ORIGINAL INVESTIGATION

Urban Chinese Smokers From Lower Socioeconomic Backgrounds Face More Barriers to Quitting: Results From the International Tobacco Control-China Survey

Hua-Hie Yong PhD¹, Mohammad Siahpush PhD², Ron Borland PhD¹, Lin Li PhD¹, Richard J. O'Connor PhD³, Jilan Yang MSc⁴, Geoffrey T. Fong PhD^{5,6}, Yuan Jiang PhD⁶

¹VicHealth Centre for Tobacco Control, The Cancer Council Victoria, Carlton, VIC, Australia; ²Department of Health Promotion, Social & Behavioral Health, University of Nebraska Medical Center, Omaha, NE; ³Department of Health Behavior, Roswell Park Cancer Institute, Buffalo, NY; ⁴Department of Health Studies and Gerontology, University of Waterloo, Waterloo, ON, Canada; ⁵Department of Psychology, University of Waterloo, Waterloo, ON, Canada; ⁶Ontario Institute for Cancer Research, Toronto, ON, Canada; ⁷Tobacco Control Office, Chinese Center for Disease Control and Prevention, Beijing, China

Corresponding Author: Hua-Hie Yong, Ph.D., The Cancer Council Victoria, VicHealth Centre for Tobacco Control, 1 Rathdowne Street, Carlton, VIC 3053, Australia. Telephone: 613-9635-5385; Fax: 613-9635-5440; E-mail: hua.yong@cancervic.org.au

Received May 11, 2012; accepted September 28, 2012

ABSTRACT

Introduction: Research findings on social disparities in barriers to quitting faced by smokers from mainly Western English-language countries may or may not generalize to smokers in China. This paper sought to determine whether nicotine dependence, quitting self-efficacy, quitting interest differ by socio-economic status (SES), and whether they mediate the relationship between SES and quitting behavior of urban Chinese smokers.

Methods: Data come from 7,309 adult smokers who participated in the first 3 waves of the International Tobacco Control-China survey conducted in 7 cities across China. The association of socio-economic indicators with nicotine dependence, quitting self-efficacy, quitting interest, and behavior was evaluated using generalized estimating equations models along with a formal test of mediational effects.

Results: The SES index indicated that those from lower SES were significantly more addicted ($p < .001$), less confident ($p < .001$), and less interested in quitting ($p < .05$). This finding was replicated by education and employment status, but it was not clearly related to income. Mediation analyses revealed that the effects of SES on making quit attempts and quit success among those who tried were indirect. For quit attempts, self-efficacy, interest to quit, and heaviness of smoking index (HSI) were all significant mediators of the SES effect ($p < .001$), but for maintenance, only HSI was a significant mediator ($p < .001$).

Conclusions: Urban Chinese smokers from lower socio-economic backgrounds experience greater levels of psychological and behavioral barriers to quitting than their counterparts from higher socio-economic backgrounds and as such, they need more help to quit and do so successfully.

INTRODUCTION

Previous research conducted in high-income Western countries has shown that smokers' level of nicotine dependence, their perceived efficacy to quit smoking, and their intentions to quit smoking are strong predictors of smoking cessation behavior (Borland et al., 2010; Hyland et al., 2006; Hymowitz et al., 1997; Li et al., 2011; Zhou et al., 2009). These quitting-related variables have also been shown to be associated with socio-economic status (SES). For example, across four high-income countries (United States, Canada, United Kingdom, and Australia), lower levels of education and income were associated with higher nicotine dependence, having no interest in quitting and lower self-efficacy to quit (Siahpush, McNeil,

& Fong, 2006). Such associations may partly explain the lower rate of smoking cessation among low SES smokers. However, the extent to which these findings generalize to smokers in other countries/cultures is unclear. A recent study by Siahpush, Borland, Yong, Kin, & Sirirassamee (2008) using data from two Southeast Asian countries (Malaysia and Thailand) suggests that existing knowledge from high-income countries about social-economic disparities in smoking may not generalize readily to developing countries.

Among the developing countries, China is the largest producer and consumer of tobacco in the world (Shafey, Eriksen, Ross, & Mackay, 2009). Annual mortality associated with smoking in China is greater than one million and is expected to increase in the coming decades (Peto, Chen, & Boreham, 2009).

doi:10.1093/ntr/nts234

Advance Access publication November 2, 2012

© The Author 2012. Published by Oxford University Press on behalf of the Society for Research on Nicotine and Tobacco. All rights reserved. For permissions, please e-mail: journals.permissions@oup.com

Limited evidence suggests that like those in the West, Chinese smokers who are better educated and currently employed are less likely to take up smoking, but the relationship with income is somewhat unclear (Pan, 2004; Sun & Shun, 1995). The findings for the relationship between SES and smoking cessation are not always consistent. Using baseline data from the International Tobacco Control (ITC)-China survey, Feng and colleagues (2010) found that higher education but not income was significantly associated with having an interest to quit smoking, largely consistent with findings in the West. However, a recent study by Li et al. (2011) using the first two waves of the ITC-China project to examine prospective predictors of making a quit attempt and quit success among those who tried, failed to find any independent association between these outcomes and SES indicators such as income and education. This suggests that the observed influence of SES on quitting activity may be entirely indirect, something that awaits confirmation. Although Li et al. (2011) showed that Chinese smokers with lower nicotine dependence, higher self-efficacy, and more immediate quitting intentions were more likely to make a quit attempt independent of other factors, the predictive utility of these three factors for quit maintenance among Chinese smokers who had made a quit attempt is less clear and deserves further research.

Using the same data from the ITC-China survey as Li et al. (2011) but adding an additional wave (total of three waves), this study aimed (a) to examine whether nicotine dependence, quitting self-efficacy, and quit interest differed by SES and (b) whether SES influenced the likelihood of making a quit attempt and succeeding in an attempt directly or indirectly via these factors, among Chinese smokers from seven cities.

METHODS

Sample

Data come from the first three waves (Waves 1–3) of the ITC-China survey, a face-to-face cohort study modeled after the ITC-4 country study designed to evaluate the psychosocial and behavioral impacts of tobacco control policies (Fong et al., 2006; Thompson et al., 2006). The ITC-China cohort was recruited using a multistage cluster sampling method to obtain a representative sample of adult smokers who were registered residents in the seven cities (Beijing, Shenyang, Shanghai, Changsha, Guangzhou, Yinchuan, and subsequently a new city, Kunming, was added starting in Wave 3). These cities were selected based on geographic representations and levels of economic development. The ITC-China survey was conducted through face-to-face interviews using a standard protocol. Details of the study methodology have been reported elsewhere (Wu et al., 2010). Briefly, in each city, 10 Jie Dao or Street Districts were selected with probability of selection proportional to population size of the Jie Dao. Within each Jie Dao, two Ju Wei Hui or residential blocks were selected, with selection probability proportional to size. Within each selected Ju Wei Hui, a complete list of addresses of the dwelling units (households) was first compiled, and then a sample of 300 households were drawn from the list by simple random sampling without replacement. The enumerated 300 households were ordered randomly, and adult smokers were then approached until 40 adult smokers were surveyed. Smokers

were defined as those who had smoked more than 100 cigarettes in their life and smoked at least weekly at the time of the survey. Because of low smoking prevalence among women, one male smoker and one female smoker from every selected household were surveyed whenever possible to increase the sample size for women. The next birthday method was used to select the individual to be interviewed where multiple persons were eligible in a household. The average time taken to complete a survey was 31 min. Baseline survey (Wave 1) involving 4,732 adult smokers was conducted between April and August, 2006. Of these, 3,863 were successfully followed up in the second wave in late 2007 (between November, 2007 and January, 2008), about 16 months later with a follow-up rate of 81.6%. A small sample of 917 adult smokers was recruited at Wave 2 using the same sampling frame as in the original sample to replenish those lost to attrition, thus yielding a total sample of 4,780 respondents at Wave 2. Of these, 3,841 were successfully followed up at Wave 3 (about 22 months later with a follow-up rate of 80.4%), conducted between May and October 2009. A small sample of 1,660 adult smokers was recruited to replace those lost to attrition, including 800 from a newly included city, Kunming.

All study materials and procedures had been cleared for ethics by the research ethics board of the University of Waterloo and by the institutional review boards of the China National Centers for Disease Control and Prevention.

Measures

Predictor Variables

Socioeconomic indicators. Three indicators of SES were used. Reported levels of education consisted of three broad categories where “low” level of education refers to no schooling or having only primary school education, “moderate” were those with high school or technical secondary education, and “high” were those with university or postgraduate degree. Reported monthly household income was based on six broad categories: less than 1,000 Chinese Yuan (CNY), 1,000–2,999 CNY, 3,000–4,999 CNY, 5,000–6,999 CNY, 7,000–8,999 CNY, and 9,000+ CNY. For analysis purposes, we recoded them into three categories: “low” income was defined as those with monthly household income less than 1,000 CNY (approximately US\$145), “medium” income were those between 1,000–3,000 CNY (US\$145–440), and “high” income were those equal to or greater than 3,000 CNY (US\$440 or more). Employment status consisted of three categories: employed full-time or part-time, unemployed, and other which consisted of retirees and students. The three SES indicators were only moderately correlated (Spearman rho ranging .17 to .27, $p < .001$). To provide a summary score of respondents’ socio-economic position, an overall index of SES was also created by combining the responses to the three individual indicators as follows: low (low education, low income, and unemployed/other), high (high education, high income, and employed), and medium (all other combinations among the three indicators). Index score was computed based on information on education and employment status for cases where their income data were missing because of refusal to disclose their income.

Covariates. These include age, sex, city, survey wave, and cohort/year of recruitment.

Barriers to quit smoking in urban Chinese population

Outcome Variables

Nicotine dependence. At each wave, respondents were asked to report the number of cigarettes smoked per day and time to first cigarette upon waking. The responses to these two questions were combined to form the heaviness of smoking index (HSI) for assessing nicotine dependence (Heatherton, Kozlowski, Frecker, Rickert, & Robinson, 1989).

Quitting self-efficacy. This construct was assessed using the question: "If you decided to give up smoking completely in the next 6 months, how sure are you that you would succeed?" with response options: "not at all sure," "slightly sure," "moderately sure," and "extremely sure." Respondents who said "not at all" were distinguished from others.

Quitting interest. Assessed using the question: "Do you plan to quit smoking?" with response options: "in the next month," "in the next 6 months," "sometime in the future after 6 months," or "not at all." Those who were not planning to quit were defined as not having any interest in quitting, and all others as having an interest in quitting.

Quitting behavior. Quit attempts and quit success among those who tried were the two main outcomes of interest assessed at the next survey wave. To assess making a quit attempt, at each follow-up, respondents were asked "Since we last talked to you in [year], have you made any attempts to quit smoking?" Those who reported making at least one attempt between waves or who were still quit at follow-up were defined as making attempts. Among this group of quit attempters, quit success was defined as those who were still quit at follow-up.

Data Analysis

All analyses were conducted using Stata Statistical Software 10.1. Chi-square tests were used to examine the association between categorical variables and *t*-tests for group differences. Generalized estimating equations (GEE) were used to model the association between SES indicators and outcome variables of interest such as HSI, quit self-efficacy, and quit interest assessed in the same wave (cross-sectional analyses using Waves 1–3 data) and quitting activity assessed at the next wave (longitudinal analyses using Waves 1 and 2 data as predictors, and Waves 2 and 3 as outcomes). For continuous outcome variables, a Gaussian family distribution with identity link function was employed, whereas for binary outcome variables, a binomial distribution with logit link function was used in the GEE models. We assumed a working correlation structure that is unstructured given the large sample and used robust variance to compute the *p* values for the parameter estimates (Hanley, Negassa, Edwards, & Forrester, 2003). All models controlled for potential confounders such as demographic variables, survey years, and year of recruitment as well as any baseline variables that showed differences between those retained and those lost to the study. GEE models can account for the correlated nature of the data due to repeated measurements and also allows anyone with at least two waves of data to be included in predictive analyses, thus allowing the inclusion of replenishment sample to help minimize bias due to attrition. Mediation analyses were conducted according to the method proposed by Zhao, Lynch, & Chen (2010) instead of the commonly used Baron and Kenny's procedures, which have been criticized recently

(Hayes, 2009; Krause et al., 2010). The main advantage of the approach by Zhao et al. (2010) is that it uses a single test of the statistical significance of the mediating pathway, that is, it only requires the indirect effect to be significant for mediation to be established. Bootstrapping case resampling approach with 500 replications was employed to obtain bias-corrected 95% confidence intervals as this approach does not depend on a normal sampling distribution.

RESULTS

Sample Characteristics

Characteristics of the sample are presented in Table 1. The vast majority were male (95%) and aged 40 years and above (82%). Almost one in two had low level of self-efficacy to quit smoking and more than two-thirds had no interest in quitting. Compared with those lost to the study, those retained in the longitudinal sample (i.e., surveyed in two or more waves) had the same gender distribution, but had lower level of education, lower monthly income, more likely to be unemployed, and of older age groups. The retained were also more likely to have a low self-efficacy to quit, less interest in quitting, and had a higher mean score on the HSI.

Association of SES With HSI, Quit Self-Efficacy, Quit Interest, and Quit Behavior

As can be seen in Table 2, after controlling for potential confounders such as age, sex, city, wave, and cohort, Chinese smokers who were less educated were more likely to have low self-efficacy to quit smoking, no interest in quitting, and be addicted to smoking than their better educated counterparts. Lower education was not associated with making a quit attempt at all and was only marginally associated with quit success among those who tried with the moderately educated smokers being less likely to succeed in a quit attempt. Although the pattern of association between monthly household income and the various outcomes was similar to that of education, the statistically significant effect was primarily with those who refused to disclose their income. Compared with the high-income smokers, those who refused to disclose their income were significantly more likely to have low confidence in being able to quit successfully. The refusals were also more likely to have no interest in quitting compared with the high-income smokers. Income was not related to making a quit attempt although at the pairwise comparison level, there was a marginal effect with low-income smokers being significantly less likely to succeed in their quit attempts compared with their high-income counterparts. Employment status was related to the three mediating variables but not to the quitting outcome variables. Those who were unemployed were more likely to have low self-efficacy to quit, more addicted and marginally more likely to have no interest in quitting. When the SES index was used instead, the results indicated that urban Chinese smokers from lower SES backgrounds were less likely to have confidence in being able to quit smoking, have less interest in quitting, and were more addicted to nicotine than those from higher SES backgrounds. Consistent with the individual indicators results, the SES index was not significantly related to making quit attempts or quit maintenance.

Table 1. Cross-Sectional and Longitudinal Sample Characteristics

Variables	Cross-sectional sample (<i>n</i> = 7,309)	Longitudinal sample		<i>p</i> value for group differences (followed up vs. not followed up)
		Followed up (<i>n</i> = 4,562)	Not followed up (<i>n</i> = 2,747)	
Education (%)				
Low	12.4	13.6	10.4	<.001
Medium	63.8	66.3	59.6	
High	23.9	20.2	29.9	
Household income per month (%)				
Low	17.6	20.2	13.3	<.001
Medium	42.7	44.9	38.9	
High	32.6	27.9	40.4	
Not disclosed	7.1	6.9	7.4	
Employment status				
Employed	61.3	58.4	66.2	<.001
Unemployed	14.4	15.8	12.0	
Other	24.4	25.9	21.8	
Socio-economic status (SES) index				
Low	3.9	4.6	2.7	<.001
Medium	83.1	85.0	79.8	
High	13.0	10.4	17.4	
% Male	95.0	94.8	95.3	0.403
Age group (%)				
18–24	1.2	0.4	2.7	<.001
25–39	16.9	12.9	23.7	
40–54	44.3	45.7	41.9	
55+	37.5	41.1	31.7	
City (%)				
Beijing	12.9	16.9	6.2	<.001
Shenyang	17.0	15.7	19.2	
Shanghai	13.1	17.1	6.4	
Changsha	14.1	16.8	9.7	
Guangzhou	16.3	16.9	15.1	
Yinchuan	15.7	16.5	14.3	
Kunming	10.9	0	29.1	
% with low self-efficacy to quit	48.3	49.5	46.3	<.010
% with no interest in quitting	72.4	75.4	67.5	<.001
Heaviness of smoking index				
Mean	2.44	2.52	2.32	<.001
Standard error	0.02	0.03	0.03	
Cohort (<i>n</i>)				
Wave 1 (2006)	4,732	3,863	869	<.001
Wave 2 (2007–2008)	917	699	21	
Wave 3 (2009)	1,660	0	1,660	

Note. Percentages are based on unweighted data. For cross-sectional sample, *n* represents number of unique individual respondents recruited across the three waves (Waves 1, 2, and 3). For longitudinal sample, *n* for followed up sample represents those who provided at least one outcome data at follow-up. Kunming was added as another sampling city starting in Wave 3 and hence, was not included in the longitudinal sample for analysis.

Table 2. Direct and Indirect Effect of Education and Income on Quit Attempts and Quit Success Among Those Who Tried

	Outcomes						
	Low SE ^a	No quit interest (QI) ^a	HSI ^a	Quit attempt (QA) ^a	Mediated QA ^b	Quit success (QS) ^a	Mediated QS ^b
Predictors	<i>n</i> = 7,256	<i>n</i> = 7,261	<i>n</i> = 7,089	<i>n</i> = 4,545	<i>n</i> = 4,371	<i>n</i> = 1,675	<i>n</i> = 1,550
SES indicators							
Education							
Low	(<i>p</i> < .001) 1.41***	(<i>p</i> = .041) 1.19*	(<i>p</i> < .001) 0.55***	(<i>p</i> = .394) 1.01	(<i>p</i> = .340) 1.16	(<i>p</i> = .046) 1.01	(<i>p</i> = .459) 1.08
Medium	1.13**	1.13*	0.33***	0.92	1.00	0.75*	0.89
High	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Household income per month							
Low	(<i>p</i> < .010) 1.13	(<i>p</i> < .001) 1.05	(<i>p</i> = .171) 0.01	(<i>p</i> = .656) 1.03	(<i>p</i> = .740) 1.09	(<i>p</i> = .145) 0.64*	(<i>p</i> = .281) 0.69
Medium	1.02	1.06	-0.03	0.98	1.01	0.84	0.87
High	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Not disclosed	1.31***	1.48***	0.09	0.89	0.96	0.83	0.75
Employment status							
Employed	(<i>p</i> < .010) Ref	(<i>p</i> = .073) Ref	(<i>p</i> < .001) Ref	(<i>p</i> = .885) Ref	(<i>p</i> = .506) Ref	(<i>p</i> = .103) Ref	(<i>p</i> = .221) Ref
Unemployed	1.21**	1.14*	0.19***	1.01	1.11	1.30	1.24
Other	1.03	0.96	-0.05	0.96	1.00	1.35	1.31
SES index							
Low	(<i>p</i> < .001) 1.65***	(<i>p</i> = .033) 1.37*	(<i>p</i> < .001) 0.43***	(<i>p</i> = .805) 1.05	(<i>p</i> = .293) 1.31	(<i>p</i> = .316) 1.12	(<i>p</i> = .541) 1.34
Medium	1.14*	1.13*	0.30***	0.97	1.09	0.84	1.02
High	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Mediators ^c							
Low self-efficacy to quit (SE)	-	-	-	-	0.62***	-	1.04
No QI	-	-	-	-	0.49***	-	1.04
HSI	-	-	-	-	0.92***	-	0.83***

Note. HSI = heaviness of smoking index; SES = socio-economic status.

All figures are odds ratios except for HSI as an outcome where regression coefficients are reported.

^aModels controlled for age, sex, city, wave, and cohort.

^bModels also controlled for self-efficacy, quit intention, and HSI.

^cOdds ratios and level of significance reported for the three mediators for mediated QA and mediated QS outcomes are exactly the same for both model using SES index as predictor and model based on individual SES indicators.

p* < .05; *p* < .01; ****p* < .001.

Mediated Effect of SES on Quitting Behavior

As shown in Table 2, the mediation analyses revealed that there was a significant indirect effect, but no significant direct effect of SES measures on making quit attempts (i.e., the inhibiting effect of low SES on quit attempts was indirect via the three mediating variables where low SES smokers characterized by a low quitting self-efficacy, low quit interest, and high nicotine addiction were less likely to make a subsequent quit attempt). The parameter estimates for the indirect effects of SES index on quit attempts via low self-efficacy, low quitting interest, and nicotine dependence are 0.0060 (bootstrap bias-corrected [BC] 95% confidence interval [CI]: 0.0021 to 0.0109), 0.0072 (BC 95% CI: 0.0020 to 0.0138), and 0.0059 (BC 95% CI: 0.0034 to 0.0096), respectively, and the total indirect effect is 0.0191 (BC 95% CI: 0.0109 to 0.0287). For quit success, again there was no direct but only indirect effect of the SES variables, and of the three potential mediators, only HSI was significantly related to quit success. The parameter estimates for the indirect effects of SES index on quit success via low self-efficacy, low quit interest, and nicotine dependence are -0.0005 (BC 95% CI: -0.0080 to 0.0007), -0.0002 (BC 95% CI: -0.0055 to 0.0013), and 0.0149 (BC 95% CI: 0.0071 to 0.0260), respectively, and the total indirect effect is 0.0142 (BC 95% CI: 0.0057 to 0.0248).

DISCUSSION

The findings from this study provide evidence to show firstly, that like many other countries both in the West and in Asia, Chinese smokers from lower socio-economic backgrounds are less confident in being able to quit smoking, have lower interest in quitting, and are more addicted to smoking than their counterparts from higher socio-economic backgrounds, and secondly, that such characteristics are part of the reasons why those from more disadvantaged backgrounds are less likely to quit smoking.

The higher levels of nicotine dependency among low SES groups in China may be because of their over reliance on cigarette smoking as a form of simple pleasure of life that they can afford compared with their higher SES counterparts who have the means to engage in other more expensive but less harmful pleasurable activities (Shaw, Dorling, Gordon, & Davey-Smith, 1999). As demonstrated previously by Li et al. (2011), the greater nicotine dependency would make it harder to quit smoking. Thus, it is not surprising that this group has lower confidence in being able to quit and have lower interest in quitting their habits. The lower quitting self-efficacy and quitting interest may also arise from social factors such as the levels of support for quitting and social pressure to quit smoking from friends and family members. For example, blue-collar workers, compared with other workers, have been found to experience less social pressure to quit and less social support for quitting (Sorensen, Emmons, Stoddard, Linnan, & Avrunin, 2002). In fact, there is some recent evidence from a small exploratory study conducted from a Guangzhou hospital smoking cessation clinic in China to suggest that the social-cultural context of Chinese smokers where cigarettes are commonly given as a gift and the widespread misconception about quitting being harmful to health may make it even more challenging for them to quit smoking (Zhang, Chan, Fong, Malone, & Lam, 2011).

It is possible that low SES smokers may be more susceptible to this kind of social-cultural pressure than those from higher SES groups, something that awaits future research. It may also be the case that low SES smokers have low self-confidence in quitting because they have less access to smoking cessation aids and resources to help them quit due to cost factors (Murray, Bauld, Hackshaw, & McNeil, 2009).

This study demonstrates that factors such as nicotine dependency, interest in quitting, and self-efficacy are serving as mediators through which SES exerts its influence on quitting behavior among Chinese smokers particularly for quitting initiation. According to Zhao et al. (2010), this is a case of an indirect-only mediation as there is no evidence of a direct effect of SES on quitting behavior suggesting that SES is merely a distal predictor of quitting behavior. In other words, socio-economic disadvantage poses few direct barriers to smoking cessation for urban Chinese smokers. What appears to be the case is that urban Chinese smokers from lower SES backgrounds tend to be more addicted, have lower self-efficacy and lower interest in quitting, and characteristics that are associated with lower likelihood of making a quit attempt. Even when they try to quit smoking, being more addicted makes it harder to sustain abstinence. These findings suggest that smokers from lower SES groups need not only additional help to overcome the initial barriers to quitting but also after they have quit, they need help to overcome the risks of relapsing because of their higher nicotine dependency. It is unclear at this stage what form of help is best for smokers in China. Yang et al. (2011) using data from the first 2 waves of the ITC-China survey found that less than 6% of Chinese smokers used any form of nicotine replacement therapy (NRT) or Zyban for making quit attempts. They also found that visiting a doctor or health professional is enough to increase the odds of making a quit attempt as well as quitting successfully, which is encouraging. However, strangely they also found that those who used any NRT or Zyban for quitting were also more likely to relapse compared with those who quit without any assistance, perhaps due to differential memory effects, something recently demonstrated in Western smokers (Borland, Partos, & Cummings, 2011). Nevertheless, the social variations in nicotine dependence, self-efficacy, and quit interest also suggest that any population-level intervention for smoking cessation may be less effective for those from lower SES groups and specific targeting may be necessary to reach this group to ensure effectiveness and to help reduce the disparity in cessation rates across socio-economic groups. China ratified the Framework Convention on Tobacco Control in 2005 and it is obliged, under article 14, to assist Chinese smokers to quit. This is also consistent with one of its major goals under the 12th five-year plan, endorsed by the National People's Congress in March, 2011, to improve the life expectancy of Chinese population by 1 year (Zhu, Young-soo, & Beaglehole, 2012).

This study has several limitations that warrant mention. First, the use of self-report data particularly for quitting activity may lead to either under-reporting of brief attempts and those that occur long time ago (Borland et al., 2011) or over-reporting of quit success because of social desirability bias, both of which could artificially inflate the quitting success rate. Second, because of attrition, respondents from higher socio-economic background were under-represented in our longitudinal sample, and although attempts were made in all our models to control for any baseline differences between

those included/retained and those excluded/lost to the study, caution should be exercised when generalizing our findings as there may be other unmeasured differences between the two groups, which, if present, could result in some confounding of effect found. Third, our findings were based on sample from seven cities and thus, may not generalize to the rest of China especially to those who live in the vast rural regions. However, a major strength of this study is its longitudinal design. The use of GEE models for analysis also helps to maximize the cases available for analyses, thus, increasing the power of detection of effects. The use of multiple indicators of SES is another strength as the consistency of the findings across measures suggests that any effect found is not idiosyncratic to a particular measure.

In conclusion, urban Chinese smokers from lower socio-economic backgrounds experience greater levels of psychological and behavioral barriers to quitting than their counterparts from higher socio-economic backgrounds and as such, they need more help to quit and do so successfully.

FUNDING

The study was supported by multiple grants including P50 CA111236, R01 CA125116, and R01 CA100362 (Roswell Park Transdisciplinary Tobacco Use Research Center) and also in part from grant P01 CA138389 (Medical University of South Carolina, Charleston), all from the U.S. National Cancer Institute, Canadian Institutes for Health Research (57897 and 79551), National Health and Medical Research Council of Australia (265903, 450110, and APP1005922), the Ontario Institute for Cancer Research and Chinese Center for Disease Control and Prevention.

DECLARATION OF INTERESTS

None declared.

ACKNOWLEDGMENTS

The authors would like to thank other members of the ITC-China team for their support.

REFERENCES

- Borland, R., Partos, T., & Cummings, K. (2011). Systematic biases in cross-sectional community studies may underestimate the effectiveness of stop-smoking medications. *Nicotine & Tobacco Research*. doi:10.1093/ntr/nts002
- Borland, R., Yong, H. H., Balmford, J., Cooper, J., Cummings, K., O'Connor, R., . . . Fong, G. T. (2010). Motivational factors predict quit attempts but not maintenance of smoking cessation: Findings from the International Tobacco Control Four Country project. *Nicotine & Tobacco Research*, 12, S4–S11. doi:10.1093/ntr/ntq050
- Feng, G., Jiang, Y., Li, Q., Yong, H., Elton-Marshall, T., Yang, J., . . . Fong, G. (2010). Individual-level factors associated with intentions to quit smoking among adult smokers in six cities of China: Findings from the ITC China Survey. *Tobacco Control*, 19, i6–11. doi:10.1136/tc.2010.037093
- Fong, G. T., Cummings, K. M., Borland, R., Hastings, G., Hyland, A., Giovino, G., . . . Thompson, M. E. (2006). The

- conceptual framework of the International Tobacco Control (ITC) Policy Evaluation Project. *Tobacco Control*, 15, i3–11. doi:10.1136/tc.2005.015438
- Hanley, J. A., Negassa, A., Edwardes, M. D., & Forrester, J. E. (2003). Statistical analysis of correlated data using generalized estimating equations: an orientation. *American Journal of Epidemiology*, 157, 364–375. doi:10.1093/aje/kwf215
- Hayes, A. (2009). Beyond Baron and Kenny: statistical mediation analysis in the new millennium. *Communication Monographs*, 76, 408–420. doi:10.1080/03637750903310360
- Heatherton, T. F., Kozlowski, L. T., Frecker, R. C., Rickert, W., & Robinson, J. (1989). Measuring the heaviness of smoking: using self-reported time to the first cigarette of the day and number of cigarettes smoked per day. *British Journal of Addiction*, 84, 791–799. doi:10.1111/j.1360-0443.1989.tb03059.x
- Hyland, A., Borland, R., Li, Q., Yong, H., McNeil, A., Fong, G. T., . . . Cummings, K. M. (2006). Individual-level predictors of cessation behaviours among participants in the International Tobacco Control (ITC) policy evaluation study. *Tobacco Control*, 15, iii83–94. doi:10.1136/tc.2005.013516
- Hymowitz, N., Cummings, K. M., Hyland, A., Lynn, W. R., Pechacek, T. F., & Hartwell, T. D. (1997). Predictors of smoking cessation in a cohort of adult smokers followed for five years. *Tobacco Control*, 6, S57–S62. doi:10.1136/tc.6.suppl_2.S57
- Krause, M. R., Serlin, R. C., Ward, S. E., Rony, R. Y., Ezenwa, M. O., & Naab, F. (2010). Testing mediation in nursing research: Beyond Baron and Kenny. *Nursing Research*, 59, 288–294. doi:10.1097/NNR.0b013e3181dd26b3
- Li, L., Feng, G., Jiang, Y., Yong, H. H., Borland, R., & Fong, G. T. (2011). Prospective predictors of quitting behaviours among adult smokers in six cities in China: Findings from the International Tobacco Control (ITC) China Survey. *Addiction*, 106, 1335–1345. doi:10.1111/j.1360-0443.2011.03444.x
- Murray, R. L., Bauld, L., Hackshaw, L. E., & McNeill, A. (2009). Improving access to smoking cessation services for disadvantaged groups: a systematic review. *Journal of Public Health*, 31, 258–277. doi:10.1093/pubmed/fdp008
- Pan, Z. (2004). Socioeconomic predictors of smoking and smoking frequency in urban China: evidence of smoking as a social function. *Health Promotion International*, 19, 309–315. doi:10.1093/heapro/dah304
- Peto, R., Chen, Z., & Boreham, J. (2009). The growing epidemic in China. *CVD Prevention and Control*, 4, 61–70. doi:10.1016/j.cvdpc.2008.12.001
- Shafey, O., Eriksen, M., Ross, H., & Mackay, J. (2009). *The tobacco atlas* (3rd ed.). Atlanta, GA: American Cancer Society.
- Shaw, M., Dorling, D., Gordon, D., & Davey-Smith, G. (1999). *The widening gap: Health inequalities and policy in Britain*. Bristol: The Policy Press.
- Siahpush, M., Borland, R., Yong, H. H., Kin, F., & Sirirassamee, B. (2008). Socio-economic variations in tobacco consumption, intention to quit and self-efficacy to quit among male smokers in Thailand and Malaysia: Results from the International Tobacco Control-South-East Asia (ITC-SEA) survey. *Addiction*, 103, 502–508. doi:10.1111/j.1360-0443.2007.02113.x
- Siahpush, M., McNeil, A., Borland, R., & Fong, G. T. (2006). Socioeconomic variations in nicotine dependence, self-efficacy and intention to quit across four countries: Findings from the International Tobacco Control Policy Evaluation Survey. *Tobacco Control*, 15, iii71–75. doi:10.1136/tc.2004.008763
- Sorensen, G., Emmons, K., Stoddard, A. M., Linnan, L., & Arunin, J. (2002). Do social influences contribute to

- occupational differences in quitting smoking and attitudes toward quitting? *American Journal of Health Promotion: AJHP*, 16, 135–141. doi:10.4278/0890-1171-16.3.135
- Sun, W., & Shun, J. (1995). Smoking behavior amongst different socioeconomic groups in the workplace in the People's Republic of China. *Health Promotion International*, 10, 261–266. doi:10.1093/heapro/10.4.261
- Thompson, M., Fong, G., Hammond, D., Boudreau, C., Driezen, P., Hyland, A., . . . Laux, F. L. (2006). Methods of the International Tobacco Control (ITC) Four Country Survey. *Tobacco Control*, 15, iii12–18. doi:10.1136/tc.2005.013870
- Wu, C., Thompson, M. E., Fong, G. T., Li, Q., Jiang, Y., Yang, Y., Feng G. (2010). Methods of the International Tobacco Control (ITC) China Survey. *Tobacco Control*, 19, i1–i5. doi:10.1136/tc.2009.029900
- Yang, J., Hammond, D., Driezen, P., O'Connor, R. J., Li, Q., Yong, H. H., . . . Jiang, Y. (2011). The use of cessation assistance among smokers from China: Findings from the ITC China Survey. *BMC Public Health*, 11, 75. doi:10.1186/1471-2458-11-75
- Zhang, J., Chan, S., Fong, D., Malone, R., & Lam, T. (2011). The social context of smoking cessation in China: An exploratory interview study. *Tobacco Control*. doi:10.1136/tc.2010.040691
- Zhao, X., Lynch, J., & Chen, Q. (2010). Reconsidering Baron & Kenny: Myths and truths about mediation analysis. *Journal of Consumer Research*, 37, 197–206. doi:10.1086/651257
- Zhou, X., Nonnemaker, J., Sherrill, B., Gilsenan, A. W., Coste, F., & West, R. (2009). Attempts to quit smoking and relapse: Factors associated with success or failure from the ATTEMPT cohort study. *Addictive Behaviors*, 34, 365–373. doi:10.1016/j.addbeh.2008.11.013
- Zhu, C., Young-soo, S., & Beaglehole, R. (2012). Tobacco control in China: Small steps towards a giant leap. *The Lancet*, 379, 779–780. doi:10.1016/S0140-6736(11)61933-8