Who purchases cigarettes from cheaper sources in China? Findings from the ITC China Survey

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Received 6 March 2013
Revised 21 August 2013
Accepted 6 September 2013

To cite: Yao T, Huang J, Sung H-Y, *et al*. *Tob Control* Published Online First: [*please include* Day Month Year] doi:10.1136/tobaccocontrol-2013-051040

ABSTRACT

Objective The availability of cigarettes from cheaper sources constitutes a major challenge to public health throughout the world, including China, because it may counteract price-based tobacco control policies. The goal of this study was to identify factors associated with purchasing cigarettes from cheaper sources among adult smokers in China.

Methods Data were analysed from Waves 1 to 3 of the International Tobacco Control China Survey conducted in 2006–2009 among adult smokers in six cities in China (N=7980). One survey question asked, "In the last 6 months, have you purchased cheaper cigarettes than you can get from local stores for economic reasons?" We examined whether sociodemographic factors and smoking intensity were associated with purchasing cigarettes from cheaper sources using the general estimating equations model. Sociodemographic factors considered were gender, age, marital status, monthly household income, education, employment status and city of residence.

Results 15.6% of smokers reported purchasing cigarettes from cheaper sources. After controlling for other covariates, the associations of the behaviour of purchasing cigarettes from cheaper sources with age (adjusted OR (AOR)=1.49, 95% CI 1.17 to 3.92 for age 18–24 compared with age 55+) and with income (AOR=2.93, 95% CI 2.27 to 3.79 for low income compared with high income) were statistically significant, but there was no statistically significant relationship with smoking intensity.

Conclusions Our findings indicate that young and low-income smokers are more likely than older and high-income smokers to purchase cigarettes from cheaper sources in China. Tobacco control policies that reduce the availability of cigarettes from cheaper sources could have an impact on reducing cigarette consumption among young and low-income smokers in China.

INTRODUCTION

China is the largest consumer of tobacco in the world, and smoking has a large impact on the population and health. In 2010, current smoking prevalence in China was 28.7%: 52.9% for men and 2.4% for women.[1] In addition, more than 556 million non-smoking adults (61.8%) in China were exposed to secondhand smoke in 2010.[2] The smoking prevalence in rural areas is higher than in urban areas (30.0% vs 27.1%, in 2012).[2] China is the largest tobacco producer in the world, with 2.4 trillion cigarettes produced in 2011.[3] Smoking increases the risk of lung cancer, cardiovascular disease and other smoking-related diseases that result in premature death and higher medical expenditures in China. It is estimated that there are 1 million tobacco attributable deaths each year in China and this number is expected to rise to 2.2 million per year by 2020.[4 5] A recent study found that the total healthcare expenditures attributable to cigarette smoking in China rose by 154% from 2000 to 2008, amounting to $6.2 billion in 2008.[6]

Cigarette smoking is an important public health issue in China. In order to reduce smoking prevalence, it is necessary to understand cigarette purchasing behaviour. Multiple studies worldwide have shown that increasing cigarette prices is one of the most effective ways to reduce cigarette consumption. A comparison of trends in cigarette prices and overall US cigarette consumption from 1970 to 2007 shows that there is a strong correlation between high prices and low consumption even in the context of many other factors that influence consumption.[7] A study conducted in Turkey found that a 20% increase in the Special Consumption Tax on tobacco in January 2010 resulted in a 13.6% decrease in tobacco consumption.[8] A recent review that assessed 100 studies on tobacco taxes, including a growing number from low-income and middle-income countries, demonstrated that increases in tobacco taxes are a highly effective strategy for reducing tobacco use.[9]

Previous studies suggest that the presence of cigarettes from cheaper sources (eg, internet and discount cigarettes) may undermine the effects of price and tax policies on reducing smoking prevalence and cigarette consumption. When cigarette prices go up, besides quitting and cutting back their cigarette consumption, some smokers may switch to buying cheaper brands of cigarettes or cigarettes from cheaper sources to save money. Several studies conducted in developed countries showed that in response to high cigarette taxes, 34–61% of smokers chose to buy cigarettes from cheaper sources to save money on cigarettes.[10 11] A study conducted in New Jersey found that when the cigarette tax increased between 2000 and 2002, among current cigarette smokers, the prevalence of ever purchasing tobacco via the internet increased by over 500% and usually purchasing cigarettes via the internet increased by nearly 300%.[12] A recent study from the US Minnesota Adult Tobacco Survey Cohort Study found that 53% of the participants reported buying cigarettes from less expensive places in response to increasing prices.[13] However, little research has focused on this issue in China. China's tobacco industry is both owned and regulated by the government. The Chinese government plays an important role in both tobacco and cigarette production through the State Tobacco

Monopoly Administration (STMA) and the China National Tobacco Company (CNTC). The STMA forms part of the same organisation as the CNTC, but works as a governmental body for administration of the tobacco monopoly. The STMA determines government tobacco policy, including the allocation of tobacco production quotas among the provinces, pricing of tobacco leaf, production of cigarettes and international trade parameters. Since 1991, the STMA has delegated authority to the CNTC for the administration of all aspects of tobacco policy.[14] The CNTC produces more than 200 domestic cigarette brands.[15] Unlike other countries, in China there is huge price variation among brands, ranging from less than US$1 per pack to more than US$30 per pack. A previous study by Li *et al* examined the purchase of cheaper cigarettes among smokers in six cities in China and found that the lowest tertile (lower bound) of cigarette prices paid by them ranged from US$0.41 per pack in Shenyang to US$1.08 per pack in Shanghai. They also found that smokers who reported buying the cheapest cigarettes tended to be older, heavier smokers and to have lower education and income.[16] Cigarettes are also available from cheaper sources in China. However, to our knowledge, no study has examined the purchase of cigarettes from cheaper sources in China. Given that China has the largest number of smokers (350 million smokers) in the world,[1] it is important to investigate the extent of purchasing cigarettes from cheaper sources and how that behaviour impacts the effects of price and tax policies on reducing cigarette smoking among Chinese smokers. The objective of this study was to determine the prevalence and characteristics of smokers who purchase cigarettes from cheaper sources in China.

METHODS

Data source

We analysed data from the International Tobacco Control (ITC) China Survey. The ITC Project is the first international cohort study of tobacco use consisting of parallel longitudinal cohort surveys of tobacco users in 22 countries so far and non-users in most of those countries. The ITC China Survey is a longitudinal survey of smoking behaviour among adults in seven cities in China: Beijing, Shanghai, Guangzhou, Changsha, Kunming, Shenyang and Yinchuan. These seven cities were selected because they differ in size, geographic location and level of economic development. The ITC China Survey collects detailed information about demographic characteristics, smoking behaviours, cigarette purchasing behaviours and smoking cessation. Four waves of the ITC China Survey have been conducted by team members from the central and local offices of the China Center for Disease Control and Prevention (CDC) in 2006, 2007/2008, 2009 and 2011.

Study design and sample

Eligible respondents in each city included current adult smokers and non-smokers 18 years of age and older. In each city, the ITC China Survey employed a multistage cluster sampling design to create a representative cohort of adult urban current smokers and non-smokers. Current smokers were defined as having smoked 100 cigarettes in their lifetime and currently smoking at least once a week. Using a standardised questionnaire, a face-to-face interview was conducted to collect demographic characteristics and detailed information on smoking history from each respondent.

Our study sample focused on current smokers who were interviewed in each of the first three waves of the ITC China Survey from all cities except for Kunming, as it was added to the ITC China Survey at Wave 3. We focused on current smokers because the study question focused on the purchasing behaviour of those who currently smoke. We did not use the Wave 4 data because the data set was not yet available when we conducted this study.

Among the six-city study sample, 2773 respondents (8319 observations) were classified as current smokers in all three waves, and 338 respondents (539 observations) switched smoking status during the three waves. As a result, a total of 8858 observations of current smokers were eligible for the final study sample. After excluding 240 observations with missing values for purchasing cigarettes from cheaper sources and 638 additional observations with missing values for demographic characteristics or smoking intensity, a total of 7980 observations were included in the final study sample.

All materials and procedures used in the ITC China Survey were reviewed and cleared with regard to ethics by the Office of Research Ethics Board at the University of Waterloo (Waterloo, Canada) and the Institutional Review Boards at Roswell Park Cancer Institute (Buffalo, USA), the Cancer Council Victoria (Victoria, Australia) and the China CDC (Beijing, China). A detailed description of the survey methods can be found elsewhere.[17]

Measures

Dependent variable

The dependent variable was obtained by the response to the question: "In the last 6 months, have you purchased cheaper cigarettes than you can get from local stores for economic reasons?" Purchasing cigarettes from cheaper sources was defined as those who answered 'occasionally' and 'often' to that question, whereas not purchasing cigarettes from cheaper sources was defined as those who answered 'never'. Those who did not answer or reported unknown status were coded as missing.

Independent variables

Two groups of independent variables were included: sociodemographic characteristics and smoking intensity. Sociodemographic characteristics included gender, age, marital status, monthly household income, education, employment status and city of residence. Age was grouped into 18–24-years-old, 25–39-years-old, 40–54-years-old and 55-years-old or older. Marital status was classified as married or living together, divorced or separated or widowed and single. Monthly household income was classified into four categories based on the cut-offs for urban areas from the 2010 China Statistics Yearbook[18]: low income (<1000 Yuan, equal to US$147 using the 2009 exchange rate of 6.8 Yuan per dollar[18]), middle income (1000–2999 Yuan, equal to US$147–441) and high income (>3000 Yuan, equal to US$441). Education was categorised as low education (less than high school), middle education (high school) and high education (more than high school). Employment status was classified as employed, unemployed and retired. Smoking intensity was categorised as light (≤10 cigarettes per day (CPD), moderate (11–20 CPD) and heavy (≥21 CPD) smokers.

Statistical analysis

All analyses were conducted with STATA, V.12.0. Because of the longitudinal nature of the data, the general estimating equations (GEE)[19 20] model was used to examine the significant factors associated with purchasing cigarettes from cheaper sources among current smokers. In the estimation, the GEE model was

specified with a binomial distribution and logit link. We used quasi-likelihood under the independence model criterion (QIC) for model selection. We compared models with different correlation matrix structures (independent, autoregressive, exchangeable and unstructured) and chose the exchangeable working correlation matrix structure because it yielded the lowest QIC score. Adjusted ORs (AORs) and the corresponding 95% CIs were computed to assess the strength of association. A two-tailed p value of <0.05 was considered statistically significant.

RESULTS

Sociodemographic characteristics and smoking intensity

The sociodemographic characteristics of the study sample are reported in table 1. Most current smokers were men (95.4%), married or living together (90.8%), aged 40–54 years (50.4%), of middle education (68.4%) and employed (59.9%). 16.0% of current smokers were low income, and 46.2% and 37.8% were middle income and high income, respectively. Nearly half were moderate smokers (49.3%).

Table 1 Sociodemographic characteristics and smoking intensity of respondents reporting current smoking in Waves 1–3 of the International Tobacco Control China Survey (N=7980)

Characteristic	n	Per cent
Gender		
Men	7610	95.4
Women	370	4.6
Age (years)		
18–24	55	0.7
25–39	1188	14.9
40–54	4024	50.4
55+	2713	34.0
Marital status		
Married or living together	7246	90.8
Divorced or separated or widowed	466	5.8
Single	268	3.4
Monthly household income		
Low	1273	16.0
Middle	3687	46.2
High	3020	37.8
Education		
Low	929	11.7
Middle	5462	68.4
High	1589	19.9
Employment status		
Employed	4779	59.9
Unemployed	1012	12.7
Retired	2189	27.4
City		
Beijing	1577	19.8
Shenyang	990	12.4
Shanghai	1673	21.0
Changsha	1414	17.7
Guangzhou	1139	14.3
Yinchuan	1187	14.9
Smoking intensity (CPD)		
Light (0–10)	2784	34.9
Moderate (11–20)	3933	49.3
Heavy (21+)	1263	15.8
Total	7980	

CPD, cigarettes per day.

Behaviour of purchasing cigarettes from cheaper sources and associated factors

15.6% of smokers reported purchasing cigarettes from cheaper sources during the last 6 months (see table 2). The GEE results showed that the associations between the behaviour of purchasing cigarettes from cheaper sources and age and income were statistically significant after controlling for other covariates. Smokers aged 18–24 years were more likely to purchase cigarettes from cheaper sources in the last 6 months than smokers aged 55 years and above (AOR=1.49, 95% CI 1.17 to 3.92).

Table 2 Percentage of smokers who recently purchased cigarettes from cheaper sources by characteristic and AORs from the general estimating equations model

Characteristic	Per cent purchasing cigarettes from cheaper sources	AOR	95% CI
Total	15.6		
Gender			
Men	15.8	Reference	
Women	12.2	0.68	0.44 to 1.05
Age (years)			
18–24	23.6	1.49*	1.17 to 3.92
25–39	20.2	1.32	0.94 to 1.84
40–54	15.6	0.92	0.71 to 1.19
55+	13.6	Reference	
Marital status			
Married or living together	15.6	Reference	
Divorced or separated or windowed	17.2	1.10	0.78 to 1.54
Single	13.8	0.70	0.43 to 1.16
Monthly household income			
Low	26.2	2.93*	2.27 to 3.79
Middle	17.0	1.73*	1.39 to 2.15
High	9.5	Reference	
Education			
Low	17.2	0.90	0.64 to 1.27
Middle	16.1	0.99	0.76 to 1.29
High	13.0	Reference	
Employment status			
Employed	14.9	Reference	
Unemployed	24.7	1.21	0.94 to 1.56
Retired	13.0	0.84	0.63 to 1.12
City			
Beijing	11.1	Reference	
Shenyang	19.3	1.29	0.88 to 1.90
Shanghai	10.4	0.80	0.55 to 1.16
Changsha	15.1	1.00	0.69 to 1.46
Guangzhou	13.6	1.03	0.69 to 1.54
Yinchuan	28.7	2.22*	1.53 to 3.23
Smoking intensity (CPD)			
Light (0–10 CPD)	14.7	Reference	
Moderate (11–20 CPD)	15.8	0.96	0.78 to 1.19
Heavy (21+ CPD)	17.4	0.91	0.68 to 1.22

QIC score: 6584.16.
*p<0.05 (two-tailed).
AOR, adjusted OR; CPD, cigarettes per day; QIC, quasi-likelihood under the independence model criterion.

Low-income smokers were more than twice as likely to purchase cigarettes from cheaper sources as high-income smokers (AOR=2.93, 95% CI 2.27 to 3.79). This association was slightly smaller among middle-income smokers. Compared with Beijing smokers, smokers in Yinchuan were more likely to purchase cigarettes from cheaper sources. There was no statistically significant relationship between smoking intensity and purchasing cigarettes from cheaper sources.

DISCUSSION

The results of this study indicate that in China, low-income smokers were 2.93 times as likely as high-income smokers, and middle-income smokers were 1.73 times as likely as high-income smokers to purchase cigarettes from cheaper sources. These findings are consistent with most studies showing that low-income smokers are more likely to use price-minimising strategies to lower their cigarette expenditures than high-income smokers,[13 21] although one recent study reported that low-income US smokers were less likely to use price-minimising strategies.[22]

Consistent with a previous study that showed young adults in the USA were more likely to use price-minimising strategies than older adults,[13] our study found that one such behaviour in China is purchasing cigarettes from cheaper sources. Young adults have been regarded as an important target by the tobacco industry for many years.[23] Limits on the availability of cigarettes from cheaper sources may encourage more young adult smokers to quit or cut down on smoking.

Our results are consistent, albeit not statistically significant, with two US studies which reported that heavy smokers (≥15 CPD) were more likely than light smokers (<15 CPD) to buy cigarettes from less expensive places.[13 22] Because we used different cut-offs for intensity (to be consistent with other studies of ITC China Survey data), it is not possible to compare our results directly with results from these two studies. More research is needed to further examine the relationship between smoking intensity and the purchasing of cigarettes from cheaper sources.

The proportion of smokers purchasing cigarettes from cheaper sources found in this study (15.6%) is lower than the proportion reported in three studies conducted in the USA, which reported proportions of 34–61.1%.[10 11 13] This may be because the three US studies included additional measures of price-minimising strategies, such as buying cigarettes from Indian reservations, other states or other countries and using coupons or promotions.

In addition, our study found that smokers in Yinchuan were more likely to purchase cigarettes from cheaper sources than smokers in Beijing. This may be because Yinchuan is the least developed of the cities included in the study and has lowest per capita annual household income.[18] It is also possible that access to cigarettes from cheaper sources was easier in Yinchuan.

Taxation is often used to increase cigarette prices to reduce consumption.[24–26] To date, the goal of increasing prices by raising cigarette taxes in China has not been achieved. In May 2009, in order to fulfil its obligation to the Framework Convention on Tobacco Control, China raised cigarette taxes at the producer level.[26] However, studies based on both observational and survey data found that the cigarette retail prices did not change after this tax adjustment, and the tax adjustment was just a redistribution between producer prices and wholesale prices.[27 28] Moreover, survey data showed that cigarette nominal retail prices in China actually decreased from 2007 to 2010.[27] As a result, the 2009 increase in the tax on cigarettes in China failed as a public health policy because that tax increase did not result in any increase in cigarette retail prices. Our study suggests that if China were to implement a tax increase that increases cigarette retail prices, reduction in consumption may still not be achieved due to consumers purchasing cigarettes from cheaper sources in order to minimise the prices they pay. A study conducted in the USA found that smokers who reported buying cigarettes from cheaper sources were less likely to intend to quit smoking,[11] which suggests that the availability of cigarettes from cheaper sources may weaken intentions to quit. Therefore, making cigarettes from cheaper sources less available could be an effective way to reduce cigarette consumption in China. Without access to cigarettes from cheaper sources, when cigarette prices increase, smokers in China would be faced with fewer substitution options and might instead consider quitting or reducing cigarette consumption.

It is also possible that smokers facing higher prices might switch to cheap brands of cigarettes. Cheap cigarettes are not equivalent to cigarettes from cheaper sources, which is the main focus of this study. There has been no study examining the purchase of cigarettes from cheaper sources or its relationship with the behaviour of purchasing cheaper cigarettes among smokers in China. A subanalysis of our data showed that 43.1%, 33.4% and 23.5% of smokers in our study sample purchased cheap brands of cigarettes (less than 5 Yuan per pack), median-priced brands (5–40 Yuan per pack) and expensive brands (over 40 Yuan per pack), respectively. Among smokers who purchased cheap brands of cigarettes, 20.5% of them bought their cigarettes from cheaper sources. This percentage was only 11.0% and 16.4% for smokers who purchased expensive brands and median-priced brands, respectively. Therefore, this study provides evidence that some smokers who purchased cheap or more expensive brands of cigarettes reported purchasing cigarettes from cheaper sources. Hence, the availability of cigarettes from cheaper sources results in additional challenges for tobacco control in China beyond the availability of cheap cigarettes.

There were several limitations to this study. First, we used self-reported data. Due to distrust of unfamiliar people, smokers in China might not be willing to report buying cigarettes from cheaper sources in a face-to-face survey with an unknown interviewer, which may lead to under-reporting of this behaviour. Also, self-reported information may be subject to recall bias. Second, the wording of the ITC China Survey question used to construct the dependent variable may lead more low-income smokers compared with high-income smokers to answer in the affirmative since 'economic reasons' is in the question. However, a previous study by Li *et al*[16] used an objective measure—the price of cigarettes paid by smokers—to examine the correlates of purchasing cheaper cigarettes in China. Their finding that low-income smokers were more likely than high-income smokers to purchase cheaper cigarettes is consistent with our finding that lower income smokers were more likely than high-income smokers to purchase cigarettes from cheaper sources. Nevertheless, future study with a preferred survey question (eg, "Have you purchased cigarettes from other sources because they were cheaper?") would be useful. Third, the ITC China Survey did not ask separate questions about specific cheaper sources. Therefore, we cannot determine what proportion of the smokers, who purchased cigarettes from cheaper sources, purchased via internet versus discount cigarettes. Future research is needed in this area. Fourth, this study only included smokers. Those smokers who did not access cheaper sources to purchase cigarettes might quit smoking. Therefore, there may be

selection bias in the estimation because continuing smokers might be those who were more likely to find and purchase cigarettes from cheaper sources. Finally, while the ITC China Survey draws its samples from urban cities (which account for less than 10% of the total population[18]), 54.3% of the Chinese population live in a rural area, so these findings may not be generalisable to the national level.

In summary, our study found that younger and low-income smokers are more likely than older and high-income smokers to purchase cigarettes from cheaper sources in China. Tobacco control policies that ultimately reduce the availability of cigarettes from cheaper sources could have great potential for reducing cigarette consumption, especially among young and low-income smokers in China.

What this article adds

- This article shows that young and low-income smokers are more likely than older and high-income smokers to purchase cigarettes from cheaper sources in China.
- Tobacco control measures need to be implemented to reduce the availability of cigarettes from cheaper sources, which could have an impact on reducing cigarette consumption among young and low-income smokers in China.

Acknowledgements We thank the Chinese Center for Disease Control and Prevention and the local CDC representatives in each city for their collection of data, and Prof Frank Chaloupka at the University of Illinois at Chicago, Richard S. Gallagher and members of the University of California, San Francisco Tobacco Center's Writer's Task Force for their helpful comments and suggestions.

Contributors GF and YJ conceptualised the study, obtained funding and collected data. TY, JH, WM, HS, MO and ZM participated in the data analysis and interpretation of the results. All drafts were written by TY and commented on by all authors. All authors read and approved the final manuscript.

Funding The ITC China Project was supported by grants from the US National Cancer Institute (R01 CA125116 and P01 CA138389), the Roswell Park Transdisciplinary Tobacco Use Research Center (P50 CA111236), the Canadian Institutes of Health Research (57897, 79551 and 115016) and the Chinese Center for Disease Control and Prevention. Additional support was provided by the US National Institutes of Health Fogarty International Center (Grant R01 TW05938), the US National Cancer Institute (Grant CA-113710) and the University of California, San Francisco Dorothy Pechman Rice Postdoctoral Fellowship. Geoffrey T Fong was supported by a Senior Investigator Award from the Ontario Institute for Cancer Research and by a Prevention Scientist Award from the Canadian Cancer Society Research Institute.

Competing interests GTF was supported by a Senior Investigator Award from the Ontario Institute for Cancer Research and by a Prevention Scientist Award from the Canadian Cancer Society Research Institute.

Patient consent Obtained.

Ethics approval The ITC China Survey was conducted with the approval of China CDC Ethical Review Committee and the Office of Research Ethics Committee at the University of Waterloo.

Provenance and peer review Not commissioned; externally peer reviewed.

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在中国谁从廉价途径购买卷烟？国际烟草控制政策评估项目（ITC）中国调查的发现

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2013年3月6日收稿
2013年8月21日修订
2013年9月6日接受
2013年9月27日在线优先发表

引用建议：
Yao T, Huang J, Sung H-Y, *et al*. *Tob Control* 2014;**23**:i97–i101.

摘要

目的 从廉价途径购买卷烟可以抵消以价格为基础的烟草控制政策的有效性，对全球公共卫生事业带来了巨大的挑战，其中也包括中国。本次研究的目的在于确定与中国成年吸烟者从廉价途径购买卷烟相关的各种因素。

方法 分析ITC项目中国调查六城市2006-2009年第一轮至第三轮调查的数据（样本量=7980）。调查问题为：“在过去六个月中，您是否因为经济原因购买过比当地商店售价更加便宜的卷烟？”我们采用广义估计方程模型，对各社会人口学因素和吸烟强度是否与购买廉价途径卷烟相关进行了分析。分析的社会人口学因素包括性别、年龄、婚姻状况、家庭月收入、教育水平、就业状况和居住城市。

结果 15.6%的吸烟者报告从廉价途径购买过卷烟。在控制其它协变量后，与从廉价途径购买卷烟的行为之间具有显著相关性的因素包括年龄（18-24岁年龄组与55岁以上年龄组相比，调整OR（AOR）=1.49，95% CI：1.17-3.92）和低收入（低收入与高收入相比，AOR=2.93，95% CI：2.27-3.79），然而与吸烟强度之间的关联不具有统计显著性。

结论 本次研究结果显示，在中国，年轻吸烟者和低收入吸烟者比年龄更大或高收入的吸烟者更有可能从廉价途径购买卷烟。降低廉价途径卷烟可获得性的控烟政策可对减少中国年轻吸烟者和低收入吸烟者的卷烟消费量产生影响。

前言

中国是全世界最大的烟草消费国，吸烟对中国人口和公众健康造成了巨大的影响。2010年，中国的吸烟率为28.7%，其中男性吸烟率为52.9%，女性吸烟率为2.4%[1]。同年，中国有超过5.56亿非吸烟成人（61.8%）遭受二手烟雾伤害[2]。农村地区吸烟率比城市地区更高，2012年分别为30.0%和27.1%[2]。中国是全球最大的烟草生产国，2011年卷烟产量高达2.4万亿支[3]。吸烟会导致肺癌、心血管疾病和其它与吸烟相关疾病风险的上升，从而增加中国的早亡人数和医疗费用。据估计，中国每年有100万例死亡可归因于烟草，且这个数字到2020年预计会提高到220万[4,5]。近期的一项研究发现，从2000年至2008年，中国由吸烟带来的总医疗费用上升了154%，达到62亿美元[6]。

吸烟在中国是一个严重的公共卫生问题。为了降低吸烟率，我们有必要了解购烟行为。全球多项研究已显示，提高卷烟价格是降低卷烟消费量最有效的手段之一。一项对美国1970年至2007年卷烟价格趋势与卷烟消费总量的比较研究显示，在存在很多其它影响消费的因素的背景下，高烟价仍与低消费之间存在很强的相关性[7]。一项在土耳其开展的研究发现，2010年1月该国提高特别烟草消费税20%后，烟草消费量下降了13.6%[8]。近期对100多项烟草税收相关研究（其中包括很多中低收入国家）的一项综述显示，提高烟草税是减少烟草使用十分有效的一个策略[9]。

此前多项研究显示，从廉价途径购买卷烟（如网络购买或低价卷烟）会破坏价格和税收政策对于降低吸烟率和减少卷烟消费量的效用。当卷烟价格上升时，除了选择戒烟、减少卷烟消费量以外，部分吸烟者可能会转向更加廉价的品牌或者从更加廉价的途径购买卷烟，以达到省钱的目的。几项在发达国家开展的研究显示，针对很高的卷烟税，34-61%的吸烟者选择从廉价途径购买卷烟，以便节约卷烟花费[10,11]。一项在美国新泽西州开展的研究发现，2000年至2002年卷烟税提高后，当前吸烟者中，曾经在网上购买过卷烟的吸烟者比例上升了500%多，而经常在网上购买卷烟的人数比例上升了将近300%[12]。近期一个来自美国明尼苏达成人烟草调查的队列研究发现，面对烟价提高，53%的调查对象报告从更加廉价的途径购买卷烟[13]。然而，在中国尚没有针对这一问题开展研究。中国的烟草业是由政府所有并由政府负责监管。中国政府通过国家烟草专卖局和中国烟草总公司在烟草和卷烟生产方面扮演着十分重要的角色。国家烟草专卖局和中国烟草总公司是同一机构。国家烟草专卖局负责制定政府的烟草政策，包括各省的烟草生产配额分配、烟叶定价、卷烟生产和国际贸易指标等。从1991年至今，国家烟草专卖局授权中国烟草总公司负责管理各项烟草政策[14]。中国烟草总公司生产的国内品牌超过200个[14]。与其他国家不同，在中国各品牌之间的价格差距非常大，有的品牌不到

1美元一包，有的高达30多美元一包。此前Li等人研究了中国六个城市的吸烟者从廉价途径购买卷烟的情况，发现吸烟者支付的卷烟价格中的最低价格（下界）从深圳的每包不到0.41美元到上海的每包超过1.08美元。该研究同时发现，报告购买最便宜卷烟的吸烟者多为年龄大、吸烟量大、教育程度低和收入水平低的吸烟者[16]。在中国也可以从廉价途径获得卷烟，但是据我们所知，还没有研究具体考察中国从廉价途径购买卷烟的情况。中国的吸烟者人数全球第一（3.5亿）[1]，因此了解从廉价途径购买卷烟的状况，以及研究这一行为如何影响价格和税收政策在减少中国吸烟者吸烟量方面的影响，具有十分重要的意义。本次研究旨在确定从廉价途径购买卷烟的中国吸烟者的比例和特征。

方法

数据来源

我们对ITC项目中国调查的数据进行了分析。ITC项目是全球第一个针对烟草使用的国际性队列研究；到目前为止，共对22个国家的吸烟者和其中大部分国家的非吸烟者开展了平行纵向队列调查。ITC项目中国调查是一项针对中国七个城市成人吸烟行为的纵向调查，包括北京、上海、广州、长沙、昆明、沈阳和银川。选择这七个城市是因为它们在规模、地理位置和经济发展水平方面具有显著差异。ITC项目中国调查收集了关于人口学特征、吸烟行为、购烟行为和戒烟等方面的具体信息。中国疾病预防控制中心（中国CDC）和当地机构的团队成员分别在2006、2007/2008、2009和2011年开展了四轮ITC项目中国调查。

研究设计与样本

各城市的合格调查对象包括年龄在18岁及以上的成人吸烟者和非吸烟者。在每个城市，ITC项目中国调查采用多阶段分组抽样设计，建立对城市当前成人吸烟者和非吸烟者具有代表性的队列。当前吸烟者定义为曾经吸烟超过100支，且当前每周至少吸烟一次的调查对象。研究采用标准化问卷开展面对面调查，收集每位调查对象的人口学特征和详细的吸烟史信息。

我们的研究样本集中在除昆明市以外所有ITC项目中国调查城市中，且为前三轮调查中均接受过调查的当前吸烟者（不包括昆明是因为该城市是第三轮调查时新增的城市）。我们主要关注当前吸烟者，是因为本研究课题关注的是当前吸烟者的购买行为。我们没有采用第四轮调查的数据，因为我们在进行本次研究时这一轮的数据尚不可用。

在本次六个城市的样本中，2773名调查对象（8319人次）在所有三轮调查中均被划分为当前吸烟者，338名调查对象（539人次）的吸烟状况在前三轮调查过程中发生了变化。因此，最终样本纳入了当前吸烟者的8858个观察值。在排除缺失从廉价途径购买卷烟的信息的240个观察值以及缺失人口学特征或吸烟强度信息的638个观察值后，本次研究样本共纳入7980个观察值。

ITC项目中国调查所使用的所有材料和程序均经过University of Waterloo（加拿大，滑铁卢）研究伦理委员会办公室、Roswell Park Cancer Institute（美国，布法罗）机构审查委员会、Cancer Council Victoria（澳大利亚，维多利亚）和中国CDC（中国，北京）的伦理审查。本次研究的方法学内容另见它文[17]。

变量

因变量

因变量数据根据下列调查问题的答案确定：“在过去六个月内，您是否因经济原因购买过比当地商店价格更低的卷烟？”从廉价途径购买卷烟被定义为对上述问题的回答为“偶尔”或者“经常”，而不从廉价途径购买卷烟被定义为对上述问题的回答为“从来没有”。没有回答上述问题或者报告状况未知的调查对象被编码为缺失值。

自变量

研究包含了两组自变量：社会人口学特征和吸烟强度。社会人口学特征包括性别、年龄、婚姻状况、家庭月收入、教育水平、就业状况和居住城市。年龄组划分为18-24岁、25-39岁、40-54岁、以及55岁及以上。婚姻状况分为已婚或同居、离异或分居或丧偶、以及单身。家庭月收入根据2010年《中国统计年鉴》[18]对城市地区的划分分为三等：低收入（<1000元，按2009年人民币对美元汇率6.8元兑换1美元折合147美元）、中等收入（1000-2999元，折合147-441美元）和高收入（>3000元，折合441美元）。教育水平分为低教育水平（高中以下）、中等教育水平（高中）和高教育水平（高中以上）。就业状况分为就业、失业和退休。吸烟强度分为轻度（每天≤10支）、中度（每天11-20支）和重度（每天≥21支）吸烟者。

统计分析

所有分析均采用STATA V.12.0软件。由于是纵向数据，研究采用广义估计方程（GEE）[19,20]模型分析当前吸烟者中与从廉价途径购买卷烟有关的显著性因素。在估算中，GEE模型采用二项分布和logit连接细化。我们采用独立模型准则下的似然法（QIC）进行模型选择。我们将模型与不同的相关性矩阵结构（独立、自回归、可交换、非结构化）进行比较，最后选择可交换工作相关性矩阵结构的原因是因为该结构得出的QIC得分最低。计算调整OR（AOR）和相应的95%置信空间（CI），以评估相关性的强度。双尾p值小于0.05则视为具有统计学显著性。

结果

社会人口学特征与吸烟强度

表1为本次研究样本的社会人口学特征。绝大多数当前吸烟者为男性（95.4%）、已婚或同居（90.8%）、年龄40-54岁（50.4%）、中等教育水平（68.4%）和就业（59.9%）。16.0%的当前吸烟者为低收入水平，中等和高收入水平的比例分别为46.2%和37.8%。将近一半当前吸烟者为中度吸烟者（49.3%）。

购买廉价途径卷烟的行为及其相关因素

15.6%的吸烟者报告在过去六个月中通过廉价途径购买过卷烟（见表2）。GEE分析结果显示，在控制其它协变量之后，从廉价途径购买卷烟的行为与年龄和收入水平两个因素之间的相关性具有统计显著性。年龄在18-24岁之间的吸烟者比55岁及以上的吸烟者在过去六个月内更可能从廉价途径购买卷烟（AOR=1.49，95%CI：1.17-3.92）。低收入水平的吸烟者从廉价途径购买卷烟的可能性是高收入吸烟者的两倍多（AOR=2.93，95%CI：2.27-3.79）。这一相关性在中等收入吸烟者当中稍弱一点。与北京吸烟者相比，银川

吸烟者更可能从廉价途径购买卷烟。吸烟强度与从廉价途径购买卷烟之间的相关性不具有统计学显著性。

讨论

本研究结果显示，在中国，低收入吸烟者从廉价途径购买卷烟的可能性是高收入吸烟者的2.93倍，中等收入吸烟者是高收入吸烟者的1.73倍。这一结果与其它研究结果是一致的，均表明低收入吸烟者比高收入吸烟者更有可能采用价格最低化策略来降低自己的卷烟费用[13,21]，尽管近期一项研究表明美国低收入吸烟者采用价格最低化策略的可能性较低[22]。此前的一项研究发现，美国年轻成年人比年龄更大的成年人更可能采用价格最低化策略[13]，本次研究同样也在中国发现

表1 ITC项目中国调查第一至第三轮报告为当前吸烟者的调查对象的社会人口学特征和吸烟强度（N=7980）

特征	人次数	百分比
性别		
男性	7610	95.4
女性	370	4.6
年龄		
18-24	55	0.7
25-39	1188	14.9
40-54	4024	50.4
55+	2713	34.0
婚姻状况		
已婚或同居	7246	90.8
离异或分居或丧偶	466	5.8
单身	268	3.4
家庭月收入		
低	1273	16.0
中等	3687	46.2
高	3020	37.8
教育水平		
低水平	929	11.7
中等水平	5462	68.4
高水平	1589	19.9
就业状况		
就业	4779	59.9
失业	1012	12.7
退休	2189	27.4
城市		
北京	1577	19.8
沈阳	990	12.4
上海	1673	21.0
长沙	1414	17.7
广州	1139	14.3
银川	1187	14.9
吸烟强度（CPD）		
轻度（0-10）	2784	34.9
中度（11-20）	3933	49.3
重度（21+）	1263	15.8
合计	7980	

CPD：每天吸烟支数。

表2 根据广义估计方程，不同特征的近期从廉价途径购买卷烟的吸烟者比例与调整OR值

特征	购买廉价途径卷烟的吸烟者比例	AOR	95% CI
合计	15.6		
性别			
男性	15.8	参照组	
女性	12.2	0.68	0.44 to 1.05
年龄			
18-24	23.6	1.49*	1.17 to 3.92
25-39	20.2	1.32	0.94 to 1.84
40-54	15.6	0.92	0.71 to 1.19
55+	13.6	参照组	
婚姻状况			
已婚或同居	15.6	参照组	
离异或分居或丧偶	17.2	1.10	0.78 to 1.54
单身	13.8	0.70	0.43 to 1.16
家庭月收入			
低	26.2	2.93*	2.27 to 3.79
中等	17.0	1.73*	1.39 to 2.15
高	9.5	参照组	
教育水平			
低水平	17.2	0.90	0.64 to 1.27
中等水平	16.1	0.99	0.76 to 1.29
高水平	13.0	参照组	
就业状况			
就业	14.9	参照组	
失业	24.7	1.21	0.94 to 1.56
退休	13.0	0.84	0.63 to 1.12
城市			
北京	11.1	参照组	
沈阳	19.3	1.29	0.88 to 1.90
上海	10.4	0.80	0.55 to 1.16
长沙	15.1	1.00	0.69 to 1.46
广州	13.6	1.03	0.69 to 1.54
银川	28.7	2.22*	1.53 to 3.23
吸烟强度（CPD）			
轻度（0-10）	14.7	参照组	
中度（11-20）	15.8	0.96	0.78 to 1.19
重度（21+）	17.4	0.91	0.68 to 1.22

QIC得分：6584.16。*p<0.05（双尾）。AOR：调整OR；CPD：每天吸烟支数； QIC：独立模型准则下似然法。

这种通过廉价途径购买卷烟的行为。年轻成年人多年来一直是烟草业的重点目标人群[23]。限制从廉价途径获得卷烟可促使更多年轻成年人戒烟或者减少吸烟量。

虽然本次研究的结果不具有统计显著性，但是也与两项美国研究的结果一致：重度吸烟者（每日吸烟≥15支）比轻度吸烟者（每日吸烟<15支）更有可能从廉价途径购买卷烟[13,22]。鉴于我们对吸烟强度采用的是不同的划分标准（以匹配对ITC项目中国调查数据的其它研究），我们无法将本次研究的结果与上述两项美国研究的结果直接进行比较。今后还需要开展进一步的研究，考察吸烟强度与从廉价途径购买卷烟之间的关系。

本次研究得出的从廉价途径购买卷烟的吸烟者比例（15.6%）低于另外三项美国研究报告的比例（34-61.1%）[10,11,13]。这可能是因为另外三项美国研究还纳入了其它的价格最低化策略指标，譬如从印第安人保留地、其它州或者其它国家购买卷烟，以及使用代金券购买或促销时购买卷烟。

此外，我们在研究中还发现，银川吸烟者比北京吸烟者更可能从廉价途径购买卷烟，这可能是因为银川是纳入的几个城市中经济发展水平和家庭人均年收入最低的城市[18]。另外，可能在银川也比较容易从廉价途径获得卷烟。

税收措施常常被用来提高烟价，从而降低消费量[24-26]。时至今日，通过提高卷烟税来提高烟价的目标仍未实现。2009年5月，中国为了履行其对《烟草控制框架公约》的义务，在生产层面提高了卷烟税[26]。然而，多项基于观察和数据调查的研究发现，调整税率之后卷烟的零售价格并未发生改变，调整税率仅仅是在生产价格和批发价格之间进行了再分配[27,28]。此外，调查数据还显示，中国卷烟的名义零售价格从2007年到2010年反而有所降低[27]。因此，2009年中国对卷烟税的提高没有造成卷烟零售价格的上涨。本次研究指出，即使中国提高卷烟税，并且实现了卷烟零售价格的提升，也未必能够降低消费量，因为消费者会从廉价途径购买卷烟，从而最大限度地降低其支付的价格。美国的一项研究发现，从廉价途径购买卷烟的吸烟者计划戒烟的可能性更低[11]，这个结果说明廉价途径卷烟的存在可能弱化戒烟意愿。因此，降低从廉价途径获得卷烟的可能性可以成为有效减少中国烟草消费量的一个措施。如果无法从廉价途径获得卷烟，那么在卷烟价格上涨时，中国吸烟者面前的替代方案就更少了，从而更加可能考虑戒烟或者减少吸烟量。

此外，吸烟者在面对更高的烟价时，可能转向更低价的品牌。廉价的卷烟与通过廉价途径购买的卷烟（这也是我们这次研究的关注焦点）不是同一个概念。目前尚没有研究具体考察中国吸烟者通过廉价途径购买卷烟的情况，或者这种购买方式与购买廉价卷烟的行为之间的关系。对我们的数据进行的一项亚分析结果显示，我们的研究样本中43.1%、33.4%和23.5%的吸烟者购买过低价品牌（价格低于5元每包）、中等价格品牌（每包5-40元）和高价品牌（超过40元每包）的卷烟。在购买过低价品牌卷烟的吸烟者当中，20.5%是通过廉价途径购买的。这一比例在购买高价和中等价格品牌卷烟的吸烟者当中仅为11.0%和16.4%。因此，本次研究得出的证据显示，购买低价或价格更高的品牌卷烟的吸烟者当中，有一部分报告是通过廉价途径购买的。鉴于此，通过廉价途径获得卷烟对中国控烟工作带来的挑战比廉价卷烟更大。

本次研究存在几个局限。第一，我们采用的是自报数据。由于中国吸烟者对不熟悉的人不太信任，他们可能不愿意在跟一个不认识的调查员在面对面调查当中，报告自己从廉价途径购买过卷烟，这可能导致对这一行为的低报。此外，自报信息还存在回忆偏差的风险。第二，在ITC项目中国调查中，由于用于提供因变量数据的问题措辞中使用了“经济原因”这一表述，可能导致更多的低收入吸烟者比高收入吸烟者给出肯定的回答。不过，在之前Li等人[16]的一项研究中，采用的是一个客观指标——吸烟者支付的卷烟价格，来分析中国吸烟者购买廉价卷烟的有关因素。他们发现，低收入吸烟者比高收入吸烟者购买廉价卷烟的可能性更高，这与我们的研究结果是一致的，即低收入吸烟者通过廉价途径购买卷烟的可能性比高收入吸烟者更高。但在未来的研究中，建议使用其它形式的调查问题（如“您是否因为价格更便宜而从其它途径购买过卷烟？”）。第三，ITC项目中国调查并没有专门提出关于具体的廉价途径的问题。因此，我们无法确定吸烟者当中通过各种廉价途径购买卷烟的比例，如在网上买烟或者买低价卷烟。未来需要针对这一方面开展研究。第四，本次研究仅纳入了吸烟者。那些没有通过廉价途径购买卷烟的吸烟者可能是已经戒烟了，因此在估算时可能存在选择偏差的情况，因为持续吸烟者可能是那些更有可能找到并从廉价途径购买卷烟的吸烟者。最后一点，ITC项目中国调查是从城市地区采样（占中国总人口的比例不到10%[18]），而中国人口的54.3%都居住在农村地区，因此这次研究的结果不能泛化到全国层面上。

总之，本次研究发现，在中国，年龄更低和收入水平更低的吸烟者比年龄更高、收入水平更高的吸烟者通过廉价途径购买卷烟的可能性更大。能最终减少从廉价途径获得卷烟的控烟政策可对减少中国卷烟消费量，特别是减少年轻吸烟者和低收入吸烟者的卷烟消费量，起到很大作用。

本文贡献

- ▶ 本文展示了，与高年龄和高收入吸烟者相比，年轻吸烟者和低收入吸烟者通过廉价途径购买卷烟的可能性更高。
- ▶ 需要采取可减少从廉价途径获得卷烟现象的控烟措施，因为这可以有效降低中国年轻吸烟者和低收入吸烟者的卷烟消费量。

致谢

感谢中国疾病预防控制中心和各城市疾病预防控制中心的工作人员收集了数据。感谢芝加哥伊利诺伊州立大学 Frank Chaloupka教授、Richard S. Gallagher教授，和加利福尼亚大学旧金山分校烟草中心专家小组的成员提出的评论和建议。

贡献

GF和YJ构思了本研究，得到资助并收集了数据。TY、JH、WM、HS、MO和ZM参与了数据分析和结果解释。TY撰写了所有草稿并由其他作者评论。所有作者阅读并同意了最终版本。

经费

ITC中国项目得到了the US National Cancer Institute (R01 CA125116 and P01 CA138389)，the Roswell Park Transdisciplinary Tobacco Use Research Center (P50 CA111236)，the Canadian Institutes of Health Research (57897, 79551 and 115016)，和中国疾病预防控制中心的资助。

The US National Institutes of Health Fogarty International Center (Grant R01 TW05938)、the US National Cancer Institute (Grant CA-113710)、the University of California, San Francisco Dorothy Pechman Rice Postdoctoral Fellowship也对本研究提供了支持。GTF获得the Ontario Institute for Cancer Research的Senior Investigator Award和the Canadian Cancer Society Research Institute的Prevention Scientist Award的支持。

利益冲突 无。

知情同意 已获得。

伦理审核 ITC中国调查通过了University of Waterloo（加拿大）研究伦理委员会以及中国疾病预防控制中心伦理审查委员会的伦理学审查。

出处和同行审查 未开展；外部同行已评审。

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