, Germany

Reiner Hanewinkel: hanewinkel@ift-nord.de

Abstract

Aims—To study the effects of smoking restrictions in Germany on coronary syndromes and their associated costs.

Methods and results—All German states implemented laws partially restricting smoking in the public and hospitality sectors between August 2007 and July 2008. We conducted a before-and-after study to examine trends for the hospitalization rate for angina pectoris and acute myocardial infarction (AMI) for an insurance cohort of 3,700,384 individuals 30 years and older. Outcome measures were hospitalization rates for coronary syndromes, and hospitalization costs. Mean age of the cohort was 56 years, and two-thirds were female. Some 2.2 and 1.1% persons were hospitalized for angina pectoris and AMI, respectively, during the study period from January 2004 through December 2008. Law implementation was associated with a 13.3% (95% confidence interval 8.2, 18.4) decline in angina pectoris and an 8.6% (5.0, 12.2) decline in AMI after 1 year. Hospitalization costs also decreased significantly for the two conditions—9.6% (2.5, 16.6) for angina pectoris and 20.1% (16.0, 24.2) for AMI at 1 year following law implementation. Assuming the law caused the observed declines, it prevented 1,880 hospitalizations and saved 7.7 million Euros in costs for this cohort during the year following law implementation.

Conclusions—Partial smoking restrictions in Germany were followed by reductions in hospitalization for angina pectoris and AMI, declines that continued through 1 year following these laws and resulted in substantial cost savings. Strengthening the laws could further reduce morbidity and costs from acute coronary syndromes in Germany.

Keywords

Smoking ban; Cardiovascular diseases; Hospitalizations; Costs; Germany

Introduction

Ischemic heart disease is the leading cause of death for both males and females in industrialized countries, killing some 2,000,000 in developed nations each year [1]. Smoking in turn is one of the leading causative yet potentially modifiable risk factors for the development of premature atherosclerotic diseases and premature death in industrialized as well as developing countries [2]. Data from the British Doctors' Study suggest that each cigarette shortens the life expectancy by 28 min [3]. Increased mortality of smokers has recently also been shown after percutaneous coronary interventions [4].

There is a large literature implicating also exposure to secondhand smoke (SHS) in the development of acute ischemic heart disease events. One of many recent reviews, the 2006 US Surgeon General Report [5], provided a pooled relative risk estimate for the effects of SHS on ischemic heart disease among nonsmokers of 1.27 (1.19–1.36), based on data from 9 cohort and 7 case–control studies. From a biological perspective, current evidence supports SHS exposure as both long- and short-term risk factors for acute coronary events [6, 7]. The pathophysiology of ischemic heart disease begins with atheroma development, a chronic process that is enhanced by cigarette smoking [8, 9] and progresses more rapidly in persons exposed to SHS. But acute processes—plaque rupture and thrombus formation—are almost always implicated in the onset of coronary symptoms that send patients to the hospital. Evidence has surfaced in the past 10 years that implicates SHS in endothelial dysfunction, enhanced platelet aggregation [10–12], and thrombus formation [13, 14], providing a mechanism by which SHS exposure could precipitate these events. Consistent with the notion that small amounts of SHS could precipitate acute myocardial infarction (AMI), one study has shown a log-linear exposure–response relationship between cardiovascular mortality and exposure to fine particulates, with large increases in risk associated with very small exposure increases at the low range of exposure [15]. Thus, SHS exposure has the potential to enhance both the chronic process underlying the disease and to precipitate acute coronary events.

The implementation of smoke-free workplace laws offers the opportunity to conduct before-and-after observational studies to determine if the incidence of acute coronary events declines following smoking restrictions. Many studies from different countries have now been published [16–32]. The first was a small study that showed a drop in hospital admissions for AMI in Helena, Montana, after implementation of city ordinance [26]. Subsequent studies have varied in design and the size of the community but pointed to a 10–20% decline in hospital admissions for myocardial infarction within 6 months of the successful implementation of a comprehensive smoke-free workplace law. The most carefully controlled prospective study was conducted in nine Scottish hospitals, showing that admissions for acute coronary syndrome (patients admitted with chest pain and elevated cardiac troponin) dropped by 17% from 3,235 to 2,684 comparing 10-month periods before and after a national smoking workplace law was implemented [25]. Two recent meta-analyses concluded that strong smoke-free laws were associated with a 17% reduction in AMI, with greater influence among younger persons and nonsmokers [33, 34]. The meta-analyses showed larger reductions for studies with longer follow-up, suggesting a long-term benefit. No study to our knowledge has studied the medical cost savings associated with smoke-free workplace laws.

This report involves a medical claims cohort of over 3.7 million persons, aged 30 years and older, enrolled continuously in a closed-panel insurance plan in Germany. The plan covered persons in every German state and during a time when each state implemented a smoking restriction law aimed at the hospitality industry. Because the study spans a timeframe that covers 3 years prior to implementation of the laws, it offers an opportunity to illustrate the trend for hospitalization for acute coronary events long before the law was implemented, and helps to differentiate any pre-existing temporal trends in hospitalization for these conditions from the effect of changing laws governing exposure to SHS. Our objective was to assess trends for hospitalization for acute coronary events—AMI and for angina pectoris. Because hospitalization costs were also available, we also aimed to determine the degree to which the laws were associated with cost savings.

Methods

Overview

The study design involved assembling a claims cohort of individuals at risk for coronary events, who were alive and continuously covered by a large insurance company for a period before and after hospitality smoking laws were implemented in Germany. The insurance company provided data on basic demographics of each individual, date of hospitalization, diagnosis and cost of hospitalization for acute coronary events during the time period. Because hospitality laws were implemented individually by the 16 states (Bundesländer) which have a marked regional variation of ischemic heart disease mortality [35], time was shifted by state so that “time zero” represented the time point for law implementation in each corresponding state. Thus, a virtual nationwide “time zero” was constructed for this study. Trend for hospitalization before time zero was compared with trend after time zero.

Patients

Germany has the world’s oldest universal health care system, with origins dating back to Otto von Bismarck’s Health Insurance Act of 1883. Currently, 85% of the population is covered by a statutory health insurance plan, which provides a standard specified level of coverage. The Deutsche Angestellten-Krankenkasse (DAK) is the third biggest health insurance company in Germany, providing health coverage to some 6,016,182 individuals in 2008. For this study, DAK identified all members who were 30 years of age as of 1 January 2004 and continuously insured by the company through 31 December 2008 ($n = 3,700,384$), creating a unique record for each eligible patient that included age, sex, and occupation, excluding individuals who became members after 1 January 2004, those who left DAK before 31 December 2008, or those who died due to any cause during this period. They then searched the administrative dataset of hospital bills to identify all hospitalizations with a primary ICD-10 diagnosis code for stable or unstable angina pectoris (I20.0–I20.9) or AMI (I21.0–I21.9) for this patient cohort, creating linked records of subsequent hospitalizations which contained the ICD-10 code, date of admission, and state (i.e., the 16 German states) in which the hospitalization occurred. We excluded hospitalizations for recurrent AMI within 28 days of the initial event (I22.0–I22.9) reasoning these were most likely treatment failures of the index event. The insurance company also provided the hospitalization costs, in euros, associated with each hospitalization. All unique patient identifiers were stripped from the records. The study was reviewed by the IRB at Dartmouth College and classified as exempt because of the inability to link the data to any individual.

Exposure: smoking restriction policy aimed at the hospitality industry

On 1 September 2007 the German government passed legislation addressing public smoking, ending smoking in federal buildings and the transportation system (trains and buses) and allowing private employers to introduce a total or partial smoking ban to protect

nonsmokers in the workplace. The law left the decision on how to limit smoking in the hospitality sector (public areas of hotels, restaurants and bars) to the individual states (Bundesländer). Hospitality smoking laws were subsequently passed by all states and implemented on the following dates: Baden-Württemberg, Lower Saxony, Mecklenburg West Pomerania—1 August 2007; Hesse—1 October 2007; Bavaria, Berlin, Brandenburg, Bremen, Hamburg, Saxony-Anhalt, Schleswig-Holstein—1 January 2008; Saxony—1 February 2008; Rhineland-Palatinate, Saarland—15 February 2008; North Rhine-Westphalia, Thuringia—1 July 2008. The federal law gave the states discretion regarding the extent of the smoking restriction in the hospitality section. Rather than being 100% smoke-free, as in many other places that have been evaluated, most of the states continued to allow smoking in small bars without any food delivery and in separate rooms in large restaurants. Nevertheless, a population-based survey revealed a significant decrease of cigarettes smoked in Germany from 2006 (before the implementation of the federal laws) to 2009 (after the implementation of the smoke-free laws) [36]. According to population-based statistics provided by the German Statistical Agency (available at <http://www.gbe-bund.de/>) hospital admission due to fractures (ICD-10 code S72.0), which should not be affected by smoke-free laws increased slightly from 65,100 cases in 2007 to 66,954 cases in 2009. In the same time period, hospital admissions due to bronchitis (J40), which might be affected by smoke-free laws decreased from 16,900 cases in 2007 to 15,391 cases in 2009.

Outcomes

We calculated a monthly rate of hospitalization for angina pectoris and for AMI and compared rate trends before and after the laws on public smoking were implemented. Since the hospitality smoking restrictions took place on different dates in the 16 states, the hospitalization data were shifted in time so that zero represents the day when the hospitality law was implemented. The admission rates of hospitalization in Germany for any specific day t was computed by the weighted average formula:

$$r_t = \sum h_{st} n_{st} / \sum n_{st}$$

where h_{st} is number of individuals admitted to a hospital in state s on day t , and n_{st} is the number of individuals enrolled in the insurance company. Hospital admission rates are described as number per million insured per month. The same formula for rates was used for the analysis on stratified subsamples including age and sex. Each hospitalization was associated with a cost, in euros; costs were adjusted using the German inflation index for each year of the study.

Statistical methods

Logistic regression analysis was used to examine the odds of hospitalization for angina or AMI according to age, sex, and occupation. The rate data were then analyzed using a change point time series linear regression model:

$$r_t = \alpha + \beta d_t + \gamma D_t + \varepsilon_t$$

where $d_t = \min(t, 0)$, $D_t = \max(t, 0)$, ε_t is normally distributed unobservable error term with zero mean and constant variance, α is the intercept term (hospitalization rate at the day the hospitality smoking law was implemented), and β and γ are slope coefficients that describe how the hospitalization rate changed over time. The rate of change is described as the increase or decrease in the number hospitalized per million per month.

The linear model describes the change in rate of hospitalization from before to after the antismoking law in a concise format. For example, $\alpha + \beta t$ describes the change of rate before the law ($t < 0$) and $\alpha + \gamma t$ after the law ($t > 0$). The null hypothesis $H_0: \beta = 0$ is that the rate of hospitalization in Germany remained the same after the law was implemented; testing the null hypothesis $H_0: \beta = \gamma$ answers the question whether or not the dynamics of the hospitalization rate was altered after the antismoking law was implemented. Theoretically, we assumed that the smoking law would cause an instantaneous decline in the rate, resulting in a cumulative reduction in hospitalizations over time. The regression lines were plotted along with background lines showing day-to-day variation in the hospitalization rate (the raw data) and a monthly average plotted on a week-to-week basis, in order to visualize whether the empirical data conformed to the theoretical model. The percent reduction in the rate was computed to express the cumulative effect of the law a year after the hospitality law took place. Since $a + 365b$ estimates the rate of hospitalization after 1 year if the law had no effect, and $a + 365g$ if the law had an effect, the effect size is estimated as $365(b - g)/a$ on the percent scale, where a , b , and g are the least squares estimates of α , β , and γ . The standard error of the effect size was computed using the delta-method [37]. This process was carried out for each outcome first on the population as a whole, then by effect modifiers suggested by prior research [18, 20], older (> 68 years) versus younger men and men versus women. Inflation-adjusted costs over time were assessed in much the same way, as a rate (costs per million insured per day).

Results

Characteristics of the patient sample and hospitalization incidence

Table 1 shows cohort demographics and how they related to the incidence of hospitalization for angina and AMI. Age for the patient cohort ranged from 30 to 105 years (mean 56 years). There were more females (66.5%) than males, reflecting the fact that DAK insures industries (administration, services) that, in Germany, employ larger numbers of women. The majority of persons in the cohort were either employed (39.9%) or retired from their employment (43.5%).

Some 2.16% of cohort members were hospitalized one or more times for angina pectoris and 1.06% for AMI during the study period. Hospitalization rates for both conditions were highest among males and among older, unemployed and retired individuals. For both conditions, the majority of patients were hospitalized only once. Repeat hospitalization (after more than 30 days) occurred in 22.5% of patients hospitalized for angina (median follow-up 33 months) and in 29.2% of those hospitalized for AMI (median follow-up 27 months). Of those hospitalized for angina, 11.1% were hospitalized at some other time for AMI; of those hospitalized for AMI, 22.8% were hospitalized at some other time for angina pectoris.

Hospitalization trends

Angina pectoris—Figure 1 shows the hospitalization trend for angina pectoris during the study period. The light gray line represents the date-to-day variation in the raw data; the blue line illustrates smoothed week-to-week changes in the number hospitalized per million per month (moving average); the black lines represent the estimate for change in rate over time before and then after the hospitality law, with the before line extended out 1 year as a dashed line. Prior to the law (zero on the x -axis) there was essentially no change in the angina hospitalization rate over time, which remained level at about 480 hospitalizations per million per month. After the law, there was a statistically significant downward trend, with slope resulting in a decline of about 5 hospitalizations per month [slope = -5.33 (95% confidence interval 7.18, 3.48)]. Figure 1 includes a side-by-side comparison of the slope estimates

before and after the law, with 95% confidence interval error bars (p value for the difference in slope <0.0001). By 1 year after implementation, the hospitalization rate for angina had decreased by 13.3% (95% confidence interval; 8.2–18.4) (Table 2), for a total of 1,431 hospitalizations prevented. The percent reduction in angina was not significantly different for older versus younger individuals, or men versus women.

Acute myocardial infarction—Figure 2 shows the hospitalization trend for AMI during the study period. Prior to the implementation of hospitality smoking laws, there was a linear upward trend in the AMI hospitalization rate, which increased by about 1.5 hospitalizations per month [slope = 1.74 (95% confidence interval 1.54, 1.94)]. After the laws were implemented, there was no longer a statistically significant upward trend in the hospitalization rate. Figure 2 includes a side-by-side comparison of the slope estimates before and after the law, with 95% confidence interval error bars (p value for the difference in slope <0.0001). By 1 year after implementation, the hospitalization rate for myocardial infarction had decreased by 8.6% (95% confidence interval 5.0, 12.2) because of elimination of the upward trend (Table 2), a total of 449 hospitalizations prevented. The percent reduction in acute myocardial infarction was significantly larger for younger compared to older persons ($p = 0.01$) but did not differ with respect to gender.

Hospitalization costs

The trend for costs for both angina pectoris and AMI were largely similar to the trend for hospitalization for those conditions (figures not shown). Baseline costs for angina pectoris were 1.2 million euros per million insured per month. Costs for angina pectoris hospitalization were reduced by 9.6% (2.5, 16.6) by 1 year after the hospitality smoking restriction laws, a cost savings of 2.5 million euros during that 1 year period (Table 2). The cost reduction for angina pectoris was statistically significant only for older members and men. Baseline costs for AMI were 1.05 million euros per million insured per month. Costs for AMI hospitalization were reduced by 20.1% by 1 year after law implementation, for a total cost savings of 5.2 million euros. Cost savings for AMI were about the same across subgroups.

Discussion

This is to our knowledge the first study to evaluate the effects of a smoking ban on the incidence of hospital admissions for angina and for myocardial infarction from the perspective of a large insurance company. This study documents significant declines in hospitalization rates for angina pectoris and AMI following implementation of partial indoor smoking restrictions in German hospitality venues, along with substantial and significant declines in associated inflation-adjusted cost. The large size of the cohort allowed for the illustration of the immediate decline in the hospitalization rate for both conditions that extended for at least a year following law implementation. For angina pectoris, the laws heralded an actual decline in hospitalization rate; for AMI, the laws were associated with stabilization of a longer term upward trend in AMI hospitalization. The results are consistent with recently published meta-analyses that examined 11 studies and concluded that effect size was larger for studies with longer post-law study periods [33, 34].

An 8.6% reduction for AMI 1 year after law implementation is lower than effects reported in some other studies. The German policy approach to indoor smoking has been incremental, with restrictions applying to public settings (including transportation) applied about 1 year prior to the hospitality laws. Phasing in these laws over time will reduce the marginal effect of individual changes, as was observed when New York implemented a strong statewide law after a substantial fraction of the population was already covered by strong local laws [22].

Additionally, in contrast to other settings in the US and Europe, where 100% smoke-free policies were applied to all bars and restaurants, most German states chose to implement only partial restrictions. Weaker workplace smoking restrictions are associated with weaker effects [38], which may also account for the smaller effect in Germany.

One meta-analysis [34] pointed to subgroup analyses in some European studies. Two studies of AMI using claims data in Italy suggested larger declines in AMI for younger women [18, 20], or among men in certain age categories [20]. This study confirmed larger declines among younger persons but also found larger declines among men, not women. In contrast to most other studies of myocardial infarction where the majority of patients are men, the majority of patients covered by the German health insurance company (DAK) are women, making the majority of AMI patients women. Women smoke less than men and smoking habits decrease with increasing age in both genders [39], and women suffer from AMI at a later age [40]. The older age tends to mitigate the influence of smoking bans on the myocardial infarction rate—as has also been shown in the Italian study on smoking bans [20]—probably to some degree because elderly persons tend to visit public restaurants less often than younger persons. The social norms in Germany in addition make it less likely that elderly single/widowed women attend public restaurants as often as men would do. The decision to use age 68 years as the cutoff for separating younger from older individuals, was chosen because this was the mean age of the (although mostly male) patients in a recent large observational study of AMI in Germany covering a similar time period [41]. Nevertheless, we reran the analysis with age 65 as the cutoff and found no change in the results.

Our study also differs from some of the other studies, in that we found hospitalization rates for AMI in Germany to be increasing in the years leading up to the smoking law. The reversal of long-term declines in AMI hospitalization in Germany may be a result of increasing use of cardiac troponin in making the diagnosis, following the publication of a consensus document indicating a preference for this approach in 2000 [42–45]. The consensus statement anticipated that “the application of the new, more sensitive diagnostic criteria for MI will cause the recorded incidence of MI to rise and the case fatality rate to fall.” Our findings are consistent with that prediction. Another study that prospectively recruited hospitalized patients from 156 hospitals across Germany between 2000 and 2002 found that introducing troponin as a biomarker for MI in routine care in Germany doubled the rates of classified MI compared with the old definition [46].

The strengths of this study include the large sample, which allowed for the visualization of hospitalization trends, and the development of a claims cohort which allowed for direct calculation of hospitalization rates and costs. As pointed out in a recent Institute of Medicine report on this topic, this study cannot distinguish between effects of the law because of reduced SHS exposure among nonsmokers from other possible effects—for example, decreased smoking among smokers [47]. As with other claims datasets, there are limitations that include the reliance on claims data to make the diagnosis, limited information on each individual patient (which did not allow us to examine smoking status), no information on health care and medication delivery, and limited information about how the hospitality smoking restrictions in each state affected indoor smoking and SHS exposure. This study cannot rule out the possibility that there was a downward spike in hospitalizations overall, due to administrative or other reasons, that affected hospitalization rates for all conditions and was timed to coincide with smoke-free laws, but given the concordance of findings in the existing literature, this seems increasingly unlikely.

In summary, implementation of state-ordered hospitality smoking restrictions in Germany resulted in statistically significant declines in the rate of hospitalization for acute coronary

events. Because such hospitalizations are common and costly, declines in the 7–13% range result in important decreases in morbidity and costs to the medical system. As a result of intensive lobbying by the tobacco industry, German states have begun to roll back their indoor smoking laws. For example, since March 2010 the parliament of Hesse eased the smoking restrictions in that state by allowing to smoking in small bars, in small family-style restaurants, in discotheques, and in casinos. Similar discussions are taking place in other German states. This study would suggest that these rollbacks will have health implications—more heart attacks and other coronary events. Workplace smoking restrictions may offer the opportunity to improve the general health of the population *and* save money—a rare constellation in medicine.

Acknowledgments

Deutsche Angestellten-Krankenkasse (DAK), a German health insurance firm, provided the data for the analysis and some funding to support the data analysis. Dr. Sargent receives funding from the National Institutes of Health (CA 77026).

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Fig. 1.

Trend for hospitalization that included an ICD10 code for angina. Time is shifted by state, such that each state's hospitality ban begins at time 0. The *gray line* reflects day-to-day variation in the crude hospitalization rate; the *blue line* reflects month-to-month variation in the crude hospitalization rate. The *black lines* are the best fit linear regression lines for the hospitalization trend before and after implementation of the law. The *inset* shows slope estimates with 95% confidence intervals for both trend lines, with the estimate scaled to reflect change in the monthly hospitalization rate. *Asterisk* before the law, there was no significant time trend (slope = 0.06 [−0.55, 0.66]); after the law, there was a statistically significant downward time trend, −5.3 (95% CI −7.2, −3.5) admissions per month; *p*-value for the difference in slope < 0.0001

Fig. 2.

Trend for hospitalization that included an ICD10 code for acute myocardial infarction. Time is shifted by state, such that each state's hospitality ban begins at time 0. The *gray line* reflects day-to-day variation in the crude hospitalization rate; the *blue line* reflects month-to-month variation in the crude hospitalization rate. The *black lines* are the best fit linear regression lines for the hospitalization trend before and after implementation of the law. The *inset* shows slope estimates with 95% confidence intervals for both trend lines, with the estimate scaled to reflect change in the monthly hospitalization rate. *Asterisk* before the law, there was a statistically significant upward time trend, with hospital admissions for angina increasing by 1.7 (95% CI 1.5, 1.9) per month; after the law, there was no significant time trend (slope = 0.05 [−0.57, 0.66]); *p*-value for the difference in slope <0.0001)

Table 1

Relation between age, sex and occupation and hospitalization for angina or acute myocardial infarction

Number and percent of patients			Hospitalized one or more times for angina			Hospitalized one or more times for acute myocardial infarction		
	N	Percent	Percent	AOR	95% CI	Percent	AOR	95% CI
Total	3,700,384	100	2.16			1.06		
Age in years								
30–39	577,522	15.6	0.12	Ref		0.07	Ref	
40–49	790,072	21.4	0.52	4.5	4.1, 4.8	0.31	4.90	4.4, 5.5
50–59	761,964	20.6	1.55	13.0	12.0, 14.0	0.78	11.87	10.7, 13.2
60–69	889,024	24.0	2.98	22.8	21.0, 24.66	1.22	17.21	15.46, 19.15
70–79	483,024	13.1	5.44	42.6	39.3, 46.2	2.39	34.21	30.72, 38.09
80–89	183,560	5.0	5.54	47.5	43.9, 51.5	3.89	64.15	57.55, 71.51
90	15,218	0.4	3.86	34.5	30.8, 38.7	4.97	90.75	79.76, 103.3
Sex								
Male	1,241,474	33.6	3.39	Ref		1.83	Ref	
Female	2,458,910	66.5	1.55	0.45	0.44, 0.45	0.66	0.34	0.34, 0.35
Occupation								
Unemployed/welfare	378,105	10.2	1.68	1.29	1.25, 1.33	0.95	1.36	1.31, 1.42
Trainee/student	1,744	0.1	0.11	0.77	0.19, 3.10	0.06	0.66	0.092, 4.71
Handicapped/workman's comp	10,756	0.3	0.47	0.93	0.70, 1.22	0.52	1.76	1.35, 2.30
Employed	1,476,623	39.9	0.76	Ref		0.40	Ref	
Family member	225,364	6.1	1.11	1.06	1.01, 1.11	0.48	1.03	0.96, 1.10
Retired	1,607,792	43.5	3.73	1.20	1.16, 1.23	1.77	1.14	1.09, 1.18

AOR adjusted odds ratio

Table 2

Percent reduction in hospitalization rate and hospitalization cost 1 year after implementation of hospitality smoking laws in Germany

Disease subgroup	Hospitalization		Cost	
	Baseline* hospitalization rate (per million per month)	Percent reduction rate 1 year post-smoking ban (95% CI)	Baseline* inflation- adjusted hospitalization costs [†]	Percent reduction rate 1 year post-smoking ban (95% CI)
<i>Angina</i>				
Overall	486.08	13.28 (8.19, 18.36)	1.24	9.55 (2.47, 16.64)
Age				
Younger (< 68)	265.73	12.98 (6.45, 19.52)	0.63	4.04 (−6.67, 14.76)
Older (>68)	1344.38	15.66 (10.94, 20.39)	3.60	14.99 (8.36, 21.62)
Sex				
Women	331.85	10.92 (5.31, 16.53)	0.74	5.02 (−3.36, 13.4)
Men	790.87	14.32 (8.83, 19.81)	2.22	11.61 (3.67, 19.54)
<i>Myocardial infarction</i>				
Overall	215.69	8.58 (4.99, 12.17)	1.05	20.08 (15.98, 24.17)
Age				
Younger (< 68)	111.42	15.77 (10.57, 20.97)	0.52	22.75 (16, 29.5)
Older (>68)	622.14	6.38 (2.2, 10.56)	3.08	20.33 (15.54, 25.12)
Sex				
Women	135.81	4.54 (−0.71, 9.79)	0.62	18.76 (13, 24.53)
Men	372.95	9.58 (5.09, 14.06)	1.89	19.53 (14.06, 25)

* Baseline values assessed at the time hospitality laws were implemented

[†] Inflation-adjusted to year 2005 hospitalization costs in millions of Euros per million insured per month