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Effects of cigarette price and packaging on hypothetical quit-smoking behaviour: a discrete choice experiment among Vietnamese adults who smoke

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ABSTRACT

Introduction Raising cigarette prices, increasing graphic health warning label (HWL) coverage and requiring plain packaging could reduce cigarette smoking in Vietnam. This discrete choice experiment estimates the potential impact of these policies on smoking behaviour.

Methods In February–May 2022, we conducted a phone-based, cross-sectional survey of 1494 Vietnamese adults who smoke. Participants were randomly assigned to view four individual cigarette pack images, varied on price (15 000 (*reference group*); 20 000; 30 000 or 40 000 Vietnamese dong (VND)) and packaging (branded pack with 50% graphic HWL (*reference group*); branded pack with 85% graphic HWL; plain pack with 50% graphic HWL or branded pack without HWL). Participants responded if they would quit or continue smoking if they could only purchase the pack shown. We used binomial logistic regressions to estimate the relative risk (RR) of price and packaging on hypothetical quitting.

Results Participants were more likely to report they would quit when presented with 30 000 VND (RR 1.20, 95% CI 1.07 to 1.35) and 40 000 VND packs (RR 1.40, 95% CI 1.23 to 1.58) vs the 15 000 VND pack. Participants were also more likely to report they would quit when shown the branded pack with 85% HWL (RR 1.30, 95% CI 1.18 to 1.42) and plain pack with 50% HWL (RR 1.34, 95% CI 1.21 to 1.49) vs the branded pack with 50% HWL coverage. Participants had significantly lower quit likelihood (RR 0.41, 95% CI 0.35 to 0.48) when shown the branded pack without a HWL.

Conclusions Results suggest raising cigarette prices to at least 30 000 VND, implementing larger graphic HWLs or plain packaging could decrease smoking rates in Vietnam.

INTRODUCTION

Vietnam has been a party to the WHO's Framework Convention on Tobacco Control (FCTC) since 2005.¹ Although the country has implemented many of the FCTC tobacco control policy recommendations (eg, smoke-free air laws; tobacco advertising bans; 50% graphic health warning label (HWL) coverage),¹ progress has stalled on increasing cigarette excise tax and advancing other packaging-related policies like plain packaging or increasing the size of the graphic HWL.²

Taxation is one of the most effective tobacco control strategies to reduce consumption.^{3–5} The current cigarette tax rate in Vietnam is low

WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ The evidence base to date supports that cigarette taxation, plain packaging and increased health warning label (HWL) size are effective policies to reduce smoking globally.
- ⇒ To propel country-specific policies forward, there is a need for data on the degree of change needed to influence cigarette demand.

WHAT THIS STUDY ADDS

- ⇒ We conducted an experiment to understand (1) at what level of price increases are adults who smoke 'willing to quit' and (2) the impact of plain packaging versus branded packaging with different HWL size.
- ⇒ To influence quit behaviour in Vietnam, results suggest that the price of cigarette packs should be increased to at least 30 000 Vietnamese dong and packaging regulations modified to require 85% graphic HWL coverage or plain packaging with 50% graphic HWL coverage.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

- ⇒ Findings highlight policy mechanisms to enhance the effectiveness of cigarette price increases and packaging and labelling requirements in Vietnam that can support the country's overarching goal of reducing cigarette consumption.

compared with other countries in the Western Pacific Region,⁵ and Vietnam's ad valorem tax rate accounts for only 35.6% of the retail price of a pack of cigarettes at the time of purchase, which is below the WHO's recommended tax rate of 70% and lower than the regional average of 55.6%.^{5,6} Affordability of cigarettes in Vietnam has also grown over the past 25 years. Household incomes have dramatically increased by >500% from 1994 to 2017 while the price of cigarettes has only marginally risen by 6% over the same time period.^{7,8} The result is the wide availability of low-cost cigarettes in Vietnam. The average price of a cigarette pack is between 15 000 and 20 000 Vietnamese dong (VND) or US\$0.64–US\$0.85.^{9,10} Evidence suggests that consumers are more likely to purchase cigarettes if they are more affordable,⁴

and the current cigarette excise tax in Vietnam appears insufficient to decrease affordability.¹¹

In addition to tax, modifications to cigarette packaging, including larger graphic HWLs or plain packaging, have the potential to reduce tobacco use. Since 2012, Vietnam has required that graphic HWLs cover 50% of the front and back of the cigarette pack.² Prior research suggests larger graphic HWLs are effective in increasing quit attempts^{12–15} and preventing smoking initiation among adolescents.^{15–17} Furthermore, plain packaging standards—which would mandate a single colour (eg, drab olive) presentation on all cigarette packs—could reduce pack appeal,¹⁸ increase the salience of graphic HWLs^{18 19} and deter smoking behaviour.¹⁸

Discrete choice experiments (DCEs) are one quantitative approach to identify the relative importance consumers place on various cigarette price and packaging attributes when making smoking-related choices.²⁰ DCEs have been widely used in tobacco control research to elicit preferences of individuals in hypothetical scenarios and inform policy development.²¹ To date, only a handful of DCE studies have been conducted in Vietnam. The first assessed the impact of HWLs (50% graphic HWL vs 30% text-only) on consumers' hypothetical decision to purchase a pack of cigarettes,²² while the second estimated the relative importance of cigarette price (2000 VND, 12 000 VND, 45 000 VND, 100 000 VND) and different HWL attributes (eg, graphic image type versus text; HWL coverage (30%, 50%, 85%)) on the same outcome.²³ Both studies found that graphic HWLs versus text-only warnings had the greatest relative impact on reducing hypothetical cigarette demand among people who smoke and those who do not,^{22 23} and higher-cost cigarettes ($\geq 45 000$ VND) significantly reduced demand among people who smoke.²³ In the current study, we build on this research to estimate the relative importance of different policy approaches like tobacco taxation, plain packaging and increased HWL coverage on hypothetical intention to quit among Vietnamese adults who smoke.

METHODS

Sample

Data were collected February–May 2022 via telephone survey. We chose a phone-based design because COVID-19 conditions in Vietnam prevented in-person data collection and online survey panel options were limited. Our sample was recruited from an existing database of over 30 000 research participants developed and maintained by the market research firm, Milestones. A team of trained interviewers employed by Milestones administered the survey over the phone and all followed the same outreach protocol to enrol eligible participants (see details in online supplemental material). Participants were eligible if they were aged ≥ 18 years, smoked at least 100 cigarettes in their lifetime, smoked on at least one of the past 30 days, had smart phone and active phone number in Milestones' database and were able to speak and read Vietnamese. Participants also needed to answer the two Heaviness of Smoking Index questions—time to first cigarette and number of cigarettes smoked per day—to calculate their nicotine dependence score (low, medium, high).²⁴

In total, we recruited 1500 adults who currently smoke. Quotas were set to recruit the sample equally across the three main regions of Vietnam (north (n=500), central (n=500), south (n=500)). We also set quotas to recruit an equal number of adults who smoke based on nicotine dependence level (low (n=493), medium (n=514), high (n=493)).

Discrete choice experiment design and protocol

A DCE is structured such that individuals make choices over a set of *alternatives* known as a *choice set*. Each alternative is defined by several *attributes*. The underlying assumption is that a respondent will choose the alternative that provides the highest individual benefit.²⁰ From the collection of choices, we can estimate the relative influence of each attribute.

We used a balanced, orthogonal fractional factorial design to construct eight choice sets (d-efficiency=0.90). Each participant was randomised to view one choice set. Table 1 summarises the choice sets and distribution across participants. Within each choice set, participants viewed four separate cigarette pack alternatives that varied on two attributes:

- ▶ *Price*: 15 000 VND; 20 000 VND; 30 000 VND; 40 000 VND.
- ▶ *Packaging design*: branded pack, 50% graphic HWL coverage; branded pack, 85% graphic HWL coverage; plain pack, 50% graphic HWL coverage; branded pack, no HWL coverage.















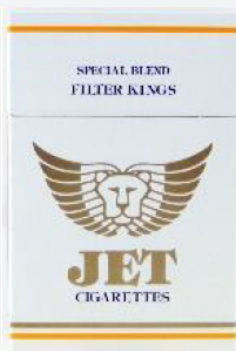

We selected the levels of each attribute based on prior literature^{9 10 22 23} and the current tobacco control environment in Vietnam. Price levels were based on the average cigarette price in Vietnam (15 000 VND),^{9 10} the price of a pack under a potential 5000 VND specific tax increase (20 000 VND)⁵ and prices under a potentially higher future specific tax increases (30 000 VND, 40 000 VND). Packaging levels were based on the current law (50% graphic HWL coverage, no plain packaging),² a prior DCE study in Vietnam demonstrating the potential impact of increasing graphic HWL coverage from 50% to 85%²³ and recommendations for plain packaging by tobacco control advocates.² We used the same graphic HWL of lung cancer currently in rotation in Vietnam on each pack (table 1).²⁵

We used two cigarette brands to create the study stimuli: Thang Long, one of the most popular domestic brands and Jet, a popular foreign brand sold in Vietnam without a HWL label.¹⁰ For all Thang Long packs, we varied pack price, branding and graphic HWL coverage. For the Jet pack, we only varied price, and the pack was branded without a HWL to reflect packs that may be available for sale in Vietnam under any policy change condition.

Measures

















Participants first answered a series of demographic and tobacco use questions. Next, the interviewer texted each participant a link to a Showcard programmed in Microsoft Forms to view their choice set on their mobile phone. First, the interviewer confirmed that the choice set letter (A–H) on the first page matched the choice set assigned to the participant. Once confirmed, the interviewer asked the participant to press 'Next' and the first image in the choice set appeared. The structure of our DCE approach was based on prior work by Goto *et al.*²⁶ The interview asked the participant the following question: *Consider a scenario where you could only purchase the cigarette pack in image 1. In the situation presented, would you quit smoking? Or continue to smoke?*²⁶ The interviewer recorded the participant's response (quit/continue) and then asked them to click 'Next' to view image 2. This process was repeated for the remaining images, and a total of four responses per participant were recorded. For a subset of participants (n=63) who could not open the Microsoft Forms link or refused to open the link due to security concerns, interviewers sent each image in the block as a text message one at a time and recorded the response before sending the next image.

Table 1 Choice sets by letter block, number of Vietnamese adults who smoke (n=1494 total) randomised to view a block and the price and packaging design attributes shown within the choice set

Block	No. randomised to view	Choice set: participant viewed each image separately, in the order presented			
A	182 participants	1. 30 000 VND 	2. 15 000 VND 	3. 20 000 VND 	4. 40 000 VND 
B	185 participants	1. 15 000 VND 	2. 40 000 VND 	3. 20 000 VND 	4. 30 000 VND 
C	183 participants	1. 15 000 VND 	2. 20 000 VND 	3. 40 000 VND 	4. 30 000 VND 
D	154 participants	1. 30 000 VND 	2. 20 000 VND 	3. 40 000 VND 	4. 15 000 VND 

Continued

Table 1 Continued

Block	No. randomised to view	Choice set: participant viewed each image separately, in the order presented			
E	205 participants	1. 30 000 VND 	2. 15 000 VND 	3. 40 000 VND 	4. 20 000 VND 
F	194 participants	1. 40 000 VND 	2. 30 000 VND 	3. 20 000 VND 	4. 15 000 VND 
G	198 participants	1. 30 000 VND 	2. 40 000 VND 	3. 20 000 VND 	4. 15 000 VND 
H	193 participants	1. 15 000 VND 	2. 20 000 VND 	3. 30 000 VND 	4. 40 000 VND 

VND, Vietnamese dong.

Table 2 Demographic characteristics of Vietnamese adults who smoke cigarettes (n=1494)

	% (n)
Age (mean, (SD))	29.7 (8.4)
Sex	
Male	92.9% (1388)
Female	7.1% (106)
Annual household income (in VND)	
≤10 500 000	19.4% (290)
10 500 001–20 000 000	43.7% (652)
>20 000 000	36.9% (552)
Region of Vietnam	
North	33.3% (497)
Central	33.3% (498)
South	33.4% (499)
Nicotine dependence level*	
Low	32.9% (492)
Medium	34.2% (511)
High	32.9% (491)
Last cigarette brand purchased	
Thang Long	29.2% (437)
Jet	15.8% (236)
Any other brand	45.0% (821)

*Based on the Heaviness of Smoking Index, which is calculated based on reported time to first cigarette and number of cigarettes smoked per day.
VND, Vietnamese dong.

Analysis

The final analytic sample was 1494 participants with complete demographic information; six participants refused to answer the income question. All analyses were conducted using the choice models package (*cm*) in Stata V.16. To calculate the relative risk (RR) of cigarette pack price and packaging design on the outcome of hypothetically quitting smoking, we used binomial logistic regression models with clustered variance estimates to adjust for multiple responses by each participant. Models were conducted among the full analytic sample and

among subsamples stratified by nicotine dependence (low, medium, high). All models controlled for demographic characteristics (age, sex, income), nicotine dependence (full sample only) and last cigarette brand purchased (Thang Long, Jet, any other brand).

RESULTS

Sample description

Table 2 presents participant characteristics. Overall, the mean age of participants in the full analytic sample was 29.7 years old (range: 18–75 years) and nearly all were male (92.9%), which is aligned with prevalence data that most people who smoke in Vietnam are men.²⁷ By income, 19.4% of participants reported an annual household income ≤10 500 000 VND, while 43.7% reported an annual income of 10 500 001–20 000 000 VND and 36.9% reported an annual income >20 000 000 VND. Participants were evenly distributed by low (32.9%), medium (34.2%) and high (32.9%) nicotine dependence as per our target recruitment quotas. Around one-third (29.2%) identified Thang Long as the last cigarette brand they purchased and 15.8% identified Jet as the last brand purchased.

Effect of price on hypothetical quit behaviour

Table 3 presents results from binomial logistic regression models. In the full analytic sample and in subsamples stratified by nicotine dependence, there was no significant difference in hypothetical quit behaviour if a pack cost 20 000 VND vs 15 000 VND. For the full sample, participants were 20% more likely to indicate they would quit if a pack cost 30 000 VND (RR 1.20, 95% CI 1.07 to 1.35) and 40% more likely to quit smoking if the pack cost 40 000 VND (RR 1.40, 95% CI 1.23 to 1.58) vs 15 000 VND, respectively.

Among the low nicotine dependence group, patterns in hypothetical quit behaviour for pack price were similar to the full sample. Among the medium and high nicotine dependence groups, participants were more likely to say they would quit smoking only for packs that cost 40 000 VND (RR 1.43, 95% CI 1.15 to 1.78 and RR 1.29, 95% CI 1.04 to 1.61), respectively.

Table 3 Binomial logistic regression overall and stratified by nicotine dependence level of the hypothetical decision to quit smoking among 1494 Vietnamese adults who smoke cigarettes in response to cigarette pack price and packaging design attributes

	Quit smoking versus continue to smoke (ref)			
	Total (n=1494)	Nicotine dependence level†		
		Low (n=492)	Medium (n=511)	High (n=491)
	RR (95% CI)‡	RR (95% CI)‡	RR (95% CI)‡	RR (95% CI)‡
Price (VND)				
15 000 (ref)	ref	ref	ref	ref
20 000	0.91 (0.81 to 1.02)	0.84 (0.69 to 1.02)	0.84 (0.67 to 1.04)	1.09 (0.90 to 1.31)
30 000	1.20 (1.07 to 1.35)**	1.34 (1.11 to 1.63)**	1.12 (0.90 to 1.39)	1.14 (0.94 to 1.40)
40 000	1.40 (1.23 to 1.58)***	1.46 (1.17 to 1.83)**	1.43 (1.15 to 1.78)**	1.29 (1.04 to 1.61)*
Packaging design				
Branded pack, 50% graphic HWL coverage	ref	ref	ref	Ref
Branded pack, 85% graphic HWL coverage	1.30 (1.18 to 1.42)***	1.42 (1.22 to 1.67)***	1.20 (1.00 to 1.44)*	1.28 (1.11 to 1.48)**
Plain pack, 50% graphic HWL coverage	1.34 (1.21 to 1.49)***	1.45 (1.22 to 1.73)***	1.23 (1.02 to 1.48)*	1.38 (1.17 to 1.62)***
Branded pack, no HWL coverage	0.41 (0.35 to 0.48)***	0.44 (0.34 to 0.57)***	0.38 (0.29 to 0.50)***	0.40 (0.30 to 0.53)***

*P<0.05, **p<0.01, ***p<0.001.
†Based on the Heaviness of Smoking Index, which is calculated based on reported time to first cigarette and number of cigarettes smoked per day.
‡Models adjusted for age, sex, income, nicotine dependence (only for unstratified, total sample) and last brand of cigarettes purchased.
HWL, health warning label; ref, reference group; RR, relative risk; VND, Vietnamese dong.

Effect of packaging on hypothetical quit behaviour

For packaging design, in the full analytic sample participants were 30% more likely to say they would quit smoking when presented with a branded pack with 85% graphic HWL coverage (RR 1.30, 95% CI 1.18 to 1.42) vs a branded pack with 50% graphic HWL coverage. Participants were also 34% more likely to quit smoking when presented with a plain pack with 50% graphic HWL coverage (RR 1.34, 95% CI 1.21 to 1.49). When presented with a branded pack without a HWL, participants were 59% less likely (RR 0.41, 95% CI 0.35 to 0.48) to say they would quit smoking versus when they were exposed to a branded pack with 50% graphic HWL coverage. These patterns were similar across the low, medium and high nicotine dependence groups (table 3).

DISCUSSION

Approximately 24% of all adults and 47% of men in Vietnam smoke, which is higher than rates of smoking in other countries in the region including Australia (13.0% adults, 15.2% men), Cambodia (14.2% adults, 28.0% men) and Japan (17.9% adults, 28.3% men) and similar to rates of smoking in China (25.3% adults, 47.8% men).²⁸ Results from this study provide insight into the potential impact of various tobacco control policies in Vietnam on reducing smoking-related behaviour among adults. Overall, we found that increasing the price of cigarettes to at least 30 000 VND per pack, incorporating larger graphic HWLs on the pack and plain packaging had a significant influence on increasing the hypothetical decision to quit smoking among Vietnamese adults who smoke. These findings align with and support evidence from prior DCEs conducted in Vietnam^{22 23} and offer suggestions for future regulatory strategy in Vietnam.

Increasing cigarette prices through taxation—particularly a mixed system that includes both an ad valorem tax plus a standard, flat specific excise tax added to the price of each pack of cigarettes²⁹—is one of the most effective tobacco control policies available.^{3 4} Prior evidence suggests that raising the price of cigarettes to 45 000 VND or 100 000 VND could reduce cigarette demand among Vietnamese adults who smoke.²³ Additionally, a 2017 study found that the median self-reported price required to quit cigarettes among a survey of Vietnamese adults who smoke was 62 000 VND.³⁰ In our study, we found that a moderate price increase from an average of 15 000 VND to 20 000 VND, which corresponds to the potential specific tax increase of 5000 VND,⁵ had limited impact on hypothetical quitting behaviour. Instead, increasing the price of a cigarette pack from 15 000 VND to 30 000 VND or more (15 000 VND or higher specific tax increase) increased hypothetical quit behaviour, and a higher specific tax increase (25 000 VND) was needed to significantly increase quit behaviour among those with higher nicotine dependence levels. There are data to suggest the most (74%) Vietnamese adults support increasing cigarette prices by 5000 VND or higher.³¹ Taken together, evidence across these studies indicate that shifting to a mixed ad valorem and excise tax system that raises cigarette pack prices to at least 30 000 VND (ie, adding a 15 000 specific excise tax) may be necessary to influence quit-smoking behaviour among adults who smoke in Vietnam and could have broad public support.

With respect to packaging design, we found that increasing coverage of the graphic HWL on a branded cigarette pack from 50% to 85% increased hypothetical quit rate among participants across nicotine dependence levels. Additionally, plain packaging with the current 50% graphic HWL was equally effective at increasing hypothetical quit rate. These findings contribute to the

global body of literature on the impact of larger graphic HWLs and plain packaging on smoking behaviour.^{12–19} In addition, our results highlight the important role of these policies in the specific context of Vietnam, where nearly one in two Vietnamese men (and one in four Vietnamese adults) currently smoke cigarettes.²⁸ Only a handful of studies to date have examined the influence of HWLs on smoking-related behaviour among consumers in Vietnam,^{22 23 32 33} and none has explored the impact of plain packaging. Among those studies on graphic HWLs, some suggest that the current 50% graphic HWL coverage on a branded packs may be losing salience among individuals who smoke and may be limited in its impact on increasing motivation to quit.^{32 33} Findings from our study highlight mechanisms to enhance the effectiveness of cigarette packaging and labelling requirements in Vietnam, including reducing exposure to branding either through larger graphic HWLs or via the implementation of plain packaging standards.

This study is subject to several limitations. First, this study is hypothetical in nature and may not reflect the actual decisions that individuals make under real-world policy conditions. Nonetheless, the DCE is a valid experimental approach to investigate potential patterns of behaviours in response to policies that have yet to be implemented. Second, we used two existing popular brands sold in Vietnam to develop our experimental stimuli. Although we controlled for current use of the brands (Thang Long, Jet) in our models, it is possible that prior experience or beliefs about these brands was a confounding factor that could have influenced participants' responses. Third, the survey questionnaire was administered over the phone and participants were required to view the DCE images on their own cell phone device versus a study provided device. Therefore, we were unable to standardise the viewing experience across participants. It is possible that there was variation in image colour or display quality across participants, which could have impacted the answers provided. In addition, although our study sample was equally distributed across the three regions of Vietnam and by nicotine dependence level, this was not a nationally representative sample and findings are not reflective of all Vietnamese adults who smoke. Furthermore, we only measured hypothetical quit behaviour and did not examine other important outcomes, such as intention to quit or reduction in cigarette smoking which is an area for future research.

This study contributes to a growing body of evidence to support cigarette tax and packaging policies in Vietnam. Our findings indicate that a substantive specific tax increase ($\geq 15 000$), larger graphic HWLs or the implementation of plain packaging with 50% graphic health warning coverage could potentially increase quit behaviour among Vietnamese adults who smoke. In Vietnam, rates of tobacco use remain high and there have been insufficient declines in the smoking rate over the past two decades.²⁷ Currently, Vietnam has fallen behind their goal of a 30% reduction in smoking rates by 2025.²⁸ Implementing one or more tax and packaging-related policies could be a pathway to further reduce smoking rates in Vietnam.

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