

# The effect of price on cigarette consumption among youth in Indonesia: Implications for tobacco tax policy

*by* Ridhwan Fauzi

---

**Submission date:** 28-Mar-2023 05:30AM (UTC-0400)

**Submission ID:** 2048918443

**File name:** WMHP-Demand\_Youth.pdf (1.09M)

**Word count:** 6009

**Character count:** 31694

# The effect of price on cigarette consumption among youth in Indonesia: Implications for tobacco tax policy

Ridhwan Fauzi<sup>1,2</sup>  | Sathirakorn Pongpanich<sup>1</sup> 

23

<sup>1</sup>College of Public Health Sciences, Chulalongkorn University, Pathumwan, Bangkok, Thailand

<sup>2</sup>Faculty of Public Health, Universitas Muhammadiyah Jakarta, South Tangerang, Banten, Indonesia

## Correspondence

<sup>12</sup>Ridhwan Fauzi, Faculty of Public Health, Universitas Muhammadiyah Jakarta, Jl. K.H. Ahmad Dahlan, Cireundeu, Ciputat, South Tangerang City, Banten, Indonesia.  
 Email: ridhwanfauzi@umj.ac.id

<sup>19</sup>Sathirakorn Pongpanich, College of Public Health Sciences, Chulalongkorn University, Phayathai Road, Wangmai, Pathumwan, Bangkok, Thailand.  
 Email: sathirakorn.p@chula.ac.th

## Funding information

Chulalongkorn University Graduate School Thesis, Grant/Award Number: 2/2564

## Abstract

The study aimed to estimate cigarette price elasticity among youth in Indonesia. We used a two-part model to estimate the impact of price on smoking participation and smoking intensity on smokers. Data were obtained from National Socioeconomic Survey or *Survei Sosial Ekonomi Nasional* 2015, 2016, 2017, 2019, and 2020. This study included males and females aged 15–24 years from all districts. We controlled for socio-economic variables such as age, sex, education, working status, marital status, wealth quintile, place of residence, geographical region, and year of the survey. Price was negatively associated with cigarette consumption. The estimated total cigarette price elasticity was approximately  $-0.6740$ , meaning a 10% increase in price would reduce cigarette consumption by 6.74%. We also found that females were more sensitive to price change than males. This result indicated that the percentage change in demand for cigarettes among youth is less than the percentage change in price or inelastic. Therefore, a higher tariff and simpler tobacco tax structure is necessary to make cigarettes less affordable in Indonesia.

## KEYWORDS

cigarette, demand, Indonesia, price, tax, tobacco, youth

## Key points

- Price was negatively and significantly associated with youth smoking behavior, indicating that pricing policy through taxation would reduce smoking behavior among youth in Indonesia.
- The demand for cigarettes among youth in Indonesia was inelastic to price change. Thus, a substantial



increase in tobacco tax is necessary to make the cigarette price less affordable.

- A simpler tobacco tax structure is also needed to create less variability in cigarette prices. Hence, the smokers would not switch to a lowered price brand when the tobacco tax was increased.

## INTRODUCTION

Indonesia is an upper-middle-income country considered the tobacco industry's "Disneyland" (Webster, 2013). The country is the world's third-largest tobacco market, with almost 60 million smokers or 33.8% of the adult population (Kemenkes-Ministry of Health, 2019; Lian & Dorotheo, 2018). Most current adult smokers (77.7%) start smoking before 19 years old (Kemenkes-Ministry of Health, 2019). In the last two previous surveys conducted by the Ministry of Health, the smoking prevalence among children aged 10–14 years had elevated from 3.7% in 2013 to 4.9% in 2018, while in aged 15–19 years, the prevalence was 20.5% and 20.8%, respectively (Soerojo et al., 2020). In addition, the average age of smoking initiation was getting younger, from 17.2 in 2013 to 16.8 years in 2018 (Soerojo et al., 2020).

Price is a crucial determinant of cigarettes demand (NCI WHO, 2016). Empirical evidence has shown that an increase in cigarette price would reduce people's decision to smoke and the amount or number of cigarettes smoked by remaining smokers (NCI WHO, 2016). From an economic perspective, price elasticity is a measure of the change in the quantity of products consumed in response to the change in price, assuming other variables are constant. A prior study using aggregate consumption data suggested that cigarette price elasticity ranged from  $-0.037$  to  $-16.04$  in low- and middle-income countries (LMICs) of the Asia Pacific Region, meaning a 10% increase in price would reduce the number of cigarette consumption between 0.37% to 13.04% (Ho et al., 2018). Furthermore, the pricing intervention has more noticeable impact on youth than adults (NCI WHO, 2016). A previous study using the Global Youth Tobacco Survey (GYTS) from 17 LMICs revealed that youth's total cigarette price elasticity was approximately  $-2.11$ , which was more elastic than those found in adults (Kostova et al., 2011; NCI WHO, 2016).

There is no single optimal taxation system that is suitable for all countries (Yurekli, 2013). However, a simpler tax structure (unitary or single tax) is easier to administer (WHO, 2015). It prevents smokers from shifting the higher-taxed and higher-priced brands to lower-taxed and lower-priced brands (Ahsan et al., 2016). Moreover, the tax rates should be adjusted annually, taking into account inflation and income growth (WHO, 2015). Without regular adjustment, the real value of cigarettes price will fall over time (Chaloupka et al., 2012). Ultimately, WHO recommended that tobacco excise taxes account for at least 70% of the retail price (WHO, 2015).

Indonesia has one of the most complicated tobacco tax structures globally (Ahsan et al., 2016). It uses multitiert with different tariffs based on cigarette type, production scale, and retail price (Ahsan et al., 2016). Currently, there are eight specific tax tariffs, with the lowest of 115 Rupiah and the highest of 1065 Rupiah per stick (Kemenkeu-Ministry of Finance, 2021). In addition, the Indonesian government has increased the cigarette excise tax tariff every year since 2010, but in 2018 and 2019 (Soerojo et al., 2020). Recently, the Ministry of Finance announced on average a 12.5% increase in the cigarette excise tax tariff from January 1, 2022, onward (Kemenkeu-Ministry of Finance, 2021). However, the policy may have a limited impact on cigarette price and consumption, which could be reflected by a growing domestic cigarette production in the past decade (Soerojo et al., 2020). The Ministry of Finance recorded that cigarette production had increased from 317.8 billion in 2011 to



356.5 billion sticks in 2019 (Soerojo et al., 2020). Moreover, the complex excise taxes structure may create an opportunity for the tobacco industry to sell cigarettes at a wide range of prices (Ahsan et al., 2016). A study from the World Bank shows that the cigarette price in Indonesia was relatively more affordable in 2016 than in 2005 (Zheng et al., 2018). The government is planning to reform the excise tax system in Indonesia, but the implementation process is likely to be delayed due to political lobbying from tobacco industry (Bigwanto, 2019).

Although the burden of tobacco use is considerably high and smoking prevalence among youth is increasing in Indonesia, the literature examining the demand for cigarettes is limited, and no literature exists on youth. Ahsan et al. (2013) and Adioetomo and Djutaharta (2005) rely on the household as the unit of analysis to examine the effect of price on the demand for cigarettes in Indonesia. Household data, however, lack information on individual-level data. In fact, smoking is an individual-level decision rather than a household. Moreover, those studies may not be appropriate to estimate the current cigarette price elasticity as the tobacco tax system has changed in recent years, which inevitably impacts the market price of cigarettes (Ahsan et al., 2016; NCI WHO, 2016).

The paper estimates the cigarettes price elasticity among youth aged 15–24 years in Indonesia by using *Survey Sosial Ekonomi Nasional* (SUSENAS) or National Socio-economic Survey. The SUSENAS provides individual-level cigarettes consumption data as well as social determinants, which may affect the demand for consumption. This study addressed the need for evidence examining the impact of the price on cigarettes consumption among youth in Indonesia. The finding can be used to support tobacco excise tax reform advocacy and help the policymakers to improve tobacco control regulation in Indonesia.

## MATERIALS AND METHODS

### Data

The national socioeconomic survey is a major annual household survey organized by the Central Agency of Statistics Indonesia. The SUSENAS captures broad social and economic issues, including demographic, education, health, employment, housing, and information and technology (BPS-Statistics Indonesia, 2020). Although the SUSENAS is not panel data, it provides sufficient information on the time series of cross-sections. Since 2015, the SUSENAS has collected information on smoking behavior at the individual level. However, the SUSENAS 2018 did not gather smoking information because the data collection schedule was in the same year as Basic Health Research or Riset Kesehatan Dasar (RISKESDAS) 2018 conducted by the ministry of health. In addition, there is no change in tobacco control regulation as well as tobacco excise tax structure during the period of 2015–2015. Thus, this study used the pooled cross-sectional design derived from the SUSENAS 2015, 2016, 2017, 2019, and 2020.

The SUSENAS used a multistage sampling method. First, a total of 25%–40% of census blocks were systematically selected by probability proportional to the size depending on the type of residence and economic status of the households. Second, 10 households were systematically picked from each selected census block stratified by household head education level. The total participant was around one million individuals from 300,000 households in all districts in Indonesia (Adji & Asmanto, 2019). This study included all individuals aged 15–24 years who had complete smoking information. We excluded those who had ever attended special needs schools. The final participants were 886,521 male and female youth from the SUSENAS 2015, 2016, 2017, 2019, and 2020. The Research Ethics

Review Committee of Chulalongkorn University had granted an ethical review exemption for this study (COA number 040/2021).

## Dependent variables

The outcome variables were smoking participation<sup>1</sup> and smoking intensity<sup>8</sup>. The smoking participation was in binary format. The youth who smoked at least one<sup>16</sup> day in the past 30 days had coded as 1 and 0 otherwise. The smoking intensity was the number of cigarettes smoked during the past week conditional on being a smoker. These variables were derived from the SUSENAS. The empirical model of this study consists of the following equations:

$$P(\text{current smoking} = 1) = \Lambda(\beta'X), \quad (1)$$

$$\mu = \text{Exp}(\beta'X) \text{ if current smoking} > 0, \quad (2)$$

where  $\Lambda$  is the logistic distribution function,  $X$  is the explanatory variable, including price, age, sex, education, health problem, economic status, working status, marital status, place of residence, geographical region, year, and interaction term between price variable and year dummy variables<sup>42</sup> is the coefficient corresponding to the explanatory variables, and  $\mu$  is the predicted mean of the number of cigarettes consumed per week.

## Explanatory variables

All explanatory variables were obtained from the SUSENAS. The economic variables were household expenditure per capita and cigarette price. Those variables were measured in Rupiah, adjusted with the Consumer Price Index (CPI) 2020 (BPS-Statistics Indonesia, 2021). The household expenditure per capita was calculated from the estimated monthly expenditure household divided by the total of household members (Equation 3). The household expenditure per capita was then classified into five quintiles: lowest, low, middle, high, and highest. Household expenditure is preferable to measure the living standard of developing countries (O'Donnell et al., 2007):

$$\text{HEP}_{x,t} = \frac{\text{MHE}_{x,t} * \text{CPI}_{2020}}{\text{HM}_{x,t} * \text{CPI}_t}, \quad (3)$$

where HEP is the household<sup>21</sup> expenditure per capita of the household  $x$  in year  $t$ , MHE is the total monthly expenditure of household, HM is the number of a household member, and CPI is the consumer price index.

Cigarette price data were calculated from the average consumption price for cigarettes per stick among all households with cigarette expenditure in different locations. The location-specific price was assigned based on districts, type of residence, and the survey year in this study. Given that the market price data is unavailable, this approach is recommended to avoid the endogeneity problem (WHO, 2011).

We controlled sociodemographic variables including age, sex, working status, education (years of schooling), health problems, marital status, place of residence, and geographical region. In addition, female, urban, and not working were assigned as a reference category in the sex, place of residence, and working status variable, respectively. The participants were asked about their general health condition. The value of 1 was assigned to those who<sup>35</sup> reported having health problems affecting their daily activities during the past month. The marital status variable was categorized into never married, married, and divorced/widowed.

We also created a dummy variable for the region, including Sumatera (omitted variable), Java & Bali, central (NTB, Central Kalimantan and Sulawesi), and eastern region (NTT, Maluku and Papua.)

The general procedure to model pooled cross-sectional data includes time dummy variables in the analysis. This study employed the dummy variable for the survey year to control the unobservable time factor. The year 2015 was assigned as a reference variable. In addition, the government regularly increases the excise tax tariff during 2015–2020. This policy may impact the price of cigarettes each year. Therefore, we included the interaction term between the price variable and year dummy variables in the models.

## Statistical analysis

26

A two-part econometric model was employed to estimate the demand for cigarettes. The first part estimated smoking participation using the logit specification, while the second part estimated smoking intensity using the generalized linear model (GLMs). The Box–Cox and modified-park tests were performed to determine an appropriate link function and family distribution of the GLMs model. The results showed that log was an appropriate link function ( $\lambda = 0.3543$ ), while the suitable family distribution was Poisson. The model specification was then evaluated using Pregibon's link test. Ultimately, the total elasticity is the sum of smoking participation elasticity and smoking intensity elasticity. We also conducted the incremental analysis to approximate differential price elasticity by sex. The estimate of the coefficient was presented with a 95% confidence interval. All data analyses were performed using STATA v.16 software.

The total cigarettes price elasticity was obtained as follows:

$$\eta = \eta_p + \eta_i, \quad (4)$$

where  $\eta$  is the total cigarette price elasticity,  $\eta_p$  is the smoking participation elasticity, and  $\eta_i$  is the smoking intensity elasticity.

1

## RESULTS

Table 1 contains descriptive statistics of the characteristics of participants. Of the 886,521 participants, the proportion of males and females in the smoking participation model was nearly the same (48.47% vs. 51.43%). About 154,514 participants (17.43%) were categorized as current smokers. The estimated cigarette consumption per week was 75 sticks (52.93). Of the 154,514 current smokers, the majority (98.36%) were male. Almost three-quarters (74.87%) of smokers were currently working. The proportion of smokers from the poorest households was slightly higher (19.22%) than those from the richest (15.71%).

Table 2 shows a multivariate analysis of smoking participation specifications. Cigarette price, education, and living in urban had a negative effect on the chance of being smokers ( $p < 0.001$ ). Males were more likely to smoke cigarettes than females ( $p < 0.001$ ). Marital status, economic status, and geographical region were associated with current smoking status. Afterward, age and working status were positively associated with smoking participation.

Price and education were also negatively associated with the smoking intensity among smokers, while age had a positive association. Working status, health problems, geographical region, and type of residence were also associated with the number of cigarettes smoked in a week among smokers. Male smokers smoked more quantity of

**TABLE 1** Characteristics of participants

Variables	Smoking participation	Smoking intensity
Observation	886,521	154,514
Cigarette prices (Indonesian rupiah), mean (SD)	1043.94 (266.56)	1028 (248.45)
Age in years, mean (SD)	19.08 (2.91)	20.74 (2.43)
<b>Sex, <i>n</i> (%)</b>		
<b>Female</b>	429,703 (48.47)	2534 (1.64)
<b>Male</b>	45,653 (51.43)	886,980 (98.36)
Education in years, mean (SD)	10.45 (3.01)	9.75 (3.28)
Health problem, <i>n</i> (%)		
No	727,682 (82.08)	128,834 (83.38)
Yes	158,839 (17.92)	25,680 (16.62)
Economic status, <i>n</i> (%)		
Poorest	200,830 (22.65)	29,699 (19.22)
Poorer	193,111 (21.78)	33,734 (21.83)
Middle	181,698 (20.50)	34,657 (22.43)
Richer	166,519 (18.78)	32,144 (20.80)
Richest	144,363 (16.28)	24,280 (15.71)
Working status, <i>n</i> (%)		
No	564,625 (64.39)	38,828 (25.13)
Yes	321,896 (36.31)	115,686 (74.87)
<b>Marital status</b>		
<b>Never married</b>	740,722 (83.55)	126,164 (81.65)
<b>Married</b>	139,313 (15.71)	27,264 (17.65)
<b>Divorced/widowed</b>	6486 (0.73)	1086 (0.70)
<b>Smoking status, <i>n</i> (%)</b>		
No	732,007 (82.57)	N/A
Yes	154,514 (17.43)	N/A
Cigarette consumption per week, mean (SD)	N/A	75.19 (52.93)
Place of residence, <i>n</i> (%)		
Rural	493,832 (55.70)	92,128 (59.62)
Urban	392,689 (44.30)	62,386 (40.38)
Cigarette price per stick, mean (SD)	1043.94 (266.56)	1028.33 (246.45)
Region, <i>n</i> (%)		
Sumatera	261,048 (29.45)	45,265 (29.30)
Java and Bali	264,611 (29.85)	49,640 (32.13)

TABLE 1 (Continued)

Variables	Smoking participation	Smoking intensity
Central	236,571 (26.69)	40,763 (26.38)
Eastern	124,291 (14.02)	18,846 (12.20)
Year of survey, <i>n</i> (%)		
2015	166,778 (18.81)	29,314 (18.97)
2016	169,721 (19.14)	28,100 (18.19)
2017	174,157 (19.64)	31,122 (20.14)
2019	184,088 (20.77)	32,660 (21.14)
2020	191,777 (21.63)	33,318 (21.56)

cigarettes than their counterparts. Those who had married were more likely to smoke more cigarettes than those who never married, but no association was found among those who had divorced or widowed. Higher-income smokers consumed more cigarettes per week than lower-income smokers (Table 3).

As shown in Table 4, the cigarette price elasticity was approximately  $-0.6740$ , indicating that a 10% increase in price was associated with a 6.74% reduction in overall cigarette consumption. Furthermore, the results revealed that the demand for cigarettes among females was more sensitive to price change than males ( $-0.7703$  vs.  $-0.6204$ ).

## DISCUSSION

We estimated that a 10% increase in price would reduce 6.74% of cigarette consumption among youth aged 15–24 years in Indonesia. In this study, the smoking participation elasticity is slightly lower than in the previous study among the general public, ranging from  $-0.42$  to  $-0.51$  (Sahadewo et al., 2018). These results are not surprising because youth usually spend a higher share of disposable income buying cigarettes than adults (NCI WHO, 2016). Thus, they are more responsive to the price change than adult smokers. In addition, the duration of smoking is associated with the severity of nicotine tolerance (USDHSS, 2014). The majority of current adult smokers start smoking before the age of 19 years, meaning youth have a relatively shorter duration of smoking than adult smokers (Soerojo et al., 2020). Therefore, youth are less addicted to cigarettes, suggesting they may be more sensitive to the price change than adults (NCI WHO, 2016).

Our analysis measured the price variable in single sticks/loose cigarettes rather than in a pack. Unlike in other countries, a majority (71.3%) of youth smokers in Indonesia purchased the cigarettes as individual sticks (Kemenkes WHO CDC, 2020). Single stick cigarettes make the product more affordable for youth. The prices varied between 1000 to 2500 Rupiah or less than US\$0.1 per stick (Kemenkes WHO CDC, 2020). Although the government regulation number 109, the year 2012, has banned the sale of single stick cigarettes, most (60%) of the youth smokers were never refused to purchase cigarettes because of their age (Kemenkes WHO CDC, 2020; Soerojo et al., 2020). In addition, selling loose cigarettes may increase the availability of cigarettes. A study in Denpasar City found that a total of 67% of retailers within a 250-m radius of a school reported selling cigarettes as single sticks (Astuti et al., 2019). Therefore, the loose cigarette selling is one of the most crucial issues that hinder the reduction of tobacco consumption among youth in Indonesia.



**TABLE 2** Smoking participation model, coefficient, and 95% confidence interval

<b>Explanatory variables</b>	<b>Coefficient</b>	<b>95% Confidence interval</b>
Price	-0.0004	-0.0005; -0.0003
Sex		
Female	Ref.	
Male	4.8049	4.7609; 4.8488
Age	0.2602	0.2571; 0.2633
Health problem		
No	Ref.	
Yes	0.0846	0.0652; 0.1040
Education	-0.1245	-0.1271; -0.1219
Working status		
No	Ref.	
Yes	1.1787	1.1623; 1.1951
Marital status		
Never married	Ref.	
Married	0.4043	0.3778; 0.4308
Divorced/widowed	0.6977	0.5868; 0.8087
Economic status		
Poorest	Ref.	
Poorer	0.3078	0.2855; 0.3301
Middle	0.4883	0.4657; 0.5108
Richer	0.5740	0.5507; 0.5973
Richest	0.5156	0.4908; 0.5425
Type of residence		
Rural	Ref.	
Urban	-0.1361	-0.1523; -0.1198
Region		
Sumatera	Ref.	
Java and Bali	0.2640	0.2452; 0.2828
Central	-0.0704	-0.0894; -0.0514
Eastern	-0.1330	-0.1613; -0.1046
Year of survey		
2015	Ref.	
2016	-0.0990	-0.2078; 0.0098
2017	0.1196	0.0108; 0.2285

TABLE 2 (Continued)

Explanatory variables	Coefficient	95% Confidence interval
2019	0.0788	-0.0248; 0.1825
2020	0.0792	-0.0176; 0.1760
Year × price <sup>a</sup>		
2015	Ref.	
2016	0.0001	-0.00003; 0.0002
2017	0.00001	-0.0001; 0.0001
2019	0.0001	-0.00003; 0.0002
2020	0.0001	-0.00002; 0.0002
Constant	-9.9755	-10.0799; -9.8712

<sup>a</sup>Interaction term between price variable and year dummy variables.

33 Another important finding is that higher economic status increased the likelihood of smoking participation and the number of cigarettes smoked among smokers. The result is not surprising because cigarettes are legal, and smoking is normal and socially acceptable in Indonesia (Astuti et al., 2020). The economic theory suggests that as the income increases, the demand for normal products increases as well (IARC, 2011). In addition, the youth from wealthier families may have more disposable income to buy cigarettes than their counterparts. Some studies use pocket money as a proxy to measure the economic status of youth (Cui et al., 2019; Kostova et al., 2011). A previous study in Canada found that the amount of pocket money was positively associated with smoking initiation and smoking intensity among students in Grades 7–12 (Cui et al., 2019).

The current study revealed that females were more responsive to price change than males (-0.7703 vs. -0.6204). There are two possible explanations for this result. First, smoking behavior in females may relate to traditional cultural values in Indonesia. Social approval is a significant predictor of smoking continuation/cessation among youth (Vallata et al., 2021). Smoking is viewed as unacceptable behavior for females in Indonesia (Barracough, 1999). Thus, females might have less incentive to stick up smoking behavior than males if the cigarette price increases. Females also have minor bargaining power in household spending decision-making (Pangaribowo & Sukamdi, 2019). This situation may render it more difficult for females to continue smoking. Second, females may consider smoking a luxury, making them more likely to smoke premium brands. A study in Surabaya City showed that white machine-rolled cigarettes were the most commonly smoked cigarette among females, followed by kreteks (Hardesty et al., 2019). According to the current cigarette tax structure, white cigarettes are subjected to the highest tax tariff (Kemenkeu-Ministry of Finance, 2020). Hence, white cigarettes are the most expensive type of cigarettes. In addition, white cigarette tax evasion usually increases at a higher rate than kreteks and hand-rolled cigarettes, making the white cigarette less affordable over the years (Kemenkeu-Ministry of Finance, 2020).

This is the first study to estimate price elasticity among youth in Indonesia. However, it is subject to some limitations. First, the smoking behavior was obtained from the self-report, which is prone to reporting and recall bias. However, the sensitivity and specificity of self-report are still considerably high in assessing the smoking behavior in youth (Dolcini et al., 2003). Second, in the model, we do not include the following variables, which may affect smoking participation and intensity, such as tobacco advertising/promotion exposure,

**TABLE 3** Smoking intensity model, coefficient, and 95% confidence interval

<b>Explanatory variables</b>	<b>Coefficient</b>	<b>95% Confidence interval</b>
Price	-0.0003	-0.0004; -0.0003
Sex		
Female	Ref.	
Male	0.0342	0.0033; 0.0652
Age	0.0275	0.0260; 0.0290
Health problem		
No	Ref.	
Yes	-0.0636	-0.0728; -0.0545
Education	-0.0152	-0.0162; -0.0141
Working status		
No	Ref.	
Yes	0.2453	0.2362; 0.2545
Marital status		
Never married	Ref.	
Married	0.0601	0.0515; 0.0688
Divorced/widowed	0.0333	-0.0008; 0.0674
Economic status		
Poorest	Ref.	
Poorer	0.2187	0.2077; 0.2297
Middle	0.3185	0.3076; 0.3294
Richer	0.4075	0.3964; 0.4185
Richest	0.5106	0.4982; 0.5230
Type of residence		
Rural	Ref.	
Urban	-0.0890	-0.0967; -0.0814
Region		
Sumatera	Ref.	
Java and Bali	-0.2176	-0.2260; -0.2092
Central	-0.0247	-0.0328; -0.0165
Eastern	-0.3321	-0.3482; -0.3160
Year of survey		
2015	Ref.	
2016	-0.0024	-0.0705; 0.0657
2017	0.1087	0.0498; 0.1677

**TABLE 3** (Continued)

Explanatory variables	Coefficient	95% Confidence interval
2019	0.2333	0.1733; 0.2933
2020	0.1644	0.1058; 0.2231
Year × price <sup>a</sup>		
2015	Ref.	
2016	0.0001	0.00003; 0.0002
2017	-0.00004	-0.0001; 0.00003
2019	-0.0001	-0.0002; -0.0001
2020	-0.0001	-0.0001; 0.000001
Constant	3.7452	3.6981; 3.8249

<sup>a</sup>Interaction term between price variable and year dummy variables.

**TABLE 4** Cigarette price elasticity sex and coefficient (95% confidence interval)

	Cigarette price elasticity		
	Smoking participation	Smoking intensity	Total
Overall	-0.3130 (-0.3473; -0.2788)	-0.3610 (-0.3850; -0.3369)	-0.6740
Sex			
Female	-0.3756 (-0.4166; -0.3346)	-0.3947 (-0.4209; -0.3685)	-0.7703
Male	-0.2600 (-0.2885; -0.2315)	-0.3604 (-0.3844; -0.3364)	-0.6204

antismoking sentiment, antitobacco media exposure, peer influence, and access to buy cigarettes. Those variables are not available in the SUSENAS data sets. Third, the SUSENAS may not be appropriate to describe the overall tobacco prevalence in Indonesia. Unlike RISKESDAS, the SUSENAS do not take into account the consumption of other tobacco products such as rolled my own cigarettes, electronic cigarettes, and shisha. However, it is still valid to measure cigarettes consumption in Indonesia.

## CONCLUSIONS

The present study was designed to determine the role of price in cigarette consumption among youth in Indonesia. We found that price had a negative impact on cigarette consumption among youth. This result indicates that pricing policy through taxation would be effective in reducing smoking behavior among youth. We also estimated that cigarette price elasticity was approximately -0.68, which means demand for cigarettes is inelastic to the price change. An increase in cigarette price would not change cigarette consumption as much as its change in price. Thus, we first recommend that the Ministry of Finance simplify the tobacco taxation structure. A simpler taxation structure would create less variability in cigarette prices across brands. This could make smokers more difficult to switch brands when the tax is increased. A study by Prasetyo and Adrison (2020) using transactional data of cigarettes brands produced in Indonesia from 2005 to 2017 found that tax tiers were negatively associated with cigarette prices in Indonesia (Prasetyo & Adrison, 2020). Second,

the annual cigarette tax rate increase should be higher<sup>28</sup> than the income growth. An optimal tax increase would make cigarettes less affordable as well as generate additional revenue for the government. Third, we recommended the local government strengthen the enforcement of single/loose cigarettes selling banned regulation. Banning the selling of cigarettes as single sticks could significantly reduce the affordability and availability of cigarettes. Moreover, further<sup>18</sup> studies would be interesting to assess the impact of combination pricing and other tobacco control policy such as advertisement ban, smoke-free area regulations, and pictorial health warnings on cigarette packs.

13

### ACKNOWLEDGMENT

This study was partially supported by the Chulalongkorn University Graduate Research Scholarship.

3

### CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

### DATA AVAILABILITY STATEMENT

Data were obtained from the Central Agency of Statistics Indonesia (BPS) and cannot be shared with third parties according to an agreement signed by BPS and the author (Ridhwan Fauzi). The data (described in this article) can be obtained by request to BPS.

7

### ETHICS STATEMENT

The study was exempted from ethical review according to The Research Ethics Review Committee of Chulalongkorn University (COA number 040/2021).

### AUTHOR BIOGRAPHIES

24

**Ridhwan Fauzi** is a doctoral student at the College of Public Health Sciences, Chulalongkorn University, Thailand, and a lecturer at the Faculty of Public Health, Universitas Muhammadiyah Jakarta, Indonesia.

**Sathirakorn Pongpanich** is a professor at the College of Public Health Sciences, Chulalongkorn University, Thailand.

### REFERENCES

- Adioetomo, S. M., Djutaharta, T., & Hendratno, K. (2005). *Cigarette consumption, taxation, and household income: Indonesia case study*. The World Bank.
- Adji, A., & Asmanto, P. (2019). *Harmonisation of susenas and riskesdas*. The National Team for The Acceleration of Poverty Reduction.
- Ahsan, A., Wiyono, N. H., Kiting, A. S., Djutaharta, T., & Aninditya, F. (2013). *Impact of increasing tobacco tax on government revenue and tobacco consumption*. USAID.
- Ahsan, A., Wiyono, N. H., Toersilarningsih, R., Asmanedi, Kiting, A. S., & Aninditya, F. (2016). *Tobacco excise policy reform: An initiative for healthy Indonesia*. Lembaga Demografi, Faculty of Economics and Business Universitas Indonesia.
- Astuti, P. A. S., Assunta, M., & Freeman, B. (2020). Why is tobacco control progress in Indonesia stalled?—A qualitative analysis of interviews with tobacco control experts. *BMC Public Health*, 20(1), 527. <https://doi.org/10.1186/s12889-020-08640-6>
- Astuti, P. A. S., Mulyawan, K. H., Sebayang, S. K., Kurniasari, N., & Freeman, B. (2019). Cigarette retailer density around schools and neighbourhoods in Bali, Indonesia: A GIS mapping. *Tobacco Induced Diseases*, 17, 55. <https://doi.org/10.18332/tid/110004>
- Barracough, S. (1999). Women and tobacco in Indonesia. *Tobacco Control*, 8(3), 327–332. <https://doi.org/10.1136/tc.8.3.327>

- Bigwanto, M. (2019). *Tobacco industry interference undermined tobacco tax policy in Indonesia*. Southeast Asia Tobacco Control Alliance (SEATCA).
- BPS-Statistics Indonesia. (2020). *Survei Sosial Ekonomi Nasional (SUSENAS) Kor, 2020*. Central Agency of Statistics.
- BPS-Statistics Indonesia. (2021). *Statistical yearbook of Indonesia 2021*. Central Agency of Statistics.
- Chaloupka, F. J., Yurekli, A., & Fong, G. T. Tobacco taxes as a tobacco control strategy. *Tobacco Control* 2012; 21(2):172-180. <https://doi.org/10.1136/tobaccocontrol-2011-050417>
- Cui, Y., Forget, E. L., Zhu, Y., Torabi, M., & Oguzoglu, U. (2019). The effects of cigarette price and the amount of pocket money on youth smoking initiation and intensity in Canada. *Canadian Journal of Public Health*, 110(1), 93–102. <https://doi.org/10.17269/s41997-018-0123-9>
- Dolcini, M. M., Adler, N. E., Lee, P., & Bauman, K. E. (2003). An assessment of the validity of adolescent self-reported smoking using three biological indicators. *Nicotine & Tobacco Research: Official Journal of the Society for Research on Nicotine and Tobacco*, 5(4), 473–483.
- Hardesty, J. J., Kaplan, B., Martini, S., Megatsari, H., Kennedy, R. D., & Cohen, J. E. (2019). Smoking among female daily smokers in Surabaya, Indonesia. *Public Health*, 172, 40–42. <https://doi.org/10.1016/j.puhe.2019.03.007>.
- Ho, L. M., Schafferer, C., Lee, J. M., Yeh, C. Y., & Hsieh, C. J. (2018). Raising cigarette excise tax to reduce consumption in low-and middle-income countries of the Asia-Pacific region: A simulation of the anticipated health and taxation revenues impacts. *BMC Public Health*, 18(1), 1187. <https://doi.org/10.1186/s12889-018-6096-z>.
- IARC. (2011). *IARC handbooks of cancer prevention; Effectiveness of tax and price policies for tobacco control*. International Agency for Research on Cancer (IARC).
- Kemenkes, WHO, CDC. (2020). *Fact sheet Global Youth Tobacco Survey (GYTS) Indonesia 2019*.
- Kemenkes-Ministry of Health. (2019). *Laporan Nasional Riskesdas, 2018*. Lembaga Penerbit Badan Penelitian dan Pengembangan Kesehatan (LPB).
- Kemenkeu-Ministry of Finance. (2020). *Peraturan Menteri Keuangan nomor 198/PMK.011/2020 tentang tarif cukai hasil tembakau*. Ministry of Finance Republic of Indonesia.
- Kemenkeu-Ministry of Finance. (2021). *Peraturan Menteri Keuangan nomor 192/PMK.010/2021 tentang tarif cukai hasil tembakau berupa sigaret, cerutu, rokok daun atau klobot, dan tembakau iris*. Ministry of Finance Republic of Indonesia.
- Kostova, D., Ross, H., Blecher, E., & Markowitz, S. (2011). Is youth smoking responsive to cigarette prices? Evidence from low- and middle-income countries. *Tobacco Control*, 20(6), 419–424. <https://doi.org/10.1136/tc.2010.038786>.
- Lian, T. Y., & Dorotheo, E. U. (2018). *The Tobacco Control Atlas: ASEAN region (4th edn)*. Southeast Asia Tobacco Control Alliance (SEATCA).
- NCI, WHO. (2016). *The economics of tobacco and tobacco control*. Department of Health and Human Services.
- O'Donnell, O., vanDoorslaer, E., Wagstaff, A., & Lindelow, M. (2007). *Analyzing health equity using household survey data: A guide to techniques and their implementation*. The World Bank.
- Pangaribowo, E. H., & Sukamdi, T. D. (2019). Women's bargaining power and household expenditure in Indonesia: the role of gender-differentiated assets and social capital. *GeoJournal*, 84(4), 939–960. <https://doi.org/10.1007/s10708-018-9901-4>
- Prasetyo, B. W., & Adrison, V. (2020). Cigarette prices in a complex cigarette tax system: Empirical evidence from Indonesia. *Tobacco Control*, 29(6), 618–623. <https://doi.org/10.1136/tobaccocontrol-2018-054872> [published Online First: 2019/06/30]
- Sahadewo, G. A., Iglesias, R., Araujo, E. C., Nargis, N., Harimurti, P., Drope, J., Li, Q., Durazo, J., Witoelar, F., & Sikoki, B. (2018). *The economics of tobacco taxation and employment in Indonesia; Health, population, and nutrition global practice*. World Bank Group.
- Soerojo, W., Bigwanto, M., Susilo, D., & Wiyono, N. H. (2020). *Fakta tembakau Indonesia 2020 data empirik untuk pengendalian tembakau*. Ikatan Ahli Kesehatan Masyarakat Indonesia (IAKMI).
- USDHSS. (2014). *The health consequences of smoking: 50 years of progress. A report of the surgeon general*. US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.
- Vallata, A., O'Loughlin, J., Cengelli, S., & Alla, F. (2021). Predictors of cigarette smoking cessation in adolescents: A systematic review. *Journal of Adolescent Health*, 68(4), 649–657. <https://doi.org/10.1016/j.jadohealth.2020.09.025>
- Webster, P. C. (2013). Indonesia: The tobacco industry's "Disneyland". *Canadian Medical Association Journal*, 185(2), E97–E98. <https://doi.org/10.1503/cmaj.109-4342>
- WHO. (2011). *WHO report on the global tobacco epidemic, 2011; Warning about the dangers of tobacco*. WHO Press.
- WHO. (2015). *WHO report on the global tobacco epidemic, 2015; Raising taxes on tobacco*. WHO Press.

Yurekli, A. (2013). *Economics of Tobacco Toolkit, Tool 4: Design and administer tobacco taxes*. The World Bank.  
Zheng, R., Marquez, P. V., Ahsan, A., Hu, X., & Wang, Y. (2018). *Cigarette affordability in Indonesia 2002–2017*. The World Bank.

**How to cite this article:** Fauzi, R., Pongpanich, S. (2022). The effect of price on cigarette consumption among youth in Indonesia: Implication for tobacco tax policy. *World Medical & Health Policy*, 1–14. <https://doi.org/10.1002/wmh3.516>

# The effect of price on cigarette consumption among youth in Indonesia: Implications for tobacco tax policy

## ORIGINALITY REPORT

17%

SIMILARITY INDEX

13%

INTERNET SOURCES

10%

PUBLICATIONS

5%

STUDENT PAPERS

## PRIMARY SOURCES

- 1 Moin Uddin Ahmed, Mohammad Habibullah Pulok, Rubayyat Hashmi, Mohammad Hajizadeh, Nigar Nargis. "Price and income elasticities of cigarettes smoking demand in Bangladesh: Evidence from urban adolescents and young adults", *Nicotine & Tobacco Research*, 2021  
Publication 1%
- 2 [www.tobaccoinduceddiseases.org](http://www.tobaccoinduceddiseases.org)  
Internet Source 1%
- 3 Submitted to Liverpool John Moores University  
Student Paper 1%
- 4 [cancercontrol.cancer.gov](http://cancercontrol.cancer.gov)  
Internet Source 1%
- 5 Faizal Rahmanto Moeis, Renny Nurhasana, Fandy Rahardi, Danty Novitasari et al. "The Framework Convention on Tobacco Control (FCTC) and implementation of tobacco control policies: Lessons learned from Indonesia and Thailand", *World Medical & Health Policy*, 2022 1%



---

6	D. Kostova. "Is youth smoking responsive to cigarette prices? Evidence from low- and middle-income countries", Tobacco Control, 11/01/2011 Publication	1 %
7	9pdf.net Internet Source	<1 %
8	journals.plos.org Internet Source	<1 %
9	Submitted to Oxford Brookes University Student Paper	<1 %
10	www.igscpp.org Internet Source	<1 %
11	openknowledge.worldbank.org Internet Source	<1 %
12	publikasi.dinus.ac.id Internet Source	<1 %
13	theses.gla.ac.uk Internet Source	<1 %
14	www.journaltocs.ac.uk Internet Source	<1 %
15	www.seatca.org Internet Source	<1 %
16	academic.oup.com Internet Source	<1 %

---

17	<a href="http://www.mdpi.com">www.mdpi.com</a> Internet Source	<1 %
18	Ridhwan Fauzi, Chitlada Areesantichai. "Factors associated with electronic cigarettes use among adolescents in Jakarta, Indonesia", Journal of Health Research, 2020 Publication	<1 %
19	Awirut Charoensappakit, Pongpratch Puapatanakul, Kearnkiat Praditpornsilpa, Attakorn Palasuwan et al. "Urinary red blood cell - derived microparticles and phosphatidylserine - exposing red blood cells in glomerular and non - glomerular hematuria patients", Cytometry Part B: Clinical Cytometry, 2022 Publication	<1 %
20	<a href="http://documents1.worldbank.org">documents1.worldbank.org</a> Internet Source	<1 %
21	<a href="http://media.neliti.com">media.neliti.com</a> Internet Source	<1 %
22	Submitted to University of New South Wales Student Paper	<1 %
23	Submitted to Suan Dusit Rajabhat University Student Paper	<1 %
24	<a href="http://hiv-aids-std.conferenceseries.com">hiv-aids-std.conferenceseries.com</a> Internet Source	<1 %

25

Internet Source

<1 %

26

Submitted to African Tax Administration Forum

Student Paper

<1 %

27

[bmcpublichealth.biomedcentral.com](http://bmcpublichealth.biomedcentral.com)

Internet Source

<1 %

28

[seatca.org](http://seatca.org)

Internet Source

<1 %

29

[www.nveo.org](http://www.nveo.org)

Internet Source

<1 %

30

[ses.library.usyd.edu.au](http://ses.library.usyd.edu.au)

Internet Source

<1 %

31

[fema.ipb.ac.id](http://fema.ipb.ac.id)

Internet Source

<1 %

32

Bagus Wahyu Prasetyo, Vid Adrison.  
"Cigarette prices in a complex cigarette tax system: empirical evidence from Indonesia",  
Tobacco Control, 2019

Publication

<1 %

33

Submitted to King's College

Student Paper

<1 %

34

[dokumen.tips](http://dokumen.tips)

Internet Source

<1 %

35

[escholarship.org](http://escholarship.org)

Internet Source

<1 %

36	<a href="http://formative.jmir.org">formative.jmir.org</a> Internet Source	<1 %
37	<a href="http://healthdocbox.com">healthdocbox.com</a> Internet Source	<1 %
38	<a href="http://mgaleg.maryland.gov">mgaleg.maryland.gov</a> Internet Source	<1 %
39	<a href="http://pediatrics.jmir.org">pediatrics.jmir.org</a> Internet Source	<1 %
40	<a href="http://repository.ubn.ru.nl">repository.ubn.ru.nl</a> Internet Source	<1 %
41	<a href="http://www.econstor.eu">www.econstor.eu</a> Internet Source	<1 %
42	Cuong Viet Nguyen, Thu Thi Le, Nguyen Hanh Nguyen, Ky The Hoang. "Socioeconomic inequality in smoking: Evidence from a decomposition analysis", Clinical Epidemiology and Global Health, 2023 Publication	<1 %
43	Neni Susilawati, Daffa Abyan, Sabrina Cristalia Aruan, Marcel Angwyn. "Does the increase in the cigarette excise tax affect cigarette consumption?", International Journal of Public Health Science (IJPHS), 2022 Publication	<1 %
44	Xiaoyang Dong, Libin Chen, Yi Liu, Li Zhao, Weidong Wang. "Effects of pocket money	<1 %

on weight status among junior high school students: a longitudinal study in China",  
Research Square Platform LLC, 2022

Publication

---

45	<a href="https://apps.who.int">apps.who.int</a> Internet Source	<1 %
46	<a href="https://open.uct.ac.za">open.uct.ac.za</a> Internet Source	<1 %
47	<a href="https://scholarcommons.sc.edu">scholarcommons.sc.edu</a> Internet Source	<1 %
48	<a href="https://tobacco21.org">tobacco21.org</a> Internet Source	<1 %
49	<a href="https://tobacconomics.org">tobacconomics.org</a> Internet Source	<1 %

---

Exclude quotes On

Exclude matches Off

Exclude bibliography On

# The effect of price on cigarette consumption among youth in Indonesia: Implications for tobacco tax policy

---

## GRADEMARK REPORT

---

FINAL GRADE

**/0**

GENERAL COMMENTS

**Instructor**

---

PAGE 1

---

PAGE 2

---

PAGE 3

---

PAGE 4

---

PAGE 5

---

PAGE 6

---

PAGE 7

---

PAGE 8

---

PAGE 9

---

PAGE 10

---

PAGE 11

---

PAGE 12

---

PAGE 13

---

PAGE 14

---