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Evaluating the efficacy of different smoking policies in restaurants and bars in Beijing, China: A four-year follow-up study

Ruiling Liu [a], Yuan Jiang [b], Mark J. Travers [c], Qiang Li [d], S. Katharine Hammond [a,*]

[a] School of Public Health, University of California Berkeley, 50 University Hall #7360, Berkeley, CA 94720, USA
[b] Chinese Center for Disease Control and Prevention, 27 Nanwei Road, Beijing 100050, China
[c] Division of Cancer Prevention and Population Sciences, Roswell Park Cancer Institute, Elm & Carlton Streets, Buffalo, NY 14263, USA
[d] Department of Psychology, University of Waterloo, 200 University Avenue West, Waterloo, ON N2L 3G1, Canada

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ABSTRACT

Introduction: In 2006, the World Health Organization Framework Convention on Tobacco Control became effective in mainland China. In 2007, advocacy on voluntary smoking bans in restaurants was initiated in Beijing, and in 2008 the Beijing government implemented a smoking regulation, requiring big restaurants to prohibit or restrict smoking.
Objectives: To evaluate the efficacy of different smoking policies adopted by Beijing restaurants and bars from 2006 to 2010.
Methods: The study conducted field observations of patron smoking behavior and monitored fine particulate matter from secondhand smoke (SHS PM) from 91, 85, 94 and 79 Beijing restaurants and bars in 2006, 2007, 2008 and 2010, respectively, during peak-patronage times, with overlaps of venues during each two years. Area nicotine sampling during peak patronage times and servers' personal nicotine sampling during their working shifts were also conducted in 2010.
Results: Smoking was nominally prohibited or restricted in 18% of restaurants and bars monitored in 2006, in 11% of venues in 2007, in 83% of venues in 2008, and in 69% of venues in 2010. However, smoking was observed in more than 40% of the nominal nonsmoking venues/sections in 2008 and 2010. The median of observed patron active smoker density (ASD) was 0.24, 0.27, 0.00 and 0.10 active smokers per 100 m^3 in 2006, 2007, 2008 and 2010, respectively. The median of SHS PM concentrations was 53, 83, 18 and 27 $\mu g/m^3$, respectively. In 2010, both the median SHS PM and air nicotine concentrations in designated nonsmoking sections were about 40% of those in designated smoking sections, according to simultaneous sampling in both sections. Servers' personal exposure to air nicotine was quite similar in venues with different nominal smoking policies. In the 15 venues followed from 2006 to 2010, SHS PM concentrations changed randomly from 2006 to 2007, decreased in most venues in 2008, and then increased to some extent in 2010.
Conclusion: Voluntary smoking policy is rarely adopted and cannot protect people from SHS exposure in restaurants and bars. The 2008 Beijing governmental smoking regulation failed to significantly reduce SHS exposure shortly or two years after its implementation. Restricting smoking to designated sections cannot eliminate SHS exposure.

Introduction

The adoption of the World Health Organization Framework Convention on Tobacco Control (WHO FCTC) and the availability of technical support from WHO resulted in the rapid diffusion of smoke-free legislation around the world (IARC, 2009). Though restaurants and bars are important workplaces and public places, they are often exempted from smoke-free air policies. As of July 2012, a total of 66 nations worldwide have enacted 100% smoke-free law in workplaces and hospitality venues, 46 of the 66 include both restaurants and bars (ANRF, 2012).

Studies show that, after the implementation of complete smoke-free laws, airborne nicotine concentrations have decreased more than 90% in both restaurants and bars in Italy (Gorini et al., 2008) and Guatemala (Barnoya et al., 2011), 83% in Irish bars (Mulcahy et al., 2005), and 82–98% in various hospitality venues in Uruguay (Blanco-Marquizo et al., 2010), Sweden (Larsson et al., 2008), Chile (Erazo et al., 2010), and Norway (Ellingsen et al., 2006). Similarly, concentrations of indoor respirable particulate matter have decreased more than 85% in restaurants, bars or

* Corresponding author. Tel.: +1 510 6430289; fax: +1 510 6425815.
E-mail address: hammondk@berkeley.edu (S.K. Hammond).

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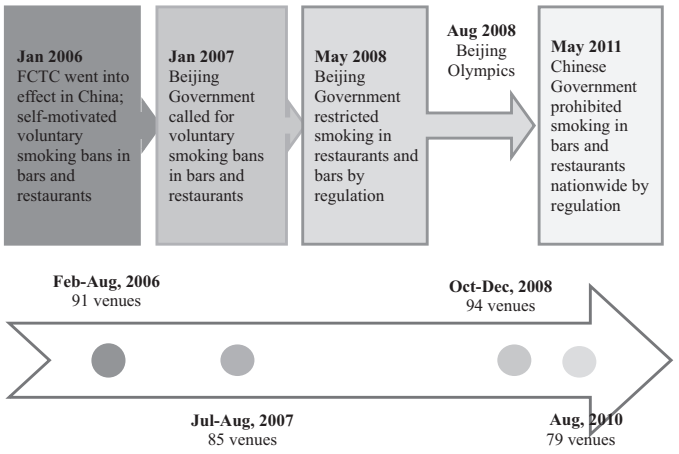

Fig. 1. Tobacco control activities and the timeline of SHS monitoring in restaurants and bars in Beijing from 2006 to 2010 FCTC: Framework Convention of Tobacco Control.

various hospitality venues in Germany (Gleich et al., 2011), Scotland, Wales and England (Gotz et al., 2008; Semple et al., 2010), Argentina (Schoj et al., 2010), Ontario (Zhang et al., 2010), and some U.S. cities/states, such as Boston (Repace et al., 2006), Austin (Waring and Siegel, 2007), Delaware (Repace, 2004), Western New York (Travers et al., 2004), Massachusetts (Alpert et al., 2007), and Minnesota (Bohac et al., 2010). However, partial smoking restrictions that exempt some hospitality venues lead to only limited reduction or non-significant changes of airborne nicotine or indoor respirable particulate matter concentrations in hospitality venues in Finland (Johnsson et al., 2006), Chile (Erazo et al., 2010), and Rome (Valente et al., 2007).

In China, 52.9% of adult males and 2.4% of females were current smokers in 2010 (Li et al., 2011). A total of 740 million nonsmokers were potentially exposed in 2010. Of those nonsmoking adults exposed to SHS, 72% were in public places, compared to 67% at homes and 63% in work places in 2010 (Xiao et al., 2010). SHS was estimated to cause 22,000 lung cancer deaths and 33,800 is chemic heart disease deaths in 2002 (Gan et al., 2007). However, smoke-free legislation in China is quite limited, and smoking in hospitality venues is generally not regulated (Yang et al., 2008).

In 2006, the WHO FCTC became effective in mainland China (WHO, 2011a,b). Since then, smoking policies changed rapidly in public places, especially in restaurants. In January 2007, the Beijing Health Bureau and the Chinese Center for Disease Control and Prevention (CDC) called for voluntary smoking bans in restaurants in Beijing. On May 1st 2008, the Beijing government passed a regulation requiring large restaurants (the dimensions were not specified) within the city to prohibit or restrict smoking. Several other big cities, including Shanghai, Guangzhou, Hangzhou, and Yinchuan, have followed Beijing in the regulation of smoking in public places. Because the government is committed to the WHO FCTC, China must provide universal protection against SHS exposure within five years of the treaty's entry into force in China (WHO, 2011a,b). On May 1st 2011, the Chinese Ministry of Health implemented the revised implementation guidelines of the *Health Regulations in Public Places* issued in 1987 to tighten its rules of restricting smoking in all indoor public places including restaurants and bars. See Fig. 1 for the changes of smoking policies in Beijing from 2006 to 2011.

Since smoke-free policies in restaurants and bars have just recently come to the attention of the Chinese population, there is little evidence on evaluating their efficacy. Given that China has about one-third of the world's total smokers (CDC, 2010), it is important to add the evidence from China to the existing pool of scientific literature on smoking policy evaluation. The rapid changes of smoking policies in Beijing restaurants and bars provide a good opportunity to evaluate the efficacy of different policies. Environmental SHS concentrations in restaurants and bars have been monitored in the years 2006, 2007, 2008 and 2010 (Fig. 1), with overlaps of venues in each two years. This paper evaluates the efficacy of different smoking policies adopted from 2006 to 2010 in Beijing restaurants and bars using the data collected in those four years.

Methods

Data collected by four studies, which were conducted from 2006 to 2010 in line with the changes of smoking policies, were used to evaluate the efficacy of different smoking policies in Beijing Restaurants and Bars: self-motivated voluntary smoking restrictions by restaurant and bar owners in 2006, government-encouraged voluntary smoking restrictions in 2007, and governmental regulatory smoking restrictions in 2008 (Fig. 1).

SHS monitoring from 2006 to 2008

According to the Standards of Industry Classification issued by the National Statistics Agency of China, hospitality venues are classified into five categories: Chinese restaurants, Chinese fast food restaurants, Western restaurants, Western fast food restaurants, and bars. In 2006, a convenience sample was selected from each of these categories in eight different districts of Beijing, with consideration of venue size and average expenses per patron per visit; a total of 91 venues (81 restaurants and 10 bars) were selected. In 2007, a similar sampling approach was used, except that venue selection was restricted to two of the eight districts due to logistical issues. Venues were sampled from each of the five categories in the ratio of 10:1:1:1:3 according to the number of restaurants and bars listed on website yellow page. Venues monitored in 2006 in these two districts were also included. Twenty one restaurants and two bars were followed from 2006 to 2007, and another 50 restaurants and 12 bars located in the same two districts were conveniently selected, resulting in 85 venues (71 restaurants and 14 bars) included in 2007. In 2008, the Chinese CDC released a list of the first 100 restaurants which prohibited or restricted smoking as required by the 2008 smoking regulation. Forty four venues were conveniently selected from that list and 52 from the list of venues monitored in 2007, with data from 94 venues (87 restaurants and seven bars) available for analysis.

The same standard protocol for data collection was used from 2006 to 2008. Trained staff from the Chinese CDC visited each venue during peak patronage times as patrons, sat at a table as close to the center of the dining area as possible, bought some food or drinks, placed a bag with a real-time fine particulate matter ($PM_{2.5}$) monitor (TSI SidePak AM510 Aerosol Monitor, TSI, St. Paul, Minnesota, USA) on the table or a chair, with the sampling inlet close to the breathing zone, and monitored $PM_{2.5}$ concentrations for at least 30 min. They asked servers about the smoking policy in the venue, examined whether there were any nonsmoking signs, and counted the number of total patrons and active smokers right after entering and before leaving the dining area and every 15 min during their stay there. They also measured the dimensions of the dining area with a sonic meter or estimated the dimensions when the area was irregular in shape. All the observations and measurements were conducted discreetly to avoid causing potential behavior changes among patrons and workers. Outdoor $PM_{2.5}$ concentrations were also monitored for at least 5 min either right before entering or after leaving each venue. For each visit, the difference between the average indoor and outdoor $PM_{2.5}$ concentration was multiplied with an adjustment factor of 0.32, suitable for SHS (Hyland et al., 2008), and was taken as SHS related $PM_{2.5}$ (SHS PM). For venues