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Does the type of CIA policy significantly affect bar and restaurant employment in Minnesota cities?

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Abstract

Background—Clean indoor air (CIA) policies that include free-standing bars and restaurants have been adopted by communities to protect employees in all workplaces from exposure to environmental tobacco smoke, most notably employees working in restaurants and free-standing bars. However, due to the perception of negative economic effects on alcohol-licensed hospitality businesses, partial CIA policies (those that provide an exemption for free-standing bars) have been proposed as a means to reduce the risk of economic effects of comprehensive CIA policies applied to all worksites.

Objective—To determine if partial CIA produce differential economic effects compared to comprehensive CIA policies using bar and restaurant employment per capita.

Design, setting, and subjects—Ten cities in the state of Minnesota were studied from 2003 to 2006. Economic data were drawn from monthly employment in bars and restaurants, and a pooled time-series was completed to evaluate three types of local CIA policies: Comprehensive, partial, or none beyond the state law.

Results—Communities with a comprehensive CIA policy had a decrease of 9 employees per 10,000 residents compared with communities with a partial CIA policies (p=0.10). Communities with any type of CIA policy (partial or comprehensive) had an increase of 3 employees per 10,000 residents compared to communities without any CIA policies (p=0.36).

Conclusion—There were no significant differential economic effects by CIA policy type in Minnesota cities. These findings support the adoption of comprehensive CIA policies to provide all employees protection from environmental tobacco smoke exposure.

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Keywords

Tobacco; policy; clean indoor air; time-series; economics

Over the past fifteen years, many communities around the world have enacted regulations that restrict smoking in indoor workplaces. These regulations, referred to as clean indoor air (CIA) policies, have been justified to protect workers from exposure to secondhand smoke, which is known to cause lung cancer, heart disease, respiratory conditions and other diseases in non-smokers.(U.S. Department of Health and Human Services, 2006)

While CIA policies are the most effective means to protect workers from secondhand smoke, (U.S. Department of Health and Human Services, 2006) not all workplaces have been equally protected by CIA policies. Hospitality businesses, namely bars and restaurants, licensed to sell alcohol have asked to be exempt from such policies based on the established connection between smoking and alcohol consumption. (Room, 2004; Zacny, 1990) In the United States, cities and states began to these so-called partial CIA policies in the 1980s and 1990s. Beginning with California in the late 1990s, cities and states more commonly eliminated the exemption for free-standing bars in CIA policies, which established comprehensive CIA policies that applied to all hospitality businesses. As of October 2007, over 300 U.S. communities enacted local, comprehensive CIA policies that included all workplaces, and over 400 additional communities enacted partial CIA policies with an exemption for free-standing bars. (American Nonsmokers' Rights Foundation, 2007)

The exemption of restaurants and/or bars from CIA policies has stemmed from concerns raised that businesses licensed to sell alcohol would suffer economic harms from a reduction in patronage by smokers. The tobacco industry and its collaborators have argued in favor of the exemption of free-standing bars from CIA policies as an accommodation to smokers in order to reduce the predicted negative economic effects on alcohol-licensed hospitality businesses. (Dearlove, 2002; Ritch, 2001; Tsoukalas, 2003)

Numerous studies have evaluated the issue of economic effects of CIA policies on worksites, and contrary to opponent's claims, have concluded that there are no significant economic effects on hospitality businesses. (Scollo, 2003) Within a review of 97 published studies on the topic, 21 out of 37 studies met recommended criteria for a high-quality economic analysis, (Siegel, 1992) and all 21 studies of these concluded no significant economic effect of CIA policies. However, 90 of these studies evaluated CIA policies where bars were exempt, and only 34 of the studies on focused on comprehensive CIA policies.

Given that most comprehensive CIA policies were adopted in the late 1990s and early 2000s, there are fewer evaluations of the economic effects of comprehensive policies. Data from California bars showed a minor increase in bar revenues following a state-level comprehensive CIA policy. (Cowling, 2005) Studies in the cities of El Paso, TX, Lexington, KY, and Ottawa, ON in Canada all found no statistically significant effects on objective economic outcomes for bars.(Centers for Disease Control and Prevention, 2004; Luk, 2006; Pyles, 2007) While there is limited data on comprehensive CIA policies, findings appear to be consistent with evaluations of partial CIA policies.

The perceived controversy over economic effects on hospitality businesses has persisted despite the consistency of economic evaluations completed on partial and comprehensive policies, separately. Opponents of CIA policies have continued to argue for less comprehensive CIA policies.(Dearlove, 2002; Tsoukalas, 2003) Internal tobacco industry documents demonstrate their opposition to comprehensive CIA policies: "Total workplace bans are significantly more detrimental to the industry than moderate workplace restrictions… any

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policy that seeks accommodation is, therefore, eminently correct." (Heironimus, April 16, 1992) As the tobacco industry has continued to support and influence hospitality industry groups, (Bryan-Jones, 2006; Dearlove, 2002) the issue of potential economic effects remains a part of the CIA policy debate.

Studies to date have focused on individual communities to determine economic effects, so that no studies have directly compared economic outcomes by CIA policy type. Such an evaluation could determine whether the use of partial CIA policies produces different economic effects relative to comprehensive CIA policies. This paper describes and compares the effects of the type of CIA policies on hospitality employment in a sample of Minnesota cities. This analysis was completed using a pooled time-series analysis to allow for the direct comparison by the type of CIA policy. The primary research question was: Does the type of CIA policy significantly affect bar and restaurant employment in Minnesota cities?

METHODS

Sample

Minnesota provides a timely venue in which to study the effects of local CIA policy types, as twelve partial and comprehensive local CIA policies were enacted between 2001 and 2006 [16]. Given that cities were not randomly assigned CIA policy status, a convenience sample of communities with CIA policies was drawn to best represent varying regions of the state, population size, and CIA policy types (see Figure 1.) Region of the state was important to include non-urban areas of the state, as well as communities of varying sizes: small cities, suburbs, and large cities. The type of CIA policy was a key component to address the research question regarding comprehensive and partial CIA policies. Where possible, a comparison community matched by community size was included to detect the possible historical effect of hospitality business changes unrelated to CIA policies. The final sample included eight communities with local CIA policies, and two comparison communities without a CIA policy during the period of study (no comparison community was available for large cities).

Measures

Employment in the hospitality industry was the objective outcome measure chosen for this analysis. Given the importance of using objective outcome data at frequent intervals to assess the research question, the most appropriate outcome measure was based on data collected by the Minnesota Department of Employment and Economic Development (DEED) where licensed businesses are required by law to report monthly employment. The total number of employees was determined for each month, aggregated by city, defined by the North American Industry Classification System (NAICS) industry codes. The study period included data from January 2003 through September 2006. At the requirement of Minnesota DEED, all cities other than urban centers of Minneapolis and St. Paul, Minnesota, were identified by their respective city type (small city, suburb) rather than by name in order to protect the confidentiality of individual businesses.

Due to the correlation between alcohol consumption and smoking, a CIA policy have been claimed to have a disproportionate effect on businesses licensed to sell alcohol compared to businesses without an alcohol license. Therefore, only free-standing bars (NAICS code 7224, which included lounges, taverns, and nightclubs, etc.) and full-service restaurants (NAICS code 7221, which included family, fine dining, and steak houses, etc.) were included in the study. Limited service restaurants (NAICS codes 7222 and 7223, which included fast food establishments, cafeterias, delis, and catering services) were excluded due to the low liklihood possesion of a license for alcohol sales.

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The primary outcome measure, described as bar and restaurant employment per capita, was calculated by combining the total number of employees in full-service restaurants and free-standing bars (NAICS codes 7221 and 7224), divided by the community population size, based on US Census 2000. (U.S. Census Bureau, 2000) The use of a per capita measure was chosen to account for differences in population size between selected communities. To account for overall changes within the hospitality industry, total employment within the entire hospitality industry (NAICS code 72) divided by the community population size; this covariate was used to account for potential overall changes within the hospitality industry that may be unrelated to CIA policies.

The primary explanatory variable was CIA policy type, defined with three levels: comprehensive, partial and none. Comprehensive CIA policies were those banning smoking in restaurants and free-standing bars without exemptions that pertain to alcohol license type, certain hours of operation, or proportion of food-to-alcohol sales. Partial policies were defined as CIA policies that banned smoking in workplaces, including restaurants, with an exemption for free-standing bars. Communities without CIA policies or those that designated smoking sections were defined as having no CIA policy, and generally served as a comparison group. Workplaces outside of the hospitality industry, such as office buildings, factories, or others were not evaluated in this analysis.

The study period for this analysis was January 2003 to September 2006, where time was measured in months. The sample size was determined by the number of communities (cities, n=10) multiplied by the number of monthly time points (n=45), for a total sample size of n=450.

The time period and adoption pattern of CIA policy type are shown in Figure 1. Over the 45-month study period, the majority of communities by month units had no CIA policy (n=259, or 58%), some enacted partial CIA policies (n=128, or 28%), and few enacted comprehensive policies (n=63, or 14%). The range of hospitality employment for the study cities was 467 to 11,296 employees, and the total number of establishments ranged from 20 to 440 per city.

Statistical analysis

For this study, the primary interest was to determine if there were differences in employment between communities. To analyze this question, a pooled time-series was applied using a mixed model regression, estimated as:

$$y_{it}=x_{kit}\beta_k+e_{it}$$

where i = 1, 2,…, 10 cross-sectional units (cities), t = 1, 2, …, 45 time period units (months), and k = 1 explanatory variables (employment in the rest of the hospitality industry, per capita). y refers to the dependent variable (bar and restaurant employment per capita) and X refers a matrix of independent variable (CIA policy type), and *e* is a random error.

The pooled time-series model was estimated via mixed model regression using PROC MIXED in SAS version 9.1.3. (SAS Institute Inc., 2001) To explore the differences between the varying types of CIA policies, a mixed model regression was completed to compare mean employment by policy type. The mixed model allowed for either a fixed or randomly varying intercept or slope for each community. To account for the autocorrelation over time, a banded Toeplitz covariance structure was applied. Statistical significance was measured with an alpha value of 0.05, with a Bonferroni adjustment when multiple comparisons were made.

For the mixed model regression, a diagnostic assessment of the residuals was completed. Although there was a clustering effect in the errors by city, the outcome measures was deemed

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appropriate given that the distribution of residuals appeared normal and the quantile-quantile (Q-Q) plot was acceptable with little or no hetereoscedasticity.

RESULTS

The unadjusted quarterly employment for bars and restaurants are presented in Figure 2. As a general trend, most communities exhibited a roughly stable trend in employment over the study period, with the exception of a steep drop in employment for City A between the fourth quarter of 2005 and the first quarter of 2006. The city of Minneapolis demonstrated the most consistent seasonal trend with employment peaks during the second quarter and valleys during the fourth quarter of each year.

Results from the pooled-time series analysis are shown in Table 1. For bar and restaurant employment per capita, communities with comprehensive CIA policies had nearly 9 fewer employees per 10,000 communities members, relative to communities with partial CIA policies, although this difference was not statistically significant (p=0.10). Compared to communities without CIA policies, communities with comprehensive CIA Communities with comprehensive CIA policies had 2 fewer employees per 10,000 (p=0.71). Communities with partial CIA policies had 7 more employees per 10,000 compared to communities with no CIA policies (p=0.08). Given the potential for the largest city to be an outlier, the analysis was repeated without the city of Minneapolis, and results for comprehensive compared to partial (9 fewer employees per 10,000), comprehensive compared to none (2 fewer employees per 10,000), and partial compared to none (7 more employees per 10,000), although none of these comparisons were statistically significant (p=0.13, 0.69, 0.09, respectively; data not shown).

DISCUSSION

The economic effects of CIA policies have been evaluated in local communities in the U.S. and internationally.(American's for Nonsmokers' Rights, 2006) Our analyses found no statistically significant differences in bar and restaurant employment over time by CIA policy type in Minnesota communities. This study is the first to explore whether there are differential effects on economic factors by CIA policy type.

Typically, CIA policies have been studied via cross-sectional models (comparing observations across space) or time-series models (comparing observations across time). By incorporating cross-sections and time into a pooled time-series analysis, variations across units in both time and space may be captured. Recent advances have made it possible to model both sources of variability simultaneously while providing accurate parameter estimates and standard errors. (Beck, 1995) In particular, pooled time-series are a valuable tool when individual-level data are not made available, and when the nature of an association is not well characterized. (Rehm, 2001)

The issue of CIA policy strength is often raised when such policies are under consideration for enactment at the local or state level. The controversy around the use of comprehensive policies has been based on concerns that the smoking-drinking correlation (Room, 2004) could result in disastrous economic effects for hospitality businesses. In Minnesota, this concern for economic health of bars was part of the discussion that led to a rollback of a county-level, comprehensive CIA policy, (Williams, 2005a) despite evidence suggesting no significant short-term economic effects on hospitality businesses. (Hennepin County Office of Budget and Finance, 2005) Results from our analysis may be useful in this debate as these findings help to describe the scale of economic effects based on objective, empirical data. Specifically, while there was decrease in bar and restaurant employment comparing partial to comprehensive CIA policies communities, the scale of this effect was quite small, with an estimated decrease of 9

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employees (with a confidence interval of a 20 employee decrease to a 2 employee increase) per 10,000 residents. We believe these findings reinforce that large-scale changes in employment are not being observed following the establishment of comprehensive CIA policies. Such information may be useful to the policy debate when economic and public health concerns play a role in the determination of policy strength.

The use of an objective measure of economic health of hospitality businesses allows for an unbiased assessment of the outcome. In their review of the quality of economic studies, Scollo et al. found consistency between various measures of economic effects of CIA policies, regardless of the outcome measure selected, including employment and revenue. (Scollo, 2003) In our assessment, employment data were selected due to the mandatory reporting, frequency of reporting, and availability of the information. Employment contributes to the labor costs for a business, which is a component of hospitality business profitability. (Bureau of Labor and Statistics, 2007) We believe the use of employment, revenue, or other objective outcome measures present the best available unbiased estimates of potential economic effects on hospitality businesses.

There are other potential positive results of CIA policies may for hospitality businesses. Bars as businesses themselves were shown to have a comparable or increased market value when sold in a community with a CIA policy compared to communities without a CIA policy. (Alamar, 2004,2007) With regard to individual employees, there are clear health benefits to employees in who work in a smoke-free environment. In addition, other data have suggested that employees increase in their support for CIA policies after adoption, (Hilton, 2007;Pursell, 2007) which may assist in staffing retention.

One criticism of time-series analysis in applied research is the difficulty of obtaining an objective outcome measure for a sufficient amount of time to provide statistical power. Power in time-series analysis depends to a large degree on the number of data points, but also on the type of association, variation of the series, seasonality, and other factors. (Rehm, 2001) While the modest length of the time-series nearly reached the minimum recommended length of 50 time-points, (Box, 1976) the pooling of 10 cross-sections provided a large boost in sample size, and thus, statistical power. As with any regression model, an increase in statistical power increases confidence that the research findings are not due to Type II error. Given the seriousness of these concerns regarding limited power in time-series analyses, we completed a post-hoc power analysis. In the comparison of partial to comprehensive CIA policies, our analysis was estimated to have an effect size of 0.20, described by Cohen as between a small and medium effect size. (Cohen, 1992) Despite this reasonable effect size, this analysis could be improved by the addition of more time periods and/or cross-sections with partial and comprehensive policies to increase the power to detect a difference between partial and comprehensive CIA policies.

Consistent with other published finding regarding time-series analyses evaluating partial or comprehensive CIA policies in individual communities, we found that there was no significant decrease in employment in bars and restaurants for communities with any type of CIA policy (partial or comprehensive) compared to communities without a CIA policy. Post-hoc power estimates resulted in an effect size of 0.18, which is considered to be between a small to moderate effect size; these estimates were based on the sample size (n=250) and assuming 0.80 statistical power with a two-sided test with an alpha value of 0.05 (data not shown). The consistency of these findings with other time-series analyses on the economic effects of CIA policies increases our confidence in the generalizability of these findings from other states or provinces.

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Despite these strengths, this analysis is not without limitations. An important limitation in the use of aggregated data is that we are able to estimate an overall average, but we are not able to determine differential effects at the business- or neighborhood-level. To provide a stronger causal linkage between a CIA policy and economic effects would require individual-level business data, which were not available for use. Future studies should incorporate individual-level business data whenever possible to clarify questions regarding effects for certain types of businesses or neighborhood areas.

There are four assumptions made in the application of a pooled model to address this research question. First, we assume that the selection of cities in this sample is assumed to be similar in seasonal patterns and economic conditions due to proximity and location within one U.S. state. Our results therefore depend on the validity of the data that are input, and on the assumptions made to combine the cross-sections. (Beck, 1995; Rehm, 2001; Sayrs, 1989) Second, size differences between communities were assumed to be appropriately accounted for in this analysis through the calculation of a per capita change in employment. Third, in categorizing each community by policy status, we assume that any policy effects would be similar across the communities. Given the volume and consistency of studies on the effects of CIA policies, this assumption is reasonable. Finally, this analysis assumes equal compliance by CIA policy status. Although local compliance data were not evaluated here, numerous CIA policies around the U.S. have reported high levels of compliance immediately following policy enactment. (Hyland, 1999; Skeer, 2004; Weber, 2003)

Lastly, a null finding should be interpreted with thoughtful consideration of the appropriateness of study design and analytic methods. The study design used an objective outcome measure of economic effects, focused on businesses most likely to be licensed to sell alcohol, and included comparison communities to provide an historical context. The sample size for the pooled analysis is reasonable, and the regression models accounted for any relevant differences in population size and overall changes to the hospitality industry. These design characteristics and analytic features provide added confidence that a modest effect size could be detected in this analysis. Given the dramatic claims by CIA policy opponents, (Kuneman, 2006; Williams, 2005a, 2005b) large-scale changes in employment would likely be detected by this study design. Further, when the largest potential outlier in the analysis was excluded the study results did not change, providing additional confidence in the stability of the results.

CONCLUSIONS

Local CIA policies in eight communities in Minnesota showed no significant short- or longer-term effect on total employment in bars and restaurants. This is the first published evaluation on differential effects of the type of CIA policy and economic factors in hospitality businesses. These findings are consistent with the overall findings reported from credible, peer-reviewed studies on economic effects on hospitality businesses from CIA policies. Policy makers can continue to enact comprehensive CIA policies to effectively protect against exposure to secondhand smoke without concerns for overall adverse economic consequences. Further, these findings provide evidence to support the adoption of comprehensive CIA policies for all workplaces (without exemption) as the most simple and cost-effective means to protect workers from secondhand smoke exposure.(U.S. Department of Health and Human Services, 2006)

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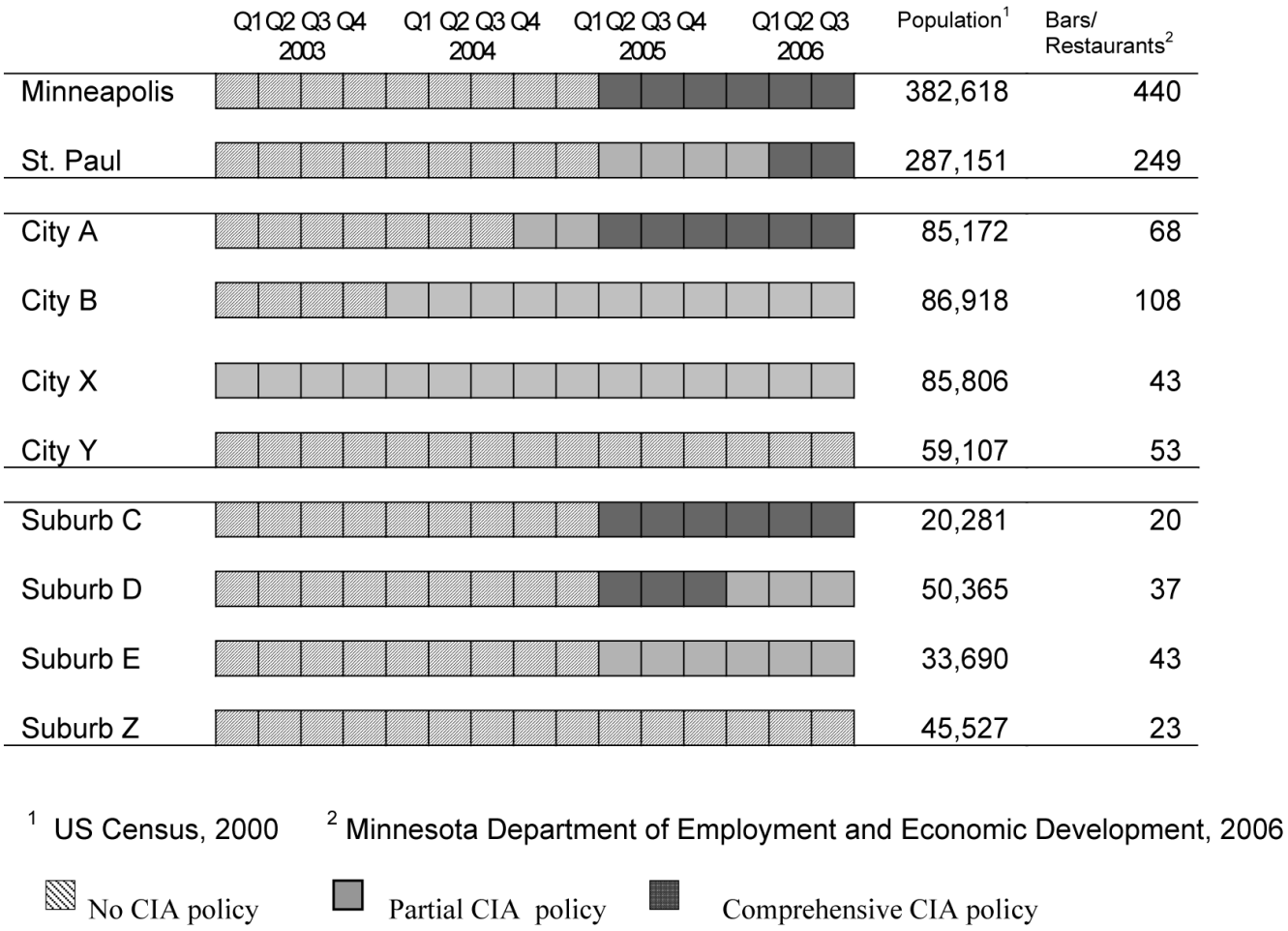

Figure 1.
Clean indoor air policy status, by city for 2003 to 2006

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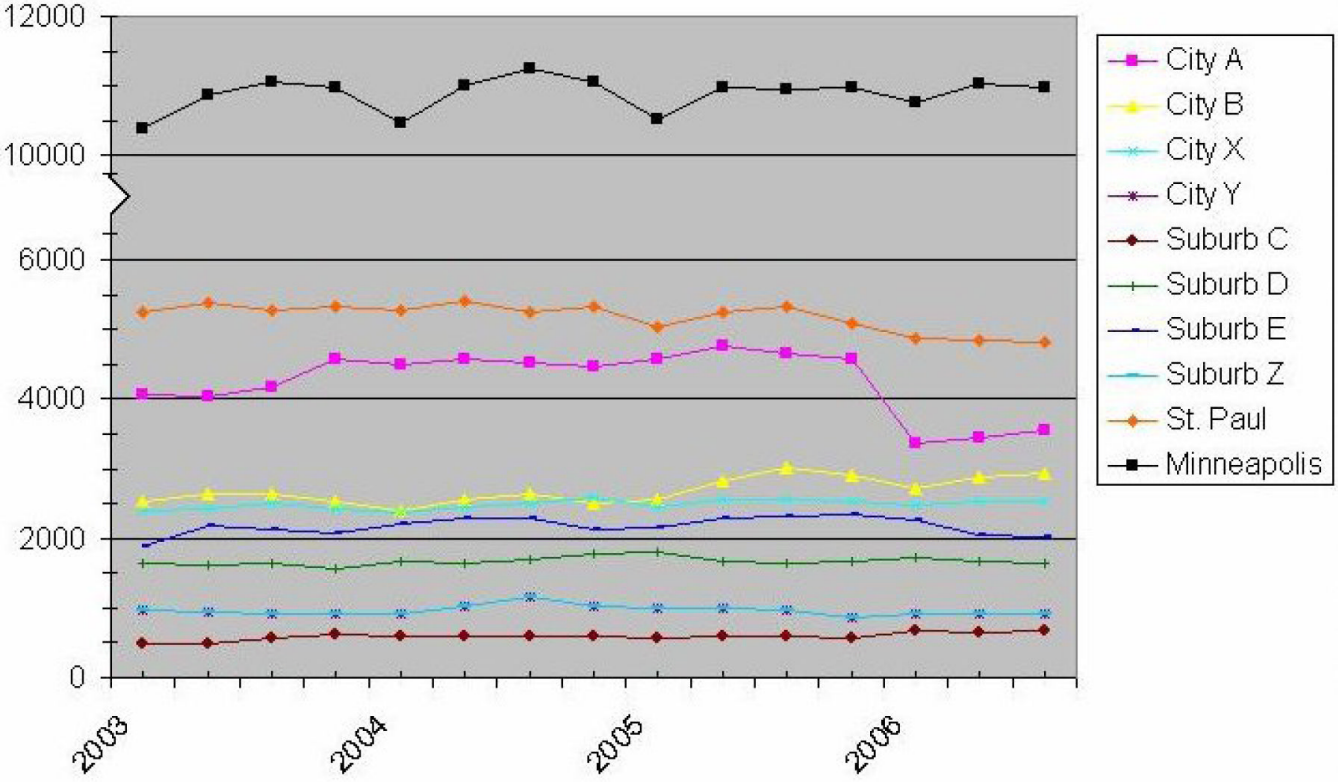

Figure 2.
Total bar and restaurant employment by quarter, by city

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Table 1

Comparison of hospitality employment by clean indoor air polices by type, Minnesota cities: Estimates from a pooled time-series analysis

Measures of hospitality employment	Estimate (CI)	p-value
Bar and restaurant employment‡	*Per 10,000 population*	
Comprehensive vs partial CIA policy	-8.8 (-19.3 to 1.7)	0.10
Comprehensive vs. no CIA policy	-1.5 (-9.6 to 6.6)	0.71
Partial vs no CIA policy	7.2 (-8.6 to 15.3)	0.08
Bar and restaurant employment‡	*Per 10,000 population*	
Any CIA policy vs. no CIA policy	2.9 (-3.3 to 9.0)	0.36

‡Adjusted by employment in the rest of the hospitality industry

◤Bonferroni adjusted for multiple comparisons

** $p<0.01$