

TO: ACTING CITY MANAGER 1994 DECEMBER 14

FROM: MEDICAL HEALTH OFFICER

SUBJECT: 100% SMOKE-FREE INDOOR ENVIRONMENTS

PURPOSE: TO INFORM COUNCIL OF THE GREATER VANCOUVER METROPOLITAN HEALTH DEPARTMENTS' INITIATIVE TO ACHIEVE 100% SMOKE-FREE INDOOR ENVIRONMENTS IN PUBLIC PLACES.

TO OBTAIN COUNCIL'S APPROVAL TO INVESTIGATE THE RAMIFICATIONS OF PROCEEDING WITH THE PROPOSED STRATEGIES TO ACHIEVE THIS OBJECTIVE.

RECOMMENDATION:

1. THAT the Health Department, in conjunction with other Greater Vancouver Metropolitan Health Departments/Units, carry out a public consultation process through the spring of 1995 in order to investigate the ramifications of achieving 100% smoke-free indoor environments in public places.

REPORT

1.0 BACKGROUND

On 1987 October 05, Council adopted the Burnaby Smoking Regulation Bylaw No. 8771 to further the care, protection, promotion and preservation of the health of the inhabitants of Burnaby by regulating the places where smoking is permitted. The Bylaw has been successful as a "first step" in reducing exposure to environmental tobacco smoke. Compliance levels are generally good and violations of the Bylaw have been resolved without court actions. Nevertheless, the Bylaw is now out of step with current medical knowledge about the effects of environmental tobacco smoke. In addition, the general public is becoming increasingly intolerant of smoking in public places, especially restaurants.

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2.0 ADVERSE HEALTH EFFECTS OF ENVIRONMENTAL TOBACCO SMOKE

Environmental Tobacco Smoke (ETS) more commonly referred to as secondhand smoke or sidestream smoke, was recently declared a Class A Carcinogen (known human carcinogen) by the U.S. Environmental Protection Agency. ETS is responsible for approximately 3,000 lung cancer deaths annually among U.S. non-smokers. Studies have also indicated that ETS increases the risk of other types of cancer and heart disease.

The B.C. Ministry of Health estimates that tobacco smoke causes 50 lung cancer deaths annually in non-smokers, 37 from workplace exposure. ETS is estimated to be responsible for:

- * 1,800 to 3,600 cases of lower respiratory tract infections in infants with 200 to 400 cases requiring hospitalization;
- * 80 to 400 new cases of childhood asthma per year;
- * 1,000 to 4,000 asthmatic children whose symptoms have worsened by tobacco smoke pollution.

Restaurant employees have an approximately 50% increased risk of lung cancer that is attributable to restaurant tobacco smoke exposure. They are 1.5 to 2 times more likely to die from lung cancer (see Attachment 1).

With respect to the Sudden Infant Death Syndrome (SIDS), a joint statement has recently been released by Health Canada, the Canadian Pediatric Society, Canadian Institute of Child Health, and the Canadian Foundation for the Study of Infant Deaths stating that exposure to ETS is a significant risk factor for SIDS. An infant who has been exposed either before or after birth is placed at an increased risk for SIDS compared to those infants who have not been exposed.

The weight of evidence now clearly indicates that persons who are "passively" exposed to tobacco smoke are at a significantly increased risk of developing lung cancer and other serious diseases. The Provincial Health Officer is expected to release a significant position paper on ETS later this year which will accord the elimination of ETS a high priority in our efforts toward improving public health and reducing the burden on the acute care system.

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3.0 PAST EXPERIENCES IN REGULATING SMOKING IN PUBLIC PLACES

The Burnaby Smoking Bylaw is typical of those adopted in the 1980s, placing 'partial' restrictions in premises such as public buildings, offices, restaurants, retail stores and institutions. The Bylaw was based upon minimizing the effect of ETS at worksites and in public places. Its underlying assumption is that non-smoking is the norm (75% of British Columbians do not smoke) and that accommodations can be made to allow for smoking in designated areas.

Nearly 10 years of experience with the Bylaw has illustrated that placing smokers and non-smokers in the same indoor space or even in separate rooms that are on the same ventilation system does not eliminate exposure to tobacco smoke since the heating, ventilation & air conditioning system recirculates most of the contaminated indoor air. Providing enough ventilation to eliminate all deleterious effects of tobacco smoke pollution on non-smokers would, in the words of one researcher, "create a windstorm" indoors. Air cleaning devices or desktop smokeless ashtrays are not effective in reducing the concentration of tobacco smoke in a space. Many distinctions between smoking and non-smoking areas in restaurants, for example, are quite arbitrary and artificial with ETS showing no respect for these "boundaries".

What is required to address ETS is the next generation of smoking control regulation, one which guarantees 100% smoke-free indoor environments. This report recognizes that the most effective way to maintain indoor air quality is to control the source of the pollutant by restricting smoking to totally separate rooms which are heated, cooled and ventilated separately from non-smoking rooms or by banning smoking indoors.

ETS has been proven to be a serious public health and occupational health hazard. Workers in indoor worksites such as offices, the foodservice industry and the entertainment industry are being unnecessarily exposed to a known carcinogen. Furthermore, it is our perception that the general public is growing increasingly intolerant of ETS as the Health Department has received verbal and written requests to amend and strengthen the Smoking Bylaw. Therefore, it is very appropriate to review our Smoking Bylaw and policies to move toward the elimination of ETS.

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During the 1990s there has been a significant trend in the U.S. to adopt local ordinances that completely ban smoking in premises that are accessible to the public. The State of Vermont has banned smoking in all public places except bars. The California City of San Luis Obispo banned smoking in all public places, including bars, in August of 1990. They boast 98% compliance and an independent study showed that business did not suffer as many restaurateurs had feared. More than 100 municipalities in California have banned smoking in restaurants. A recent report on tobacco use in California concluded that smoking bans in restaurants would not reduce revenues and were, in fact, likely to increase revenues slightly (see Attachment 2).

4.0 CURRENT INITIATIVES IN REGULATING SMOKING IN PUBLIC PLACES

On the voluntary front, the Breathers' Dining Guide published by AirSpace (Non-smokers' Rights Society) identifies upwards of 500 British Columbia eateries, most in the Lower Mainland, that are non-smoking. Earlier this year, McDonald's Canada banned smoking in all of its corporate operations and encouraged franchisees to follow suit. The benefits to restaurants of eliminating smoking are significant but often understated. For example, the elimination of distinctions between smoking and non-smoking areas should reduce waiting time for patrons and eliminates the need to ask patrons for their preference. Cost savings in maintenance of everything from drapes to air cleaning equipment can be significant. Lost staff time due to respiratory illnesses arising from exposure to ETS will be virtually eliminated. In short, elimination of smoking in foodservice establishments should be good for the bottom line, as long as the ban is applied uniformly to the food services and entertainment industries and broadly based geographically.

On the national front in the U.S., the Occupational Safety and Health Administration (OSHA) has proposed an outright ban on smoking in the indoor workplace. Although this proposal has resulted in the predictable tobacco-sponsored write-in campaign, it has received the support of the Building Owners' and Managers' Association (BOMA). BOMA actually requested such a ban over a year ago since it feels that ETS is the leading cause of indoor air quality complaints as well as the primary cause of fires in office buildings.

In Canada, the City of Scarborough has proposed a smoking ban in public places and expects to have it in place early in 1995. Feedback from owners of restaurants and bars/cabarets on the proposal have been negative as most owners fear that their customers will simply go to adjoining communities that have no ban on smoking.

The Worker's Compensation Board of British Columbia (WCB) is busy drafting indoor air quality regulations which will seek to address ETS as an occupational health hazard. Unfortunately, the proposed regulations do not go as far as the OSHA proposal. In fact, they closely resemble the existing approach in municipal smoking bylaws of limiting smoking to "designated smoking areas", which this report has already depicted as inadequate. Furthermore, the draft proposal affords even less protection to workers in the entertainment and foodservice industry. The region's Medical Health Officers intend on presenting briefs to the WCB public hearings in the spring of 1995, lobbying for more stringent regulations.

Provincially, the Provincial Health Officer's position paper on ETS may set the stage for discussions around a provincial clean indoor air regulation. However, there is no indication that we can expect such province-wide legislation to eliminate ETS in the near future, despite sizable public petitions being tabled in the legislature.

At the local government level, the Capital Regional District Health Committee is considering strategies to achieve 100% smoke-free environments in restaurants and other premises such as bars, bingo halls and casinos. Most recently, the City of Surrey has enacted a more stringent smoking by-law reducing the allowable maximum smoking areas in restaurants from the existing 50% to 20%.

The City of New Westminster is in the midst of a public consultation initiative to develop recommendations to revise their Smoking Control Bylaw. The public consultation process which includes a general survey, a series of articles in local newspaper, interviews and meetings with key stakeholders, community open house, and a 24 hour hot line, started in July, 1994 and will be completed by the end of 1994. Preliminary data from input collected to date indicate that:

- * All business groups support a regional approach to accomplish a complete ban on smoking in public places as they are concerned with adverse economic impact if smoking ban was implemented only in New Westminster;
- * Over 80% of survey respondents and hot line callers favor an immediate and stronger restriction on smoking in public places and in office work places;
- * Support exists for a smoking ban in office spaces and places of public assembly;

- * Business groups seem to accept that a smoking ban in public places is inevitable. However, they would like the ban date to be delayed as long as possible and not to come into effect during the busier fall/Christmas season;
- * Mall managers prefer a phase-in period to achieve 100% smoke-free indoor environments;
- * Restaurateurs want the same rules to be applied to bars and pubs that serve food; and
- * Bar, pub and cabaret owners strongly oppose smoking restrictions in their premises.

In Richmond, the Chamber of Commerce and the Restaurant Association have both surveyed their respective membership regarding smoking/non-smoking seating requirements. Questions that were asked include:

- * The current smoking bylaw in Richmond requires 50% of restaurant seating to be non-smoking. Would you agree to a reduction of smoking seating?
- * If smoke-free seating was increased to 75%, what impact do you think it would have on the restaurant business in Richmond?
- * Are there complaints with regards to insufficient "non-smoking" seating available at your restaurant?
- * What percentage of your business is tourists who request smoking seating?
- * Are you a smoke-free restaurant and/or workplace?
- * Do you agree with public recognition awards for businesses who provide a smoke-free environment?

The response rate for the Chamber of Commerce survey was 11% and the Restaurant Association survey was 39%. Based on the responses, there appears to be support in favour of increasing the non-smoking seating requirements in restaurants.

In Burnaby, Health Department staff, in response to the motion adopted at the regular Council Meeting on 1994 November 21 for specific information, contacted the following organizations and obtained their initial thoughts on the proposed smoking ban in indoor public places:

1. Staff at the Urban Development Institute do not know if this would be an issue the Board would want to get involved in. They refrained from providing an opinion on the proposed ban as the issue has not been presented to the Board;
2. With respect to new developments, there is no technical or legislative constraint that would preclude the development of a separate floor or room with a totally separate ventilation system for smokers;
3. The Restaurant & Foodservices Association of B.C. believes that the restaurants, in an increasingly competitive environment, must be allowed to operate with as little government intervention as possible. The Association, however, recognizes the harmful effects of cigarette smoking and is willing to work with regulatory bodies to find an acceptable balance between non-smokers and smokers, as well ensuring a level playing field with all other sectors of the Hospitality Industry;
4. The Executive Director of the Building Owner's & Manager's Association commented that the said issue is timely as air quality in commercial buildings and office workplaces is becoming a major concern with tenants in the member owned or managed buildings;
5. The Executive Director of the Neighbourhood Pubs Association of B.C. commented that pub owners are against any move to ban smoking in their premises as they believe the ban would cause financial hardship and be difficult to enforce. Several pubs have designated "no smoking" areas of approximately 25% of their total seating capacity and this seems to have been well received and enhanced their business. In the Capital Regional District where the bylaw presently requires at least 60% "no smoking", pub owners are having difficulties complying;
6. A representative of the B.C. and Yukon Hotels Association commented that the said issue should be addressed Provincially, not at the community or regional level. He believes that providing separately ventilated indoor areas must be considered and that a complete ban may have a dramatic negative effect on international tourism as many of their clients comes from other parts of the world where there is a much higher incidence of smoking among adults; and
7. The president of the B.C. Cabaret Association commented that a smoking ban in bars and cabarets would be an absolute nightmare as the increased staff needed to police would be impractical from a financial point of view.

Although the proposed smoking ban in public places has not been favourably received by the organizations that staff have contacted, these organizations do show a significant interest in the issue and are willing to actively participate as key stakeholders during the formal public consultation process.

Other Health Departments in the Lower Mainland are currently reviewing their smoking control bylaws. A coordinated regional approach to achieve 100% smoke-free indoor environments has been proposed by the Metropolitan Board of Health, in conjunction with neighbouring Lower Mainland municipalities. At its meeting on 1994 October 26, the following motion was passed:

"THAT the Metropolitan Board of Health endorses the recommendations outlined in the Draft Council Report for 100% Smoke-Free Indoor Environments; THAT the draft report be distributed to all member municipalities including the surrounding municipalities of the Fraser Valley, and THAT public consultation become a vital element of the process."

5.0 REGIONAL STRATEGY TOWARD ACHIEVING 100% SMOKE-FREE INDOOR ENVIRONMENTS IN PUBLIC PLACES

This report recommends that the Health Department, in conjunction with other Greater Vancouver Metropolitan Health Departments/Units carry out a public consultation process in order to investigate the ramifications of achieving smoke-free indoor environments in public places. It suggests that the public, including key stakeholders, need to be consulted as to the ramifications, ways, means, and timing of moving toward the elimination of ETS. Stakeholders to be consulted would include associations representing the foodservice, licensed establishment and entertainment industry, BOMA, other affected industries, AirSpace, B.C. Lung Association, Heart & Stroke Foundation, Cancer Society, etc. In addition, general consultation with the public through various mechanisms is contemplated.

In keeping with a regionally-coordinated process, it is the Health Department's intention to arrange, to the extent possible, a regional consultation program, pooling resources to obtain broad-based feedback. Funding for these processes will be sought at the regional level through health funding agencies and senior governments.

As a minimum, the consultation process will involve the following two major components:

1. A scientifically sound, independently run public opinion survey on the subject. Survey data will provide specific information regarding the smoking behaviour and preference of Burnaby residents and residents of other Metropolitan Vancouver Health Departments/Units. A steering committee with representatives from each Metropolitan Health Department and industries such as the Restaurant & Food Services Association, the Cabaret Association, the Hotel Association, and the Building Owner's & Manager's Association will establish the framework for the survey and provide guidance to the selected polling company;
2. A series of open houses or workshops in Burnaby (as well as other Lower Mainland Municipalities) aimed at exchanging information and receiving feedback from stakeholders such as health lobby groups, citizens, consumer groups, and interested individuals.

In order to initiate discussion and consultation, a tentative timetable for implementation is proposed and will be adjusted to reflect the results of the consultation process. A report back to Council in the spring of 1995 will propose an implementation schedule based on input received through the public consultation process as well as the final bylaw language including any necessary exemptions. A suggested implementation plan that can be used for initial discussions is as follows:

- * 1995 April 01 - ban smoking in the workplace (offices)
- * 1995 July 01 - ban smoking in restaurants
- * 1996 January 01 - ban smoking in remaining indoor public places (bars, cabarets, bingo/casinos, bowling alleys)

Some resistance to an outright ban is expected from the foodservice sector while significant resistance is expected from the last group based on the experience of other jurisdictions. Some of the resistance can be addressed if we are able to put together a region-wide ban on indoor smoking by convincing Lower Mainland Councils that such a ban is good public policy as had been endorsed by the Metropolitan Board of Health.

Achieving smoke-free indoor environments in public places through legislation will have significant positive impacts on the health and quality of life of all residents in Burnaby. It will also have significant positive financial impacts on the smoker and nonsmoker, employer (liabilities), building owner (reduced maintenance, reduced fire risk) and medical system. Since a smoking ban would be generally self-enforcing, no additional staff resources will be required.

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6.0 CONCLUSION

The weight of medical evidence clearly indicates that the public and workers "passively" exposed to tobacco smoke are at increased risk of developing lung cancer and other serious diseases. Sound public health policy would dictate that it is time to phase out smoking indoors as quickly as possible. This report proposes that the Health Department comprehensively investigate the ramifications of severely restricting and/or totally prohibiting indoor smoking in public places by early 1996. A total ban on smoking in the workplace and public places is the only policy that would totally protect public health and the health of workers from ETS exposure. Clearly a great deal of consultation with affected stakeholders needs to take place in order to discover and minimize any negative impacts from an indoor smoking ban. Consultation may also identify some areas where an outright ban is unachievable or unapplicable, in which case alternatives need to be explored.



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Involuntary Smoking in the Restaurant Workplace

A Review of Employee Exposure and Health Effects

Michael Siegel, MD, MPH

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Objective.—To determine the relative exposure to environmental tobacco smoke for bar and restaurant employees compared with office employees and with nonsmokers exposed in the home (part 1) and to determine whether this exposure is contributing to an elevated lung cancer risk in these employees (part 2).

Data Sources.—MEDLINE and bibliographies from identified publications.

Study Selection.—In part 1, published studies of indoor air quality were included if they reported a mean concentration of carbon monoxide, nicotine, or particulate matter from measurements taken in one or more bars, restaurants, offices, or residences with at least one smoker. In part 2, published epidemiologic studies that reported a risk estimate for lung cancer incidence or mortality in food-service workers were included if they controlled, directly or indirectly, for active smoking.

Data Extraction.—In part 1, a weighted average of the mean concentration of carbon monoxide, nicotine, and respirable suspended particulates reported in studies was calculated for bars, restaurants, offices, and residences. In part 2, the relative lung cancer risk for food-service workers compared with that for the general population was examined in the six identified studies.

Data Synthesis.—Levels of environmental tobacco smoke in restaurants were approximately 1.6 to 2.0 times higher than in office workplaces of other businesses and 1.5 times higher than in residences with at least one smoker. Levels in bars were 3.9 to 6.1 times higher than in offices and 4.4 to 4.5 times higher than in residences. The epidemiologic evidence suggested that there may be a 50% increase in lung cancer risk among food-service workers that is in part attributable to tobacco smoke exposure in the workplace.

Conclusions.—Environmental tobacco smoke is a significant occupational health hazard for food-service workers. To protect these workers, smoking in bars and restaurants should be prohibited.

(JAMA. 1993;270:490-498)

THE ADVERSE health effects of environmental tobacco smoke (ETS) exposure are now well recognized.¹⁻⁴ The Environmental Protection Agency classified ETS as a group A carcinogen and estimated that it causes about 3000 lung cancer deaths per year in nonsmokers.⁵ The workplace is a major source of ETS exposure, and the National Institute for Occupational Safety and Health has recommended that involuntary exposure to tobacco smoke be eliminated by pro-

hibiting smoking in the workplace.⁶ Many state and local governments have responded to this recommendation by prohibiting smoking in public and/or private workplaces.⁶

Many local governments have regulated smoking in restaurants.⁷ These efforts have generally focused on protecting the public from ETS (Hatfield L. Face-off: smoking in restaurants? *San Francisco Examiner*. February 27, 1992: A1). However, restaurants are also workplaces, and because restaurant employees spend a much longer time in the restaurant than do patrons, ETS exposure is more likely to result in adverse health effects for them.

This review assesses the potential health hazard of ETS exposure for bar

and restaurant employees. There are two questions considered. First, what is the relative exposure to ETS for bar and restaurant employees compared with employees of other businesses and with individuals who live in a home with a smoker? Second, does ETS exposure in bars and restaurants produce an elevated lung cancer risk among these workers? To answer the first question, published indoor air quality data for bars, restaurants, offices, and residences were reviewed. To answer the second question, the epidemiologic studies of lung cancer risk in food-service workers were reviewed.

METHODS

Literature Review

A literature search was carried out using the National Library of Medicine MEDLINE database to locate published studies that reported measurements of tobacco constituents, indoor air and studies of occupational lung cancer risk in food-service workers. Bibliographies from each publication were reviewed to identify additional relevant citations.

In part 1, studies were included if they met the following criteria: (1) reported the mean concentration of carbon monoxide, nicotine, or respirable suspended particulates from measurements taken in one or more restaurants, bars, offices, or residences with at least one smoker; (2) did not include measurements taken in designated smoking areas; and (3) did not include measurements taken under smoke-free conditions. Thus, these studies include measurements in restaurants and offices that allowed smoking anywhere, or in the nonsmoking areas of restaurants and offices that restricted smoking to a designated area. Measurements in residences were taken in the presence of at least one smoker. In addition to individual studies obtained through the computer search, three published reviews were

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Reprint requests to the Office on Smoking and Health, Centers for Disease Control and Prevention, MS R50, 4770 Buford Hwy NE, Atlanta, GA 30341 (Dr Siegel).

Table 1.—Indoor Air Concentrations of Carbon Monoxide, Nicotine, and Respirable Suspended Particulates in Restaurants, Bars, Offices, and Residences*

Constituent	No. of Studies	No. of Sites Sampled	Weighted Mean†	Range	Ratio‡
Carbon monoxide, ppm					
Offices	12	1161	3.0	1.0-3.3	1.0
Restaurants	12	229	5.1	0.5-9.9	1.7
Bars	10	32	11.6	3.1-17	3.9
Nicotine, µg/m ³					
Offices	22	940	4.1	0.8-22.1	1.0
Residences	7	91	4.3	1.6-21	1.0
Restaurants	17	402	6.5	3.4-34	1.6
Bars	10	25	19.7	7.4-65.5	4.8
Particulates, µg/m ³					
Offices	19	912	57	6-256	1.0
Residences	13	524	78	32-700	1.4
Restaurants	12	211	117	27-690	2.0
Bars	10	16	348	75-1320	6.1

*Data from Sterling et al.,¹ Repace,² Guerin et al.,¹⁰ and Turner et al.¹¹ No studies met the inclusion criteria for measurement of carbon monoxide in residences.

†Weighted average of individual study mean concentrations for all measurements taken. Weights used were the number of restaurants, bars, offices, or homes sampled.

‡Ratio of weighted mean restaurant, bar, or residence to weighted mean office concentration.

helpful in ensuring that most of the relevant literature was included in the analysis. First, Sterling et al¹ reviewed the published literature on air sampling of tobacco constituents as of 1982. Second, Repace² reviewed the results of about 50 studies of indoor ETS concentrations that were published before 1987. Third, the most recent and extensive review of the literature, published by Guerin et al¹⁰ in 1992, reports the results of nearly 100 air-sampling studies. Finally, data from the largest single study of indoor ETS levels, in which Turner et al¹¹ tested 585 office environments, were included in this review and analysis. It should be noted that data from individuals or groups allied with and funded by the tobacco industry¹¹ were included in the analysis.

In part 2, studies were included if they met the following criteria: (1) reported a risk estimate of lung cancer incidence or mortality in food-service workers compared with other workers or with the general population; and (2) controlled, directly or indirectly, for the confounding effects of active smoking.

Data Analysis

In part 1, a weighted average of the mean carbon monoxide, nicotine, and respirable suspended particulates concentrations reported in each of the studies was calculated for bars, restaurants, offices, and residences. The weight given to each study was the number of separate restaurants, offices, or homes sampled. This weighting procedure resulted in heavier weighting of studies that reported the means of a large number of separate office or restaurant measurements. These studies are more likely to reflect typical workplace concentrations than those measuring concentrations in

a single workplace.

In part 2, no attempt was made to statistically pool the individual lung cancer risk estimates, owing to the small number of studies and the variability in study designs.

RESULTS

Part 1: ETS Levels in Restaurant Air

The mean restaurant ETS constituent concentrations are between 1.6 and 2.0 times higher than those in the office workplaces studied, and 1.5 times higher than levels in homes with at least one smoker present (Table 1). Mean concentrations of ETS constituents in bars are 3.9 to 6.1 times higher than in the office workplaces, and 4.4 to 4.5 times higher than in the residences.

One must be cautious in comparing ETS exposure in the home and workplace based only on ETS concentrations in ambient air because the duration of exposure is different in each environment. Repace² has shown that total exposure is proportional to both concentration and duration of exposure. Based on time-budget studies that have estimated the average amount of time spent by working persons in various environments, the average US adult spends about 14 hours in the home and 6 hours in the workplace per day.¹² Allowing for 8 hours of sleep per day, and assuming that persons exposed to ETS at home are exposed during all waking hours, the duration of exposure is similar in the two environments (6 hours). Thus, total exposure to ETS is likely to be at least 1.5 times higher for restaurant workers than for persons who live with a smoker, and at least 4.4 times higher for bar workers than for individuals with only domestic ETS exposure.

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Eleven studies have examined lung cancer risk in food-service workers without controlling for active smoking.¹³⁻²¹ These studies were excluded from the analysis. Six studies have examined lung cancer risk in food-service workers, controlling for active smoking and other potential confounding variables.²¹⁻²⁶ One of these was a historical cohort study that examined occupational lung cancer mortality. Five were case-control studies that included incident lung cancer cases (Table 2).

Investigators in the California Occupational Mortality studies²⁴⁻²⁷ reviewed California's mortality data from 1979 through 1981 by occupation.²⁴⁻²⁷ Crude standardized mortality ratios (SMRs) were calculated for food-service workers. Singleton and Beaumont²⁵ and Beaumont et al²⁷ then attempted to control for smoking, alcohol, and socioeconomic status indirectly by adjusting for national occupational smoking and alcohol use rates (imputed from National Health Interview Survey data and average occupational socioeconomic status). For white male food-service workers, the unadjusted lung cancer SMR was 105% and the adjusted SMR was 125% (95% confidence interval [CI], 90% to 169%). For male bartenders, the adjusted SMR was 152% (95% CI, 118% to 192%). For white waitresses, the crude SMR was 368% and the adjusted SMR was 148% (95% CI, 125% to 174%).

Williams et al²³ conducted a case-control study using cancer mortality data from the Third National Cancer Survey. Occupational history and a range of potential confounders were determined by interview. Odds ratios (ORs) for working in various occupations were determined for a variety of cancer types, adjusted for smoking, alcohol, income, and education. For female food-service workers, the adjusted lung cancer OR was 1.88. For male food-service workers, no risk estimate was reported owing to the small number of cases (two).

Lerchen et al²² studied the relationship between occupation and lung cancer among males in a case-control study using the New Mexico Tumor Registry. Cases and population-based controls were interviewed to obtain occupational and smoking histories. For males employed in the "eating and drinking establishment industry" category, an adjusted OR of 1.3 (95% CI, 0.8 to 2.0) was reported.

Schoenberg et al²⁶ examined the relationship between occupation and lung cancer in New Jersey males in a case-control study. Cases obtained from a state health department reporting system and

Table 2.—Studies of Lung Cancer Risk in Food-Service Workers, Controlled for Active Smoking*

Source	Subjects	Study Design	Risk Estimate (95% Confidence Interval)	No. of Cases or Deaths	Additional Confounders Controlled
Males					
Singleton and Beaumont ²⁵	California (deaths) Bartenders Other food-service workers	Historical cohort	SMR=1.52 (1.18-1.92)	69	Age, sex, race, SES, alcohol
			SMR=1.25 (0.90-1.69)	42	
Lerchen et al ²⁹	New Mexico (incident cases) Eating and drinking industry workers	Case-control	OR=1.6 (0.8-2.9)	26	Age, sex, race, diet
Schoenberg et al ³⁰	New Jersey (incident cases) Bartenders Other food-service workers	Case-control	OR=... (1.2-1.3)†	29	Age, sex, race, SES, diet
			OR=... (1.1-1.2)†	37	
Zahn et al ³¹	Missouri food-service workers (incident cases)	Case-control	OR=1.8 (1.0-3.5)	24	Age, sex, race
Females					
Singleton and Beaumont ²⁵	California waitresses (deaths)	Historical cohort	SMR=1.48 (1.25-1.74)	149	Age, sex, race, SES, alcohol
Williams et al ²⁸	US food-service workers (incident cases)	Case-control	OR=1.88	12	Age, sex, race, SES, alcohol
Keller and Howe ³²	Illinois females employed in eating and drinking places; nonsmokers (incident cases)	Case-control	OR=1.92 (1.21-3.07)	Not given	Age, sex, race

*SMR indicates standardized mortality ratio; SES, socioeconomic status; and OR, odds ratio.
†Specific OR not given in source cited.

population-based controls were interviewed to obtain occupational, smoking, and dietary histories. The adjusted OR for male bartenders was between 1.2 and 1.3, and for other food-service workers was between 1.1 and 1.2.

Zahn et al³¹ conducted a case-control study to determine (after adjusting for smoking) the relationship between lung cancer and occupation. Data from the Missouri Cancer Registry, which includes occupational and smoking histories, were reviewed for white male lung cancer cases diagnosed between 1980 and 1985. The adjusted OR for food-service workers was 1.8 (95% CI, 1.0 to 3.5).

Keller and Howe³² performed a case-control study using all incident lung cancers among nonsmokers entered in the Illinois Cancer Registry from 1985 to 1987. The controls were nonsmoking colon cancer cases. Unlike the other five studies, Keller and Howe's study controlled for active smoking by specification rather than adjustment. Only nonsmokers were included in the analysis. The OR for lung cancer in females employed in eating and drinking places was 1.92 (95% CI, 1.21 to 3.07). No risk estimate was given for males.

Taken together, these studies suggest that there is an excess lung cancer risk of approximately 50% (range 10% to 90%) among food-service workers compared with the general population, controlling for active smoking. In the two studies that examined bartenders and other food-service workers separately, this excess lung cancer risk was found for both groups of workers.^{28,30} Thus, it appears that there is an elevated lung

cancer risk in both bar and restaurant workers that persists after controlling for active smoking.

COMMENT

The availability of ambient air survey data on ETS levels in more than 1000 offices, more than 400 restaurants, and more than 600 homes provides an opportunity to estimate the relative ETS exposure of bar and restaurant workers compared with that of office workers and with that of individuals who live with a smoker. In this analysis, ETS exposure for restaurant workers was estimated to be 1.6 to 2.0 times higher than for office workers, and at least 1.5 times higher than for persons who live with a smoker. For bar workers, ETS exposure was estimated to be 3.9 to 6.1 times higher than for office workers, and at least 4.4 to 4.5 times higher than for persons exposed in the home. An attempt was made to determine whether this increased estimated workplace ETS exposure in bars and restaurants produces an increase in lung cancer risk for these workers. In six epidemiologic studies that controlled for active smoking, an excess lung cancer risk of approximately 50% (range, 10% to 90%) was found for food-service workers compared with the general population. This excess risk could well be due to the increased ETS exposure of food-service workers. However, there are several alternative explanations that must be considered.

First, residual confounding by smoking might explain the elevation in lung cancer risk for food-service workers.

There are several reasons to believe that this is not the case. Three case-control studies that controlled for smoking^{29,31} involved detailed smoking histories. Smoking status was measured as a categorical³¹ or continuous variable,^{29,30} incorporating duration and intensity of smoking. Moreover, the adjustment for smoking produced little change in the OR for males. Lerchen et al²⁹ reported a change in OR from 1.7 to 1.6 when smoking was added to the regression model. Schoenberg et al³⁰ reported a change in OR of no more than 0.1 for food-service workers when smoking was considered. The finding of an elevated lung cancer risk among female food-service workers in a study restricted to nonsmokers³² adds further evidence that residual confounding by smoking is unlikely to explain the elevated lung cancer risk among food-service workers.

Second, confounding by a variable known to be associated with both lung cancer and food-service employment might explain the observed association. The most important considerations are age, sex, race, socioeconomic status, and diet (saturated fat and β -carotene [vitamin A] intake³³). However, age, sex, and race were controlled in all six studies (Table 2). Socioeconomic status was controlled in three studies, and diet in two. Vitamin A intake, but not saturated fat intake, was specifically measured in these studies.^{29,30}

Third, publication bias might explain why the six published studies reported an increased lung cancer risk in food-service workers. However, since these studies examine the relationship between lung cancer and a wide variety of occupations, they will almost certainly find a positive association with one or more occupations. Therefore, it is not plausible that studies finding no association between lung cancer and food-service employment have been differentially rejected or not submitted for publication.

Finally, the observed increase in lung cancer risk among food-service workers might be due to a carcinogenic exposure other than ETS. The most important consideration is exposure to cooking fumes. Air samples of cooking fumes have been shown to be mutagenic in the Ames assay,³⁴ and cooks have been shown to have elevated risks of respiratory tract cancers.^{14,17,20,35-38} However, there are several reasons to believe that exposure to cooking fumes is not contributing substantially to the increased lung cancer risk among food-service workers. First, a study of the mutagenicity of restaurant air³⁴ suggests that ETS is the major contributor to the mutagenicity of air from dining areas. In this study, the mutagen-

nicity of air from dining areas was closely correlated with smoker density, but had no relation to the mutagenicity of air from kitchen samples. Second, ventilation in restaurants is generally designed to prevent cooking fumes from escaping into dining areas.³¹ Average ventilation rates over cooking surfaces in four restaurants studied met the minimum requirements of the American Conference of Governmental Industrial Hygienists.³² The most important source of exposure to cooking fumes in these restaurants was contamination in "cook's breathing zones during active work processes."³³ Third, a time-budget study of cooks found that only 83% to 60% of a cook's shift is spent over cooking surfaces.³⁴ Food-service personnel would be expected to spend a much lower percentage of their time in contact with air contaminants over cooking surfaces. Finally, the studies that have controlled for active smoking and examined lung cancer risk in cooks have not reported an elevated risk for these workers. Singleton and Beaumont²⁶ found an adjusted lung cancer SMR of 91% for males and 102% for females. Schoenberg et al³⁰ reported an adjusted OR of 0.9 for cooks. It is quite possible that the increased lung cancer risk among cooks is due to confounding by active smoking. Smoking rates in male cooks are 80% higher than in the general male population.³⁵

An elevation in lung cancer risk attributable to ETS exposure in the restaurant workplace is plausible. Since domestic ETS exposure is associated with a relative risk for lung cancer of 1.3^{1,2,36} and this review estimated that typical restaurant ETS exposure is at least 1.5 times higher than domestic exposure, an excess lung cancer risk over 30% in restaurant workers, compared with unexposed nonsmokers in domestic settings, would be expected. High levels of restaurant air mutagenicity³⁴ and increased levels of urine mutagenicity³⁴ and 3-aminobiphenyl,³⁷ a suspected carcinogenic hemoglobin adduct, have been demonstrated in ETS-exposed restaurant workers.

The effects of domestic ETS exposure³⁸ and ETS exposure in the workplace in general⁶ have been recognized. This review of exposure to and health effects of ETS in bar and restaurant workplaces specifically addresses ETS as an important occupational health hazard for food-service workers. Public health efforts to regulate smoking in bars and restaurants can no longer focus only on protecting the patron. Food-service workers must be afforded the same public health protection as other workers. To protect these workers from the hazards of ETS, smoking should be prohibited in bars and restaurants.

I wish to thank Thomas Novotny, MD, and James Seward, MD, for their helpful suggestions in the review of the manuscript.

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The Effect of Ordinances Requiring Smoke-Free Restaurants on Restaurant Sales

ITEM	1
MANAGER'S REPORT NO.	71
COUNCIL MEETING	94/12/19

ABSTRACT

Objectives. The effect on restaurant revenues of local ordinances requiring smoke-free restaurants is an important consideration for restaurateurs themselves and the cities that depend on sales tax revenues to provide services.

Methods. Data were obtained from the California State Board of Equalization and Colorado State Department of Revenue on taxable restaurant sales from 1986 (1982 for Aspen) through 1993 for all 15 cities where ordinances were in force, as well as for 15 similar control communities without smoke-free ordinances during this period. These data were analyzed using multiple regression, including time and a dummy variable for whether an ordinance was in force. Total restaurant sales were analyzed as a fraction of total retail sales and restaurant sales in smoke-free cities vs the comparison cities similar in population, median income, and other factors.

Results. Ordinances had no significant effect on the fraction of total retail sales that went to restaurants or on the ratio of restaurant sales in communities with ordinances compared with those in the matched control communities.

Conclusions. Smoke-free restaurant ordinances do not adversely affect restaurant sales. (*Am J Public Health*. 1994;84:1081-1085)

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Introduction

As the evidence that environmental tobacco smoke endangers nonsmokers¹⁻⁵ has accumulated, more and more communities have restricted or eliminated smoking in public places and workplaces. Several communities have enacted legislation that requires smoke-free restaurants, thereby protecting the public and, particularly, restaurant employees⁶ from the toxic chemicals in secondhand tobacco smoke. Such legislation, however, is not in the interests of the tobacco industry because creation of smoke-free restaurants is a highly visible statement that tobacco use is no longer socially acceptable.⁷ Thus, tobacco companies have sponsored front organizations like the Beverly Hills Restaurant Association, Restaurants for a Sensible Voluntary Policy on Smoking, Californians for Fair Business Policy, and the California Business and Restaurant Alliance to mobilize restaurants against local smoke-free ordinances.^{8,9} This strategy achieved its first success in 1987, when the tobacco industry convinced the Beverly Hills City Council to repeal the first 100% smoke-free restaurant ordinance in California on the basis of undocumented claims that business dropped 30% because of the ordinance.^{8,9} Because similar predictions for other cities have been published nationally, voiced repeatedly through public testimony, and regularly printed in news reports, we tested the hypothesis that the passage of a smoke-free restaurant ordinance is accompanied by an immediate significant drop in restaurant sales.¹⁰

This study analyzes sales tax data for the first 15 US cities to enact smoke-free ordinances affecting restaurants. The California cities of Auburn, Bellflower (which repealed its ordinance in March 1992),

Beverly Hills (which amended its ordinance 4 months after it went into force), El Cerrito, Lodi, Martinez, Palo Alto, Paradise, Roseville, Ross, Sacramento, and San Luis Obispo, and the Colorado cities of Aspen, Snowmass Village, and Telluride have had such 100% smoke-free restaurant ordinances in force long enough to assess their effects. We also examined sales tax data from 15 comparison cities similar to the smoke-free cities in population, income, smoking prevalence, and other factors.¹¹⁻¹³ An analysis of restaurant sales as a fraction of total retail sales, and of restaurant sales in cities with smoke-free restaurant ordinances compared with those in similar cities that do not have smoke-free ordinances, shows no significant effects on business.

Methods

Data on taxable restaurant sales and total retail sales were obtained from the California State Board of Equalization¹⁴ and Colorado State Department of Revenue¹⁵ from the first quarter of 1986 through the first or second quarter of 1993 (depending on data availability) for the 15 communities that had smoke-free restaurant ordinances in force. Included were cities whose ordinances were in force for at least four quarters during this period, plus Beverly Hills and Bellflower, Calif, whose ordinances were repealed. Data were also obtained for 15 comparison communities where no such smoke-free

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TABLE 1—Profile of Smoke-Free and Comparison Cities

Smoke-Free and Comparison Cities	Population (1989) ^a	Geographical			Type of Smoking Restriction ^b	Median Household Income (1989) ^a	% of Smokers ^c	Date Ordinance in Effect	No. of Months in Effect ^d
		Inside Urbanized Area	Outside Urbanized Area	Rural Nonfarm					
Aspen, Colo	5 049		X		100%	37 467	23.5	10/85	95
Vail, Colo	3 659		X		Some	41 211			
Auburn, Calif	10 592		X		100%	37 272	24.1	10/91	21
Oroville, Calif	11 960		X		None	16 614	23.6		
Beverly Hills, Calif	31 971	X			100%	54 348	21.8	4/87–8/87	5
Santa Monica, Calif	86 905	X			Some	35 997			
Bellflower, Calif	61 815	X			100%	32 711	21.8	6/91–3/92	10
Lakewood, Calif	73 000	X			None	44 700			
El Cerrito, Calif	22 869	X			100%	39 538	22.9	11/91	20
San Pablo, Calif	25 158	X			Some	25 479			
Lodi, Calif	51 874	X			100%	30 739	24.1	11/90	32
Merced, Calif	56 216	X			Some	24 727	25.1		
Martinez, Calif	32 038	X			100%	45 964	22.0	3/92	16
Pleasant Hill, Calif	31 585	X			Some	46 885			
Palo Alto, Calif	55 544	X			100%	55 333	19.7	11/91	20
Mountain View, Calif	67 460	X			None	42 431			
Paradise, Calif	25 408		X		100%	22 954	23.6	8/91	23
Red Bluff, Calif	12 363		X		None	19 474			
Roseville, Calif	44 685	X			100%	39 975	24.1	9/91	22
Chico, Calif	40 076	X			Some	19 005	23.6		
Ross, Calif	2 180	X			100%	84 414	21.6	1/90	42
Tiburon, Calif	7 532	X			None	75 864			
Sacramento, Calif	369 365	X			100%	28 183	25.2	5/92	14
Fresno, Calif	354 202	X			Some	24 923	25.1		
San Luis Obispo, Calif	41 958	X			100%	25 982	18.9	8/90	35
Santa Maria, Calif	61 284	X			Some	29 492			
Snowmass, Colo	1 426			X	100%	39 107	23.5	5/89	51
Breckenridge, Colo	1 285			X	Some	33 259			
Telluride, Colo	1 292			X	100%	31 968	23.5	4/88	63
Steamboat Springs, Colo	6 695		X		Some	29 363			

^a1990 US Census of Population and Housing.¹¹

^b"Some" refers to no more than 60% seating areas for nonsmokers.

^cTobacco Use in California (reported by county)¹² for California and Behavioral Risk Factor Surveillance Study for Colorado (statewide) 1991.¹³

^dNumber of months for which data were available for this study.

ordinance was in force or where no more than 60% seating availability for nonsmokers occurred as a part of an existing ordinance (Table 1). Sales data for Aspen and its comparison city were collected from the first quarter of 1982 because Aspen's ordinance was passed in 1985. Data were recorded for "Eating and Drinking Places" and "Total Retail Sales." Published data for restaurant sales and total retail sales in the city of Paradise for the second, third, and fourth quarters of 1990 and in the city of San Luis Obispo for the fourth quarter of 1990 and first quarter of 1991 were corrected as instructed by the Board of Equalization to

account for late-reported data (written communications from Robert Rossi, June 15, 1992, and July 20, 1993).

To account for population growth, inflation, and changes in underlying economic conditions, the fraction (*F*) of total retail sales at restaurants was computed as follows:

$$F = \frac{\text{Restaurant Sales}}{\text{Total Retail Sales}}$$

If an ordinance adversely affected restaurants, this fraction would be expected to drop when the ordinance was in force. Restaurant sales in cities with ordinances

were also compared with sales in comparable cities without ordinances as follows:

$$C = \frac{\text{Restaurant Sales in City with Ordinance}}{\text{Restaurant Sales in City without Ordinance}}$$

Again, if an ordinance adversely affected sales, this ratio would be expected to drop.

Data were analyzed with linear regression¹⁶:

$$y = b_0 + b_t t + b_L L + b_W W,$$

where *y* is the dependent variable (*F* or *C*), *t* is time needed to represent the

underlying secular trend, and L is a dummy variable that indicates whether a smoke-free restaurant law is in force. The estimate of the coefficient b_L quantifies the annual rate of increase (or decrease) in the dependent variable, y , each year. The dummy variable L quantifies the presence of a smoke-free restaurant ordinance as follows:

$$L = \begin{cases} 0 & \text{If No Ordinance} \\ \frac{1}{3} & \text{If Ordinance in Force for} \\ & \text{1 Month of Quarter} \\ \frac{2}{3} & \text{If Ordinance in Force for} \\ & \text{2 Months of Quarter} \\ 1 & \text{If Ordinance in Force for} \\ & \text{Entire Quarter} \end{cases}$$

The coefficient b_L quantifies the magnitude of the effect of the ordinance on the dependent variable. Because all of the Colorado cities under study are ski centers, the restaurant business is much stronger during the winter tourist season. To allow for this effect, the dummy variable W was included for the Colorado cities, set to 1 for the first quarter (the winter tourist season) and 0 otherwise.

Not only were data analyzed for each city separately, but all the data on restaurant sales as a percentage of total retail sales for all 15 cities with ordinances for the entire year period were pooled in a single analysis, including 29 additional dummy variables, to allow for between-city differences in the mean values of the fraction of total retail sales going to restaurants.

The variance inflation factors for each variable were computed to assess multicollinearity, and the Durbin-Watson statistic was computed to test for autocorrelation among the residuals. The variance inflation factors were always well below 2, and the Durbin-Watson statistic never reached statistical significance. A change is considered statistically significant when $P < .05$.

Results

Table 2 summarizes the results for total restaurant sales as a fraction of all retail sales (F), and total restaurant sales in cities with ordinances compared with those in the matched comparison cities (C). The first column in the table is the mean value observed from 1986 (1982 for Aspen) to the second quarter of 1993 to provide a comparison with the magnitude of the change associated with the ordinance.

Smoke-free ordinances generally had no statistically significant effect on the

TABLE 2—Effect of Smoke-Free Restaurant Ordinances on Total Restaurant Sales

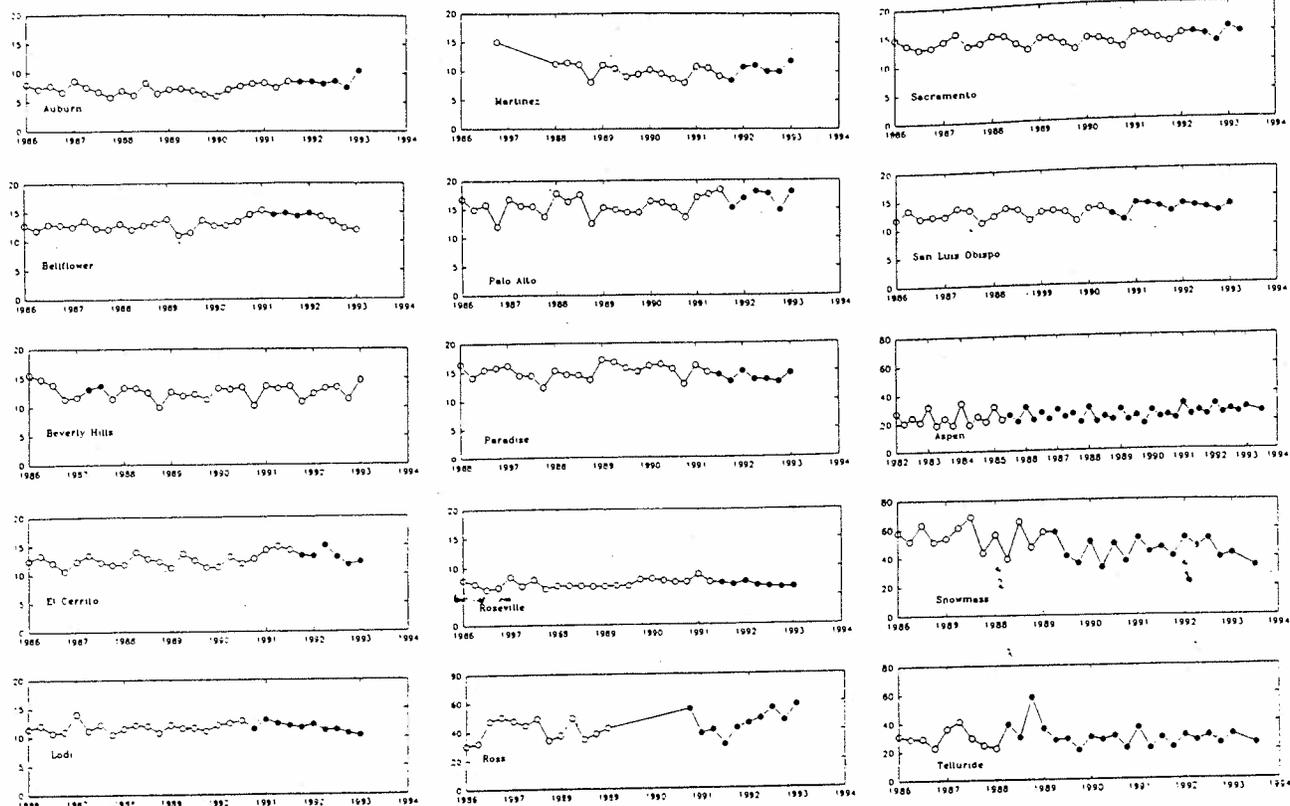
City	Mean	Effect of Ordinance		Model	
		Change, b_L	P	R^2	P
Fraction of total retail sales, F, %					
Aspen	24.8	1.1 ± 1.3	.408	.688	.000
Auburn	7.5	1.0 ± 0.5	.092	.319	.007
Bellflower	13.1	1.5 ± 0.6	.025	.313	.008
Beverly Hills	12.8	0.6 ± 1.2	.633	.033	.646
El Cerrito	12.7	-0.4 ± 0.7	.637	.100	.255
Lodi	11.7	0.1 ± 0.6	.902	.005	.939
Martinez	10.3	2.9 ± 1.0	.008	.404	.007
Palo Alto	15.8	0.7 ± 1.1	.520	.115	.204
Paradise	14.9	-1.4 ± 0.8	.078	.181	.075
Roseville	7.1	-0.9 ± 0.4	.039	.156	.111
Ross	43.5	-3.3 ± 9.1	.715	.132	.243
Sacramento	13.9	0.9 ± 0.6	.102	.102	.233
San Luis Obispo	12.7	0.2 ± 0.6	.764	.082	.327
Snowmass	49.2	6.0 ± 5.7	.301	.374	.006
Telluride	29.6	9.4 ± 4.7	.055	.197	.120
All combined	18.4	-1.3 ± 1.0	.210	.611	.000
Ratio of sales with comparison city, C					
Aspen	1.12	.21 ± .12	.106	.153	.071
Auburn	.44	.03 ± .02	.186	.052	.327
Bellflower	.50	-.02 ± .02	.347	.036	.621
Beverly Hills	.56	-.06 ± .04	.171	.238	.029
El Cerrito	1.28	-.00 ± .08	.998	.053	.495
Lodi	.90	-.01 ± .03	.742	.270	.017
Martinez	.41	.04 ± .03	.194	.329	.001
Palo Alto	1.69	.23 ± .07	.004	.416	.001
Paradise	.71	-.07 ± .03	.049	.144	.132
Roseville	.68	-.02 ± .03	.562	.089	.300
Ross	.05	.02 ± .01	.196	.302	.028
Sacramento	1.10	-.05 ± .03	.091	.403	.001
San Luis Obispo	1.12	-.08 ± 0.6	.177	.154	.113
Snowmass	.95	-.29 ± .20	.193	.584	.000
Telluride	.42	.08 ± .07	.282	.372	.006
All combined	.82	-.04 ± .03	.166	.828	.000

fraction of retail sales that went to restaurants or on total restaurant sales in cities with ordinances compared with those in cities without smoke-free ordinances (Table 2 and Figure 1). There is marginal evidence that the fraction of total retail sales to restaurants increased in two cities (Bellflower, $P = .025$; Martinez, $P = .008$) and decreased in one city (Roseville, $P = .039$). In a comparison of restaurant sales in one city with an ordinance versus one city without an ordinance, sales increased in one city (Palo Alto, $P = .004$) and decreased in another (Paradise, $P = .049$). The lack of consistent response suggests that these results may simply reflect random variation, given the large number of P values that were computed. Analysis of all the data in pooled regressions did not detect significant changes in the percentage of retail sales or sales in cities with smoke-free ordinances compared with those in cities without ordinances.

Beverly Hills is a particularly important case because it has been used by the tobacco industry to support the claim that smoke-free restaurant ordinances are associated with a 30% drop in business (Figure 2). However, data reveal that no such drop in sales occurred upon enactment, and that no increase in sales followed repeal 4 months later. Likewise, despite the fact that the Bellflower ordinance was repealed because of claims that business dropped, the ordinance was actually associated with a marginally significant ($P = .025$) increase in business.

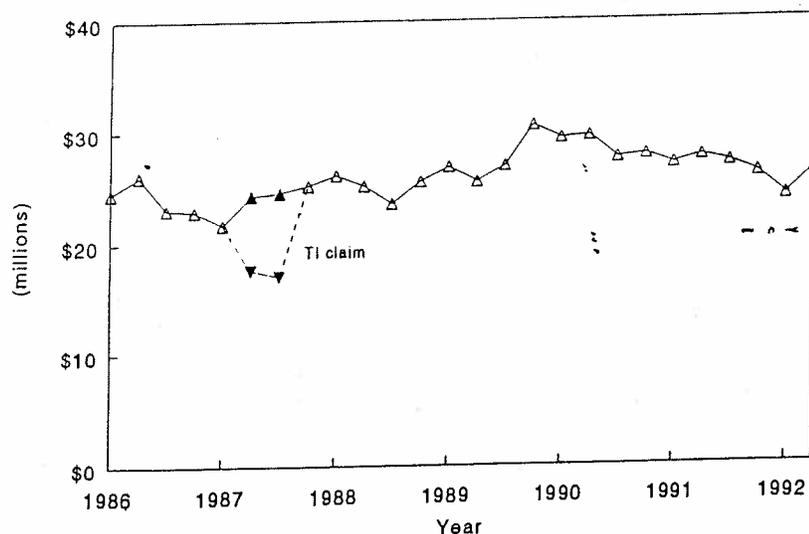
Discussion

This is the first comprehensive study that examines taxable sales data to determine the economic impact of smoke-free restaurant ordinances on restaurant sales. Using data from the California State Board of Equalization and the Colorado State Department of Revenue for pur-



Note. The quarters in which 100% smoke-free ordinances were in effect are represented by solid circles.

FIGURE 1—Restaurant sales as a percentage of total retail sales for the 15 communities included in the study.



Note. Period of smoke-free ordinance is indicated by the solid triangles.

FIGURE 2—The 100% smoke-free restaurant ordinance in force in Beverly Hills did not reduce sales by 30% (dashed line with "TI [tobacco industry] claim"), as the tobacco industry had suggested; rather, it had no significant effect on sales.

poses of paying sales taxes has several advantages. First, the numbers reflect *all* restaurant sales in a community, not just those of a small sample of restaurants. Second, the numbers are objective; they were collected through consistent methods by agencies with no interest in the effects of smoking restrictions on restaurant sales. Third, sales tax data can be expected to be reasonably accurate since it is a crime to lie in reporting the figures.

The communities studied in the report are different from each other and represent a cross-section of communities that might enact legislation controlling smoking in restaurants: Auburn is a small Sierra foothills community; Beverly Hills is a well-to-do urban city; Bellflower is a middle-class bedroom community; El Cerrito and Martinez lie within highly industrial areas; Lodi is a rural agricultural center; Palo Alto is a large suburban university community; Paradise is a small, semiagricultural community; Sacramento is a large city and the state capital; San Luis Obispo is a college town; Roseville represents a semirural bedroom commu-

nity: Ross is a small affluent San Francisco Bay community; and the three Colorado cities are mountainous, tourist resort areas. The fact that there were no adverse effects on business in these communities supports the conclusion that the results generalize broadly. Further, these 15 cities represent every city that has passed smoke-free ordinances that have been in effect long enough to study.

This study covers a significant period of time. It is important to take into account long-term (secular) trends as well as the quarter-by-quarter random variation and short-term economic changes. We avoided short-term analyses because it is generally possible to reach any conclusion desired by selectively picking the "correct" two quarters for analysis.¹⁷ To avoid such biases and increase the power of the statistical analysis to detect an effect of the ordinances, we used data for a 7-year period (12 years for Aspen and Vail). This length of time allowed us to obtain good estimates of secular trends before evaluating any effects of the ordinances.

A common concern is raised about the possibility that patrons will dine in adjacent communities without such restrictions. Our data address this concern because the cities examined in this study are not isolated communities. Auburn, Lodi, Martinez, Paradise, Roseville, and San Luis Obispo, while not in large urban centers, are all surrounded by unincorporated areas that contain restaurants. Beverly Hills and Bellflower and their comparison cities, Santa Monica and Lakewood, are all located in Los Angeles County, a major metropolitan area in which all communities directly abut other communities. El Cerrito, Palo Alto, Ross, and their comparison cities all lie within the San Francisco Bay region. Sacramento and its comparison city, Fresno, both large urban centers, face competition from several neighboring communities. Although the skiing communities of Aspen, Telluride, and Snowmass Village are relatively secluded, other resort towns nearby that allow smoking would represent viable tourist alternatives to these smoke-free cities. If people were leaving

these cities to dine in neighboring cities, our analysis would have detected it.

Another area of concern is the effect on bars since smoking and drinking are thought to go together. Revenues from bars and "full-service" restaurants are included in the sales tax data we used. The ordinances examined in this study contain different provisions governing bars independently and bars in relation to restaurants. Had there been a significant effect on sales in such restaurants, our analysis would have detected it. Furthermore, an analysis of individual classes of restaurants (based on whether they sell different types of alcohol) for four cities in California previously showed no effect when full-service restaurants were analyzed separately.¹⁸

Finally, the fact that the ordinances in Beverly Hills and Bellflower were repealed adds to the strength of our conclusions. Had the ordinances affected sales negatively, we would have expected to see an increase in sales following repeal. However, there was no increase in Beverly Hills, and sales dropped in Bellflower after the ordinance was repealed. Thus, legislators and government officials can enact such health and safety requirements to protect patrons and employees in restaurants from the toxins in second-hand tobacco smoke without the fear of adverse economic consequences. □

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