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

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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 analyzed from Waves 1–3 of the International Tobacco Control China Survey, conducted in 2006–2009 among adult smokers in six cities in China (N=7,980). One survey question asked, “In the last six months, have you purchased cheaper cigarettes than you can

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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 (GEE) 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 behavior of purchasing cigarettes from cheaper sources with age (AOR=1.49, 95% CI=1.17–3.92 for age 18–24 compared to age 55+) and with income (AOR=2.93, 95% CI=2.27–3.79 for low income compared to 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.

Keywords

Cheaper sources; Smoking; China; Taxation; Income

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 nonsmoking adults (61.8%) in China were exposed to secondhand smoke (SHS) 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 one 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 behavior. 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 U.S. 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 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 (for example, 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 U.S. 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 organization 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 1 US dollar per pack to more than 30 US dollars 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 behavior 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 analyzed 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 behavior 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 behaviors, cigarette purchasing behaviors, 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 nonsmokers 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 nonsmokers.

Current smokers were defined as having smoked 100 cigarettes in their lifetime and currently smoking at least once a week. Using a standardized 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 behavior of those who currently smoke. We did not use the wave 4 data because the dataset was not yet available when we conducted this study.

Among the six-city study sample, 2,773 respondents (8,319 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 8,858 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 7,980 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 six 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 (<1,000 Yuan, equal to US\$147 using the 2009 exchange rate of 6.8 Yuan per dollar[18]), middle income (1,000 – 2,999 Yuan, equal to US \$147–441), and high income (>3,000 Yuan, equal to US\$441). Education was categorized 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 categorized as light (< 10 cigarettes per day (CPD)), moderate (11–20 CPD) and heavy (≥ 21 CPD) smokers.

Statistical Analysis

All analyses were conducted with STATA, version 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, auto-regressive, exchangeable and unstructured) and chose the exchangeable working correlation matrix structure because it yielded the lowest QIC score. Adjusted odds ratios (AOR) and the corresponding 95% confidence intervals (CI) 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 male (95.4%), married or living together (90.8%), aged 40–54 (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 and high income, respectively. Nearly half were moderate smokers (49.3%).

Behavior of purchasing cigarettes from cheaper sources and associated factors

15.6% of smokers reported purchasing cigarettes from cheaper sources during the last six months (See Table 2). The GEE results showed that the associations between the behavior of purchasing cigarettes from cheaper sources and age and income were statistically significant, after controlling for other covariates. Smokers aged 18–24 were more likely to purchase cigarettes from cheaper sources in the last six months than smokers aged 55 and above (AOR=1.49, 95%CI=1.17–3.92). Low income smokers were more than twice as likely to purchase cigarettes from cheaper sources as high income smokers (AOR=2.93, 95%CI=2.27–3.79). This association was slightly smaller among middle income smokers. Compared to 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-minimizing strategies to lower their cigarette expenditures than high income smokers, [13,21] although one recent study reported that low income U.S. smokers were less likely to use price minimizing strategies.[22]

Consistent with a previous study which showed young adults in the U.S. were more likely to use price-minimizing strategies than older adults [13], our study found that one such behavior 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 U.S. 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 cutoffs 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 U.S., which reported proportions of 34% to 61.1%. [10,11,13] This may be because the three U.S. studies included additional measures of price-minimizing 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 fulfill its obligation to the Framework Convention on Tobacco Control (FCTC), 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 minimize the prices they pay. A study conducted in the U.S. 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 behavior of purchasing cheaper cigarettes among smokers in China. A sub-analysis 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 behavior. 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 to high-income smokers to answer in the affirmative since “economic reasons” is in the question. However, a previous study by Li et al. used an objective measure – the price of cigarettes paid by smokers – to examine the correlates of purchasing cheaper cigarettes in China. [16] 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 (for example, “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 vs. 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 lives in a rural area, so these findings may not be generalizable 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.

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What this paper adds

- This paper 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.

Table 1

Sociodemographic characteristics and smoking intensity of respondents reporting current smoking in Waves 1–3 of the ITC China Survey (N=7,980)

| Characteristic | n | % |
|-----------------------------------------------|------|------|
| Gender | | |
| Male | 7610 | 95.4 |
| Female | 370 | 4.6 |
| Age | | |
| 18–24 | 55 | .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 (cigarettes per day) | | |
| Light (0–10) | 2784 | 34.9 |
| Moderate (11–20) | 3933 | 49.3 |
| Heavy (21+) | 1263 | 15.8 |

| Characteristic | n | % |
|----------------|------|---|
| Total | 7980 | |

Table 2

Percentage of smokers who recently purchased cigarettes from cheaper sources by characteristic and adjusted odds ratios from the GEE model

| Characteristic | % purchasing cigarettes from cheaper sources | Adjusted Odds Ratio | 95% CI |
|-----------------------------------------------|----------------------------------------------|---------------------|-------------|
| Total | 15.6 | | |
| Gender | | | |
| Male | 15.8 | Reference | |
| Female | 12.2 | .68 | .44 – 1.05 |
| Age | | | |
| 18–24 | 23.6 | 1.49* | 1.17–3.92 |
| 25–39 | 20.2 | 1.32 | 0.94 – 1.84 |
| 40–54 | 15.6 | .92 | .71 – 1.19 |
| 55+ | 13.6 | Reference | |
| Marital status | | | |
| Married or living together | 15.6 | Reference | |
| Divorced or separated or windowed | 17.2 | 1.10 | .78 – 1.54 |
| Single | 13.8 | .70 | .43 – 1.16 |
| Monthly household income | | | |
| Low | 26.2 | 2.93* | 2.27 – 3.79 |
| Middle | 17.0 | 1.73* | 1.39 – 2.15 |
| High | 9.5 | Reference | |
| Education | | | |
| Low | 17.2 | .90 | .64–1.27 |
| Middle | 16.1 | .99 | .76–1.29 |
| High | 13.0 | Reference | |
| Employment status | | | |
| Employed | 14.9 | Reference | |
| Unemployed | 24.7 | 1.21 | .94 – 1.56 |
| Retired | 13.0 | .84 | .63 – 1.12 |
| City | | | |
| Beijing | 11.1 | Reference | |
| Shenyang | 19.3 | 1.29 | .88 – 1.90 |
| Shanghai | 10.4 | .80 | .55 – 1.16 |
| Changsha | 15.1 | 1.00 | .69 – 1.46 |
| Guangzhou | 13.6 | 1.03 | .69 – 1.54 |
| Yinchuan | 28.7 | 2.22* | 1.53 – 3.23 |
| Smoking intensity (cigarettes per day) | | | |

| Characteristic | % purchasing cigarettes from cheaper sources | Adjusted Odds Ratio | 95% CI |
|----------------------|----------------------------------------------|---------------------|------------|
| Light (0–10 CPD) | 14.7 | Reference | |
| Moderate (11–20 CPD) | 15.8 | .96 | .78 – 1.19 |
| Heavy (21+CPD) | 17.4 | .91 | .68 – 1.22 |

*
p<0.05 (2-tailed)

QIC score: 6584.16