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Effects of household, workplace, and public place smoking restrictions on smoking cessation

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ABSTRACT

The aim of this study was to evaluate the association between environmental smoking restrictions, distinguished by site, and smoking cessation by Chinese urban residents. Recruited through multi-stage quota-sampling, residents *in six Chinese cities* were surveyed. Data were both *individual-level and city-level*. Among 4735 respondents, 715 were identified as successful quitters and 405 as unsuccessful. Multilevel logistic regression analysis showed smoking cessation to be associated with city-level public place and workplace restrictions and individual-level workplace and household restrictions. Results offer justification for decision-makers to implement environmental tobacco control policies and related public health interventions aimed at markedly diminishing the high smoking prevalence in China.

1. Introduction

Each year, the tobacco-smoking epidemic kills approximately 5.4 million people globally. Unchecked, this death toll will exceed 8 million annually by 2030. More than 80% of these deaths will occur in less-developed countries, with the epidemic striking hardest in the rapidly growing economies (World Health Organization, 2008). China leads the world in tobacco consumption and smoking-related deaths. A new survey shows that 53% of Chinese men, 2% of the women, and 28% of the overall population (301 million adults) currently smoke tobacco. Simultaneously, 70% of nonsmoking adults are exposed to secondhand smoke in a typical week (WHO, 2010). While the rural, the less-educated, the middle-aged, and workers in service, manufacturing, or construction have a higher smoking prevalence than comparative groups, they also have a lower quit rate (WHO, 2010; The People's Republic of China Ministry of Health, 2007; Yang et al., 2006, 2007). Among ever-daily smokers 20–34 years of age, smoking accounted for approximately one million deaths annually during the 1990s (Peto et al., 1999; The People's Republic of China Ministry of Health, 2007). The number of deaths is projected to reach two million annually by 2025 and three million by 2050. Approximately 100 million Chinese will die from smoking-related causes over the next 50 years if the current high prevalence of smoking persists (Doll et al., 2004).

About half of smokers in more-developed countries have attempted to quit (Centers for Disease Control and Prevention, 2005; Fichtenberg and Glantz, 2002). However, the corresponding proportion is lower in less-developed countries, including China (Fichtenberg and Glantz, 2002; Yang et al., 2006, 2009). Studies show that the most smokers are unsuccessful in attempting to quit (Lee and Kahende, 2007; Yang et al., 2009).

Smoking cessation is a complex psychological and behavioral process, and successful quitting depends on both individual and environmental factors. To place smoking cessation programs in perspective, we must understand the underlying dynamics of the quitting process with respect not only to sociodemographic and behavioral characteristics of smokers, but also to their living and working environments. Prior research revealed that predictors of cessation include a mix of individual sociodemographic and behavioral factors, such as low nicotine dependence, receipt of higher education, being married and older, consuming fewer cigarettes per day, and having high self-efficacy (Hyland et al., 2006; Lee and Kahende, 2007; Yang et al., 2006, 2009). At the environmental level, some studies found that public place, workplace, and household restrictions encourage smokers to quit or reduce their smoking, and thus contribute to smoking cessation (Eriksen and Cerak, 2008; Okah et al., 2002). Better understanding of these determinants will improve the design and implementation of population-based smoking cessation programs. In many

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countries, including China, there has been a lack of data regarding tobacco control environmental factors that influence cessation. This paucity of evidence has adversely impacted decision-makers and public understanding of the Framework Convention on Tobacco Control (FCTC), and hindered development and implementation of effective smoking cessation interventions. Adjusting for sociodemographics, this study will explore the association between environmental restrictions and smoking cessation.

2. Methods

2.1. Study design

This study used a cross-sectional, multi-stage sampling design. In Stage 1, six cities were selected. Stage 2 comprised the selection of residential districts within each city, and Stage 3 the identification of blocks of apartment buildings within each district. In Stage 4, households were sampled within each block. The six study cities and their population size and economic focus were, respectively, Hangzhou (6.7 million people, light industry and tourism), Nanjing (6.2 million people, education and light industry), Guangzhou (7.7 million people, light industry and commerce), Taiyuan (3.5 million people, manufacturing), Yinchuan (1.6 million people, agriculture and light industry), and Harbin (9.9 million people, manufacturing). They were selected for their geographical location to ensure regional diversity, and also because they are capital cities. In terms of economic development, Harbin, Yinchuan, and Taiyuan are less developed, Nanjing is moderate, and Hangzhou and Guangzhou are advanced (Department of Comprehensive Statistics of National Bureau of Statistics, 2009). Two residential districts with a high population density were randomly selected from the sampling frame of each study city. Within each residential district, four 'Jiedao' (a subdistrict neighborhood administration) were randomly selected. Sixteen building blocks were then randomly selected from each 'Jiedao', and a city-wide list of households was used to randomly sample households within building blocks. Individuals aged 15 years and older, who had lived in their home for at least one year, were identified within each household. Finally, one respondent was randomly selected from each family, with eligibility being determined by the birthdate closest to the contact date (Yang et al., 2007).

2.2. Methodology

Respondents were asked to fill out a questionnaire upon receiving instructions from our trained staff. These staff members were fourth-year public health students from a local medical college (Yang et al., 2007). Mean duration for completion of the questionnaire was approximately 30 min. Staff facilitated completion as necessary. We employed the same research protocol across the six study cities to ensure procedural homogeneity. The study was approved by the Ethics Committee at the Medical Center, Zhejiang University, and informed written consent was obtained from all respondents prior to data collection. Possessing acceptable psychometric properties, our research procedures have been extensively employed in other Chinese smoking studies (Yang et al., 2006, 2007, 2009).

2.3. Measures

2.3.1. Dependent variable

The outcome variable in this study was smoking cessation, that is, successful quitting, which was assessed by means of self-report. Successful quitters were individuals who reported that they previously had smoked habitually for six or more months, but had completely stopped smoking at time of interview. Unsuccessful quitters were smokers who had tried quitting for at least 24 h on a minimum of three occasions, but later relapsed (Yang et al., 2009). A dichotomous response variable (1 = unsuccessful quitters and 2 = successful quitters) was then created. Excluded from the analyses were never smokers and current smokers who had not attempted to quit.

2.3.2. Individual-level independent variables

Sociodemographics: individual-level data were collected on age, gender, ethnicity, marital status, education, and occupation.

Environmental smoking restrictions:

(1) *Public places*: respondents were asked two questions. First, had they witnessed smoking in restaurants, hospitals, shops, buses, and other public places in their city in the last six months (yes/no)? Secondly, if answering in the affirmative, they were asked whether they had observed any smoking restrictions in any of the previously designated settings, with response options covering no restrictions/restrictions in some indoor areas/restrictions in all indoor areas, and coded dichotomously as 1 = no restrictions or partial restrictions and 2 = smoking ban.
(2) *Workplaces*: respondents were asked what smoking restrictions were in their workplace, with options covering none/in some places/in all places/in some places. For retired or unemployed respondents, 'workplace' referred to the place they went for temporary work or leisure or other activities in the community. For students, it covered such places as classrooms and libraries. The options were coded dichotomously as 1 = no restrictions or partial restrictions and 2 = smoking ban.
(3) *Households*: respondents were asked what smoking restrictions there were in their household, with options covering none/in some places/in all places. The options were coded dichotomously as 1 = no restrictions or partial restrictions and 2 = smoking ban.

2.3.3. City-level independent variables

City-level (or regional) independent variables represented two different aspects of the research domain. The first aspect was population size and level of economic development (per capita GDP and household disposable income). These data were obtained from the National Bureau of Statistics (Department of Comprehensive Statistics of National Bureau of Statistics, 2009). The second aspect covered environmental smoking restrictions in public places, workplaces, and households, respectively. We constructed contextual variables pertaining to each of the three environmental restriction categories based on aggregation of individual responses. More specifically, for the household variable we dichotomized our six study cities according to whether or not 30% or more of respondents in each city reported that their households totally banned smoking as compared to having partial or no restrictions on smoking. We employed a cutoff of 40% or more for corresponding public place and workplace variables.

2.4. Data analysis

Data analysis was conducted in several stages using SAS version 6.12 and MLinN Version 2.02 (Rashash et al., 2001). Determinants of smoking cessation were evaluated using a multilevel logistic regression model (Fone and Dunstan, 2006; Goldstein, 1995; Rashash et al., 2001). A nested hierarchical multilevel modeling technique has substantial advantages over a single-level regression procedure when there is both a defined outcome measure and clear differentiation of 'individual' and