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## Changes in cigarette prices, affordability, and brand-tier consumption after a tobacco tax increase in Thailand: Evidence from the Global Adult Tobacco Surveys, 2009 and 2011

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### ABSTRACT

Despite the 2009 implementation of a tobacco tax increase in Thailand, smoking rates remained unchanged between 2009 and 2011. Prior evidence has linked cigarette tax increases to compensatory behaviours aimed at lowering the cost of smoking, such as switching to lower-priced cigarette brands. Using data from 2009 and 2011 Global Adult Tobacco Surveys in Thailand, we estimated unadjusted changes in cigarette prices paid, cigarette affordability, and consumption of cigarettes in three price categories classified as upper-, middle-, and lower-priced brand tiers (or price tertiles). We used ordered logit regression to analyse the correlates of price-tier choice and to estimate the change in price-tier consumption adjusted for demographic and region characteristics. Between 2009 and 2011, real cigarette prices increased, but the affordability of cigarettes remained unchanged overall. There was a significant reduction in the consumption of cigarette brands in the top price-tier overall, accompanied by increases in the consumption of brands in the bottom and middle price-tiers, depending on the region. Adjusted estimates from the logit models indicate that, on average, the proportion of smokers selecting brands from upper- and middle price-tiers decreased while consumption of lower price-tier brands increased during the study period. The estimated shifts in consumption from more expensive to less expensive cigarette brands and the overall lack of change in cigarette affordability in Thailand between 2009 and 2011 are both factors that may have contributed to the observed lack of change in smoking rates after the 2009 tax increase.

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### 1. Introduction

After ratifying the WHO Framework Convention on Tobacco Control (FCTC) in 2004, Thailand introduced a wide range of tobacco control policies, including bans on smoking in indoor public places and workplaces, bans on cigarette advertising, promotion, and sponsorship, requirements for displaying health warnings on tobacco packages, and tobacco tax increases (World Health Organization, Country Office for Thailand, 2016; World Health Organization, 2013; Termsirikulchai et al., 2008). According to Thailand National Statistical Office (NSO) survey estimates, the prevalence of tobacco smoking decreased from 32.0% in 1991 to 20.7% in 2009 (Visaruthvong, 2010; Termsirikulchai et al., 2008; Tobacco Control Research and Knowledge Management Center, 2009). In May 2009, Thailand implemented a cigarette tax increase, which raised the excise tax rate from 80% to 85% of the ex-factory

price (Vathesatogkit and Charoenca, 2011; World Health Organization, 2011). The expectation among policymakers was that the 2009 tax increase would be followed by additional declines in smoking rates. However, comparison of Thailand smoking patterns before and after the tax increase, obtained from the 2009 and 2011 Global Adult Tobacco Survey (GATS), revealed that overall tobacco use remained unchanged and that quit attempts declined among current smokers (Bureau of Tobacco Control, 2012; GATS, 2012).

While raising the price of tobacco products by increasing the tobacco taxes has been shown to be effective in reducing tobacco use, evidence suggests that rising cigarette prices can be accompanied by compensatory behavior in the form of increased price minimization by smokers (International Agency for Research on Cancer, 2011; World Health Organization, 2015; Ross et al., 2009; Cornelius et al., 2014; Bader et al., 2011; Xu et al., 2013; Licht et al., 2011; Kengganpanich et al., 2009). Price minimization strategies, such as switching to less expensive brands, buying products in bulk, or purchasing individual cigarettes, aim to alleviate the rise in smoking costs at the individual level, and can attenuate the effect of increased taxes on smoking at the population level. In Thailand, a 2005 tobacco excise tax increase was

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significantly associated with price-compensating strategies like substituting roll-your-own cigarettes for manufactured cigarettes and switching to less expensive brands (White and Ross, 2015). Following the 2009 increase in the excise tobacco tax in Thailand, a number of new inexpensive cigarette brands were introduced by the Thailand Tobacco Monopoly (TTM) (Bureau of Tobacco Control, 2012; GATS, 2012). According to Bureau of Tobacco Control, of the top five cigarette brands, two were inexpensive brands (approximately 30–45 Thai Baht (THB)/pack) of Thailand Tobacco Monopoly (TTM), accounting for about one-third of purchased brands (Bureau of Tobacco Control, 2012). This restructuring of the cigarette market may be related to the absence of a decline in cigarette smoking rates in Thailand between 2009 and 2011 by increasing opportunities for brand down-switching by smokers.

The goal of this paper is to investigate changes in the average price paid per pack, the affordability of cigarettes, and brand price-tier choice after the 2009 tobacco tax increase in Thailand. We use data from Thailand Global Adult Tobacco Survey (GATS) to discuss patterns of smoking prevalence across regions in relation to changes in price, affordability, and brand price-tier choice. To our knowledge, this is the first paper examining smokers' response to 2009 cigarette tax increase in Thailand by exploring changes in cigarette price, affordability, and cigarette consumption across regions and price-tiers, and providing a better picture of what was actually going on in the market. The study demonstrates how consumers responded to the tax increase in 2009 and provides evidence of compensatory behavior.

## 2. Data and methods

### 2.1. Data

We used data from GATS Thailand 2009 and 2011. GATS is a component of the Global Tobacco Surveillance Systems (GTSS) developed by the World Health Organization (WHO) and the US Centers for Disease Control and Prevention (CDC) to track tobacco use among persons aged 15 and older across countries (Palipudi et al., 2013). GATS employs standardized survey methodology and generates nationally representative estimates on individual tobacco consumption and expenditure (Palipudi et al., 2013). The field implementation for the GATS 2009 and 2011 in Thailand took place from 1 February to 31 May and 1 October to 30 December, respectively (Bureau of Tobacco Control, 2012; GATS, 2012). The 2009 and 2011 surveys had 20,566 and 20,606 interviews with overall response rates of 94.2% and 96.3%, respectively (Bureau of Tobacco Control, 2012; GATS, 2012). Both rounds included geographical identifiers for four regions (North, Northeast, South, and Central excluding Bangkok), and Bangkok.

The Central region is the most affluent region with annual per capita GDP of 204,166 Thai Baht (USD 6696) in 2011, followed by the South region with per capita GDP of 125,270 Thai Baht (USD 4108). The Northeast and North regions are relatively less developed with per capita GDP of 48,549 Thai Baht (USD 1592) and 72,925 Thai Baht (USD 2392), respectively. The city of Bangkok is the most affluent area with per capita GDP of 422,141 Thai Baht (USD 13,845) (National Economic and Social Development Board, Thailand, 2014).

Smoking prevalence was defined as the percentage of adults who currently smoke tobacco (daily and less than daily) for both manufactured and roll-your-own (RYO) cigarettes. The quit attempt rate was defined as the percentage of respondents who smoked tobacco during the past 12 months and quit for 24 h or more during the past 12 months. Cigarette price paid per pack was estimated as the amount spent on 20 manufactured cigarettes at last purchase by smokers who smoke manufactured cigarettes at least once per week. Using the self-reported individual prices paid (or amount spent) per pack in the sample, we estimated two aggregate indicators of interest: cigarette affordability and cigarette price-tier. Following Blecher and van Walbeek (2008), cigarette affordability was evaluated using the relative income

price (RIP), where RIP was defined as the average price paid per 100 packs of cigarettes as a percentage of GDP (Blecher and van Walbeek, 2008; Blecher, 2010). A higher RIP indicates a decline in affordability. Region-specific affordability estimates were obtained using GDP values for each region. Average prices were consumption-weighted, and all monetary values from 2009 were inflation-adjusted for comparability to 2011 values.

Following the method described in WHO (2010), we constructed cigarette price-tiers from individual responses on brand and price paid at the time of the last cigarette purchase, as follows. The weighted-average prices paid by brand were ordered and categorized by tertiles, assigning brands into three price-tier categories: upper, middle, and lower tier. While a particular brand in a specific year can belong to only one of the three price-tiers, the same brand may or may not fall into the same tier in the next survey round, because brand prices may vary significantly from one year to another. This categorization of price-tiers allows comparing distribution of smokers buying manufactured cigarettes from the three price-tiers (low, middle, and high), but not by brands (Table 1).

### 2.2. Analysis

We first described unadjusted changes between 2009 and 2011 in the average price paid for manufactured cigarettes, and in cigarette affordability, by region and overall. We further evaluated unadjusted changes in consumption of brands across price-tiers by calculating the percentage of current smokers who purchased cigarettes from lower-, middle- and upper price-tiers in 2009 and 2011, by region and overall.

Next, we estimated the adjusted change in consumption across price-tiers, as well as the socio-demographic correlates of price-tier choice, using multivariate regression. The multivariate analyses were conducted only among manufactured cigarette users. Due to the ordinal nature of the dependent variable – a categorical variable denoting lower-, middle-, or upper-price-tier purchase – an ordered logit model was used to model the likelihood of purchasing from a specific price-tier. Covariates of price-tier choice included age (in 4 categories), gender, urbanicity (urban/rural), education (in 4 categories), occupation (in 6 categories), income (in 5 categories), and binary region indicators (region fixed effects). A binary indicator equal to one for year 2011 and zero for year 2009 was included to describe the adjusted average change in price-tier choice between the two periods. Thailand GATS did not collect information on brands, quantity consumed, prices paid for the roll-your-own (RYO) cigarettes, and therefore the scope of analysis is limited to manufactured cigarettes only. However, in the multivariate regression we used dual tobacco use (i.e. those smoking both manufactured and RYO cigarettes) as an additional control variable. All estimates were obtained using sampling weights for complex survey design in Stata version 14.

## 3. Results

Smoking rates for both manufactured and RYO cigarettes remained unchanged between 2009 and 2011 (Table 2), with overall smoking rates at 23.5% (95% CI: 22.6, 24.5) in 2009 and 23.8% (95% CI: 22.7,

**Table 1**  
Average price of manufactured cigarettes, by price tier.

Price tiers	Weighted average price (95% CI), in THB	
	GATS 2009 (inflation-adjusted)	GATS 2011
1 (lower)	43.82 (42.66–44.98)	42.63 (41.76–43.50)
2 (middle)	53.05 (52.45–53.65)	61.72 (61.17–62.26)
3 (upper)	55.79 (54.13–57.44)	66.62 (65.01–68.23)

Note: Price tiers based on tertiles of weighted-average prices by brand.

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