

EXPLORING THE DEMAND FOR CIGARETTES: AN ANALYSIS OF ADULTS IN MALAYSIA

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ABSTRACT

Smoking is an alarming public health issue in today's rapidly urbanising society. The objective of the present study is to investigate factors associated with the demand for cigarettes among adults in Malaysia, i.e., an ASEAN country. Statistical analyses were performed using nationally representative data with a large sample. In terms of multivariate analysis, a Tobit model was used to examine the effects of sociodemographic factors on expenditure on cigarettes. Both conditional and unconditional expectations were estimated. We found that age, gender, wealth index, education and house locality were significantly associated with expenditure on cigarettes. The elderly spent less on cigarettes compared with young adults. Males and less-educated individuals spent more on cigarettes than females and well-educated individuals. There was a positive relationship between residing in urban areas and cigarettes expenditure. In conclusion, sociodemographic factors play an important role in determining the demand for cigarettes. Findings of the present study show that a successful anti-smoking policy should be targeted primarily at individuals who spend a large amount of money on cigarettes.

Keywords: age; ASEAN; cigarette; education; gender; smoking

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1. INTRODUCTION

It is well evident that cigarette smoking is a serious public health issue across the globe, including the ASEAN countries. There is strong evidence suggesting that smoking can elevate the risks of stroke, chronic obstructive pulmonary disease and other heart diseases by 40-50% (Thakur et al., 2011). Cigarette smokers are approximately three times more likely to develop coronary heart

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disease and lung cancer compared with non-smokers (Thakur et al., 2011). Each year, smoking-induced diseases cause five million mortalities, and this figure is estimated to reach ten million by 2030 (World Health Organization, 2012a). The burden attributable to smoking is more serious in developing countries than developed countries given that 80% of smoking related deaths occur in developing countries (World Health Organization, 2011; World Health Organization, 2012a; Lim et al., 2013).

In Malaysia, i.e., an ASEAN country, nearly one-fourth of mortalities are related to smoking, accounting for nearly ten thousand deaths yearly (Lim et al., 2009; Tan, 2012). The World Health Organization (2012b) showed that almost five million Malaysian adults were cigarette smokers in 2011 (World Health Organization, 2012b). In terms of the public health burdens, smoking induced diseases were responsible for 15% of total government hospital admissions in 2006 (Institute for Public Health, 2008). Worse still, each year, approximately Ringgit Malaysia (RM) 1 billion are allocated by government for treating smoking-induced diseases (Tan, 2012). A latest study conducted by Tan et al. (2020) found that smoking had serious negative impacts on health and work productivity among Malaysian adults. In particular, smoking caused RM 275.3 billion loss of productivity, 5.5 million quality-adjusted life years and 3 million disability-adjusted life years. In view of the seriousness of smoking issue in Malaysia, the government has implemented several policies to curb smoking. These include tax on cigarettes, prohibition of smoking in public places, ban on cigarette advertising, implementation of pictorial warnings on cigarette packs, imposition of minimum age of purchasing cigarettes and prohibiting the sales of loose cigarettes.

In response to the global policy priority of reducing the prevalence of smoking, there is a growing literature suggesting that sociodemographic factors are significantly associated with smoking. Hersch (2000) drew on the Current Population Survey (CPS) data and found that income, level of education and being married had negative impacts on cigarette consumption. Manrique and Jensen (2004), in examining factors associated with tobacco consumption in Spain, found that higher income households and households with male or employed heads were more likely to smoke compared to lower income households and households headed by females or the unemployed. Based on primary survey data of Greece, Raptou et al. (2005) found that women were more likely to consume tobacco but consumed less compared to men. Furthermore, the authors found that income had a positive impact on the likelihood of smoking. Yen (2005) using data from the 1994-1996 Continuing Survey of Food Intakes by Individuals (CSFII) found that age and educational level were negatively associated with smoking.

Using data from the German Socio-Economic Panel (SOEP), Bauer et al. (2007) found that unemployed individuals, rural dwellers and higher income earners had a lower likelihood of smoking compared to employed individuals, urban dwellers and lower income earners. A study conducted in Pakistan suggested that males were more likely to smoke compared with females, less-educated adults were more likely to smoke than well-educated adults, and rural dwellers had a higher likelihood of smoking than urban dwellers (Alam et al., 2008). Aristei and Pieroni (2008) used the 2002 Italian Household Budget Survey (IHBS) and observed that households headed by well-educated individuals, older adults and males were less likely to smoke and smoked less than households headed by less-educated individuals, younger adults and females. Using the Social Statistic Survey data of Korea, Cho et al. (2008) identified that marriage and education lowered the propensity to smoke. Drawing data from the 2003 Turkish Household Expenditure Survey, Bilgic et al. (2010) found that being unmarried, females, age, educational level and being employed

were negatively associated with smoking. Lin (2010) using data of the 2004 Taiwan Panel Study of Family found that males, younger individuals, less-educated individuals and unmarried adults were more likely to smoke relative to females, older individuals, well-educated individuals and married adults.

Based on nationwide data of Malaysia, Cheah and Naidu (2012) found that age, income, females and being married were negatively correlated with smoking. Furthermore, non-Malays, urban dwellers, unemployed adults and well-educated individuals had a lower propensity to smoke than Malays, rural dwellers, employed adults and less-educated individuals. In another Malaysian study, Tan (2012) found that older, well-educated and higher income individuals were less likely to smoke than younger, less-educated and lower income individuals. Moreover, rural dwellers and males had a higher likelihood of smoking than urban dwellers and females. In a more recent study, Lim et al. (2017) using Malaysian adolescent data found that the likelihood of smoking was higher among male adolescents and those having poor academic performance and parents who smoked cigarettes compared to female adolescents and those having good academic performance and parent who did not smoke. Another adolescent study was conducted by Nur Atikah et al. (2019). The authors found that males, Bumiputera and younger adolescents were more likely to smoke than females, non-Bumiputera and older adolescents. Using a dataset of secondary school students, Li et al. (2020) found that males, adolescents having parents who were less supportive or smoked cigarettes were more likely to smoke relative to females and adolescents with parents who were more supportive or did not smoke cigarettes.

The research gap that exists is that previous Malaysian studies did not focus on expenditure on cigarettes, that is, the burden faced by smokers, and the latest research only focused on adolescent and did not pay attention to adult population. In an effort to narrow this research gap, our objective is to examine factors associated with expenditure on cigarettes among adults in Malaysia. We use a rigorous statistical approach and nationally representative data that consist of a large sample size for an in-depth analysis, thus, important findings can be generated. Our study is different from previous studies, which devoted their attention to adolescent sample (Lim et al., 2017; Nur Atikah et al., 2019; Li et al., 2020), and did not explore factors determining expenditure on cigarettes in great detail (Cheah & Naidu, 2012; Tan, 2012). Furthermore, given that previous studies related to smoking were rarely conducted in the ASEAN countries, especially in Malaysia (Hersch, 2000; Manrique & Jensen, 2004; Yen, 2005; Bauer et al., 2007; Lin, 2010), our findings offer new knowledge of which groups of people in Malaysia spend more or less on cigarettes. This can assist public policy makers in formulating more effective population-based intervention strategies. As a result, the health and well-being of Malaysian population can be improved substantially.

2. THEORETICAL MODEL

Similar to consumption of market goods and services, consumers receive utility from health consumption (Grossman, 1972). Since cigarettes can affect health, the demand for cigarettes is related to the demand for health. Mathematically, the function of health can be expressed as:

$$H = H(C, O) \quad (1)$$

where H is health, C is cigarette, O is composite good. It is expected that C has a negative effect on H , while O can have a positive or negative effect.

We assume that utility is only affected by consumption of cigarettes and composite good. Although cigarettes are bad for health, they can increase utility due to instant pleasure. Rational individuals allocate their money for cigarettes and composite good with the aim of maximising their utility. Rational individuals choose to maximise their utility subject to their budget constraint. Assuming that the functional form of utility function is unknown, the consumer choice problem can be expressed as:

$$\begin{aligned} & \max U(C, O) \\ & \text{subject to: } P_C C + P_O O = I \end{aligned} \quad (2)$$

where U is utility, P_C is the price of cigarette, P_O is the price of composite goods, and I is income.

In order to obtain the optimum amount of C and O , Lagrange multiplier (λ) is added to Equation 2, which is then written as:

$$\gamma(C, O, \lambda) = U(C, O) - \lambda(P_C C + P_O O - I) \quad (3)$$

The first-order conditions for an internal optimum are as follows:

$$\frac{\partial \gamma}{\partial C} = \frac{\partial U}{\partial C} - \lambda P_C = 0 \quad (4)$$

$$\frac{\partial \gamma}{\partial O} = \frac{\partial U}{\partial O} - \lambda P_O = 0 \quad (5)$$

$$\frac{\partial \gamma}{\partial \lambda} = P_C C + P_O O - I = 0 \quad (6)$$

Equations 4-6 can be used to solve the three unknowns (C , O , λ). However, not all the individuals consume C in an effort to maximise their utility. Non-smokers do not consume cigarettes. Hence, these consumers make optimal choice at a corner point, that is, they maximise their utility by not spending money on cigarettes. This is called 'corner point solution'. Therefore, the first order condition cannot be met if the individual is a non-smoker. Finding the optimum C and O is beyond the scope of this study. Hence, our study does not test these equations.

Based on the review of previous empirical studies related to smoking, the demand for C is expected to be affected by age, gender, income, education, ethnicity, marital status and house locality. The model of the demand for C can, thus, be expressed as:

$$C = C(A, G, I, E, R, M, L) \quad (7)$$

where A is age, G is gender, I is income, E is education, R is ethnicity, M is marital status and L is house locality. The empirical model of the present study is developed based on Equation 7.

A is anticipated to have a negative impact on C because older individuals are more aware of their health than younger individuals and consequently are less likely to adopt an unhealthy lifestyle (Cheah & Naidu, 2012; Tan, 2012, Lim et al., 2013). In terms of G , males are hypothesised to consume more C than females. This is due to the fact that males have a higher preference for risk than females (Croson & Gneezy, 2009). Since smoking is a risk behaviour, males could be more likely to indulge in it than females. Assuming C is a normal good and taxed heavily, I is expected to be positively associated with C (Gallet & List, 2003). In light of the fact that education improves allocative efficiency and productive efficiency of health production, E is hypothesised to have a negative effect on C (Grossman, 1972; Kenkel, 1991; Grossman, 2000). As pointed out by Tan (2012) and Cheah (2012), there could be cultural and religious differences in smoking. For instance, smoking is prohibited in Islam, that is, the main religion of Malays. Hence, the present study expects a significant relationship between R and C . Marriage could lower stress level because it offers social and psychological supports (Cheah & Naidu, 2012). Therefore, if M represents married people, it is anticipated to have a negative effect on C . In light of the argument of Lim et al. (2013) that anti-smoking campaign is more available in urban areas than in rural areas, the present study hypothesises L to be negatively correlated with C if L represents urban dwellers.

3. METHODS

3.1. Data

Data from the Global Adult Tobacco Survey (GATS) of Malaysia were used (Institute for Public Health, 2012). The GATS was jointly conducted by the Ministry of Health Malaysia and World Health Organization. All the adults in Malaysia were eligible for the survey. The exclusion criteria were tourists and those who were institutionalised in hospitals, hostels and prisons. The pretested questionnaires were used by the trained staff to interview (face-to-face) the respondents. Written consent was obtained from the respondents before the interview. The survey covered all the states in Malaysia (including Federal Territories). Sample collection was conducted using multistage stratified sampling. The first stage was based on enumeration block (EBs). A total of 426 EBs were chosen, which consisted of 222 urban areas and 204 rural areas. The second stage was based on living quarters (LQs). In particular, 12 LQs were selected from each EB. The third stage was based on the eligible households, and individuals were randomly selected from each household. At the end of the survey, a total of 5112 respondents were interviewed. All the protocols were approved by the Medical Research and Ethics Committee of the Ministry of Health Malaysia.

3.2. Variables

In order to allow for a non-linear relationship between age and smoking, age variable was formatted as a categorical variable with four categories: 15-24 years (reference group), 25-44 years, 45-64 years and ≥ 65 years. Female was used as the reference group for gender variable. Wealth index is an indicator of wealth of households. It measures the value of all kinds of assets owned by households, including productive assets, non-productive assets and household's amenities (Rutstein & Johnson, 2004). Wealth index was divided into five quintiles: the lowest (reference group), second, middle, fourth and the highest. Educational level was grouped into three categories: primary, secondary and tertiary (reference group). In order to facilitate comparisons, ethnicities were grouped together to form two categories: Malay and non-Malay (i.e., Chinese, Indian and

Others) (reference group), and marital status was categorised into two categories: married and unmarried (i.e., single, widowed or divorced) (reference group). House locality was divided into urban and rural areas (reference group).

3.3. *Econometric specification*

The dependent variable used in the present study was monthly expenditure on cigarettes (in RM). It was assessed by asking the respondents: ‘How much money do you spend for the purchase of cigarettes per month?’ Since the dependent variable had zero values for a large proportion of observations (i.e., non-smokers), Tobit model was used. This is because it can deal with the data that contain a lot of zeros and guarantee non-negative predicted values (Tobin, 1958). Following Wooldridge (2010), the Tobit model can be expressed as:

$$y^* = \mathbf{x}\boldsymbol{\beta} + \varepsilon$$

$$y = \begin{cases} y^* & \text{if } y^* > 0 \\ 0 & \text{if } y^* \leq 0 \end{cases} \quad (8)$$

where y is the dependent variable that denotes the money spent on cigarettes per month, y^* is an unobserved latent variable which is assumed to have normally distributed error, and the vector \mathbf{x} consists of all the independent variables (i.e., age, gender, wealth index, education, ethnicity, marital status and house locality). The dependent variable is censored at zero.

The log-likelihood function of Tobit model can be expressed as:

$$L = 1(y = 0) \log \left[1 - \Phi \left(\frac{\mathbf{x}\boldsymbol{\beta}}{\sigma} \right) \right] + 1(y > 0) \log \left[\left(\frac{1}{\sigma} \right) \phi \left(\frac{y - \mathbf{x}\boldsymbol{\beta}}{\sigma} \right) \right] \quad (9)$$

where Φ is cumulative distribution function (cdf), and ϕ is probability density function (pdf). Hence, the parameter estimates, $\boldsymbol{\beta}$, can be obtained by maximising the log-likelihood expressed in Equation 9.

Since it is inappropriate to directly interpret the $\boldsymbol{\beta}$ of Tobit model, the expected value of y conditional on \mathbf{x} was calculated. Two types of expected value were estimated – conditional expectation, $E(y|y>0, \mathbf{x})$, and unconditional expectation, $E(y|\mathbf{x})$. The conditional and unconditional expectations can be summarised as:

$$E(y|y > 0, \mathbf{x}) = \mathbf{x}\boldsymbol{\beta} + \sigma\lambda\left(\frac{\mathbf{x}\boldsymbol{\beta}}{\sigma}\right) \quad (10)$$

$$E(y|\mathbf{x}) = \Phi\left(\frac{\mathbf{x}\boldsymbol{\beta}}{\sigma}\right)\mathbf{x}\boldsymbol{\beta} + \sigma\phi\left(\frac{\mathbf{x}\boldsymbol{\beta}}{\sigma}\right) \quad (11)$$

where λ is inverse Mills ratio, which is the ratio between pdf and cdf. The marginal effect of each independent variable on cigarettes expenditure can be written as:

$$\frac{\partial E(y|y>0, \mathbf{x})}{\partial x} \quad (12)$$

$$\frac{\partial E(Y|\mathbf{X})}{\partial x} \quad (13)$$

where Equation 12 is the conditional mean of cigarettes expenditure, while Equation 13 is the unconditional mean of cigarettes expenditure.

4. RESULTS

The summary statistics of the independent variables is presented in Table 1. The majority of the respondents aged 25-44 years (41.70%), followed by those aged 45-64 (31.04%), 15-24 (17.65%) and ≥ 65 years (9.61%). Of the total respondents, 48.83% were males. In terms of wealth index, 20.27%, 20.23%, 19.72%, 19.74% and 20.03% of the respondents were in the lowest, second, middle, fourth and highest quintiles of wealth index, respectively. A large proportion of the respondents had primary-level education (48.11%), followed by those with secondary- (42.19%) and tertiary-level (9.70%) education. More than half of the sample were Malays (59.67%) and married individuals (63.47%). Approximately 48.76% of the respondents resided in urban areas.

Table 1: Summary statistics of the independent variables

Variables	Definition	Mean	SD
Age1524 [#]	Age is 15-24 years	0.1765	0.3813
Age2544	Age is 25-44 years	0.4170	0.4931
Age4564	Age is 45-64 years	0.3104	0.4627
Age65	Age is ≥ 65 years	0.0961	0.2947
Male	Gender is male	0.4883	0.4999
Female [#]	Gender is female	0.5117	0.4999
Lowest [#]	Lowest quintile of wealth index	0.2027	0.4021
Second	Second quintile of wealth index	0.2023	0.4017
Middle	Middle quintile of wealth index	0.1972	0.3979
Fourth	Fourth quintile of wealth index	0.1974	0.3981
Highest	Highest quintile of wealth index	0.2003	0.4003
Primary	Primary-level education	0.4811	0.4997
Secondary	Secondary-level education	0.4219	0.4939
Tertiary [#]	Tertiary-level education	0.0970	0.2960
Malay	Malay ethnic group	0.5967	0.4906
Non-Malay [#]	Chines, Indian and other ethnic groups	0.4033	0.4906
Married	Marital status is married	0.6347	0.4816
Unmarried [#]	Marital status is single/widowed/divorced	0.3653	0.4816
Urban	House located in urban areas	0.4876	0.4999
Rural [#]	House located in rural areas	0.5124	0.4999

Notes: SD refers to standard deviation. [#]refers to reference group of each independent variable to be included in the regression model.

Source: GATS 2011

The correlates of sociodemographic factors to monthly cigarettes expenditure are presented in Table 2. Considering the effect of age, individuals aged 25-44 years spent RM 14.64 (unconditional) and RM 31.07 (conditional) more on cigarettes than individuals aged 15-24 years. However, individuals aged ≥ 65 years spent RM 12.37 (unconditional) and RM 34.54 (conditional) less on cigarettes relative to those aged 15-24 years. In general, males spent RM 102.40 more on cigarettes compared with females. Among those who smoked, males spent RM 171.15 more on cigarettes than females. Individuals who were in the middle quintile of wealth index spent RM 11.84 more on cigarettes than their counterparts who were in the lowest quintile of wealth index. After restricting the sample to smokers, individuals who were in the middle and fourth quintiles of wealth index spent RM 23.70 and RM 14.22 more on cigarettes, respectively, compared with their counterparts who were in the lowest quintile of wealth index. Compared to individuals who had tertiary-level education, individuals who had primary-level education spent RM 12.58 (unconditional) and RM 27.57 (conditional) more on cigarettes, and individuals who had secondary-level education spent RM 12.21 (unconditional) and RM 26.21 (conditional) more on cigarettes. Urban dwellers spent RM 6.23 more on cigarettes than rural dwellers, while conditional on smoking, urban dwellers spent RM 13.83 more.

Table 2: Correlates of sociodemographic factors to monthly cigarettes expenditure

Variables	Parameter estimates	Unconditional mean	Conditional mean
Constant	-1794.761*** (102.54)	—	
Age2544	203.847*** (51.060)	14.644*** (4.046)	31.069*** (7.906)
Age4564	76.559 (55.969)	5.396 (4.154)	11.625 (8.614)
Age65	-252.444*** (83.748)	-12.372*** (3.009)	-34.539*** (10.435)
Male	1074.521*** (57.666)	102.401*** (5.128)	171.148*** (7.397)
Second	20.277 (51.239)	1.389 (3.579)	3.053 (7.761)
Middle	151.473*** (50.243)	11.843** (4.605)	23.697*** (8.210)
Fourth	92.507* (54.164)	6.810 (4.381)	14.224* (8.550)
Highest	85.687 (56.438)	6.260 (4.590)	13.147 (8.867)
Primary	183.239*** (64.507)	12.582*** (4.624)	27.572*** (9.742)
Secondary	172.607*** (59.446)	12.221*** (4.521)	26.210*** (9.145)
Malay	49.864 (33.152)	3.300 (2.177)	7.436 (4.923)
Married	-33.334 (38.255)	-2.272 (2.652)	-5.014 (5.778)
Urban	92.226***	6.234***	13.832***

	(33.068)	(2.289)	(4.961)
Likelihood ratio		917.950	

Notes: Asymptotic standard errors in parentheses. *** indicate significant at the 1% level, ** at the 5% level and * at the 10% level.

Source: GATS 2011

5. DISCUSSION

The effect of age on cigarettes expenditure was mixed. On one hand, we found that individuals aged between 25 and 44 years consumed more cigarettes than individuals aged between 15 and 24 years. The explanation for this outcome is simple. Since younger adults have less financial capability than older adults, they tend to smoke less. On the other hand, our findings showed that individuals aged 65 years or above smoked less than their counterparts aged 15-24 years, which were similar to the findings by Yen (2005) and Aristei and Pieroni (2008). This is attributable to the fact that the rate of depreciation of health capital increases with age (Grossman, 1972). As a result of depreciation of health capital, older individuals are more devoted to seeking health investment by engaging in a healthy lifestyle. Also, older individuals are more aware of their own health, as well as the negative consequences of unhealthy behaviours. The policy implication of this finding is that government intervention strategies should be targeted at young adults, instead of the elderly. These strategies should include the need to improve health awareness among young adults. For instance, information about the negative consequences of smoking should reach out to youngsters through mass media.

Our findings showed that males consumed more cigarettes than females, which lent support to the findings by Bilgic et al. (2010), Lin (2010) and Cawley and Ruhm (2012). The differences in risk and social preferences across gender could be a plausible contributing factor for this outcome (Croson & Gneezy, 2009). In actual fact, females are usually more risk averse and socially sensitive than males (Croson & Gneezy, 2009). Since smoking is a risk behaviour, women tend to avoid it. Furthermore, smoking by females is less acceptable to the society than smoking by males, especially in developing countries, thus females, who are sensitive to social cues, are less likely to smoke than males. Given this finding, anti-smoking programmes should be targeted primarily at males if the goal of reducing the prevalence of smoking is to be achieved. It is well-worth considering the strategy suggested by Tan (2012) that the public health authorities should design nationwide health awareness campaigns with a specific focus on addressing the harmful effects of smoking on men's health, such as prostate cancer, erectile dysfunction and low sperm count.

It was unsurprising to find that individuals who were in the higher quintile of wealth index consumed more cigarettes than individuals who were in the lower quintile of wealth index. Because cigarettes are expensive, higher income individuals are more capable to purchase them than lower income individuals. This finding supports the argument of Gallet and List (2003) that cigarettes are normal goods. Public policy maker should, therefore, consider increasing the price of cigarettes in the forms of tax. This policy is also echoed by Mohamed (2012), who claims that tax is effective in reducing smoking. Moreover, our findings imply that the recent action taken by the Ministry of Health Malaysia to ban all the promotions for cigarette, while allowing only the large size of cigarette packs to be sold in the market may be promising (Lee, 2012). Although the main purpose

of this strategy is to make cigarettes become unaffordable to low-income consumers, it should be undertaken carefully because it may possibly lead to illegal sales of cigarettes in the black market.

Level of education was negatively associated with expenditure on cigarettes, which was consistent with the findings of Yen (2005), Aristei and Pieroni (2008), Bilgic et al. (2010) and Lin (2010). Similar outcomes were evidenced by Currie and Moretti (2003), de Walque (2007), Grimard and Parent (2007), Cutler and Lleras-Muney (2010) and Cawley and Ruhm (2012). This is because education improves allocative efficiency and productive efficiency of producing health. In other words, education makes individuals more efficient at promoting health by improving individuals' health knowledge (Grossman, 1972; Kenkel, 1991; Grossman, 2000). Since smoking has adverse impacts on health, well-educated individuals are unlikely to engage in it. Another plausible rationale is that a high level of education is associated with a low rate of time preference (Fuchs, 1982; van der Pol, 2011). Individuals with a lower rate of time preference tend to be more rational and future oriented than those having a higher rate of time preference, and consequently have a lower likelihood of indulging in unhealthy behaviours (Fuchs, 1982; van der Pol, 2011). An implication of our finding is that education can help to reduce the prevalence of smoking. Thereby, government should devote its attention to promoting a nationwide health education programme. More health-related subjects should be introduced to primary and secondary schools. This is to ensure that individuals can acquire better knowledge on health since schooling years, especially given that individuals are unlikely to quit smoking once they have started smoking at young age (Zawahir et al., 2013). In addition, government could take an initiative to provide more health-related reading materials, such as magazines and books for the public, and these reading materials should be written in an easily understandable format in order to encourage reading from the low-educated segment of the populations.

In contrast to the findings of Alam et al. (2008) and Lim et al. (2013), urban dwellers consumed more cigarettes than rural dwellers. This may be because cigarettes are more available in urban areas than in rural areas. Another plausibility is that urban dwellers tend to suffer from stress and thus are likely to use smoking as a method to release their stress. In view of this finding, we suggest that public health authorities put more efforts into improving health awareness among urban dwellers. Public health administrators should organise more anti-smoking seminars, workshops and campaigns in urban areas with the aim of educating the dwellers about the negative impacts of smoking on health and well-being.

Findings of the present study provide government with important information on which groups of population to be focused on. Government should devote its attention to those who are likely to consume a large quantity of cigarettes. Meanwhile, those having low consumption of cigarettes should not be overlooked. The implications for policy are numerous. Firstly, government could pay special attention to individuals who are in the age group of 25-44 years. However, concentration should not be given to adults aged 65 years or above because they consume a low quantity of cigarettes. Secondly, since males consume more cigarettes than females, a tobacco-control policy aimed at reducing cigarette consumption among males rather than females may yield desirable outcomes. Thirdly, it is recommended that government should design a nationwide anti-smoking programme with a specific focus on adults who are in the middle quintile of wealth index instead of those who are in the second and highest quintiles. Fourthly, government could consider discouraging individuals with primary or secondary education from indulging in smoking, whilst those having tertiary education are suggested not to be the main focus of a policy. Lastly, if the

objective of reducing the prevalence of smoking throughout the nation is to be met, a smoking cessation programme targeted at urban dwellers is worthy of consideration.

6. CONCLUSION

In light of the alarming facts and figures of smoking, the objective of the present study is to examine factors associated with the demand for cigarettes among adults in Malaysia. This is to provide government with better information on which groups of population to be targeted at. Using nationally representative data and a rigorous statistical method, we have found that age, gender, wealth index, education and house locality are significantly associated with cigarettes expenditure. Our findings imply that an intervention strategy directed towards discouraging smoking among young adults, males, individuals in the middle quintile wealth index, less-educated individuals and urban dwellers may appear promising.

Although the present study has shed new light on sociodemographic factors associated with cigarettes expenditure in Malaysia, several limitations exist. Firstly, owing to data limitation, the effects of some non-sociodemographic variables, such as presence of chronic diseases and lifestyle on smoking cannot be explored. Secondly, the causal relationships between smoking and sociodemographic variables are unable to be identified because of cross-sectional data. Thirdly, all the information obtained from the survey are self-reported. Hence, reporting error may occur. Some individuals may under-report their expenditure on cigarettes. Despite these limitations, our study has important contributions to the literature and policy development.

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