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 3% 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 −0.082[9]; 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 behaviours[11 12]; some smokers may purchase cigarettes from different retail outlets such as tobacco discount stores[11]; there are also smokers engage 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 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

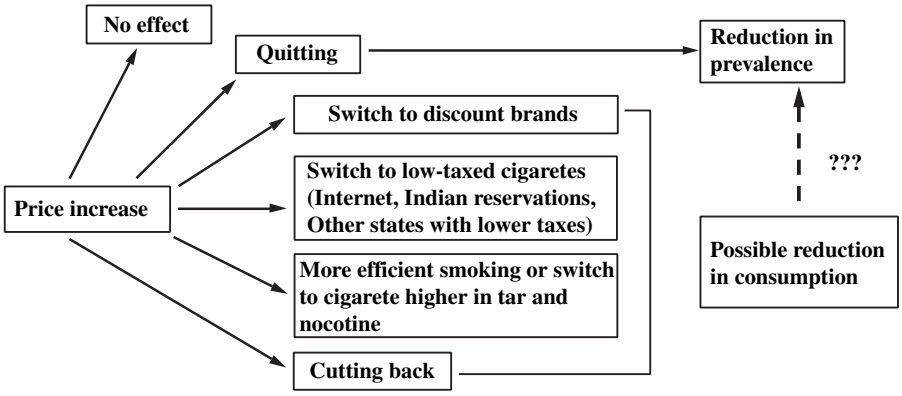

Figure 1 Compensatory model of cigarette price effects.

Adapted from: Fong GT. The International Tobacco Control Policy Evaluation Project (ITC Project): Evaluating the Impact of Policies of the WHO Framework Convention on Tobacco Control. Presentation given at the 8th Asia Pacific Conference on Tobacco or Health, Taipei, Taiwan. October 2007.

a lower income.[14] Studies also suggest that poorer and heavier smokers are sensitive to changes in cigarette prices and more likely to engage in tax avoidant behaviours.[12] Researchers proposed that less expensive cigarettes may undermine the public health effects of price and tax policies.[14 17] 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 are 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*.[18] 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 39.4% 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.

Table 1 Factory price of different grades of cigarettes in 2006 in China

Grades of cigarettes	Price per carton before VAT (¥)	Ad valorem tax rate
1	50>	45%
2	30–49	30%
3	15–30	30%
4	10–14	30%
5	<10	30%

Grades 4 and 5 are defined as 'low-level cigarettes', grades 1 and 2 are defined as 'high-level cigarettes' and grade 3 is defined as 'medium-level cigarettes'.
VAT, value added tax.

Measures

Dependent variables

Purchase of less expensive cigarettes

We asked smokers to provide information on the cost of their cigarettes: 'The last time you bought cigarettes for yourself, how much did you pay for each pack of the cigarettes?' For smokers who didn't remember price paid per pack, the price was calculated from the smokers' response to the following two questions: (1) 'The last time you bought cigarettes for yourself, how many packs of cigarettes did you purchase?' and (2) 'How much did you pay for all the cigarettes you bought last time?' In this study, less expensive cigarettes were defined as cigarettes with reported price paid in the lowest tertile within each city (coded as 1), whereas cigarettes with reported prices paid in the middle or the highest tertile were defined as regular cigarettes (coded as 0).

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'

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

City	Number of registered residents	GDP	Per capita annual disposable income (¥)	Per capita annual consumption expense (¥)
Beijing	11	7720	19978	†
Guangzhou	5	6068	19851	15445
Shanghai	13	10297	20668	14762
Changsha	2	1791	13924	10680
Shenyang	6	2483	11651	8670
Yinchuan	1	335	10068	8288

*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, 21–30, 31+)
- 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; (3) 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, V.17.0 (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.

Table 3 Median, IQR and lowest tertile of cigarette price paid (per pack) in the six cities

City	Valid N	Median	IQR	The lowest tertile of cigarette price paid (Yuan RMB)
Beijing	761	4.00	2.20	3.00 (US$ 0.44)
Shenyang	740	3.70	2.50	2.80 (US$ 0.41)
Shanghai	783	7.50	1.50	7.33 (US$ 1.08)
Changsha	793	4.40	1.00	4.00 (US$ 0.59)
Guangzhou	777	4.00	3.70	3.50 (US$ 0.51)
Yinchuan	784	5.00	3.50	4.00 (US$ 0.59)

RESULTS

The demographics of the study participants can be found in Wu *et al*.[18]

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, 7.33 in Shanghai, 4.00 in Changsha, 3.50 in Guangzhou and 4.00 in Yinchua.

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 7.33¥ (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

Table 4 Results of multivariate logistic regression examining factors associated with purchasing less expensive cigarettes

	N	Percentage who bought less expensive cigarettes*	OR	95% CI
Gender				
Male	4487	35.4	Reference	
Female	232	57.1	1.37	0.80 to 2.34
Age in years				
18–34	470	23.0	Reference	
35–44	1153	25.2	0.82	0.58 to 1.16
45–54	1624	32.4	1.08	0.79 to 1.48
55 or older	1463	53.1	2.61	1.90 to 3.59
Ethnic group				
Han	4484	33.3	Reference	
Others	235	36.4	1.01	0.66 to 1.56
Highest level of education				
Low	607	64.1	Reference	
Medium	3092	36.7	0.58	0.44 to 0.78
High	1014	16.3	0.28	0.20 to 0.39
Household income per month				
Low	911	57.4	Reference	
Medium	2120	39.6	0.50	0.39 to 0.64
High	1344	18.2	0.21	0.16 to 0.28
Don't know/cannot say	340	29.9	0.34	0.22 to 0.51
Number of cigarettes smoked per day				
1–10	1631	32.8	Reference	
11–20	2316	36.3	1.23	1.03 to 1.46
21–30	400	45.9	1.74	1.28 to 2.35
31 or more	344	40.7	1.32	0.95 to 1.83
Think about the money spent on smoking in the last month				
Never	3130	32.7	Reference	
Occasionally	961	36.8	1.18	0.95 to 1.45
Often	571	54.9	2.10	1.62 to 2.71
Don't know/cannot say	53	34.5	0.90	0.42 to 1.94
Index of knowledge about the adverse health effects of smoking				
0–1	928	44.2	Reference	
2–3	1110	37.5	0.92	0.68 to 1.24
4–5	1419	33.7	0.89	0.70 to 1.12
6–8	1234	31.3	0.77	0.59 to 1.01

City was not included in this model because we used the lowest tertile of cigarette price paid in each city as the cut-off for less expensive cigarettes, thus the percentage of smokers who bought less expensive cigarettes is the same across cities (1/3).
*Refers to the last purchase.

Table 5 Results of multivariate logistic regression examining factors associated with any intention to quit smoking

	Percentage intending to quit	OR	95% CI
City			
Beijing	29.1	Reference	
Shenyang	32.4	1.13	0.61 to 2.09
Shanghai	16.5	0.50	0.27 to 0.92
Changsha	25.2	0.99	0.58 to 1.69
Guangzhou	14.8	0.54	0.31 to 0.96
Yinchuan	28.3	0.88	0.50 to 1.55
Gender			
Male	24.3	Reference	
Female	25.3	0.92	0.53 to 1.61
Age in years			
18–34	25.3	Reference	
35–44	25.4	1.13	0.79 to 1.61
45–54	24.5	1.19	0.80 to 1.76
55 or older	23.2	1.21	0.83 to 1.77
Ethnic group			
Han	26.9	Reference	
Others	24.3	0.92	0.59 to 1.43
Highest education			
Low	19.1	Reference	
Medium	24.7	1.16	0.85 to 1.58
High	27.3	1.10	0.72 to 1.67
Household income per month			
Low	22.8	Reference	
Medium	25.6	1.13	0.85 to 1.51
High	25.5	1.27	0.91 to 1.77
Don't know/cannot say	16.6	0.85	0.52 to 1.39
Number of cigarettes smoked per day			
1–10	30.5	Reference	
11–20	22.6	0.71	0.60 to 0.84
21–30	15.7	0.50	0.36 to 0.70
31 or more	15.6	0.49	0.33 to 0.72
Think about the money spent on smoking in the last month			
Never	19.6	Reference	
Occasionally	29.6	1.61	1.26 to 2.05
Often	42.2	2.78	2.17 to 3.57
Don't know/cannot say	12.4	0.85	0.35 to 2.02
Buy less expensive cigarettes at the last purchase			
No	26.2	Reference	
Yes	21.0	0.75	0.58 to 0.96
Index of knowledge about the adverse health effects of smoking			
0–1	11.8	Reference	
2–3	17.1	1.49	1.09 to 2.04
4–5	27.5	2.56	1.95 to 3.35
6–8	37.8	3.69	2.59 to 5.23

income and consumption expenditure in 2006. Shanghai was the most affluent city, and this may partly interpret the high cigarette price and low use rate of less expensive cigarettes. However, the city economies cannot explain all the huge differences between cities. For example, Beijing and Shanghai residents had similar income and expenditure in 2006, but Beijing had 6 times higher less expensive cigarette use rates than Shanghai. The second possible interpretation is the difference in the supply of less expensive cigarettes. Because the profit margin of low-level cigarettes is very low, local tobacco companies are inactive in producing these cigarettes, which results in shortages in less expensive cigarette supply.[19] One article from Guangzhou Tobacco Company clearly stated, '…the major reason for the decrease in low-level cigarette sales is the shortage in supply'.[20] If the supply of low-level cigarettes in some cities is not enough, it's possible that less expensive cigarette smokers in these cities cannot find their usual brands and have to switch to more expensive cigarettes. The third possible interpretation might be the cultural differences among cities, which is unclear and needs further research.

In this study, the price differential among brands is large. The self-reported cigarette price ranged from 0.70¥/pack to 100¥/pack, which gives smokers more choices in the price of cigarettes. In other words, Chinese smokers have more flexibility in choosing different prices of cigarettes than most Western smokers.

Older, heavier smokers and smokers with lower SES were more likely to buy less expensive cigarettes. These findings are consistent with previous studies.[12 14] Poorer smokers bear more financial burden from smoking.[2 21] In this study, about 20% of smokers reported that their household income was less than 1000¥ per month. Even if these smokers smoked cigarettes priced at 2.5¥ per pack, a one pack per day smoker would spend 75¥ per month on smoking, which is about 7.5% of their household income. Thus, although tobacco companies have claimed that low-level cigarettes may decrease the

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 poor 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.[14] 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…'.[22] 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 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 amount of specific tax to each pack of cigarettes and eliminate the two-tier 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 cigarette 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 administrating 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.

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 intention 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 Institutional Review Boards at: Roswell Park Cancer Institute (Buffalo, USA), the Cancer Council Victoria (Victoria, Australia) and the China National Centers for Disease Control and Prevention (Beijing, China).

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REFERENCES

1. **Culyer AJ,** Newhouse JP. *Handbook of health economics*. 1 edn, New York: Elsevier, 2000.
2. **World Health Organization.** *WHO report on the global tobacco epidemic, 2008*. Geneva: The MPOWER package, 2008.
3. **Gallus S,** Schiaffino A, La Vecchia C, *et al*. Price and cigarette consumption in Europe. *Tob Control* 2006;**15**:114—19.
4. **Huang B-N,** Yang C-W, Hwang M-J. New evidence on demand for cigarettes: a panel data approach. *Int J Appl Econ* 2004;**1**:81—97.
5. **Gruber J,** Sen A, Stabile M. Estimating price elasticities when there is smuggling: the sensitivity of smoking to price in Canada. *J Health Econ* 2003;**22**:821—42.
6. **Nelson J.** Cigarette demand, structural change and advertising bans: international evidence. *Contributions to Economic Analysis and Policy* 2003;**2**:1—27.
7. **Lewitt EM,** Coate D. The potential for using excise taxes to reduce smoking. *J Health Econ* 1982;**1**:121—45.
8. **Warner KE.** Tobacco taxation as health policy in the Third World. *Am J Public Health* 1990;**80**:529—31.
9. **Lance PM,** Akin JS, Dow WH, *et al*. Is cigarette smoking in poorer nations highly sensitive to price? evidence from Russia and China. *J Health Econ* 2004;**23**:173—89.
10. **Mao Z,** Hu T-W, Yang G. New evaluating of the demand for cigarettes From Chinese residents. *Chinese Health Economics* 2005:45—7.
11. **White VM,** Gilpin EA, White MM, *et al*. How do smokers control their cigarette expenditures? *Nicotine Tob Res* 2005;**7**:625—35.

12. **Hyland A,** Bauer JE, Li Q, *et al*. Higher cigarette prices influence cigarette purchase patterns. *Tob Control* 2005;**14**:86—92.
13. **Farrelly MC,** Nimsch CT, Hyland A, *et al*. The effects of higher cigarette prices on tar and nicotine consumption in a cohort of adult smokers. *Health Econ* 2004;**13**:49—58.
14. **Cummings KM,** Hyland A, Lewit E, *et al*. Use of discount cigarettes by smokers in 20 communities in the United States, 1988—1993. *Tob Control* 1997;**6**(Suppl 2): S25—30.
15. **Carter SM.** The Australian cigarette brand as product, person, and symbol. *Tob Control* 2003:79—86.
16. **China National Tobacco Company.** *China tobacco yearbook*. Beijing: China Economic Publishing House, 2006.
17. **Hyland A,** Higbee C, Li Q, *et al*. Access to low taxed cigarettes deters smoking cessation attempts. *Am J Public Health* 2005;**95**:994—5.
18. **Wu C,** Thompson ME, Fong GT, *et al*. Methods of the International Tobacco Control (ITC) China Survey. *Tob Control* 2010;**19**(Suppl 2):i1—i5.
19. The new atlas of tobacco (in Chinese). http://www.p5w.net/newfortune/hygc/200903/t2225241.htm.
20. **Guangzhou Tobacco Company.** Analysis of Guangzhou cigarette market. 2005 (in Chinese) http://gztobacco.gov.cn/qydt/qydt2005052501.htm.
21. **Wang H,** Sindelar JL, Busch SH. The impact of tobacco expenditure on household consumption patterns in rural China. *Soc Sci Med* 2006;**62**:1414—26.
22. **Lu Y.** Appreciate the importance of low-level cigarettes and increase the supply (in Chinese). *China Tobacco* 2006. http://www.echinatobacco.com/news/2006/17/jingji/jjzhuanti/2010846.shtml.
23. **Hu TW,** Mao Z, Shi J. Recent tobacco tax rate adjustment and its potential impact on tobacco control in China. *Tob Control* 2010;**19**:80—2.