

# Chinese smokers' cigarette purchase behaviours, cigarette prices and consumption: findings from the ITC China Survey

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Received 8 March 2013

Revised 11 July 2013

Accepted 21 August 2013

Published Online First

18 September 2013

## ABSTRACT

**Background** While cigarette purchasing behaviour has been shown to be linked with certain tobacco use outcomes such as quit intentions and quit attempts, there have been very few studies examining cigarette purchasing behaviours and their impact on cigarette price and consumption in China, the world's largest cigarette consumer.

**Objective** The aim of the present study was to examine the extent and determinants of cost/price-related purchase behaviours, and estimate the impact of these behaviours on cigarette prices paid by Chinese smokers. It also assesses the socioeconomic differences in compensatory purchase behaviours, and examines how they influence the relationship between purchase behaviours, cigarette prices and cigarette consumption.

**Methods** Multivariate analyses using the general estimating equations method were conducted using data from the International Tobacco Control China Survey (the ITC China Survey), a longitudinal survey of adult smokers in seven cities in China: Beijing, Changsha, Guangzhou, Kunming, Shanghai, Shenyang and Yinchuan. In each city, about 800 smokers were surveyed in each wave. The first three waves—wave 1 (conducted between March to December 2006), wave 2 (November 2007 to March 2008) and wave 3 (May to October 2009 and February to March 2010)—of the ITC China Survey data were used in this analysis. Various aspects of smokers' self-reported price/cost-related cigarette purchasing behaviours were analysed.

**Results** Nearly three-quarters (72%) of smokers surveyed indicated that a major reason they chose their most-used cigarette brand was its low cost/price. Almost half (50.6%) of smokers reported buying in cartons in their most recent cigarette purchase. Smokers with lower income and/or low levels of education were more likely to choose a brand because of its low cost/price. However, those with higher income and/or high levels of education were more likely to buy cartons. Gender and age were also related to type of purchase behaviours. Those behaviours led to reductions in purchase prices. The price savings ranged from ¥0.54 to ¥1.01 per pack of cigarettes, depending on the behaviour examined, representing a price reduction of 8% to 15%.

**Conclusions** A significant portion of Chinese urban adult smokers engaged in cost/price-reducing purchase behaviours. Such behaviours reduce cigarette purchase prices and are associated with increased cigarette consumption. Smokers of different socioeconomic status engaged in different purchase behaviours to mitigate the impact of higher cigarette prices. Reducing tobacco use through raising tobacco taxes/prices in China needs to take into account these cost/price-reducing behaviours.

## BACKGROUND

Tobacco imposes tremendous health and economic costs on China.<sup>1–5</sup> Significantly increasing tobacco product excise taxes and prices has been shown to be an effective policy to reduce tobacco use and tobacco-caused health and economic burdens.<sup>6–7</sup> In addition, studies have also found that smokers of lower socioeconomic status (SES) tend to be more responsive to tax and price changes.<sup>7</sup> This differential responsiveness to price change based on SES serves as an important avenue to reduce tobacco use, particularly among those with low SES. The intended impact of higher prices/taxes on cessation and reduction in cigarette consumption could be mitigated, however, if smokers engage in compensatory behaviours that offset or reduce the impact of higher taxes and prices. For example, when cigarette taxes/prices become higher, smokers may switch to a cheaper brand or other less expensive tobacco products, obtain cigarettes from cheaper sources, or purchase of cartons.<sup>8–11</sup> Indeed, previous studies have found evidence that the link between high taxes/price and quit intentions and quit attempts was attenuated by smokers' price-reducing purchase behaviours.<sup>12–15</sup> Consequently, it is important to understand smokers' behavioural responses in order to accurately assess the impact of higher taxes/prices. Because of the potential importance of the possible modifying role of SES on the relationship between purchase behaviour and tobacco use outcomes, it is also important to examine the socioeconomic differences in compensatory purchase behaviours, and their role in modifying the impact of increasing cigarette prices on tobacco use outcomes. This information may be especially useful in directing future tobacco control policies in China.

Previous studies examining cigarette price elasticity in China have provided some evidence that Chinese smokers' cigarette consumption was sensitive to price changes, at least among some subgroups,<sup>16–17</sup> indicating that higher tobacco taxes/prices could be an effective policy tool to reduce tobacco use and tobacco-induced deaths and diseases in China. Unfortunately, to date, there have been very few studies that looked at smokers' purchasing behaviour in China, and its impact on cigarette prices and consumption. In addition, little is known about the potential role of SES in modifying the impact of higher tobacco prices/taxes among Chinese smokers. This paper fills these research gaps. It examines the extent and determinants of several price-reducing purchase behaviours; estimates the impact of these behaviours on cigarette

**To cite:** Huang J, Zheng R, Chaloupka FJ, et al. *Tob Control* 2014;**23**:i67–i72.

prices; and investigates the association between these behaviours and cigarette consumption among Chinese adult urban smokers. Additionally, this paper assesses the socioeconomic differences in these compensatory purchase behaviours and examines how they influence the relationship between purchase behaviours and cigarette prices.

## METHODS

### Data

The analyses in this paper rely on the International Tobacco Control Policy Evaluation Project—China Surveys (the ITC China Survey). The ITC China Project, established in 2006, is a longitudinal cohort survey conducted in seven cities in China (Beijing, Changsha, Guangzhou, Kunming, Shanghai, Shenyang and Yinchuan). These seven cities differ in their population sizes, areas and levels of economic development. They are located in different geographic regions in China, and are good representatives of China's urban areas. Approximately 800 adult smokers are recruited by probability sampling methods in each city in each wave. Respondents lost to follow-up are replaced with comparable respondents so as to maintain city level representative samples. The retention rate of the ITC China survey was high, more than 80%.<sup>18</sup> More detailed information on the ITC China survey sampling methodology can be found in Wu *et al* (2010).<sup>18</sup>

This study used the first three waves of the ITC China Surveys, conducted in 2006, 2007/2008, and 2009/2010, respectively. The sample consisted of approximately 2400 smokers from each city (800 smokers in each wave) with the exception of Kunming, which was added to ITC China Survey in the third wave, with only 800 smokers. Because of the missing values (including non-responses and refusals) in the key outcome variables, the final analytical sample consisted of approximately 13 000 smokers.

### Measures

The key variables we examined in this study were: (1) whether respondents identified cost as a major reason for choosing their most-used cigarette brand; (2) whether the most recent cigarette purchase for self was in cartons or in packs; and (3) the price of a pack of cigarette paid by smokers in their most recent purchase. In addition, we also examined the association between purchase behaviours and smoking intensity, approximated by the average number of cigarettes smoked per day.

The ITC China Survey asked smokers the cigarette brand they smoked most often in the past 30 days, and asked about the reasons for using this brand. One of the response categories is 'affordable cost/price'. We constructed a dichotomous variable based on the response to this question. If a smoker indicated that he/she considered low cost/price as a factor in choose the brand, this variable was coded as 1; otherwise, it was coded as 0. This variable captures whether Chinese smokers were cost/price conscious when making a brand choice.

The ITC China Survey also asked smokers about their most recent cigarette purchase experience; in particular, how much they paid and whether they purchased in cartons or in packs. We created a dichotomous variable to capture purchases in cartons, with a value of 1 indicating a purchase was made in cartons, and a value of 0 otherwise. The cigarette price variable used in this study was the self-reported price for a pack of cigarettes, which was constructed based on the total price paid and the total number of packs bought in the most recent cigarette purchase. In our analyses, we dropped 79 observations that reported extremely high (greater than ¥100 per pack) and low (less than ¥0.2 per pack) unit prices. The cigarette price variable

was inflation adjusted. Cigarette consumption is defined as the average number of cigarettes smoked by an individual per day, which was derived from the questions that asked about the number of cigarettes smoked per day for daily smokers, and the number of cigarettes smoked per week for non-daily smokers. Based on this cigarette per day (CPD) variable, three dichotomous variables were created to capture the smoking intensity: light smokers ( $\leq 10$  CPD), moderate smokers (11–19 CPD), and heavy smokers ( $\geq 20$  CPD).

In addition to those key variables, depending on the analysis, we also included a number of key demographic and socioeconomic individual/household-level characteristics such as family income, age, gender, level of education, marital status, and various other SES characteristics that are captured in the ITC China Surveys, as well as interview waves/years, city, and cigarette brands when appropriate. Specifically, age was grouped into 18–24 years, 25–39 years, 40–54 years, and 55 years or older. Marital status was classified as: married; divorced, separated or widowed; and single. Education level was classified into three categories: less than high school, high school, and post-secondary education. Monthly household income was classified into three categories based on the cut-offs for urban areas from the 2010 China Statistics Yearbook: low-income level ( $< ¥1000$ ), medium-income level (¥1000–2999) and high-income level ( $\geq ¥3000$ ). Employment status was grouped into employed, unemployed, and retired.

### Analysis and statistical methodology

To understand the extent of price/cost related purchase behaviours among Chinese smokers, we examined the sample means of the key purchase behaviour variables discussed above. Our calibration of the sample means uses standard complex survey poststratification techniques for variance estimation, which took into account the complex survey/sampling strategies of the ITC China Surveys. In addition, those statistics were properly weighted using the sampling weights, described fully in the weighting methodology available at <http://www.itcproject.org>.

To examine who engaged in price/cost-related purchase behaviours, we estimated the following models:

$$PB_{ijt} = \beta_0 + \beta_1 X_{ijt} + \beta_2 CPD_{ijt} + Wave_{ij} + City_{it} + e_{ijt} \quad (1)$$

Where  $PB_{ijt}$  represents one of the two purchase behaviour variables discussed above, by the  $i_{th}$  individual in the  $j_{th}$  city in interview wave/year  $t$ .  $X_{ijt}$  is a vector of individual-level and familial-level demographic and socioeconomic characteristics such as age, gender, marital status, education level, and inflation-adjusted family income. CPD is a variable capturing smoking intensity, represented by the number of cigarettes smoked per day.  $City_{it}$  is the city indicator for the  $i_{th}$  individual in interview wave/year  $t$ .  $Wave_{ij}$  is the interview wave/year indicator for the  $i_{th}$  individual in the  $j_{th}$  city, and  $e_{ijt}$  is the idiosyncratic error term.

To examine the association between purchase behaviours and cigarette price, we estimated the following model:

$$P_{ijt} = \beta_0 + \beta_1 PB_{ijt} + Wave_{ij} + City_{it} + Brand_{ijt} + e_{ijt} \quad (2)$$

Where  $P_{ijt}$  represents the log form of the inflation-adjusted price for a pack of cigarettes reported by the  $i_{th}$  individual in the  $j_{th}$  city in interview wave/year  $t$  in his/her most recent purchase for himself/herself.  $PB_{ijt}$  represents one of the two purchase behaviour variables.  $Brand_{ijt}$  is a vector of dummy variables indicating

the cigarette brand the  $i_{th}$  individual bought in his/her most recent purchase in the  $j_{th}$  city and in interview wave/year  $t$ .

Because the ITC China Survey data are longitudinal in nature, errors are correlated within observations across waves for the same individual. As a result, equation (1) and (2) were estimated using the general estimating equations (GEE) method (STATA V.12 `xtgee` command), which took into account the correlation in error terms among the same respondent across different interview waves (mean SEs were clustered by individual). Because of the nature of the purchase behaviour variables, which are all dichotomous variables, equation (1) was estimated using GEE model with a logit link, with no preimposed assumption on the structure of the covariance matrix of the error terms.

## RESULTS

Table 1 contains the summary statistics for the key SES variables used in this study. Our smoker sample was evenly distributed across interview waves and cities, with the exception of the city of Kunming, which was added in the third wave. The urban smokers in our sample were predominantly male (95%), with an average age of 50; 89% of them were married at the time of the survey. In all, 43% of the smokers in the sample reported having an average family income per month between ¥1000–2999, with 15% of smokers having a family income that fell below ¥1000 per month and about 36% with an income of more than ¥3000 per month. The income information was missing for the remaining 6%. A total of 12% of smokers reported having less than a high school education, 66% of smokers reported having a high school degree, and about 22% of smokers reported having some schooling beyond high school, which included 2-year college courses.

Close to three-quarters (73%) of smokers reported that cost/price was a reason for choosing their most-used cigarette brand, indicating a high level of cost/price consciousness among Chinese urban smokers. Approximately half of the smokers bought cigarettes in cartons in their most recent purchase. The inflation-adjusted average price for the pack of cigarettes that smokers bought in their most recent purchase was 6.75 RMB in 2009 ¥ value, and the average number of cigarettes consumed per day was 17 among the smokers in these 7 Chinese cities. Approximately 15% of smokers reported smoking more than 20 cigarettes per day; close to half reported smoking between 10 and 20 cigarettes per day, the remaining 37% smoked less than 10 cigarettes per day.

### SES profile for those who engaging in price/cost-related purchase behaviour

Table 2 presents the results for equation (1), examining the SES factors associated with the price/cost-related purchase behaviours. Compared to those with the highest income, smokers with income between ¥1000–2999 (OR 1.16 (95% CI 1.02 to 1.31)) and those with less than ¥1000 per month (OR 1.32 (95% CI 1.02 to 1.59)) were more likely to report that cost/price was a reason for choosing their most-used cigarette brand. Similarly, compared to those with at least some secondary education, those with a high school degree were more cost/price conscious (OR 1.25 (95% CI 1.09 to 1.43)) when choosing a cigarette brand. Compared to the employed, retired smokers were more likely to choose a brand for its low cost/price (OR 1.19 (95% CI 1.02 to 1.38)). Not surprisingly, compared to light smokers, those who smoke more than 10 cigarettes per day were more likely (OR 1.14 (95% CI 1.02 to 1.28)) to report that cost/price was a reason for choosing their most-used cigarette brand, the heaviest smokers—those who smoke more than

**Table 1** Summary statistics

	N	%
<b>Purchase behaviours</b>		
The most-used cigarette brand chosen because of its low cost/price: 1: yes; 0: no	14 161	72.6
Most recent cigarette purchase for self was in carton: 1: yes; 0: no	13 861	50.6
<b>Gender</b>		
Male	13 457	95.0
Female	704	5.0
<b>Age (years)</b>		
18–24	184	1.3
25–39	2465	17.4
40–54	6826	48.2
55+	4686	33.1
<b>Marital status</b>		
Married	12 633	89.2
Divorced, separated, widowed	894	6.3
Single	634	4.5
<b>Average total household income per month (¥)</b>		
<1000	2117	14.9
1000–2999	6078	42.9
≥3000	5064	35.8
Missing	902	6.4
<b>Education</b>		
Less than high school	1692	11.9
High school	9293	65.6
College and above	3176	22.4
<b>Employment status</b>		
Employed	8595	60.9
Unemployed	1869	13.3
Retired	3641	25.8
<b>Cigarettes per day (CPD)</b>		
≤10 CPD	5209	36.8
11–19 CPD	6848	48.4
≥20 CPD	2104	14.9
<b>City</b>		
Beijing	2213	15.6
Shenyang	2256	15.9
Shanghai	2255	15.9
Changsha	2185	15.4
Guangzhou	2260	16.0
Yinchuan	2203	15.6
Kunming	789	5.6

20 cigarettes per day—did not differ significantly from the lightest smokers. Female smokers (OR 0.73 (95% CI 0.53 to 0.99)) and those aged 25–39 (OR 0.78 (95% CI 0.64 to 0.96)) were less likely to report considering low cost/price as a reason for choosing a brand.

With respect to buying in cartons at the most recent purchase, female smokers (OR 1.63 (95% CI 1.28 to 2.09)), those retired (OR 1.49 (95% CI 1.28 to 1.73)), as well as medium smokers (OR 1.65 (95% CI 1.48 to 1.84)) and heavy smokers (OR 2.32 (95% CI 1.99 to 2.71)), were more likely to purchase in cartons. Compared to those aged 55 and above, younger smokers were less likely to buy in cartons, with young adults, those aged 18–24, being the least likely to buy in cartons. Compared to high-income smokers, smokers with medium-income and low-income levels were both less likely to buy in cartons, presumably due to cash constraints. Those who

**Table 2** Socioeconomic status (SES) factors associated with purchase behaviours (ORs from general estimating equation (GEE) models)

Variables	The most-used cigarette brand chosen because of its low cost		Most recent cigarette purchase for self was in carton	
	OR	95% CI	OR	95% CI
Gender				
Male	Reference		Reference	
Female	0.725*	0.530 to 0.992	1.631***	1.276 to 2.085
Age (years)				
55+	Reference		Reference	
40–54	0.921	0.794 to 1.069	0.672***	0.579 to 0.780
25–39	0.784*	0.643 to 0.956	0.383***	0.313 to 0.469
18–24	0.959	0.637 to 1.444	0.247***	0.151 to 0.403
Marital status				
Married	Reference		Reference	
Divorced or widowed	0.899	0.706 to 1.145	0.923	0.749 to 1.139
Single	1.015	0.787 to 1.309	0.602**	0.443 to 0.819
Average total household income per month (¥)				
≥3000	Reference		Reference	
1000–2999	1.158*	1.021 to 1.314	0.764***	0.680 to 0.858
<1000	1.466***	1.224 to 1.756	0.607***	0.513 to 0.719
Missing	0.925	0.751 to 1.139	0.730**	0.589 to 0.905
Education				
College and above	Reference		Reference	
High school	1.247**	1.091 to 1.426	0.736***	0.641 to 0.846
No formal education or prime school	1.074	0.865 to 1.335	0.717**	0.582 to 0.882
Employment status				
Employed	Reference		Reference	
Unemployed	0.935	0.795 to 1.101	0.959	0.822 to 1.120
Retired	1.186*	1.019 to 1.381	1.490***	1.284 to 1.730
Cigarettes per day (CPD)				
CPD low	Reference		Reference	
CPD middle	1.139*	1.018 to 1.275	1.649***	1.476 to 1.841
CPD high	1.155	0.981 to 1.360	2.322***	1.987 to 2.714
Survey wave				
Wave 1	Reference		Reference	
Wave 2	1.191**	1.060 to 1.338	1.110*	1.004 to 1.227
Wave 3	2.109***	1.863 to 2.388	1.033	0.928 to 1.151
City				
Beijing	Reference		Reference	
Shenyang	1.919***	1.547 to 2.381	0.195***	0.157 to 0.243
Shanghai	0.849	0.696 to 1.034	0.329***	0.265 to 0.408
Changsha	2.339***	1.858 to 2.944	0.200***	0.160 to 0.251
Guangzhou	0.651***	0.531 to 0.799	0.338***	0.270 to 0.424
Yinchuan	0.496***	0.405 to 0.606	0.106***	0.085 to 0.133
Kunming	1.435*	1.018 to 2.024	0.347***	0.261 to 0.460
Constant	1.588***	1.255 to 2.010	3.477***	2.797 to 4.323
Observations	14 161		14 046	
Number of IDs	7283		7257	

\*p&lt;0.05, \*\*p&lt;0.01, \*\*\*p&lt;0.001.

were single were also less likely to purchase in cartons than their married counterparts.

### The impact of purchase behaviour on cigarette prices

Table 3 presents the estimated effects of price/cost-related purchase behaviours on cigarette prices based on equation (2) using the GEE method. The results in table 3 show that the two purchase behaviours are associated with reduced cigarette prices when examined alone and in combination. There are at least two reasons that might explain why smokers engaged in those two behaviours pay less for a pack of cigarettes than their

counterparts who did not. First, smokers who engage in those two behaviours may be more likely to buy different/cheaper brands of cigarettes (different mix of brands). Second, even when buying the same brand, smokers who engage in those two behaviours may be more likely to price shop across different locations/stores/vendors and/or purchase cheaper sub-brands within the same brand, as well as engaging in other price-reducing strategies (price shopping). To better understand the impact of these different mechanisms on prices, we estimated equation (2) using two different specifications: with and without controlling for cigarette brands. The top section of table 3 excludes brand-specific



**Table 3** The impact of purchase behaviours on cigarette price (general estimating equation (GEE) models)

Variables	Coefficient	SE	Coefficient	SE	Coefficient	SE
Do not control for cigarette brands:						
The most-used cigarette brand chosen because of its low cost: 1: yes; 0: no	-0.181***	0.0145			-0.180***	0.0144
Most recent cigarette purchase for self was in carton: 1: yes; 0: no			-0.103***	0.0133	-0.101***	0.0132
Observations	13 771		13 947		13 768	
Number of IDs	7218		7250		7217	
Average real price per pack	¥6.75		¥6.75		¥6.75	
Estimated percentage reduction in real price per pack	-17%		-10%		-17%	
					-10%	
Estimated amount reduction in real price per pack	¥1.15		¥0.68		¥1.15	
					¥0.67	
Do control for cigarette brands:						
The most-used cigarette brand chosen because of its low cost: 1: yes; 0: no	-0.166***	0.0144			-0.165***	0.0143
Most recent cigarette purchase for self was in carton: 1: yes; 0: no			-0.0891***	0.0132	-0.0869***	0.0131
Observations	13 235		13 404		13 232	
Number of IDs	7139		7176		7138	
Average real price per pack	¥6.75		¥6.75		¥6.75	
Estimated percentage reduction in real price per pack	-15%		-8%		-15%	
					-8%	
Estimated amount reduction in real price per pack	¥1.01		¥0.54		¥1.02	
					¥0.54	

SEs have been adjusted to take into account the correlations in the error terms among the same respondent. Interview waves/years, and cities were included in all regressions.  
\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

indicators and shows the overall price reductions due to both mechanisms (different mix of brands and price shopping). The bottom section includes brand-specific indicators and shows the price reductions as a result of price shopping (including purchase cheaper sub-brands within the same brand).

Choosing a brand based on cost/price consideration was associated with a decrease in cigarette prices. The estimated magnitude of its coefficient translates to a reduction of 17% in price or ¥1.15 for a pack of cigarettes when brand-specific indicators were not included. When brand-specific indicators were controlled for, the price reduction was 15% or ¥1.03 for a pack of cigarettes, with the average price for a pack of cigarettes being ¥6.75. In addition, purchasing in cartons was also found to be associated with a decrease in purchase price by approximately 10%, or a reduction of ¥0.68 per pack of cigarettes, when brand-specific indicators were not included; and a reduction of 8%, or ¥0.54 per pack of cigarettes, when cigarette brands were controlled for. Sensitivity analyses (last two columns in table 3) also reveal the estimated price reductions did not change when both behaviours were controlled for. These results suggested substantial impact on cigarettes prices of engaging in price/cost-related purchase behaviours. In addition, price shopping across different locations/stores/vendors and/or buying cheaper sub-brands accounted for a significant portion (80% to 88%) of the estimated price differentials between smokers who engage in those two behaviours and smoker who did not. The rest of the price differentials between those two groups were due to their use of different cigarette brands.

It is noteworthy that the estimates in table 3 do not represent the causal impact of those behaviours on purchase prices, rather they reflect the observed price differentials associated with those behaviours. To the extent that purchase prices may be correlated with the average retail prices, and higher average overall retail cigarette prices may lead to more cost-reducing behaviours, the estimated price differentials are likely to be endogenous and represent a conservative lower-bound estimate of the true impact of those behaviours on prices.

## DISCUSSION

Our analysis of the ITC China Survey data revealed that a significant portion of Chinese urban smokers engaged in price/cost-related purchase behaviours. In particular, nearly three-quarters (72%) of smokers surveyed indicated that an important reason they chose their most-used cigarette brand was its low cost/price. Additionally, buying in cartons was also popular among Chinese smokers, with almost half of smokers reporting buying in cartons at their most recent cigarette purchase.

The analyses also revealed SES differences in engaging in price/cost-related purchase behaviours. Our analyses show that those with low family income and/or low levels of education tend to be more likely to choose a brand based on its low cost/price, indicating that low-income/education smokers are fairly sensitive to cigarette price/cost. However, those with a higher income and/or high level of education are more likely to buy in cartons, presumably to take advantage of the lower per-unit price and also to minimise time costs or opportunity costs of having to make frequent purchases. Our finding that low-income smokers were less likely to buy in cartons when they purchase cigarettes does not necessarily reflect a lack of price sensitivity among those individuals; rather, we believe it reflects the liquidity constraints among low-income smokers in China, even though the unit price is lower when purchasing cartons. In addition to SES differences, we also found significant gender differences in price/cost-related purchase behaviours. Female smokers were less likely to report that low cost/price was a reason for choosing their most-used cigarette brand, suggesting that brand choices among women are influenced more by factors other than low cost/price. However, female smokers were more likely to purchase cartons than their male counterparts. Younger adults were less likely to report that low cost/price was a reason for choosing their most-used cigarette brand; they were also less likely to purchase cartons.

The analyses in this paper also provide evidence on the impact of price/cost-related purchase behaviours on cigarette prices. Our results show that those who chose cigarette brands

based on low cost/price, and those who bought in cartons, paid significantly lower prices than those who did not, even for the same cigarette brand. The price savings ranged from ¥0.54 to ¥1.03 per pack of cigarettes, depending on the behaviour examined, representing an 8% to 15% price reduction. Previous studies have found evidence of a link between purchase behaviour and certain tobacco use outcomes, such as quit intentions and quit attempts. Our results provide additional evidence by demonstrating the link between purchase behaviour and reduced cigarette prices. This has implications for those who engage in these behaviours, particularly among low-income individuals and female smokers.

Our study is subject to a number of limitations. In particular, because our smoker sample covers only 7 cities in China, and is older than the general adult smoker population in China, the representativeness and generalisation of our findings is limited. Despite these limitations, our analyses show that Chinese adult urban smokers are sensitive to the price/cost of cigarettes. They engage in price/cost-related purchase behaviours to minimise the impact of cigarette price on consumption. More important, smokers of different SES status engage in different purchase behaviours to mitigate the impact of higher cigarette prices. Low-income smokers are more likely to consider cost/price when choosing a cigarette brand. High-income smokers and smokers with high levels of education tend to buy in cartons. This has implications for studies that examine the price elasticity of cigarette demand in China. The existence and the extent of these complex behavioural responses among Chinese smokers may explain the low price elasticities found in some recent studies.<sup>17 19</sup>

The finding from our study that smokers of different SES engage in different purchase behaviours to mitigate the impact of higher cigarette prices has important implications for tobacco control policy in China. Because low-income smokers are more likely to consider cost/price when choosing a cigarette brand, from a tobacco control policy perspective an excise tax structure that has a heavy specific tax component would be more likely to reduce tobacco use among low-income smokers because an increase in a specific tax would raise the price of cheaper brands relative to premium brands to a greater extent than would an ad valorem tax. In addition, minimum price laws that prevent cigarette retail prices from falling below a floor regardless of brand could be an effective policy tool to reduce cigarette consumption among low-income smokers, if the minimum price was set well above the current prices charged for the least expensive brands on the market. Additionally, policies that restrict price discounts through buying cartons could be an effective way to reduce cigarette consumption among high-income smokers in China.

#### What this paper adds

- ▶ This is one of the first studies to examine cigarette purchase behaviours and their relationship to cigarette price and consumption among adult urban Chinese smokers.
- ▶ A significant portion of Chinese urban smokers engage in price/cost-reducing purchase behaviours. Those behaviours reduce cigarette prices paid and are associated with increased consumption. Smokers of different socioeconomic status (SES) engaged in different purchase behaviours to mitigate the impact of higher cigarette prices.

**Acknowledgements** The authors would like to thank Richard S Gallagher for his editorial help.

**Contributors** JH, FJC, RZ and GTF designed the study; GTF, QJ, and YJ collected data; JH conducted data analysis; JH, RZ, and FJC contributed to data interpretation; JH wrote the first draft; JH, RZ, FJC and GTF revised the draft; The final version of this paper has been reviewed and approved by all coauthors.

**Funding** 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. 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 for this project was provided by a grant from the Canadian International Development Research Centre (grant no. 106839-001), titled 'Impact of Tobacco Tax and Price Policies on Tobacco Use in China'. None of the funding agencies played any role in study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the article for publication. The opinions expressed here are those of the authors, and do not necessarily reflect those of the sponsors.

**Competing interests** None.

**Patient consent** Obtained.

**Ethics approval** The ITC China Surveys were cleared for ethics by Research Ethics Boards or International Review Boards at the University of Waterloo (Canada), Roswell Park Cancer Institute (US), and the Chinese Center of Disease Control and Prevention.

**Provenance and peer review** Not commissioned; externally peer reviewed.

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