Use of less expensive cigarettes in six cities in China: findings from the International Tobacco Control (ITC) China Survey

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ABSTRACT
Objective The existence of less expensive cigarettes in China may undermine public health. The aim of the current study is to examine the use of less expensive cigarettes in six cities in China.
Methods Data was from the baseline wave of the International Tobacco Control (ITC) China Survey of 4815 adult urban smokers in 6 cities, conducted between April and August 2006. The percentage of smokers who reported buying less expensive cigarettes (the lowest pricing tertile within each city) at last purchase was computed. Complex sample multivariate logistic regression models were used to identify factors associated with use of less expensive cigarettes. The association between the use of less expensive cigarettes and intention to quit smoking was also examined.
Results Smokers who reported buying less expensive cigarettes at last purchase tended to be older, heavier smokers, to have lower education and income, and to think more about the money spent on smoking in the last month. Smokers who bought less expensive cigarettes at the last purchase and who were less knowledgeable about the health harm of smoking were less likely to intend to quit smoking.
Conclusions Measures need to be taken to minimise the price differential among cigarette brands and to increase smokers’ health knowledge, which may in turn increase their intentions to quit.

INTRODUCTION
It is well accepted that the most effective way to reduce cigarette consumption is to raise the price of cigarettes.1 2 Most econometric studies conducted in Western countries yielded price elasticity for cigarette demand estimates between −0.3 and −0.5,1 3 4–7 which implies that a 10% increase in cigarette price may result in 5% to 5% decrease in cigarette consumption. Article 6 of the World Health Organization Framework Convention on Tobacco Control (WHO FCTC), the first ever global public health treaty, asks party countries to raise the price of and tax on tobacco products.

Economists used to believe that cigarette price elasticity was higher in developing countries compared to developed countries.1 8 However, several studies suggest that China may have lower price elasticity than Western countries. For example, Lance et al estimated that the price elasticity in China was −0.0825; and Mao et al concluded that price elasticity in China was −0.15.10 One possible interpretation proposed by Mao et al is that smokers’ brand switching behaviours from expensive cigarettes to cheaper cigarettes lowered price elasticity.10

As shown in figure 1, when cigarette price goes up, smokers have different responses. Besides quitting and consumption reduction, some smokers may switch to less expensive brands or engage in tax avoidance behaviours11 12; some smokers may purchase cigarettes from different retail outlets such as tobacco discount stores11; there are also smokers engaged in compensating behaviours, for example, switching to cigarettes higher in tar and nicotine.13 The current study focuses on the use of less expensive cigarettes in China.

Like most goods, the price of cigarettes differs among brands. Examples include the three-tier cigarette pricing structure in the US (premium, discount and generic)14 and Australia (premium, mainstream and supervalue).15 China is the largest cigarette-producing country in the world, and cigarette prices vary considerably among brands. In 2006, there were 40 tobacco companies producing more than 200 domestic cigarette brands in China,16 and within brand families there were multiple brand varieties. Chinese cigarettes are classified into different grades according to the quality of tobacco leaves and the price of cigarettes. As shown in table 1, according to the classification criteria of the China National Tobacco Company, there are five grades of cigarettes in China. The factory price of grade 1 cigarettes is at least six times higher than grade 5 cigarettes. In addition, China has a two-tier taxing system for cigarettes. Namely, the tax rate for higher grades of cigarettes is higher than lower grades of cigarettes, which further widens the price differential among different grades of cigarettes.

The tobacco monopoly system in China has policies that guarantee the supply of low-level (grades 4 and 5) cigarettes. China National Tobacco Company requires local tobacco companies to produce certain amounts of low-level cigarettes each year and subsidises them to compensate for the relatively low profit margin. Thus, the production and the sale of low-level cigarettes in China are maintained according to objectives set by the China National Tobacco Company. For example, in 2006, 24.9% (503.9 billion sticks) of the cigarette production and 24.7% (500.6 billion sticks) of the cigarette sales in China were low-level cigarettes.16 The China National Tobacco Company claimed that low-level cigarettes may help satisfy low-income populations’ needs.

Cummings et al reported that in the US, smokers of discount or generic cigarette brands tend to be Caucasian, more addicted to smoking and to have
Studies also suggest that poorer and heavier smokers are sensitive to changes in cigarette prices and more likely to engage in tax-avoidant behaviours. Researchers proposed that less expensive cigarettes may undermine the public health effects of price and tax policies. Theoretically, when cigarette prices increase, smokers may switch to less expensive cigarettes to minimise the financial burden and to maintain their smoking habit. As shown in figure 1, after a price increase, smokers who switch to less expensive cigarettes may not perceive much additional financial burden and may not choose to quit or reduce consumption. Given the enormous price differential among cigarette grades in China, it is particularly important to examine the use of less expensive cigarettes because of the increased potential for smokers to choose lower-priced cigarettes. The aim of the current study is to determine the major characteristics of smokers of less expensive cigarettes, and whether the use of less expensive cigarettes is associated with decreased intentions to quit smoking.

METHODS

The International Tobacco Control (ITC) China Survey

The ITC China Survey is a prospective cohort survey in six cities in China: Beijing, Shanghai, Guangzhou, Shenyang, Changsha and Yinchuan. The six cities were selected based on their size, diverse geographic location and level of economic development. Table 2 shows the registered population, gross domestic product (GDP), per capita annual disposable income and consumption expenses in 2006 in each of the six cities. The wave 1 survey was conducted between April and August 2006. In each wave, about 800 smokers and 200 non-smokers were interviewed in each city. Participants included in this study come from 4815 smokers who completed the wave 1 survey. A more detailed description of the study design can be found in Wu et al. Briefly, in each city the ITC China Survey employed a multistage cluster sampling design to select representative adult urban smokers and non-smokers. The ITC China Survey was conducted using face-to-face interviews. The wave 1 cooperation rates range from approximately 80.0% in Beijing and Guangzhou to 95.0% in Changsha. The response rates range from 59.4% in Yinchuan to 66.0% in Guangzhou. All materials and procedures used in the ITC China Survey were reviewed and cleared with regard to ethics by the Office of Research 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 National Centres for Disease Control and Prevention (Beijing, China). This study only used the data of current smokers.

Intention to quit smoking

We asked current smokers: 'Are you planning to quit smoking?' Smokers who responded ‘within the next month’, ‘within the next 6 months’, or ‘sometime in the future, beyond 6 months’ were classified as intending to quit. Eighty per cent of smokers (80%) intended to quit or had tried to quit within the next month (74%).

Table 2 City population, gross domestic product (GDP), per capita annual disposable income and consumption expenses in 2006

<table>
<thead>
<tr>
<th>City</th>
<th>Number of registered residents</th>
<th>GDP</th>
<th>Per capita annual disposable income (¥)</th>
<th>Per capita annual consumption expense (¥)</th>
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</thead>
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<td>19978</td>
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<tr>
<td>Yinchuan</td>
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<td>335</td>
<td>10068</td>
<td>8288</td>
</tr>
</tbody>
</table>

*Data were from Statistical Report on the 2006 Economic and Social Development of each city. † Data were not available for 2006 in Beijing.
were defined as having any intention to quit smoking (coded as 1), whereas smokers who responded ‘not planning to quit’ or ‘don’t know/cannot say’ were defined as ‘having no intention to quit or others’ (coded as 0).

Independent variables
The major independent variables in this study included:
- City (Beijing, Shenyang, Shanghai, Changsha, Guangzhou, Yinchuan)
- Gender (male, female)
- Age (18–34 years, 35–44 years, 45–54 years, 55 years or older)
- Highest level of education (low=no education or elementary school, medium=junior high school or high school/technical high school, high=college, university or higher)
- Household income per month (low: <1000¥ per month, medium: 1000¥ to 2999¥, high: >3000¥, don’t know/cannot say)
- Ethnicity (Han, others)
- Number of cigarettes smoked per day (1–10, 11–20, 21–50, 51+)
- How often did you think about the money spent on smoking in the last month? (never, occasionally, often, don’t know/cannot say)

Knowledge about the adverse health effects of smoking: This index was based on smokers’ responses to the following questions: ‘Based on what you know or believe, does smoking cause the following: (1) stroke; (2) impotence in male smokers; (5) lung cancer in smokers; (4) emphysema; (5) stained teeth in smokers; (6) premature ageing; (7) lung cancer in non-smokers from secondhand smoke; and (8) CHD (coronary heart disease). Response options were: ‘yes’ (coded as 1), ‘no’ (coded as 0), ‘don’t know/cannot say’ (coded as 0). The index was computed by summing the scores for the eight questions.

Weighting procedures
Sampling weights were constructed to provide the best possible prevalence estimates. The weights were constructed separately for male adult smokers and female adult smokers. Wave 1 weights were constructed by accounting for the four levels of sample selection: Jie Dao, Ju Wei Hui, household and individual. The final weight for a sampled individual was the number of people in the city population and the sampling category represented by that individual. A full description of the weighting methodology is available at http://www.itcproject.org.

Statistical analyses
Descriptive analysis
SPSS for Windows, V17.0 (SPSS, Chicago, Illinois, USA), was used for all analyses. For each of the six cities, the median and the interquartile range for cigarette price paid were calculated.

Factors associated with purchasing less expensive cigarettes
Complex samples multivariate logistic regression models were constructed to examine factors associated with purchasing less expensive cigarettes. The dependent variable was purchase of less expensive cigarettes and the independent variables were forced to enter the model. All categorical variables were changed to dummy variables before entering the model.

Factors associated with intentions to quit smoking
Complex samples multivariate logistic regression models were constructed to examine whether use of less expensive cigarettes was associated with decreased intentions to quit. The dependent variable was intention to quit smoking, the major independent variable of interest was purchase of less expensive cigarettes. All categorical variables were changed to dummy variables before entering the model.

RESULTS
The demographics of the study participants can be found in Wu et al.16

Cigarette price in each city
Table 3 presents the median, interquartile range and the lowest tertile of cigarette price paid (per pack) of the last purchase by city. Overall, the self-reported price of cigarettes ranges from 0.70¥ RMB per pack to 100¥ RMB per pack. The median price paid per pack was highest in Shanghai (7.50¥), followed by Yinchuan (5.00¥), Changsha (4.40¥), Guangzhou (4.00¥), Beijing (4.00¥) and Shenyang (3.70¥). The lowest tertile of cigarette price paid (per pack) of the last purchase was 3.00 in Beijing, 2.80 in Shenyang, 7.53 in Shanghai, 4.00 in Changsha, 5.50 in Guangzhou and 4.00 in Yinchuan.

Factors associated with purchasing less expensive cigarettes
Table 4 shows the results of a complex samples multivariate logistic regression examining factors associated with purchasing less expensive cigarettes. Smokers who bought less expensive cigarettes at the last purchase tended to be older, heavier smokers, to have lower education and income, to smoke more cigarettes per day and to think more about the money spent on smoking in the last month.

Factors associated with intentions to quit smoking
Table 5 shows the results of a complex samples multivariate logistic regression model examining factors associated with intentions to quit smoking. Smokers who reported buying less expensive cigarettes at the last purchase were less likely to have intention to quit (OR=0.75, 95% CI 0.58 to 0.96). Compared to Beijing smokers, smokers in Shanghai (OR=0.50, 95% CI 0.27 to 0.92) and Guangzhou (OR=0.54, 95% CI 0.31 to 0.96) were less likely to have intention to quit. Other factors associated with decreased intention to quit included heavier smokers, smokers less knowledgeable about the harms of smoking and smokers who thought more about the money spent on smoking in the last month.

DISCUSSION
In this study, the median cigarette price paid ranged from 3.70¥ (about US$ 0.54) per pack in Shenyang to 7.50¥ (about US$ 1.10) per pack in Shanghai. The lowest tertile of cigarette price paid ranged from 2.80¥ (about US$ 0.41) per pack in Shenyang to 7.35¥ (about US$ 1.08) per pack in Shanghai. There are several possible interpretations for the huge differences among cities. The first one is the differences in city economy. As shown in table 2, the residents in the six cities differed in disposable income and other characteristics.
The shortage in supply resulting from a decrease in low-level cigarette sales is the major reason for the low use rate of less expensive cigarettes. These findings are consistent with previous studies. Poorer smokers bear more financial burden from smoking. In this study, about 20% of smokers reported that their household income was less than 1000 Yuan per month on smoking, which is about 7.5% of household income. Thus, although tobacco companies spend 75% of their household income. Thus, although tobacco companies spend 75% of their household income, they are more likely to buy less expensive cigarettes. These findings are consistent with previous studies. Poorer smokers bear more financial burden from smoking. In this study, about 20% of smokers reported that their household income was less than 1000 Yuan per month on smoking, which is about 7.5% of their household income. Thus, although tobacco companies spent 75% of their household income, they are more likely to buy less expensive cigarettes.
financial burden on low-income smokers, poorer smokers still spend a fair amount of their income on smoking. In comparison, raising cigarette prices may help poorer smokers to quit smoking, which would decrease their smoking expenditure to 0 and also would help them lower the risk of getting smoking-related diseases.

Smokers who reported buying less expensive cigarettes at the last purchase were less likely to intend to quit, which is consistent with Cummings et al’s study conducted in the US. This suggests that the existence of less expensive cigarettes may deter smoking cessation. In the 1980s and 1990s, US tobacco companies used discount and generic cigarettes to retain price sensitive smokers and to slow the decline of tobacco use rates among US adults. The China National Tobacco Company seems to be doing the same thing. In a paper published in the journal of China Tobacco in 2006, the authors from the China National Tobacco Company stated, ‘if we abandon the market of low-level cigarettes, we will lose consumers as well as the basis for the continuing development of the tobacco industry…” This finding has important policy relevance. The WHO FCTC requires party countries adopt price and tax policies to reduce tobacco consumption. However, when cigarette prices are increased in China, some smokers may easily find a less expensive cigarette brand to substitute for their old brand, which may damage the effects of price and tax policies. Therefore, if China is to adopt price and tax policies as suggested in the WHO FCTC, accompanying measures should be taken to reduce the price differential among brands. One option is to set a minimum price for cigarettes, another possible option is to change the current two-tier tax structure and apply the same rate for cigarettes, another possible option is to change the current two-tier tax structure and apply the same ad valorem tax, as suggested by Hu et al.23

Another interesting finding is that smokers who were more knowledgeable about the adverse health effects of smoking had more intent to quit smoking. The clear policy implication is that raising smokers’ health knowledge may be an effective way to increase cessation in China. Health education or other interventions are needed to educate Chinese smokers about the specific effects on health of smoking.

The advantages of this study included the large sample size, rigorous study design and the ability to do comparisons among cities. However, there were some limitations in this study. The first limitation is the use of self-reported price. Smokers may not be willing to report buying less expensive cigarettes in a face-to-face survey. However, for most respondents, we asked them to show the interviewers their cigarette pack, which may have lowered such possibility. The second limitation is that we used the lowest tertile of price paid at the last purchase to classify cigarettes as less expensive in each city. As shown in table 1, the cut-off of the lowest tertile was different across cities. However, this method may reflect the relative price within each city. The third limitation is the use of cross-sectional data, which restricts our ability to explore causal relationships. This issue will be addressed when the next wave of data is available. Fourth, we measured the price of the last brand of cigarettes purchased. However, the last brand purchased may not be smokers’ primary brand of cigarettes. Fifth, this study used self-reported data and may be subject to social desirability bias, namely respondents might tell the interviewer what they think he/she wants to hear. To minimise the social desirability bias, all the field interviewers were trained to be objective when administering the survey, although this may not have completely solved the problem.

In summary, there is a wide variation in the price of cigarettes in China. Smokers of less expensive cigarettes tend to be older, heavier smokers, to have lower education and income, and to think more about the money spent on smoking in the last month. Smokers who bought less expensive cigarettes who were less knowledgeable about the health harms of smoking at the last purchase were less likely to intend to quit smoking. Measures need to be taken to minimise the price differential among cigarette brands and to increase smokers’ health knowledge, which may in turn increase their intentions to quit.

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Competing interests None.

Patient consent Obtained.

Ethics approval This study was conducted with the approval of the All materials and procedures used in the ITC China Survey were reviewed and cleared for ethics by the Office of Research at the University of Waterloo (Waterloo, Canada) and the Cancer Council Victoria (Victoria, Australia) and the Chinese National Centers for Disease Control and Prevention (Beijing, China).

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

What this paper adds

► China is home to one-third of the world’s smokers. The prices of Chinese cigarettes differ dramatically. Studies from Western countries suggest that use of less expensive cigarettes may deter smoking cessation. However, little is known about the effects of less expensive cigarettes on smoking cessation in China.

► This paper suggests that Chinese smokers who use less expensive cigarettes and who are less knowledgeable about the health harms of smoking have weaker intentions to quit smoking.

► Measures need to be taken to minimise the price differential among cigarette brands and to increase smokers’ health knowledge, which may in turn increase their intentions to quit.