Economic Effect of Smoke-Free Ordinances on 11 Missouri Cities

Noaman Kayani, PhD; Stanley R. Cowan, MPA; Sherri G. Homan, RN, PhD; Janet Wilson, MEd, MPA; Victoria Fehrmann Warren, MS; Shumei Yun, MD, PhD

Suggested citation for this article: Kayani N, Cowan SR, Homan SG, Wilson J, Warren VF, Yun S. Economic Effect of Smoke-Free Ordinances on 11 Missouri Cities. [Erratum appears in Prev Chronic Dis 2012;9. http://www.cdc.gov/pcd/issues/2012/11_0277e.htm.] Prev Chronic Dis 2012;9:110277. DOI: http://dx.doi.org/10.5888/pcd9.110277

Abstract

Introduction

The harmful effects of secondhand smoke are convincing more and more communities across the United States and the world to prohibit smoking in public places, especially in eating and drinking establishments. A 1993 Missouri state law allows smoking in designated areas in indoor public places such as restaurants and bars. Consequently, some Missouri communities have adopted local ordinances that prohibit smoking in all indoor workplaces, including restaurants and bars. We used an objective measure of economic activity, the taxable sales revenues of eating and drinking establishments, to empirically examine the economic effect of smoke-free ordinances.

Methods

We studied the economic effect of smoke-free ordinances in 11 Missouri cities using multivariate log-linear regression models with log-transformed taxable sales revenues of eating and drinking establishments as the dependent variable and the smoke-free ordinance as the independent variable, while controlling for seasonality, economic condition and unemployment. We used data from 20 quarters before the smoke-free ordinances and at least 10 quarters after the smoke-free ordinances for all cities. The null hypothesis of no effect of smoke-free ordinance on taxable sales of the eating and drinking establishments was tested.

Results

Eight of the 11 cities had increased taxable sales for eating and drinking establishments postordinance. The remaining 3 experienced no change.

Conclusion

The findings of our study are consistent with findings from most published economic studies that a smoke-free ordinance does not harm a local economy.

Introduction

Tobacco use is responsible for approximately 1 in 5 deaths in the United States, or 443,000 deaths per year; exposure to secondhand smoke is estimated to cause 49,000 of these tobacco-related deaths (1). The economic cost of cigarette smoking is more than $193 billion, including $10 billion that results from secondhand smoke costs in terms of health care expenditures, illness, and death (1,2).

Adopting smoke-free policies can be a wise health and business decision. However, when a local government or legislature considers smoke-free ordinances or laws, the issue of economic impact is usually raised. Opponents claim that the ordinance will negatively affect the business of local restaurants and bars. A sizable body of evidence continues to accumulate on the economic effect of smoke-free legislation as it relates to restaurants, bars, and other hospitality venues.
A review of published economic studies found that smoke-free ordinances did not have an adverse economic effect in diverse localities such as New York City; Boston; Minneapolis/St. Paul; Lexington, Kentucky; or several cities in Texas (3-6). In Missouri, 3 studies examined the economic impact of smoke-free ordinances adopted in Maryville, Columbia, and Kansas City (7-9). The Maryville study found that the ordinance was associated with increased revenue, and the other 2 studies did not find any effect. None of these studies were published in a peer-reviewed journal.

The objective of this study was to examine whether smoke-free ordinances have any effect on sales of eating and drinking establishments using an objective measure of taxable sales revenues in 11 cities in Missouri.

Methods

Consistent with earlier studies (10-13), we conducted a multiple log-linear regression analysis, separately for each city, using SAS version 9.2 (SAS Institute, Inc, Cary, North Carolina). Cities included Ballwin, Blue Springs, Chillicothe, Columbia, Independence, Kansas City, Kirksville, Lee’s Summit, Maryville, Nixa, and North Kansas City, all of which had at least 10 quarters of taxable sales data available postordinance as of and including December 2010 (Box). We did not include communities that had a smoke-free ordinance but did not have sufficient quarters of postordinance data to analyze the effect. These included Brentwood, Clayton, Creve Coeur, Fulton, Jefferson City, Kirkwood, Lake St. Louis, Liberty, St. Louis City, O’Fallon, St. Louis County, Springfield, and Warrensburg.

Data sources

We used quarterly taxable sales data from the Missouri Department of Revenue, which reports total revenues and revenues for eating and drinking establishments under the standard industrial classification code 581 (14).

For this analysis, preordinance data included 20 quarters of data covering 5 years before each ordinance’s enactment, and postordinance data included all quarters after the ordinance’s effective date through December 2010, which ended the most recent quarter of data available.

To adjust for inflation we used the consumer price indices (current series) for all urban consumers for the Midwest region published by the Bureau of Labor Statistics (15). Unemployment data were obtained from the Missouri Economic Research and Information Center for macropolitan and micropolitan statistical areas. When the city’s unemployment data were not available, we used the county unemployment rate (16).

Data analysis

In the log linear regression analysis, the dependent variable Ln EDRev, the natural log of inflation-adjusted taxable sales revenues of eating and drinking establishments (EDRev), was regressed on several explanatory variables as follows: LnEDRev = β0 + β1Quarter2 + β2Quarter3 + β3Quarter4 + β4Ordinance + β5Ln Economic Activity + β6Unemployment + ε

The EDRev were log-transformed to achieve homogeneity in the error structure. To capture seasonal fluctuations, 3 quarterly dummy variables were added. To see if the smoke-free ordinance significantly changed the EDRev, we included a dichotomous variable, Ordinance, that takes the value of “0” for preordinance and “1” for postordinance data. To control for the city’s economic conditions and the demand for eating and drinking establishments, Ln Economic Activity, the natural log of the city’s inflation

| City         | Smoke-Free Ordinance Effective Date | Type of Ordinance                                                                 |
|--------------|-------------------------------------|-----------------------------------------------------------------------------------|
| Ballwin      | March 11, 2005                      | All workplaces, including eating and drinking establishments                       |
| Blue Springs | May 1, 2008                         | Allowed in non-publicly accessible areas of workplaces and public places, eg, employee break rooms |
| Chillicothe  | June 1, 2008                        | All workplaces, including eating and drinking establishments                       |
| Columbia     | January 7, 2007                     | All workplaces, including eating and drinking establishments                       |
| Independence | March 17, 2007                      | All workplaces, including eating and drinking establishments                       |
| Kansas City  | June 23, 2008                       | All workplaces, including eating and drinking establishments, but exempts casino gaming floors |
| Kirksville   | July 1, 2007                        | Restaurants and bars                                                              |
| Lee’s Summit | March 17, 2007                      | All workplaces, including eating and drinking establishments                       |
Initially, we included a time trend variable and its interaction term with Ordinance. We detected a multicollinearity problem on the basis of a variance inflation factor greater than 10. When the trend variable and its interaction with the ordinance variable were excluded from the model, the above reduced model did not have an issue with multicollinearity except with the city of Independence. For Independence, we additionally excluded Ln Economic Activity from the model.

We performed other model diagnostic procedures to check for linearity, normality, equal variance, independence of variance, and outliers. Using a Cook’s D of 1 or more as a criterion, we detected no outliers, and we conducted the Durbin-Watson test for first-order serial correlation. We used the critical values of Durbin-Watson when quarterly dummy and/or trend variables were included as the regressors (17). The first-order serial correlation was detected in all of the cities except Columbia and Kansas City, so we used the Newey-West estimation technique for correction of standard errors.

In the case of significant change after the smoke-free ordinance, we computed both percentage change and the dollar amount of change in taxable sales revenues. The percentage change between preordinance and postordinance was estimated by exp \( \left( \frac{\hat{\beta}_1}{\hat{\sigma}} \right) - 1 \). The amount of change was computed as \( EDRev_{post} - EDRev_{pre} \), estimated using a value of “1” for post and “0” for pre, for the Ordinance variable, and the average values for other explanatory variables in the model.

The null hypothesis of no effect of smoke-free ordinance on taxable sales of the eating and drinking establishments was tested using 2-tailed \( t \) tests.

## Results

Overall, the smoke-free ordinance was associated with a significant increase in revenue for eating and drinking establishments in 8 of the 11 cities (Table). For the other 3 cities, we were unable to detect a significant effect of the ordinance on the taxable sales revenues. The largest relative increase in revenue was in Nixa (36.5%), followed by Maryville (21.6%) and Lee's Summit (10.4%). No significant change was identified in Ballwin, Kansas City, or Chillicothe. Ballwin is in the suburb of St. Louis County in eastern Missouri; Kansas City is a large city on the western border; Chillicothe, in northern Missouri, is the most rural city in the analysis. There is limited or no commonality among the 3 cities.

## Discussion

Consistent with findings of most peer-reviewed economic studies of smoke-free ordinances, we found that smoke-free ordinances had no negative effect on the local economy. Furthermore, our study showed that smoke-free ordinances were associated with increased revenue in 8 of the 11 cities we assessed. This study provides more evidence to local and state policy makers that the fear of harmful economic effects from passing and implementing smoke-free policies is unfounded.

Implementing effective policy and programs in Missouri to prevent smoking and associated health effects is essential. Smoking caused 9,362 deaths and cost more than $4.8 billion annually in Missouri during 2003-2007 (18). In 2010, the smoking prevalence among adults in Missouri was 21.1%, the 11th highest in the nation. Missouri's tobacco excise tax is 17 cents per pack, the lowest in the nation. In addition, Missouri does not have a statewide smoke-free law.

Enacting a smoke-free ordinance at the local level is a viable approach to prevent smoking and exposure to secondhand smoke. A negative effect on the revenues of eating and drinking establishments has often been cited in opposition to new smoke-free ordinances. This study uses Missouri-specific data from multiple cities to provide empirical evidence to address this concern.

This study had several limitations. First, only combined bar and restaurant taxable sales data were available, and the data were examined in aggregate. It is possible that specific establishments may have lost revenue after enactment of a
smoke-free ordinance. However, the main focus of this study was to investigate the effect of ordinances on the local economies. Therefore, the aggregate data used in this study were sufficient. Second, other cost data, such as lost productivity, decreased property value, increased maintenance and replacement of equipment and furnishings, and increased costs of medical treatment of employees, were not included in this study. Previous studies concluded that smoke-free ordinances benefit the restaurant and bar business through greater worker productivity, lower cleaning costs, higher resale value, and potentially lower property and health insurance costs (19,20). Third, the effect of the ordinances on hospitalizations for smoke-related diseases was not included in this study, although the community benefits economically through decreased hospitalizations for myocardial infarction, asthma attacks, stroke, angina, chronic obstructive pulmonary disease, and lung infections (21-23).

Regardless of these limitations, our study used objective taxable sales data and controlled for confounding factors. Therefore, the conclusion of no negative effect is valid, even though we likely underestimated the positive effect of the ordinances due to aforementioned reasons. We also included all Missouri cities that had a smoke-free ordinance and a sufficient number of quarters of taxable sale data in the analysis. The finding of no negative effect was consistent in all 11 cities studied.

The number of local communities that have passed a smoke-free ordinance is growing in Missouri. As of June 2011, 42% of Missouri’s population resided in communities that have smoke-free ordinances. The next logical step for public health is to strive for a statewide smoke-free workplace law. The finding of this study provides evidence for garnering support from the general public and legislators by allaying fears that smoke-free ordinances harm business.

Acknowledgments
This research was supported by Cooperative Agreement no. 5U58DP001976 between the Centers for Disease Control and Prevention and Missouri Department of Health and Senior Services.

Author Information
Corresponding Author: Shumei Yun, MD, PhD, Missouri Department of Health and Senior Services, Section of Epidemiology for Public Health Practice, 920 Wildwood Dr, Jefferson City, MO 65109. Telephone: 573-522-2809. E-mail: shumei.yun@health.mo.gov.

Author Affiliations: Noaman Kayani, Sherri G. Homan, Janet Wilson, Victoria Fehrmann Warren, Missouri Department of Health and Senior Services, Jefferson City, Missouri; Stanley R. Cowan, University of Missouri—Columbia School of Medicine, Columbia, Missouri.

References
1. Centers for Disease Control and Prevention. Smoking-attributable mortality, years of potential life lost, and productivity losses: United States, 2002-2004. MMWR Morb Mortal Wkly Rep 2008;57(45):1226-8. PubMed
2. Behan D, Eriksen M, Lin Y. Economic effects of environmental tobacco smoke. Schaumburg (IL): Society of Actuaries; 2005. http://www.soa.org/files/pdf/ETSReportFinalDraft(Final%2003).pdf. Accessed August 13, 2010.
3. The state of smoke-free New York City: a one-year review. New York (NY): New York City Department of Finance, New York City Department of Health and Mental Hygiene, New York City Department of Small Business Services, New York City Economic Development Corporation; 2004. http://www.nyc.gov/html/doh/downloads/pdf/smoke/sfaa-2004report.pdf. Accessed August 13, 2010.
4. Biener L, Garrett C, Skeer M, Siegel M, Connelly G. The effects on smokers of Boston’s smoke-free bar ordinance: a longitudinal analysis of changes in compliance, patronage, policy support, and smoking at home. J Public Health Manag Pract 2007;13(6):630-6. PubMed
5. Klein EG, Forster J, Erickson D, Lytle L, Schillo B. Economic effects of clean indoor air policies on bar and restaurant employment in Minneapolis and St. Paul, Minnesota. J Public Health Manag Pract 2010;16(4):285-93. PubMed
6. Pyles MK, Mullineaux D, Okoli C, Hahn E. Economic effect of a smoke-free law in a tobacco-growing community. Tob Control 2007;16(1):66-8. CrossRef PubMed
7. Taurus JA, Chaloupka FJ. The economic impact of the 2008 Kansas City, Missouri, smoke-free air ordinance. Kansas City (MO): Health Care Foundation of Greater Kansas City; 2010.
8. Stanley R, Cowan RS, Kruckemeyer T, Baker J, Harr T. Impact of smoke-free restaurant ordinance on revenues for Maryville, Missouri. Jefferson City (MO): Missouri Department of Health and Senior Services; 2004.
9. Pakko MR. The economic impact of a smoking ban in Columbia, Missouri: an analysis of sales tax data for the first year, CRE8 occasional report no. 2008-02. St. Louis (MO): Center for Regional Economics; 2008.

10. Boles M, Dilley J, Maher JE, Boysun MJ, Reid T. Smoke-free law associated with higher than expected taxable retail sales for bars and taverns in Washington State. Prev Chronic Dis 2010;7(4):A79. http://www.cdc.gov/pcd/issues/2010/10_0187.htm. Accessed February 15, 2012. PubMed

11. Cowling DW, Bond P. Smoke-free laws and bar revenues in California — the last call. Health Econ 2005;14(12):1273-81. CrossRef PubMed

12. Hyland A, Cummings KM, Nauencm E. Analysis of taxable sales receipts: was New York City’s Smoke-Free Air Act bad for restaurant business? J Public Health Manag Pract 1999;5(1):14-21. PubMed

13. Bartosch WJ, Pope GC. Economic effect of restaurant smoking restrictions on restaurant business in Massachusetts, 1992 to 1998. Tob Control 2002;11(Suppl 2):ii38-42. PubMed

14. Public taxable sales reports. Jefferson City (MO): Missouri Department of Revenue. http://dor.mo.gov/publicreports/. Accessed August 13, 2011.

15. Consumer Price Index. US Bureau of Labor Statistics, Office of Occupational Statistics and Employment Projections. http://www.bls.gov/cpi/. Accessed August 13, 2011.

16. Missouri local area unemployment statistics. Missouri Economic Research and Information Center (MERIC), Missouri Department of Economic Development, US Department of Labor, Bureau of Labor Statistics. http://www.missourieconomy.org/indicators/laus/default.aspx?PeriodYear=2010&Month=01. Accessed August 13, 2011.

17. King ML. The Durbin-Watson test for serial correlation: bound for regression with trend and/or seasonal dummy variables. Econometrica 1981;49(6):1571-81. CrossRef

18. Tobacco state: Missouri’s bottom line for tobacco use. Jefferson City (MO): Missouri Department of Health and Senior Services; 2010. http://health.mo.gov/living/wellness/tobacco/smokingandtobacco/pdf/TobaccoState.pdf. Accessed Jan 10, 2012.

19. Halpern MT, Shikiar R, Rentz AM, Khan ZM. Impact of smoking status on workplace absenteeism and productivity. Tob Control 2001;10(3):233-8. CrossRef PubMed

20. Alamar BC, Glantz S. Smoke-free ordinances increase restaurant profit and values. Contemp Econ Policy 2004;22 (4):520-5. CrossRef PubMed

21. Centers for Disease Control and Prevention. Reduced hospitalizations for acute myocardial infarction after implementation of a smoke-free ordinance — City of Pueblo, Colorado, 2002-2006. MMWR Morb Mortal Wkly Rep 2009;57(51):1373-7. PubMed

22. Naiman A, Glazier RH, Moineddin R. Association of anti-smoking legislation with rates of hospital admission for cardiovascular and respiratory conditions. CMAJ 2010;182(8):761-7. CrossRef PubMed

23. Herman PM, Walsh M. Hospital admissions for acute myocardial infarction, angina, stroke, and asthma after implementation of Arizona’s comprehensive statewide smoking ban. Am J Public Health 2011;101(3):491-6. CrossRef PubMed

Table

Table. Effect of Smoke-Free Ordinances (SFOs) on the Revenues of Eating and Drinking Establishments in 11 Missouri Citiesa

| City          | No. of Quarters of Data Used | Factors Controlled forb | β (SE) for SFO | P Value | Change in Revenue, $ (%)c |
|---------------|------------------------------|-------------------------|----------------|---------|---------------------------|
|               | Pre-SFO | Post-SFO |                          |               |                           |                           |
| Ballwin       | 20      | 23       | All                       | −0.038 (0.043)| .39                        | NC                         |
| Blue Springs  | 20      | 11       | All                       | 0.058 (0.011) | <.001                     | 844,339 (5.9)              |
| Chillicothe   | 20      | 10       | All                       | −0.027 (0.032)| .41                        | NC                         |
| City          | No. of Quarters of Data Used | Factors Controlled for<sup>b</sup> | \( \beta \) (SE) for SFO | \( P \) Value | Change in Revenue, $ (%)<sup>c</sup> |
|--------------|-----------------------------|-----------------------------------|--------------------------|----------------|-------------------------------------|
| Columbia     | 20                          | All                               | 0.045 (0.015)           | 0.11           | 2,059,643 (4.6)                     |
| Independence | 20                          | All except economic condition     | 0.037 (0.010)           | 0.001          | 1,452,206 (3.8)                     |
| Kansas City  | 20                          | All                               | 0.033 (0.040)           | 0.42           | NC                                  |
| Kirksville   | 20                          | All                               | 0.096 (0.037)           | 0.01           | 484,159 (10.1)                      |
| Lee's Summit | 20                          | All                               | 0.099 (0.034)           | 0.006          | 2,271,787 (10.4)                    |
| Maryville    | 20                          | All                               | 0.170 (0.022)           | <.001          | 579,832 (18.6)                      |
| Nixa         | 20                          | All                               | 0.311 (0.094)           | 0.003          | 1,147,092 (36.5)                    |
| North Kansas City | 20                | All                               | 0.125 (0.046)           | 0.01           | 640,791 (13.3)                      |

Abbreviations: SE, standard error; NC, not calculated.

<sup>a</sup> Newey-West estimation technique was used for all the cities with autocorrelation except Columbia and Kansas City to estimate correct standard errors.

<sup>b</sup> All: seasonal effects, economic condition, and unemployment rate.

<sup>c</sup> Changes in values were calculated only when the smoke-free ordinance had a significant effect on the revenues of eating and drinking establishments.

The opinions expressed by authors contributing to this journal do not necessarily reflect the opinions of the U.S. Department of Health and Human Services, the Public Health Service, the Centers for Disease Control and Prevention, or the authors’ affiliated institutions.