

# Evaluation of smoke-free policies in seven cities in China, 2007–2012

Geoffrey T Fong,<sup>1,2,4</sup> Genevieve Sansone,<sup>1</sup> Mi Yan,<sup>1</sup> Lorraine Craig,<sup>1</sup> Anne C K Quah,<sup>1</sup> Yuan Jiang<sup>3</sup>

<sup>1</sup>Department of Psychology, University of Waterloo, Waterloo, Ontario, Canada

<sup>2</sup>Ontario Institute for Cancer Research, Toronto, Ontario, Canada

<sup>3</sup>Tobacco Control Office, Chinese Center for Disease Control and Prevention, Beijing, China

<sup>4</sup>School of Public Health and Health Systems, University of Waterloo, Waterloo, Ontario, Canada

## Correspondence to

Dr Genevieve Sansone, Department of Psychology, University of Waterloo, 200 University Avenue West, Waterloo, Ontario, Canada N2L 3G1; gsansone@uwaterloo.ca

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## ABSTRACT

**Background** China is the world's largest consumer of tobacco, with hundreds of millions of people exposed daily to secondhand smoke (SHS). Comprehensive smoke-free policies are the only effective way to protect the population from the harms of SHS. China does not have a comprehensive national smoke-free law but some local-level regulations have been implemented.

**Objective** To evaluate local level smoke-free regulations across 7 cities in China by measuring the prevalence of smoking in public places (workplaces, restaurants and bars), and support for smoke-free policies over time.

**Methods** Data were from Waves 2 to 4 of the International Tobacco Control (ITC) China Survey (2007–2012), a face-to-face cohort survey of approximately 800 smokers in each of 7 cities in mainland China. Multivariate logistic regression models estimated with generalised estimating equations were used to test the changes in variables over time.

**Results** As of 2012, over three-quarters of respondents were exposed to smoking in bars; more than two-thirds were exposed to smoking in restaurants and more than half were exposed to smoking in indoor workplaces. Small decreases in the prevalence of smoking were found overall from Waves 2 to 4 for indoor workplaces, restaurants and bars, although the decline was minimal for bars. Support for complete smoking bans increased over time for each venue, although it was lowest for bars.

**Conclusions** Existing partial smoking bans across China have had minimal impact on reducing smoking in public places. A strongly enforced, comprehensive national smoke-free law is urgently needed in order to achieve greater public health gains.

## INTRODUCTION

China is the world's largest producer and consumer of tobacco, with over 300 million smokers. This high smoking prevalence means that millions of people in China are exposed daily to the harms of secondhand smoke (SHS): it is estimated that 740 million non-smokers in China, including 182 million children, are exposed to SHS at least once a day; moreover, exposure to SHS causes 100 000 deaths annually in China.<sup>1</sup> It has been well established that exposure to tobacco smoke causes death and disease, and that there is no safe level of exposure to SHS.<sup>2</sup> Accordingly, the WHO recommends comprehensive smoke-free environments in all indoor public places, workplaces and public transit,<sup>3–5</sup> and Article 8 of the WHO Framework Convention on Tobacco Control (FCTC) calls for countries to adopt and implement effective

legislative measures to provide universal protection from exposure to tobacco smoke.<sup>6</sup>

China ratified the WHO FCTC in 2005, and it came into force in January 2006. As a Party to the FCTC, China is obligated to implement a comprehensive ban on smoking in all indoor public places, workplaces and public transport without exception. Article 8 also specifies that these measures to reduce SHS exposure in public places should be in place 5 years after FCTC ratification. In China, this deadline passed in 2011. Although the government and civil society have made efforts to improve smoke-free legislation, progress has been slow and problems with implementation and enforcement remain.

China does not currently have a comprehensive tobacco control law at the national level; instead, there are several different laws and regulations to regulate smoking in public places, many at the local level. Up until 2015, these local smoke-free regulations have not been comprehensive and were not fully enforced. For example, workplaces, restaurants and bars have not typically been covered, or if they are, there are allowances for designated smoking rooms.<sup>7 8</sup>

## Evaluation of smoke-free policies in China

Owing to the variation in smoke-free policies across China, there has been little research to evaluate their effectiveness, and most studies have been carried out at the local level in selected cities. Smoke-free regulations covering workplaces are especially varied across cities; however, an evaluation study conducted in seven cities in China found that smoke-free policies were more common in workplaces compared with other public places.<sup>9</sup> Research from Shanghai found that comprehensive smoke-free policies are much more effective than partial restrictions on smoking in workplaces, such as allowing indoor smoking rooms.<sup>10</sup> Smokers in smoke-free workplaces had lower daily consumption of cigarettes, more frequent quit attempts and were more confident in their ability to quit than smokers in workplaces with partial restrictions.<sup>10</sup> These findings in China demonstrate the effectiveness of comprehensive smoke-free policies over partial restrictions, consistent with studies conducted in many other countries.<sup>11</sup>

An evaluation of the smoke-free legislation in Guangzhou before and after the ban was implemented in 2010 found that self-reported exposure to SHS decreased significantly in places that had a comprehensive ban in place, and only slight declines were found in venues that had partial bans in place.<sup>12</sup> However, research from other provinces in China has also shown that such policies can only be effective in reducing smoking if they are



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properly enforced, demonstrating a need for improved enforcement and implementation of smoke-free policies.<sup>13</sup>

### Study overview and objectives

More research is needed to evaluate the impact of smoke-free policies in different venues across cities in order to enhance our understanding of the effectiveness of current smoke-free policies in China, and what needs to be done to improve smoke-free legislation.

In this study, we analysed longitudinal data from large, representative probability samples of smokers in seven cities in China to examine changes in self-reported exposure to smoking in public venues, as well as levels of support for smoke-free policies in these venues, both before and after the implementation of national-level and city-level smoke-free policies. The study design allows us to make comparisons between Chinese cities with different regulations in place, as well as with other countries that have implemented smoke-free policies.

The longitudinal design of the study also allows us to assess whether the amount of smoking or support for smoke-free policies has increased or decreased over time. We expect to find decreases in levels of smoking in cities that have implemented smoke-free policies. On the basis of previous research from China and other countries showing that support for smoke-free policies increases after these policies have been introduced,<sup>14–16</sup> we also expect that support will increase for venues that are covered by smoke-free policies in the cities where these policies were introduced.

We examined three types of venues in the present study: indoor workplaces, restaurants and bars. During the study period (2007–2012), there were no restrictions on smoking in bars in any of the seven cities. Five of the seven cities (Beijing, Shanghai, Shenyang, Guangzhou and Yinchuan) had some legislation banning smoking in various areas of indoor workplaces as well as restaurants; however, the bans covering restaurants are not comprehensive as they still allow for designated smoking areas (see Table 1). The remaining two cities included in this study (Kunming and Changsha) had no smoke-free legislation covering restaurants or workplaces. At the national level, the Ministry of Health authorised a policy prohibiting smoking in indoor public places such as schools and healthcare facilities with effect from 1 May 2011; however, not all public places were included in this ban.<sup>22</sup>

## METHODS

### Data source

The data source for this paper is the International Tobacco Control China Survey (the ITC China Survey), which is a part

of the ITC Project's 22-country international evaluation system. The ITC China Survey began in 2006 and, like ITC surveys in all countries, is a longitudinal cohort survey. In China, the cohort members are adult ( $\geq 18$  years of age) smokers and non-smokers in seven cities in China (Beijing, Shanghai, Guangzhou, Shenyang, Changsha, Yinchuan and Kunming), which were selected on the basis of geographical representativeness and levels of economic development. In all cities except Kunming, we used data collected between October 2007 and January 2008 (Wave 2), between May and October 2009 (Wave 3), and between September 2011 and November 2012 (Wave 4). The outcome variables of interest were not included in the Wave 1 surveys. Kunming was added to the ITC China Project in Wave 3; therefore, data for this city were available only for Waves 3 and 4. The sample for this study consisted of approximately 800 smokers from each city at each survey wave. Non-smokers were excluded from the study. As in all ITC Surveys, the same respondents were recontacted to participate in each subsequent survey wave. To compensate for respondents lost to attrition, new respondents were randomly selected at Waves 2, 3 and 4 using the same sampling frame so as to maintain city-level representative samples. At Wave 3, 80.4% of Wave 2 respondents were recontacted, and at Wave 4, 65.6% of the respondents were recontacted.

### Sampling design

The ITC China Survey employs a multistage cluster sampling method to obtain a representative sample of adult smokers and non-smokers at the city level. In addition, individual-level sampling weights were constructed to estimate population characteristics.

The survey was conducted via face-to-face interviews by trained survey interviewers. Survey fieldwork in all cities except for Kunming was conducted by survey interviewers from the National Center for Disease Control and Prevention (China CDC) and local CDCs. In Kunming, the survey was conducted by interviewers from the Yunnan Health Education Institute. In this paper, smokers are those who have smoked more than 100 cigarettes in their lifetime and smoked at least weekly at recruitment.

A more detailed description of the ITC China Survey methodology is presented in Wu *et al.*<sup>23, 24</sup> and at <http://www.itcproject.org>. All materials and procedures used in the ITC China Survey were reviewed and cleared for ethics by the research ethics board at the University of Waterloo (Waterloo, Ontario, Canada) and the Institutional Review Boards at Roswell Park Cancer Institute (Buffalo, New York, USA), the Cancer Council Victoria (Melbourne, Victoria, Australia) and the Chinese National Center for Disease Control and Prevention (Beijing, China).

### Measures

To measure the prevalence of smoking in bars and restaurants at Waves 2 and 3, respondents who had visited each of these venues in the past 6 months were asked 'When you visited a bar/restaurant in the last 6 months, were people smoking inside?' The response options were 'yes/no'. At Wave 4, smokers who visited a bar/restaurant in the past six months were asked about smoking restrictions on their last visit and whether smoking was allowed in any indoor area, allowed only in designated indoor areas, or no rules or restrictions. Smokers were then asked 'On your last visit, were there people smoking inside?' Those who answered 'smoking was not allowed in any indoor area' or 'no rules or restrictions' were routed to the question differently than those who answered 'Smoking was

**Table 1** Summary of city-level smoke-free policies for workplaces and restaurants

Date	City and description
May 2008	Beijing: partial ban in restaurants; partial ban in workplaces <sup>17</sup> Shenyang: partial ban in restaurants; partial ban in workplaces <sup>18</sup>
June 2009	Yinchuan: partial ban in restaurants; partial ban in workplaces <sup>19</sup>
March 2010	Shanghai: partial ban in large restaurants; ban in shared workplace areas <sup>20</sup>
September 2010	Guangzhou: partial ban in large restaurants; ban in selected indoor workplaces <sup>21</sup>

allowed only in designated indoor areas'. The responses from the two pools of respondents to these Wave 4 questions were added together.

To measure the prevalence of smoking in workplaces, those who were employed outside the home and worked inside a building were asked 'In the last 6 months, have people smoked in indoor areas where you work?' The response options were 'yes/no'.

Support for smoke-free policies was assessed with the question 'For each of the following public places—bars, restaurants, and workplaces—please tell me if you think smoking should not be allowed in any indoor areas; should be allowed only in some indoor areas; or no rules or restrictions?' Responses were dichotomised so that those who answered 'smoking should not be allowed in any indoor areas' were categorised as supporting a complete ban, and all others were categorised as supporting a partial ban or no ban.

### Data analysis

All analyses were conducted in SAS V.9.4 with SUDAAN V.11.0.1. To test the changes in the prevalence of smoking in public venues and the support for smoke-free laws between waves, separate logistic regression models (PROC MULTILOG) were estimated using generalised estimating equations (GEE).<sup>25</sup> For each GEE model, the variances were computed between clusters, whereas the intraclass correlations were computed within the individual respondents since the same questions were asked at each survey wave. Analytical survey weights that rescaled to the sample size of each city and wave were used to account for the complex sampling design.

Time in sample (number of waves completed by each respondent) was controlled for individuals in the GEE model due to the effect of being exposed to the same question several times. Explanatory variables such as demographics, smoking status and city were adjusted in each logistic regression model.

## RESULTS

### Workplaces

Respondents were asked whether people were smoking in their indoor workplaces in the past 6 months. Among smokers who were employed inside a building (N=403 to 508 across the cities), the level of smoking in workplaces declined slightly from Waves 2 (2007–2008) to 3 (2009) in most cities, but none of these decreases were significant. Declines in smoking in workplaces were larger from Waves 3 to 4 (2011–2012), with significant declines in two cities: Beijing (65% to 52%,  $p<0.01$ ) and Shenyang (74% to 62%,  $p<0.05$ ) as shown in Figure 1. Both these cities had implemented partial bans on smoking in indoor workplaces in May 2008, prior to the Wave 3 Survey and earlier than the other cities surveyed. This was followed by the national ban on smoking in public places in May 2011.

All respondents (N=757–784) were also asked whether they would support a complete ban on smoking in workplaces. Support among smokers for a complete ban on smoking in indoor workplaces increased overall from Waves 2 to 4, with greater increases found between Waves 3 and 4 than Waves 2–3 (see Figure 2). From Waves 2 to 3, support increased significantly in Shanghai (36–53%,  $p<0.01$ ) and Yinchuan (66–77%,  $p<0.001$ ), whereas in the other cities support also increased but not significantly. Between Waves 3 and 4, support increased significantly in Beijing (54–65%,  $p<0.001$ ), Shenyang (44–54%,  $p<0.05$ ), Guangzhou (40–60%,  $p<0.001$ ) and Kunming (33–44%,  $p<0.001$ ). Only Yinchuan showed a decrease in support, from 77% to 70% ( $p<0.01$ ).

### Restaurants

The percentage of smoking inside restaurants was very high at Waves 2 and 3 (88–98% across the cities; N=606–708), but decreased at Wave 4 (67–91%), after the national smoking ban was implemented (Figure 3). The decrease in smoking in restaurants from Waves 3 to 4 was significant in all seven cities: Beijing (89–67%,  $p<0.001$ ), Shenyang (93–80%,  $p<0.001$ ), Shanghai (94–77%,  $p<0.001$ ), Changsha (95–88%,  $p<0.01$ ), Guangzhou (94–72%,  $p<0.001$ ), Kunming (98–91%,  $p<0.001$ ) and Yinchuan (93–86%,  $p<0.05$ ). This suggests that the national smoking ban may have reduced the amount of smoking in restaurants since 2011, but the decline was not consistent across cities. The largest decreases were found in the three largest cities, two of which (Guangzhou and Shanghai) had implemented partial smoking bans in restaurants between Waves 3 and 4; however, the sharpest decline was in Beijing, which did not implement any local smoke-free laws during this time. Therefore, the additional local smoking bans did not always have any further impact on smoking in restaurants beyond the effects of the national ban.

Support for smoking bans in restaurants also increased overall from Waves 2 to 4. As shown in Figure 4, among smokers (N=753–798), support for a complete ban on smoking inside restaurants increased significantly from Waves 2 to 3 in Beijing (30–41%,  $p<0.001$ ), and from Waves 3 to 4 in Shenyang (31–46%,  $p<0.001$ ), Shanghai (36–53%,  $p<0.01$ ), Guangzhou (22–47%,  $p<0.001$ ) and Kunming (26–40%,  $p<0.001$ ).

### Bars

Smoking was also high in bars across the seven cities, although it was lowest in Beijing. Among smokers who had visited a bar (N=182–346), overall decreases in the amount of smoking were reported from Waves 2 to 4 in all cities, although the only significant decreases between survey waves were in Shenyang (91–79%,  $p<0.01$ ) and Kunming (99–94%,  $p<0.01$ ) from Waves 3 to 4 (Figure 5).

Support for a smoking ban in bars was lower among smokers (N=646–709) than support for bans in other venues, as shown in Figure 6. The level of support among smokers for a complete smoking ban in bars varied across the three waves, but overall support increased from Waves 2 to 4 in each city, with significant increases observed in Beijing (24% at Wave 2 to 36% at Wave 3,  $p<0.05$ ), Shenyang (23% at Wave 3 to 35% at Wave 4,  $p<0.01$ ), Guangzhou (22% at Wave 3 to 40% at Wave 4,  $p<0.001$ ) and Kunming (18% at Wave 3 to 24% at Wave 4,  $p<0.05$ ).

## DISCUSSION

The findings from this study provide evidence that partial smoke-free laws implemented between 2007 and 2012 in China have led to only small, inconsistent decreases in smoking in indoor workplaces, restaurants and bars, as reported by smokers in the ITC China Survey. As of 2012, more than two-thirds of restaurants visited by smokers and more than half of the indoor workplaces had smoking, meaning that there are still high levels of exposure to tobacco smoke in public places.

Greater declines in smoking were found between Waves 3 (2009) and 4 (2011–2012) of the Survey, compared with Waves 2 (2007–2008) to 3. This suggests that the national smoking ban implemented in 2011 as well as an increase in the number of cities in China introducing smoke-free legislation may have had some impact on reducing exposure to tobacco smoke in certain public places. Restaurants had the largest decreases in smoking, where declines of up to 22% were found across the

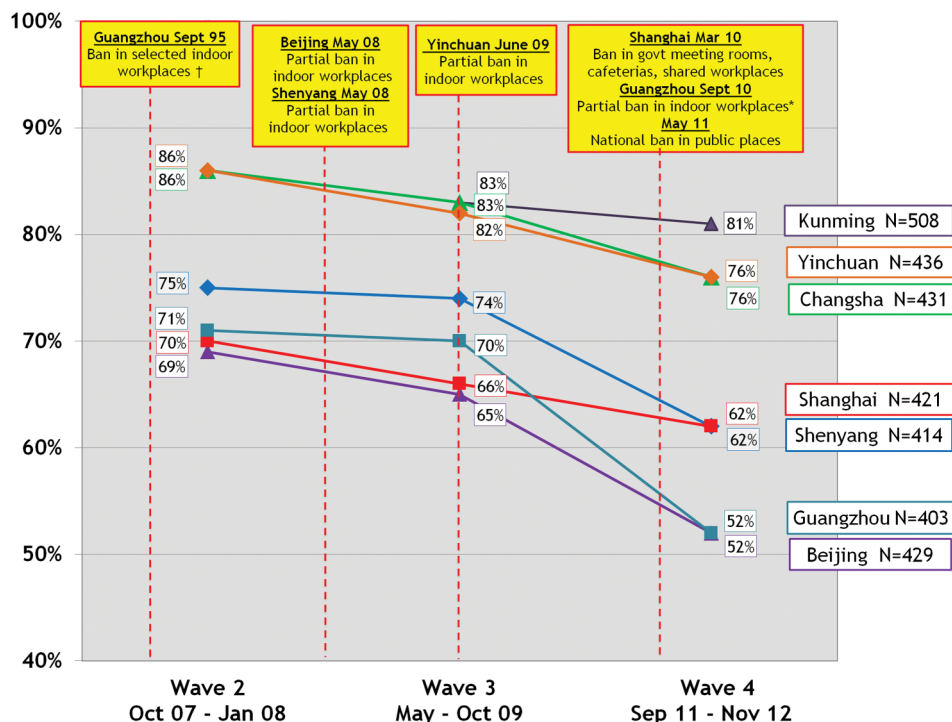


**Figure 1** Adjusted percentage of indoor workplaces with smoking, by city, by wave.

†Ban included classrooms, meeting rooms, and air conditioned offices.

\*Ban included offices, meeting rooms, cafeterias, elevators, and corridors.

Note: N sizes represent the average for each city across the survey waves.



cities surveyed. However, the findings show that the introduction of smoke-free policies at the local level did not always lead to changes in the amount of smoking in public places. In addition, the lack of any smoking restrictions in bars is evident from the finding that there was smoking in over three-quarters (77–96%) of bars visited by smokers in 2011–2012, with only minor declines in smoking over the three survey waves.

In comparison to what has been achieved in other countries, China's smoke-free legislation has been much less effective. For example, although smoking in restaurants in China across the

4 years of the three waves of the ITC China Survey did decline from 88–97% to 67–91%, these decreases are far from the decreases achieved in other countries that engaged in comprehensive bans. Nationally representative studies conducted by the ITC Project found that when Ireland and France implemented smoking bans in restaurants, the amount of smoking in these venues decreased from over 70% to <5%.<sup>14 26</sup>

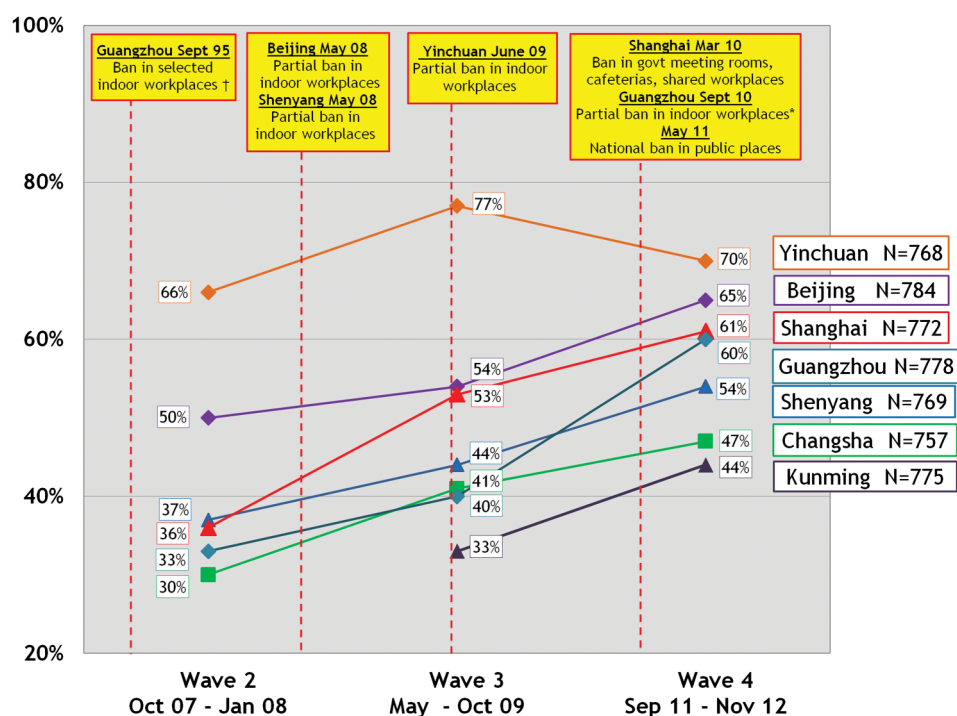
An important finding from this study is that Chinese smokers themselves are supportive of stronger smoke-free laws. Support for complete smoking bans in indoor workplaces (44–70% of

**Figure 2** Adjusted percentage of smokers who support complete smoking bans in their indoor workplaces, by city, by wave.

†Ban included classrooms, meeting rooms, and air conditioned offices.

\*Ban included offices, meeting rooms, cafeterias, elevators, and corridors.

Note: N sizes represent the average for each city across the survey waves.

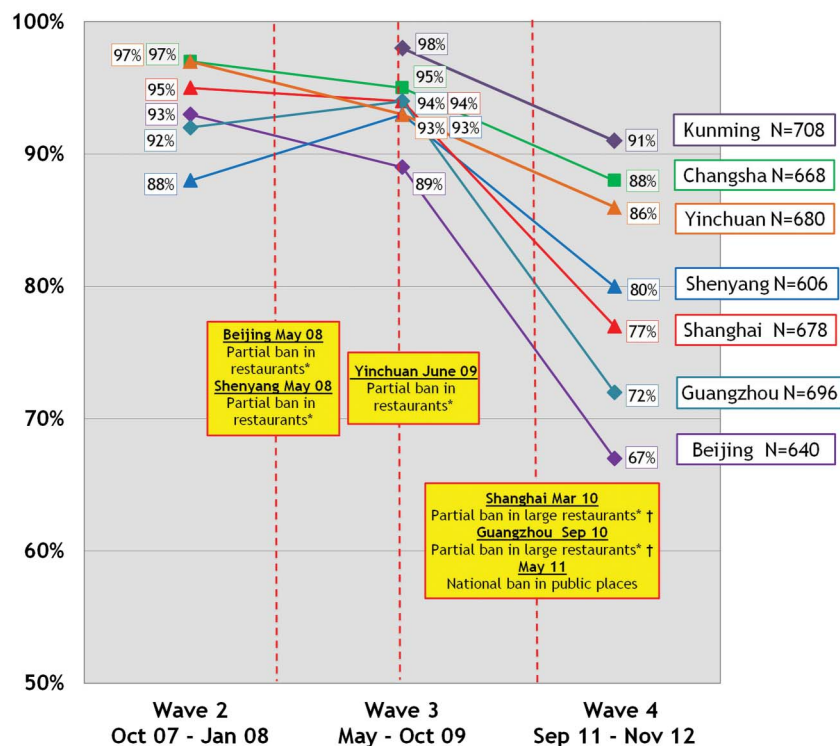


**Figure 3** Adjusted percentage of restaurants with smoking, by city, by wave.

\*Designated smoking rooms permitted; designated non-smoking areas in Yinchuan.

†Restaurants with 75+ seats or 150+ square metres.

Note: N sizes represent the average for each city across the survey waves.



smokers across the cities in 2011–2012) was higher than support for bans in restaurants (34–53%) and bars (24–44%); however, support for complete smoking bans has increased over time for all venues in each city. The percentage of smokers who currently support smoke-free bars in China is even higher than the level of support for smoke-free bars among smokers in other countries, such as Ireland and France, before those countries implemented smoking bans.<sup>14 27</sup> Moreover, evidence from these countries has shown that when smoke-free laws are properly implemented and enforced, they are highly successful as well as strongly supported by the public; in fact, public support for smoke-free laws tends to increase over time after the bans

are introduced.<sup>2 15 16</sup> However, it is not enough to simply implement smoke-free legislation; implementation must go along with adequate compliance as well as strong enforcement of the law in order to be effective.<sup>2 3</sup>

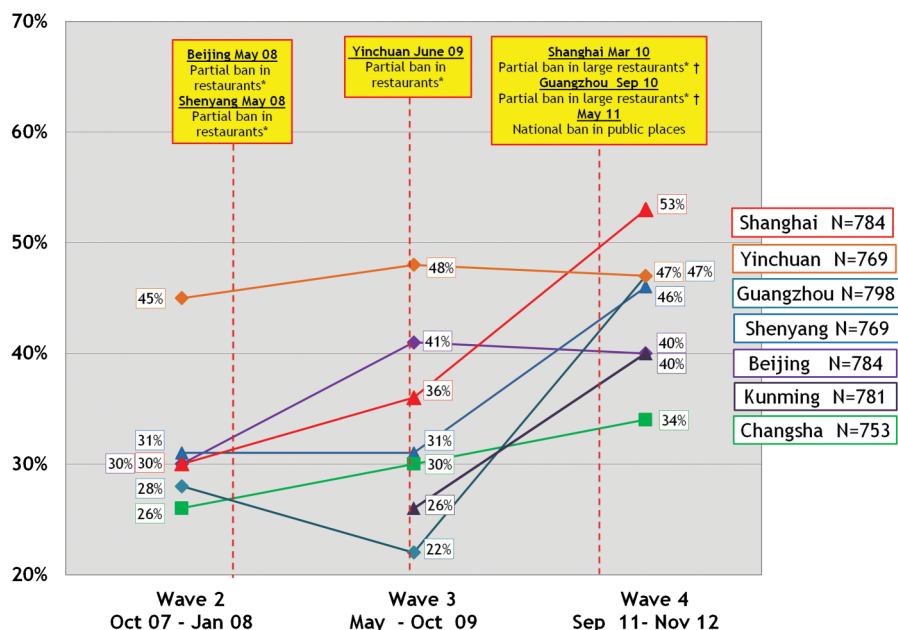
Some cities in China have recently begun to strengthen their smoke-free policies. For example, Guangzhou, which was one of the first cities in China to implement smoke-free legislation, has a comprehensive ban in certain public places such as indoor government offices, medical facilities, schools and public transportation, as well as a ban on smoking in workplaces and in restaurants with air conditioning, which is a more stringent law than any national level regulations,<sup>12 16</sup> and the capital of

**Figure 4** Adjusted percentage of smokers who support complete smoking bans in restaurants, by city, by wave.

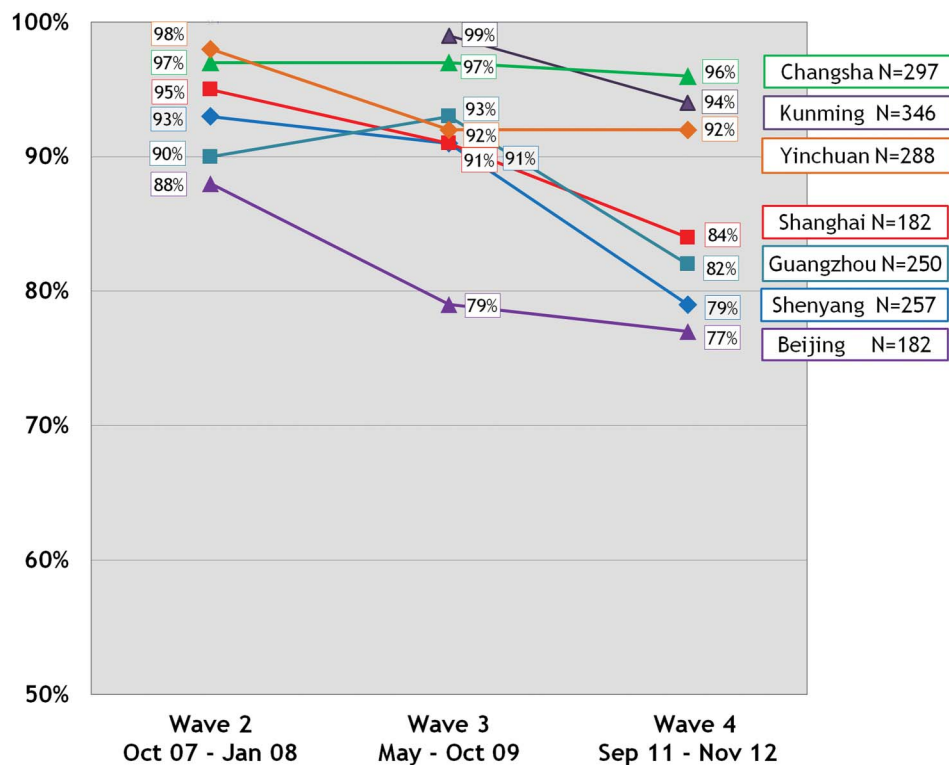
\*Designated smoking rooms permitted; designated non-smoking areas in Yinchuan.

†Restaurants with 75+ seats or 150+ square metres.

Note: N sizes represent the average for each city across the survey waves.



**Figure 5** Adjusted percentage of bars with smoking, by city, by wave.  
Note: N sizes represent the average for each city across the survey waves.

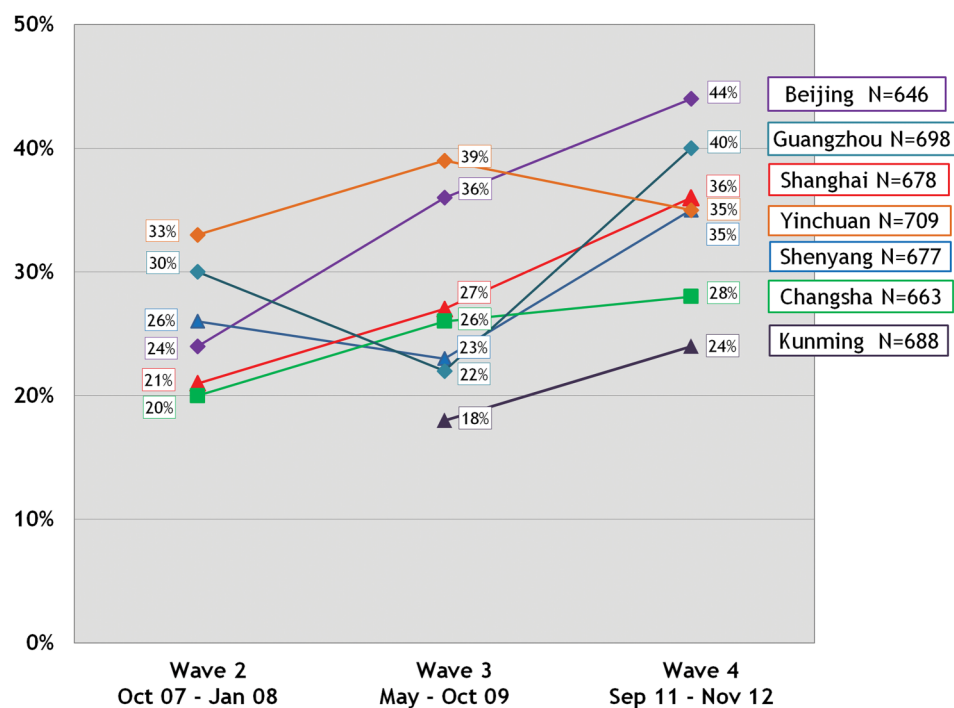


Beijing recently passed the strongest smoke-free law in the country by requiring 100% smoke-free indoor workplaces and public places as of 1 June 2015.

The Chinese government has also demonstrated a promising new level of commitment to smoke-free legislation since 2011. In November 2014, China's State Council issued a draft regulation calling for a comprehensive smoking ban in public places, workplaces and public transport, paving the way for a strong national

smoke-free law that aligns with the FCTC.<sup>28</sup> Considering the extremely high rates of exposure to tobacco smoke in China and the proven benefits of comprehensive smoke-free legislation—both to public health and to the economy—<sup>11 29</sup> if China adopts and fully enforces the proposed national legislation, this would be an enormous step towards active engagement in tobacco control and a sign that the world's largest country is committed to combating the world's largest tobacco epidemic.

**Figure 6** Adjusted percentage of smokers who support complete smoking bans in bars, by city, by wave.  
Note: N sizes represent the average for each city across the survey waves.





## What this paper adds

- This study provides evidence that the existing local smoke-free laws in China have had minimal impact on reducing the amount of smoking in indoor public places.
- However, it is encouraging that small reductions in smoking in restaurants and workplaces have been observed after partial local-level smoking bans were implemented in several cities. A comprehensive and strongly enforced national smoking ban, as called for in the Framework Convention on Tobacco Control (FCTC) Article 8 Guidelines, could achieve much greater reductions in exposure to tobacco smoke and would have a huge impact on public health.
- This study also demonstrates that smokers in China are ready for a comprehensive ban on smoking in public places, as the level of support for stronger smoke-free laws in restaurants, workplaces and bars has increased over time and is already higher than in other countries (eg, Ireland) prior to implementation of their highly successful smoke-free laws.

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**Contributors** GTF designed the study. GTF and YJ designed the survey and collected the data. MY conducted the data analysis. GS wrote the first draft. GTF, LC and ACKQ revised the draft. All authors have reviewed and approved the final version of the manuscript.

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**Competing interests** None declared.

**Ethics approval** Ethics approval was obtained from the Office of Research at the University of Waterloo (Waterloo, Canada) and the Institutional Review Boards at the Roswell Park Cancer Institute (Buffalo, USA), the Cancer Council Victoria (Victoria, Australia), and the Chinese Center for Disease Control and Prevention (Beijing, China).

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data sharing statement** Data from the International Tobacco Control Policy Evaluation (ITC) Project are available to approved researchers 2 years after the date of issuance of cleaned data sets by the ITC Data Management Centre. Researchers interested in using ITC data are required to apply for approval by submitting an International Tobacco Control Data Repository (ITCDR) request application and subsequently to sign an ITC Data Usage Agreement. To avoid any real, potential, or perceived conflict of interest between researchers using ITC data and tobacco-related entities, no ITC data will be provided directly or indirectly to any researcher, institution, or consultant that is in current receipt of any grant monies or in-kind contribution from any tobacco manufacturer, distributor, or other tobacco-related entity. The criteria for data usage approval and the contents of the Data Usage Agreement are described online (<http://www.itcproject.org>).

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