



STANTON A. GLANTZ, PhD
Professor of Medicine
Director, Center for Tobacco Control Research and Education
Suite 366 University Library
530 Parnassus Avenue
San Francisco, California 94143-1390

Phone : 415-476-3893
Fax: 415-514-9345
E-mail: glantz@medicine.ucsf.edu

More of the same:
An evaluation of

THE IMPACT OF NON-SMOKING ORDINANCES ON
RESTAURANT FINANCIAL PERFORMANCE

Deloitte & Touche LLP
Washington, DC October 2003
Preliminary Draft

The Deloitte & Touche report, the latest in a long line of “studies” financed by the tobacco industry and its allies, concludes “that in some cases, sales and profits of individual restaurants are affected, both positively and negatively, by the enactment of non-smoking ordinances.” To reach this conclusion, Deloitte & Touche present a statistical analysis that is nothing short of bizarre.

While the statistical details are complicated – which makes the report ideal for confusing policy makers – there are many points about the way the study was done that simply violate common sense.

The report bases its analysis on a series of surveys of individual restaurants done by Deloitte & Touche for the National Restaurant Association. Assuming that this is a fair random sample of all restaurants, this approach allows the researchers to take in to account more details about the characteristics of individual restaurants than studies based on publicly available sources, which provide aggregate statistics. They include these measures of individual businesses (size, type of business, whether they serve breakfast, local economic conditions, etc.) in their analysis. Done reasonably, this data set should allow them greater sensitivity in detecting an effect of smoking policies.

But Deloitte & Touche eliminate lots of restaurants from the data set:

- Fast food restaurants
- All restaurants that are covered by statewide 100% smokefree ordinances*
- All restaurants with annual sales less than \$50,000
- All restaurants with annual sales and greater than \$10 million**

*No explanation as to why just this category (when the study considers three categories of ordinances) should be eliminated on a statewide basis. The only justification given for eliminating these restaurants is that “we were not confident that our community characteristic control variance would adequately capture factors unique to an entire state...” This justification is greatly lacking since statewide control variables were certainly available if the authors felt more controls were needed and there is no reason to believe that these “factors unique to an entire state” would have effects on 100% smokefree ordinances and not ordinances with bar exemptions.

**They do this to “eliminate very large or very small restaurants” with no explanation of why this might be important or reasonable.

Deloitte & Touche use the logarithm of sales and profits as dependent variables* in the regressions and the control variables are not transformed in anyway. This is an unusual procedure that further convolutes the analysis of the results.**

Deloitte & Touche determined whether restaurants were covered by a smoking policy using the zip code of the restaurant and the American Nonsmokers' Rights Foundation ordinance database. They appear to have missapplied the ANRF database, since they code the applicability of local ordinances as follows: "If the county and place [locality] both had ordinances, information about both ordinances was associated with the zip code [of the restaurant]." Normally county ordinances only apply to unincorporated areas, not the cities and incorporated towns within the counties.

The authors code the "severity" of an ordinance using a complex scheme, rather than simply using a single variable to code whether there is a 100% smokefree policy or not. Instead of this straightforward approach, they use 33 variables to describe the smoking policy.*** They also include several variables relating the presence of simultaneous county and "place" (usually city) local ordinances and how long the smoking policy had been in effect.

The result is a statistical model with 51 independent variables, 33 of which are used to code the smoking policy. While this approach might seem to be a good idea, this complicated coding creates many more variables in the regression (statistical) model than they use, which substantially increases the likelihood of false positives. Statisticians call this the "multiple comparison problem." In plain English, the multiple comparison problem is that if you flip a coin enough times, you will get heads. Good statistical practice dictates that the model have the minimum number of variables necessary to describe the dependent variable being studied. Deloitte & Touche did not follow this dictum with their overly complex model.

This overly complex coding system leads to very small samples in each of the categories. As Table 2 of the report shows, for the five years of data used with a total sample size of 3145 restaurants, there are only 232 restaurants or 7.4% of their sample (after dropping the restaurants they dropped) that are covered by any type of smokefree ordinance. This small number of restaurants relative to the sample is exacerbated by the number of categories these restaurants are split into. For example, there are 48 restaurants or 1.5% of the sample that are covered by a 100% smokefree ordinance. Due to the categorization of these restaurants and the overly complicated coding scheme for describing ordinances, no variable for a 100% smokefree ordinance counts more than 11 restaurants or 0.3% of the sample. Given this very low sample size, it is not surprising that only 6 of the 24 possible estimated coefficients for the 100% smokefree ordinances from all of the regressions were statistically significant. Deloitte & Touche note this problem on p. 16 of the report but do not provide any explanation as to why their estimates are still scientifically sound.

*While the study notes on p.12 that all of the control variables that are in dollars are deflated to a base year of 1989, the same procedure is not mentioned for the restaurant sales or profit numbers. If Deloitte & Touche did in fact fail to adjust for inflation, that failure is a significant problem and the study cannot be considered valid because of it.

**Typically, either both the independent and control variables are transformed by logarithms or neither are.

***The 33 variables that Deloitte & Touche use to code the existence of smokefree ordinances could easily have been reduced to 1 variable. If the study were focused on the effects of 100% smokefree ordinances, then they would need only the dummy variable for the existence of a 100% smokefree ordinance and a continuous time variable that counted the years since the ordinance was enacted. If the different effects of the three types of ordinances defined by Deloitte & Touche are the focus of the study, two more dummy variables, one for 50% to 99% smokefree ordinances and one for smokefree restaurants with a bar exemption, could have been added. Reducing the number of variables would greatly increase the number of restaurants in each category (which is a major problem for this study), which would lead to better estimates of the effects (or lack of effects) of the ordinances.

As the report notes, there are a few positive and negative changes associated with the smoking policies. The few “statistically significant” (with 95% confidence*) changes are summarized in the following table:

	Beverage sales	Food sales	Total sales	Gross profits
County ordinance, smokefree restaurant, no bar restrictions, 2-3 years later	negative	no effect	negative	negative
Place [city] ordinance, nonsmoking sections, 2-3 years later	no effect	positive	positive	positive
Place [city] ordinance, nonsmoking sections, 4+ years later	positive	positive	positive	positive
Place [city] ordinance, smokefree restaurant, no bar restrictions, 4+ years later	no effect	negative	negative	negative

These results make little sense. Why, if these laws have such a drastic effect as asserted by the tobacco industry and its allies, does it take several years for them to appear? Why would ordinances that create smokefree restaurants while leaving bars unaffected have a negative effect on beverage sales (in unregulated bars) while having no effect in (regulated) restaurants? Why would county ordinances have different effects from city ordinances?

Deloitte & Touche conveniently ignore findings (if you accept their analysis) that refute several key tobacco industry claims. In particular, their analysis shows *no changes* associated with the smoking policies in food or beverage sales or gross profits:

- During the first two years following policy implementation
- For policies that require 100% smoke free restaurants *and* bars

The results they find for their “control” variables (not discussed in the report, but discernable from the statistical printouts in the Appendix) are nonsensical:

- Their analysis shows that restaurants have lower gross revenues and profits if a restaurant serves breakfast
- Both current per capita income and employment levels have estimated negative effects on restaurants, suggesting restaurants are better off when people make less money or unemployment increases (i.e., the economy is headed for recession).

In Table 4, the study presents the “statistically significant” *percentage* changes in sales and profits. The percentage effects that they have found are implausibly large due to the biased nature of their sample. As the adult smoking population over the period of the Deloitte & Touche study was approximately 24%, the effects of smokefree ordinances would not be expected, for the average restaurant, to be above 40% either positively or negatively. For negative effects of this size, the average restaurant would have to have had a smoking clientele of nearly twice the average prevalence that all refused to go to a 100% smokefree restaurant.

*The statements Deloitte and Touche make in the report are presented with “90% confidence,” a procedure which increases the number of changes they conclude are “statistically significant” beyond those in the table. This approach is surprising in a report prepared for a tobacco industry ally, since the tobacco industry sued the EPA for doing so.

In sum, the data in this study seem to have been manipulated in an effort to justify the conclusions that Deloitte & Touche's client, nominally the National Restaurant Association, wanted: that these ordinances hurt the hospitality business.

None of the “findings” of the Deloitte & Touche study refute the large peer reviewed literature on the subject that finds that smokefree ordinances do not have negative effects on the hospitality industry. (Deloitte & Touche deal with this evidence by explicitly ignoring it.) In fact, in 2003 Scollo et al.* reviewed 97 studies available as of August 31, 2002 on the effects of smokefree ordinances on the hospitality industry,. They assessed the quality of the studies based on four criteria:

- use of objective data,
- inclusion of all data points after the law was implemented and several years before,
- use of regression or other statistical methods that control for secular trends and random fluctuation in the data, and
- appropriate control for overall economic trend.

Of these 97 studies,

- All of the best designed studies report no impact or a positive impact of smokefree restaurant and bar laws on sales or employment. The 21 studies that met all four quality criteria; all 21 studies concluded that smokefree policies had no effect or a positive effect on the hospitality industry.
- 35 of the studies concluded that smokefree policies had a negative impact on the hospitality industry; all of them were funded by the tobacco industry or organizations affiliated with the tobacco industry (like the Deloitte & Touche study). None of them met all four of the quality criteria.**
- The remaining 41 studies all found no negative impact on the hospitality industry from smokefree policies.

The Deloitte & Touche study’s findings are consistent with this pattern of low quality non-peer reviewed studies funded by the tobacco industry or its allies concluding that smoking policies hurt the hospitality business.

To learn more about similar tobacco-industry inspired “studies,” and how to tell a good one from a bad one, see www.tobaccoscam.ucsf.edu.

* Scollo M, Lal A, Hyland A, and Glantz S. 2003. Review of the Quality of Studies on the Economic Effects of Smoke-Free Policies on the Hospitality Industry. *Tobacco Control*. 12: 13-20.
<http://tc.bmjournals.com/cgi/content/abstract/12/1/13>

** In studies concluding a negative impact, the odds of using a subjective outcome measure was 4.0 times (95% confidence interval (CI) 1.4 to 9.6; p = 0.007) and the odds of not being peer reviewed was 20 times (95% CI 2.6 to 166.7; p = 0.004) that of studies concluding no such negative impact.