Factors Associated with the Willingness-to-Pay for Smoking Cessation Treatments

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ABSTRACT

This study aimed to investigate the factors of the willingness-to-pay for smoking cessation treatments, such as nicotine patch, bupropion and varenicline, among Malaysians. The study was conducted using primary sourced data collected from smokers aged 18 years old and above in the state of Selangor, Malaysia. The willingness-to-pay was elicited by using the contingent valuation method and questionnaires, which were designed based on the double bounded dichotomous choice (DB-DC) format. Data analysis was performed using logistic regression and the predictive model was formed using stepwise procedures. The results of this study revealed that the main factors regarding the willingness-to-pay, for all three of the treatments examined, were income level, the awareness of the treatment, the smoker having previously tried to quit smoking and health issues due to smoking. Besides, the relationship between the willingness-to-pay and these factors was also established. The finding of this study could provide better insight for policy-makers to target specific cessation treatments and eventually to improve current smoking cessation policies.

JEL Classification: I11, I12, I18

Keywords: Willingness-to-pay; factors; Logistic Regression; Contingent Valuation Method; smoking cessation

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INTRODUCTION

Smoking leads to an earlier death, as well as life with disabilities such as lung cancer, respiratory diseases, cardiovascular diseases. In the United States, cardiovascular disease has killed more smokers who were 35 years old and above every year (U. S. Department of Health and Human Services, 2014). According to World Health Organisation, WHO (2015), six million people die each year from smoking-related issues worldwide and 600,000 of them are non-smokers who simply exposed to cigarette smoke. The number of smoking-related deaths could rise to eight million annually by 2030 if appropriate actions are not taken (World Health Organisation, 2014).

In Malaysia, there are almost 10,000 deaths linked to smoking-related diseases every year (Clearinghouse for Tobacco Control, 2005) and smoking could cause 85% of COPD and breathing problems (Yuen, 2009). Therefore, Malaysian government had been fighting smoking after it become one of the members of the Framework Convention on Tobacco Control (FCTC), the country's objective was to reduce the impact of tobacco use through several tobacco control policies which aimed to; prevent smoking uptake (participation and initiation) especially for youths, promote tobacco cessation and to protect the public from the threats of second-hand smoke. Therefore, the willingness-to-pay (WTP) for the smoking cessation treatments must be addressed in order to improve the smoking cessation programs. Improvement in the outcomes of smoking cessation programs which eventually reduce the number of smokers.

This study emphasises on examining the drivers (factors) of smoker's willingness to pay for smoking cessation treatments which allow us to uncover the major reasons that undermine or support the smoking cessation programs. The results of the study enable to increase the WTP of smokers by using the identified supporting factors and this could ease the burden for Malaysian government as the government provides subsidies to the poor with access to smoking cessation treatments (ITC Project, 2012). There are many quit smoking clinics in Malaysia, either private or public, provide counselling, prevention and treatment for tobacco dependence. Also, Universiti Sains Malaysia (USM) has offered cessation clinics and a quitline at the national level, while pharmacotherapies, such as nicotine replacement therapy (NRT) (nicotine patches and gum), varenicline and bupropion are available at community pharmacies.

Even though there are public smoking cessation clinics around Malaysia which provide free services, some patients (smokers) still choose to visit private clinics to obtain smoking cessation treatments, the factors determining smoker's willingness-to-pay for such treatments are still vague. The study of the WTP for pharmacological treatments and nicotine replacement therapy (NRT) for smokers is vital as smokers might opt to quit smoking with high WTP for the treatments. This inference can be drafted because smokers react significantly to cigarette taxes (price). Even though Norashidah, et al. (2013) estimated optimal cigarette taxes which significantly reduce consumption of cigarettes and also maximize tax revenue to the government but identifying the factors (undermine or support) WTP can be a yardstick for the government to design effective smoking cessation programs as an alternative to the cigarette taxation policy.

Willingness-to-pay (WTP) is always correlated with factors that bringing effects to it. A simple assumption can be made, which the higher the smoker's income, the higher their WTP would be and vice-versa. This assumption has been widely endorsed (National Oceanic and Atmospheric Administration, 1993) and has been demonstrated in several health-care-related WTP studies (Kaertman, et al., 1996; O'Brien, et al., 1998). Although no other studies in the same field have been carried out previously in Malaysia, there have been some similar studies undertaken in other countries.

In a nutshell, the factors of WTP for smoking cessation treatments can be either to increase (positively correlated) or decrease (negatively correlated) the WTP which both of them are equivalent important to be identified and the results can provide the policy makers a better insight on the improvement of smoking cessation program and eventually increase the quit smoking rate.

LITERATURE REVIEW

There are many factors that associated with willingness-to-pay (WTP) for smoking cessation treatments. The determinants of WTP in health-related studies that conducted previously are referred to form the predictive model (Ochonma and Onwujekwe, 2017; Minyihun, et al., 2019; Kamara, et al., 2018). Even though the WTP

of patients is getting more attention from different parties, especially from health-care providers and policy-makers (Olsen & Smith, 2001). However, WTP studies regarding smoking cessation intervention are relatively few and the study on factors of WTP is relatively rare as well.

There was a study conducted in the United States regarding the WTP for hypothetical new smoking cessation products and the results indicated that income was a significant variable that positively associated with willingness-to-pay however heavy drinkers were less likely to pay for the hypothetical new smoking cessation treatments (Busch, et al., 2004). In addition, another factor that influenced the WTP of hypothetical new smoking cessation treatments positively was female smokers with higher social economic status (SES) (Busch, et al., 2004). Anyhow, our study focused on existing smoking cessation treatments instead of hypothetical new treatments for smoking cessation and the determination of the factors of WTP was the emphasis of our study.

Another recent study was undertaken in Germany concerning the driving factors of the willingness-to-use (WTU) and the WTP for smoking cessation treatments (Aumann, et al., 2016). The data of the Germany study were collected through internet survey which focused on young and middle age smokers only and this provided limited scope and validity of the study. The results shown different significant WTP factors for different smoking cessation treatments, as overall, higher SES contributed to higher WTP as well as higher of addiction level and willingness to quit (Aumann, et al., 2016). A study conducted in Panama supported the study carried out by Aumann, et al. (2016) that WTP for cessation therapies strongly correlated to the desire for abandonment.

Moreover, there were recent studies was conducted in recent years in Vietnam which regarding the willingness-to-pay (WTP) for smartphone-based cessation supporting applications and found that significant factor that positively correlated to WTP was those who believed in health information on the internet (Tran, et al., 2018). (Ngan, et al., 2019) conducted a study to estimate the average WTP and its associated factors (if the respondents willing to use the service) on smoking cessation service and found that higher income and older respondents were more likely to pay for the service (Herrera-Ballesteros, et al., 2017).

The factors that associated with the willingness-to-pay for the smoking cessation treatments were based on the mentioned previous studies and a study carried out in the United States regarding the WTP for tobacco cessation medications examined; the willingness to quit and, the willingness to use indicated that the importance of medication costs, the convenience of use and availability over the counter which influence WTP of smokers (Dube, et al., 2016). Dube, et al. (2016) also suggested that the efficacy of the treatment can also be included as a variable or factor that influences the WTP. Another study which was undertaken in Germany, with similar study scope, used health restrictions, the number of attempts to quit smoking, the addiction degree, peer groups and, whether the smokers had heard about treatments (Aumann, et al., 2016). Moreover, the side effects of the treatment and the prevention of weight gain also affect the WTP as smokers seek to regain their health rather than worsening it after taking medications (Marti, 2012). In Vietnam, a study regarding the feasibility of e-health interventions on smoking cessation used health information-seeking behaviour which was not appropriate to be included, while smoking status and the number of quitting attempts were important in their study (Tran, et al., 2018). According to Heredia-Pi, et al. (2012), tobacco consumption, exposure to tobacco smoke and knowledge and attitudes about smoking were the significant variables which were included in their study. The level of tobacco consumption is affected by the level of nicotine dependency which can be measured using the Fagerstrom Test or Cigarette Dependence Scale (CDS) (Olsen, et al., 2012). A modelling study on projecting the future smoking prevalence in Norway suggested that age factor is one of the significant determinant to quit smoking since the highest rate of cessation in Norway is among the 70-79 years age group (Gartner, et al., 2017).

METHODOLOGY

Data

The data are obtained through direct survey which is under stated preference. These data were not available using revealed preference through market observations which generated by implementing experiments, namely; field experiments, laboratory experiments, and auctions. In direct surveys, respondents are required to

answer "yes" or "no" to indicate the willingness-to-pay (WTP) for the smoking cessation treatments. Figure 1 shows the latest classification framework for methods to determine the WTP (Breidert, et al., 2006).
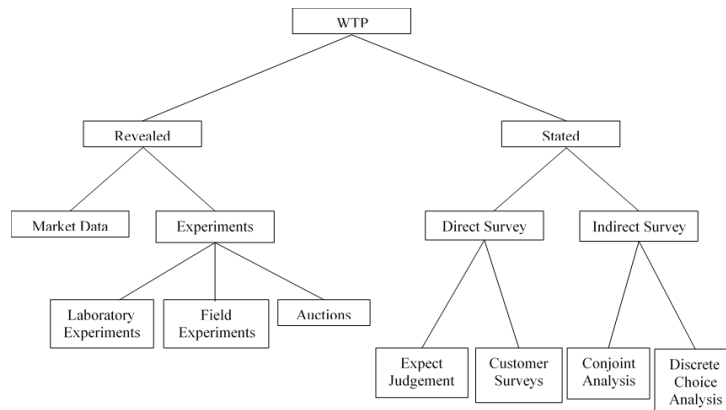
Adapted from Breidert, Hahsler, and Reutterer (2006)

Figure 1 Classification framework for methods to measure the willingness-to-pay.

The questionnaire was adapted from the questionnaires used by Aumann, Treskova, Hagemann, and von der Schulenburg (2016) in their study. In the designed questionnaire, respondents will be explained with the different between smokers and non-smokers in appearance, health status as well as the risk factor of getting smoking-related-illnesses. There are three parts of the questionnaire, Part A was related to socioeconomic characteristics of the respondent, Part B was the willingness to pay for smoking cessation treatments: Bupropion, Varenicline, and Nicotine Patch. Part C was the measurement of the smoker additive level by using Fagerstrom Test. The demographic characteristics in Part A were formed based on the factors that influence WTP from the literature review.

In Part B, respondents would be asked to state the willingness to pay for each smoking cessation treatment. They will be provided with details, such as the dosage, treatment period (recommended), as well as side effects of each treatment. Respondents were required to state the WTP for the weekly cost of each treatment which was obtained from the result of prior market survey. The questionnaires were designed using bilingual: English and Bahasa Melayu.

Besides, pilot study was conducted with ten per cent of the estimated sample, forty sets of questionnaires were distributed to smokers at Subang Jaya, Selangor, Malaysia. The respondents include smokers regardless of them ever sought for quit smoking cessation services. All respondents in the studies were given time to consider to participate in the survey by signing the consent form. After obtaining the consent from the respondents, they are required to complete the questionnaire with the assistance of enumerator or researcher. Token of appreciation was provided to the respondents who submitted the questionnaire.

The results of the pilot study indicated that the response rate was high as the enumerator approached the respondents in a friendly way and also explain the purpose of the study. However, there were some incomplete questionnaires collected which was less than 5 % of the sample. Also, there were few questions in the survey instrument required amendments as the respondents were only clear after the explanation from the enumerators. Table 1 shows the initial questions with the improved questions for both studies.

Table 1 Improvements on Questionnaires

Willingness-to-pay			
	Initial question	Improved question	Reason
Q5	Did you quit smoking before? How many times if you did so?	Have you ever tried to quit smoking and if so, how many times?	The respondents thought that the question was asking the quit smoking experience but the researcher wants to know did they try to quit smoking before
Q10, 13, 16	Do you know (smoking cessation treatment)?	Have you heard of the (smoking cessation treatment)?	The scope of knowing the treatment is too wide.
Economic costs			
	Initial question	Improved question	Reason
Q9.1	How long to you spent in the facility?	Time spent in the facility (minutes)	No unit for time given, respondents were confused.

Source: Analysis from the authors

The last part of the pilot test was the reliability of the instrument (questionnaire) using Cronbach's Alpha. The higher the value of Cronbach's Alpha the better the better it will be and usually 0.70 is acceptable (Cortina, 1993). The results of Cronbach's Alpha as 0.85.

The data collection was done at Selangor state through designed questionnaires. The reason of choosing Selangor state was the number of smokers in Selangor was the highest (Institute for Public Health (IPH), 2015) compared to other states and the cost and time of collecting data could be minimised. The locations of data collection were the municipal councils (district authority) in Selangor in order to target respondents from North to South of Selangor. Besides, the respondents for WTP survey were adult smokers aged 18 years old and above regardless the experience of using quit smoking treatments.

Table 2: Data Collection Areas

No.	Municipal Council / District Authority	Direction	No. of Questionnaires
1	Majlis Perbandaran Selayang	Central / North	50
2	Majlis Daerah Hulu Selangor	Northeast	50
4	Majlis Perbandaran Ampang Jaya	East	50
5	Majlis Perbandaran Kajang	Southeast	50
6	Majlis Perbandaran Sepang	South	50
7	Majlis Perbandaran Klang	Southwest	50
8	Majlis Daerah Kuala Selangor	West	50
9	Majlis Daerah Sabak Bernam	Northwest	50

Source: Analysis from the authors

In this study, the confidence level was quoted to be 90 percent which could be interpreted as 90 percent probability that the study includes the true value. The anticipated population proportion also needed in the sample size calculation formula as 50 % or 0.5 in decimal. Moreover, the margin of error used was 0.04 (PennState Eberly College of Science, 2016).

The formula to calculate sample size (by assuming infinite population) is:

$$m = \frac{z_{\alpha/2}^2 \, \hat{p} \, (1 - \hat{p})}{\epsilon^2}$$

where m is the sample size (assuming infinite population); $Z_{\alpha/2}$ is the critical value of the normal distribution at $\alpha/2$; $\hat{p}$ is the anticipated proportion; and ϵ is the margin of error.

The sample size was further calculated with the formula below to obtain finite sample size:

$$n = \frac{m}{1 + \frac{m - 1}{N}}$$

where n is the finite sample size; m is the sample size (assuming infinite population); and N is the given population (Selangor population multiply with smoking prevalence rate, 20.9%).

Sample size for WTP survey:

$$m = \frac{1.645^2 \, 0.5 \, (1 - 0.5)}{0.04^2}$$
$$m = 422.8164$$
$$n = \frac{422.8164}{1 + \frac{422.8164 - 1}{889567}}$$
$$n = 423$$

The sampling method used for data collection was non-random convenient sampling method because it could save time and cost and also the sampling frame for smokers is not available.

Variables

The socioeconomic status of respondents was included in the questionnaire which based on the literature review. Besides, there were other factors which affect the willingness-to-pay (WTP) for smoking cessation treatments also included. Table 3 shows the summary of factors included in previous WTP studies.

Table 3 Summary of factors influence WTP for smoking cessation treatments

Studies	Variables
Busch et al. (2004)	Addiction level, number of quit attempts, number of cigarettes per day, drinks three or more than three drinks each time, Body Mass Index (BMI) more than thirty, dieting.
Aumann et al. (2016)	Health restrictions due to smoking, addiction level, peer group with smokers, willingness-to-quit, number of quit attempts, having heard of the treatments
Dube et al. (2016)	Medication costs, convenience of use, availability over the counter, efficacy of the treatments
Tran et al. (2018)	Health information-seeking behaviour, smoking status, number of quit attempts
Heredia-Pi et al. (2012)	Tobacco consumption, exposure to tobacco smoke, knowledge and attitudes about smoking

Source: Analysis from the authors

The dependent variable was the categorical variable, willingness-to-pay (WTP) and denoted one if "yes" or null if "no". The independent variables were gender, age, employment, income, tried to quit, number of attempts, health restrictions, peer influence, willing to quit, have heard of the treatment, nicotine dependency level (Fagerstrom Score). However, the selection of variables to form the predictive model to estimate the probability of WTP was done through the logistic regression. Table 3 shows the details of variables.

Table 4 Definition of variables

Variable	Definition
Willingness-to-pay (WTP)	= 1 if respondent is willing to pay for the treatments, 0 otherwise
Age	= 0 if younger than 31 years old
	= 1 if 31-45 years old
	= 2 if 46-60 years old
	= 3 if 61 years old and older
Low income	= 0 if respondent income range is below RM 2500
Lower Middle	= 1if respondent income range is between RM 2501 – 4100
Upper Middle	= 2 if respondent income range is between RM 4101 – 5700
High income	= 3 if respondent income range is above RM 5700
Male	= 1 if gender is male, 0 otherwise
Employed	= 1 if currently working, 0 otherwise
Addiction Level:	
High	= 0 if fagerstrom test score is more than 8
Moderate	= 1 if fagerstrom test score is 5-7
Low to moderate	= 2 if fagerstrom test score is 3-4
Low	= 3 if fagerstrom test score is 1-2
Health restriction	= 1 if respondent answers yes, 0 otherwise
Peer Group (percentage of social network who is a smoker):	
> 50 %	= 0 if respondent answers yes
26 – 50 %	= 1 if respondent answers yes
11 – 25 %	= 2 if respondent answers yes
0 – 10 %	= 3 if respondent answers yes
Willing to quit	= 1 if respondent answers yes, 0 otherwise
Tried to quit	= 1 if respondent answers yea, 0 otherwise
Attempts to quit	Numeric variable
Noticed of therapy	= 1 if respondent answers yes, 0 otherwise

Source: Analysis from the authors

STATISTICAL ANALYSIS

The logistic regression analysis was used to estimate the probability of the WTP for the treatments with given the predictors or independent variables (explanatory variables) because of the binary dependent variable (also called as dummy) which takes values 0 or 1 in the probabilistic model and the model can be written as: (Stock & Watson, 2007):

$$\Pr(Y = 1 | X_1, X_2, X_3, \ldots X_i) = F(\beta_0 + \beta_1 X_1 \ldots \ldots + \beta_i X_i) \tag{1}$$

$$\Pr(Y = 1 | X_1, X_2, X_3, \ldots X_i) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_1 \ldots \ldots + \beta_i X_i)}} \tag{2}$$

$$\Pr(Y = 1 | X_1, X_2, X_3, \ldots X_i) = \frac{1}{1 + \left(\frac{1}{e^{(\beta_0 + \beta_1 X_1 \ldots \ldots + \beta_i X_i)}}\right)} \tag{3}$$

where Pr is the probability that the individual willing to pay for different pharmacological treatments and. X_i is a vector of individual socio-economic-status including dummies for: age, gender, income, employment, addiction level, health restrictions due to smoking, peer group, willingness to quit, attempts to quit smoking, having heard about the therapy, had used this therapy.

The probability of WTP can be transformed to odds ratio which is commonly used to interpret the results. The odds ratio is the ratio of the odds of a success event (willing to pay) to another failed event (not willing to pay). Equation (3) is the cumulative logistic distribution function with Pr ranges between 0 and 1 as non-linearly to $-(\beta_0 + \beta_1 X_1 \ldots \ldots + \beta_i X_i)$. Therefore, ordinary least square prcedure cannot be used to estimate the parameters. As the odds ratio can be written as:

$$\frac{Pr}{1 - Pr} = \frac{1 + e^{(\beta_0 + \beta_1 X_1 \ldots \ldots + \beta_i X_i)}}{1 + e^{-(\beta_0 + \beta_1 X_1 \ldots \ldots + \beta_i X_i)}}$$

The selection of independent variables into the model can be performed using forward selection, backward selection and stepwise selection. Stepwise selection method was used which combined both forward and backward selection process. First, the forward selection method was used and each independent variable was regressed to the dependent variable individually. The highest t-statistic independent variable was added into the model and it could not be removed. The adding process of the independent variables continues until the p-value for the remaining independent variable was insignificant (higher than 0.15). However, certain independent variables must be remained as they were significant to determine the WTP according to the literature review. The regression was done using STATA software and there were three individual models for different smoking cessation treatments.

RESULTS

We spent three months for the whole data collection process from the application for approval to the completion of data entry into the spreadsheet. The completed questionnaires were 414 which contributed to 98% response rate since the enumerators were waiting for the respondents to complete the questionnaires. The descriptive statistics for the data analysis showed that bupropion had the highest WTP of smokers followed by varenicline and nicotine patch. The average age of the respondents was 30 years old and more than three fourths of them were employed. Female respondents were less than twenty percent from the sample. Besides, more than fifty percent of the respondents were earning RM2500 and below followed by middle and upper middle-income group. High income earners were the minority in the sample. Nearly seventy-five percent of the respondents were agreed that smoking did not affect their health at the moment. The number of respondents whom having more than fifty percent smokers in their social network (28.11%) was the highest compare to other categories. The number of respondents who were not willing to quit smoking was higher (53.38%) than otherwise and the mean attempts to quit smoking was 2 times. Also, there were more respondent tried to quit smoking (61.11%) than never. The nicotine dependency level showed that majority of respondents were at moderate level, followed by low-moderate level, low lever, and the least number was high level of dependency. We also found that more than fifty percent of the respondents were never heard of all three smoking cessation treatments.

Table 5 Descriptive Statistics

n = 414			
Gender (%)	Male		82.85
	Female		17.15
Age (years), mean (SD)			29.92 (8.45)
Employment (%)	Employed		77.05
	Unemployed		22.95
Income	RM 2500 and below (0)		57.04
	RM 2501 to RM 4100 (1)		26.46
	RM 4101 to RM 5700 (2)		11.89
	RM 5700 and above (3)		4.61
Health Restrictions due to smoking	Yes		27.27
	No		72.73
Peer group (%)	0-10% (3)		21.14
	11-25% (2)		24.63
	26-50% (1)		26.12
	50% and above (0)		28.11
Willing to quit smoking (%)	Yes		46.62
	No		53.38
Addiction level (%)	Low dependence (3)		24.57
	Low to Mod dependence (2)		26.04
	Moderate dependence (1)		31.7
	High dependence (0)		17.69
Tried to quit smoking	Yes		61.11
	No		38.88
Number of attempts to quit smoking, mean (SD)			2 (3.12)
Having heard about the therapy (%)	NRT	Yes	33.82
		No	66.18
	Bupropion	Yes	13.41
		No	86.59
	Varenicline	Yes	13.76
		No	86.24
Willingness-to-Pay (WTP)	NRT	Yes	19.56
		No	80.44
	Bupropion	Yes	42.51
		No	57.49
	Varenicline	Yes	32.36
		No	67.64

Source: Analysis from the authors

The results of logistic regression were separated into three parts: nicotine patch, bupropion, varenicline. The main concern in building the predictive logistic model was the selection of a series of significant explanatory variables. The initial models were formed after using stepwise selection method but there were omitted variables added back into the initial model as there were significant according to the literature review.

Table 6: P-value of independent variables after Stepwise selection process

Explanatory Variables	Nicotine Patch	Bupropion	Varenicline
Gender	0.007	0.003	0.033
Employment	0.455 (Added)	0.020	Omitted
Income	Omitted	0.000	0.000
Tried to quit	0.128	0.012	0.021
Number of Attempts	Omitted	Omitted	Omitted
Health Restrictions due to smoking	0.049	0.001	0.002
Peer Influence	0.347 (Added)	Omitted	Omitted
Willingness to quit	0.393 (Added)	Omitted	0.941 (Added)
Heard of the treatment	0.001	0.002	0.000
Age	0.002	Omitted	Omitted
Nicotine dependency level	Omitted	0.384 (Added)	Omitted

Source: Analysis from the authors

Table 6 indicated the p-values for the explanatory variables after the stepwise selection (with variables suggested by literature) for the three smoking cessation programs, the variables with p-values greater than 0.15 were advised to be excluded from the multivariate models. Three models were compared for each smoking cessation treatment: the first model was the initial model after stepwise selection method before adding the variables suggested by literature, the second model was including variables suggested by literature, the third model was the final model. The logistic diagnostic tests were conducted to all three models were link test (for misspecification problem), goodness-of-fit: Hosmer and Lemeshow, Akaike Information Criterion

(AIC) and Bayesian Information Criterion (BIC). Further diagnosis of multicollinearity was conducted on three models in order to avoid correlation between independent variables.

Table 7 Post-estimation test for nicotine patch model

	First Model			Second Model			Final Model		
LR chi2	46.14			46.92			46.19		
Prob > chi2	0.0000			0.0000			0.0000		
Pseudo R2	0.1182			0.1227			0.1208		
Log Likelihood	-172.09144			-167.71001			-168.07744		
Independent Variable	**P-value**	**VIF**	**Tolerance**	**P-value**	**VIF**	**Tolerance**	**P-value**	**VIF**	**Tolerance**
Gender	0.003	1.04	0.9632	0.007	1.1	0.9085	0.009	1.09	0.9191
Employment				0.455	1.15	0.8704	0.362	1.11	0.8984
Income									
Tried to quit	0.049	1.03	0.9734	0.128	1.31	0.7646	0.052	1.11	0.8991
Number of Attempts									
Health Restrictions due to smoking	0.037	1.06	0.9474	0.049	1.09	0.9192	0.035	1.07	0.9343
Peer Influence				0.347	1.14	0.8779	0.365	1.14	0.8780
Willingness to quit				0.393	1.27	0.7844			
Heard of the treatment	0.002	1.06	0.9432	0.001	1.06	0.9442	0.001	1.06	0.9446
Age	0.001	1.03	0.9737	0.002	1.12	0.8941	0.002	1.12	0.8951
Nicotine dependency level									
_hat	0.001			0.000			0.000		
_hatsq	0.447			0.314			0.304		
Hosmer and Lemeshow's test	0.9363			0.6439			0.9477		
AIC	356.1829			353.42			352.1549		
BIC	379.5493			388.3196			383.1768		

Source: Analysis from the authors

Table 8 Post-estimation test for bupropion model

	First Model / Final Model			Second Model		
LR chi2	67.60			66.96		
Prob > chi2	0.0000			0.0000		
Pseudo R2	0.1297			0.1293		
Log Likelihood	-226.79622			-225.79622		
Independent Variable	**P-value**	**VIF**	**Tolerance**	**P-value**	**VIF**	**Tolerance**
Gender	0.004	1.05	0.9520	0.003	1.05	0.9488
Employment	0.014	1.13	0.8887	0.020	1.13	0.8829
Income	0.000	1.13	0.8889	0.000	1.14	0.8808
Tried to quit	0.006	1.03	0.9679	0.012	1.07	0.9361
Number of Attempts						
Health Restrictions due to smoking	0.001	1.05	0.9523	0.001	1.05	0.9524
Peer Influence						
Willingness to quit						
Heard of the treatment	0.002	1.07	0.9367	0.002	1.08	0.9270
Age						
Nicotine dependency level				0.384	1.05	0.9533
_hat	0.000			0.000		
_hatsq	0.213			0.272		
Hosmer and Lemeshow's test	0.8578			0.6219		
AIC	467.5924			466.9407		
BIC	495.2287			498.462		

Source: Analysis from the authors

Table 9 Post-estimation for varenicline model

Independent Variable	First Model / Final Model			Second Model		
LR chi2	73.74			73.74		
Prob > chi2	0.0000			0.0000		
Pseudo R2	0.1543			0.1543		
Log Likelihood	-202.02848			-202.02572		
	P-value	**VIF**	**Tolerance**	**P-value**	**VIF**	**Tolerance**
Gender	0.030	1.02	0.9760	0.033	1.05	0.9550
Employment						
Income	0.000	1.03	0.9718	0.000	1.04	0.9627
Tried to quit	0.015	1.04	0.9615	0.021	1.21	0.8288
Number of Attempts						
Health Restrictions due to smoking	0.002	1.02	0.9773	0.002	1.03	0.9675
Peer Influence						
Willingness to quit				0.941	1.22	0.8206
Heard of the treatment	0.000	1.05	0.9553	0.000	1.05	0.9509
Age						
Nicotine dependency level						
_hat	0.000			0.000		
_hatsq	0.402			0.399		
Hosmer and Lemeshow's test	0.1084			0.4253		
AIC	416.057			418.0514		
BIC	439.7138			445.651		

Source: Analysis from the authors

The final model of nicotine patch was formed after the diagnostic tests and it was improved version of the second model by removing the willingness to quit as it was having the highest VIF (further from 1) which shows it had the highest chance to correlate with other independent variables. Besides, the Hosmer and Lemeshow's test also shown better goodness-of-fit in the final model. The post-estimation test results of the bupropion model shown that the initial model was better compared to the second model that added with willingness to quit. Thus, the initial model was used as the final model since the goodness-of-fit test also shown that the model fit the data well. Similarly, the results from the post-estimation test of the varenicline model shown that the initial model was used as the final model. There was no specification problem for all three model as shown in the results of link test.

Table 10 Logistic regression for nicotine patch model

Number of observations	= 410					
LR chi2 (11)	= 52.32					
Prob > chi2	= 0.0000					
Pseudo R2	= 0.1368					
Log Likelihood	= -165.01133					

Willingness-to-pay (WTP)	Odds Ratio	Coefficient	Standard error (for Odds Ratio)	P > |z|	[95% Conf. Interval] (for Odds Ratio)	
Gender (ref: female)	0.3765	-0.9769	0.1393	0.008*	0.1823	0.7776
Employment (ref: unemployed)	1.5388	0.4309	0.5911	0.262	0.7248	3.2669
Tried to Quit (ref: no)	1.7633	0.5672	0.5557	0.072**	0.9507	3.2702
Health Restriction (ref: no)	1.7506	0.5599	0.5221	0.060**	0.9757	3.1408
Peer Influence (ref: > 50%)						
26% - 50%	1.0503	0.0490	0.4037	0.898	0.4945	2.2309
11% - 25%	1.7037	0.5328	0.6499	0.162	0.8075	3.5945
0% - 10%	1.2017	0.1837	0.5161	0.669	0.5178	2.7885
Heard of the treatment (ref: no)	2.6187	0.9627	0.7496	0.001*	1.4943	4.5893
Age (ref: younger than 31)						
31 - 45	1.2622	0.2329	0.4178	0.482	0.6597	2.4148
46 – 60	7.3763	1.9983	4.1714	0.000*	2.4348	22.3465
61 and older	4.2161	1.4389	6.9067	0.380	0.1700	104.5475
Constant	0.1248	-2.0814	0.0712	0.000	0.0407	0.3819

Note: *significance at 5%, **significance at 10%

Source: Analysis from the authors

Table 11 Logistic regression for bupropion model

Number of observations = 408
LR chi2 (11) = 68.47
Prob > chi2 = 0.0000
Pseudo R2 = 0.1314
Log Likelihood = -226.3637

Willingness-to-pay (WTP)	Odds Ratio	Coefficient	Standard error (for Odds Ratio)	P > |z|	[95% Conf. Interval] (for Odds Ratio)	
Gender (ref: female)	0.4117	-0.8874	0.1300	0.0035*	0.2217	0.7646
Employment (ref: unemployed)	0.4888	-0.7159	0.1374	0.011*	0.2817	0.8480
Income (ref: low)						
Lower middle	2.1631	0.7716	0.6109	0.006*	1.2437	3.7623
Upper middle	2.9228	1.0725	1.0875	0.004*	1.4095	6.0606
High	4.5406	1.5131	2.6758	0.010*	1/4305	14.4120
Tried to Quit (ref: no)	1.9653	0.6756	0.4832	0.006*	1.2138	3.1820
Health Restriction (ref: no)	2.3868	0.8699	0.6038	0.001*	1.4538	3.9188
Heard of the treatment (ref: no)	2.9967	1.0975	1.0881	0.003*	1.4709	6.1052
Constant	0.7652	-0.2676	0.2919	0.483	0.3623	1.6162

Note: *significance at 5%, **significance at 10%
Source: Analysis from the authors

Table 12 Logistic regression for varenicline model

Number of observations = 411
LR chi2 (11) = 74.56
Prob > chi2 = 0.0000
Pseudo R2 = 0.1568
Log Likelihood = -200.475

Willingness-to-pay (WTP)	Odds Ratio	Coefficient	Standard error (for Odds Ratio)	P > |z|	[95% Conf. Interval] (for Odds Ratio)	
Gender (ref: female)	0.5184	-0.6569	0.1645	0.038*	0.2783	0.9656
Income (ref: low)						
Lower middle	2.6745	0.9838	0.7688	0.001*	1.5225	4.6983
Upper middle	3.0297	1.1085	1.1381	0.003*	1.4509	6.3265
High	4.2694	1.4515	2.4702	0.012*	1.3736	13.2697
Tried to Quit (ref: no)	1.9362	0.6607	0.5213	0.014*	1.1423	3.2818
Health Restriction (ref: no)	2.3618	0.8594	0.6222	0.001*	1.4092	3.9582
Heard of the treatment (ref: no)	5.478	1.7007	1.9818	0.000*	2.6958	11.1319
Constant	0.1917	-1.6517	0.0730	0.000	0.0909	0.4044

Note: *significance at 5%, **significance at 10%
Source: Analysis from the authors

In logistic regression, the results can be shown either as a coefficient (log-odds) or as an odds ratio. The odds can be referred to as the ratio of the probability of success (target) to the probability of failure, which means the chance for an event to occur, relative to another event. However, the coefficient of the predictor variables in logistic regression is hard to be interpreted, as it shows the difference in log-odds. In other words, for a one-unit increase in the predictor variable, the expected change in the log-odds as the coefficient. The odds ratio was used in this study to simplify the interpretation of the results. The odds ratio shows how many times more likely a smoker (respondent) was willing to pay for the treatment, as compared to the referred group (denoted as 0).

The results shown that gender was higher significant in all three smoking cessation treatments and male was less likely to pay for the treatments. Male respondents were 62% less likely to pay for the nicotine patch; 59% less likely to pay for bupropion and 48% less likely to pay for varenicline if compared to female respondents. Employed respondents were 50% more unlikely to pay for bupropion if compared to the unemployed respondents but employment was an insignificant factor in the nicotine patch model. Income was another significant variable for bupropion and varenicline models. The results shown that high income group was four times more likely to pay for bupropion and varenicline as compared to low income group while lower and upper middle-income group had lower odds ratio to pay for those two treatments. Moreover, respondents who heard about the treatments before would be more likely to pay for the treatments which 2.6 times, 3 times, 5.5 times for nicotine patch, bupropion and varenicline respectively. Also, respondents who tried to quit smoking before were more likely to pay for bupropion (96%) and varenicline (94%) but this variable was only significant at 10% for nicotine patch with (76%). Employment is significant in the bupropion model which shown that respondents were 50% more likely to pay for it. Respondents had health issues due to smoking were two times more likely to pay for bupropion and varenicline but this variable was only significant at 10% in the nicotine patch model (75% more likely to pay). Respondents who aged between

46 to 60 were seven times more likely to pay for nicotine patch as compared to those who aged younger than 31 years old.

Table 13 Factors associated with the willingness-to-pay for smoking cessation treatments

	Nicotine patch	Bupropion	Varenicline
Positive correlated	Significant at 5% Heard of the treatment Age (46 to 60 years old)	Income Tried to quit Health restriction Heard of the treatment	Income Tried to quit Health restriction Heard of the treatment
Negative correlated	Significant at 10% Tried to quit Health restriction Significant at 5% Gender	Gender Employment	Gender
Insignificant	Employment Peer influence Age (31 to 45 years old) Age (61 years old and older)		

Source: Analysis from the author

The positively correlated variables or factors indicated that willingness-to-pay (WTP) for the smoking cessation treatments can be improved (increased) by encouraging those factors. Meanwhile, the negative correlated factors should be discouraged or avoided.

DISCUSSION

Gender (males) was negatively correlated to the willingness-to-pay (WTP) and it was significant for all three treatments which it was in contradiction to the study carried out in Germany, where males were more likely to pay for smoking cessation treatments (Aumann, et al., 2016). However, the study of Heredia-Pi et al. (2012) supported that males were less willing to pay for smoking cessation treatments unless males were told that treatment could lead to health benefits for surrounding people because males were more altruistic, as compared to females.

Income had a positive effect on the WTP for bupropion and varenicline, as the higher the income the higher the WTP. This was supported by a study carried out in the United States which stated that non-Hispanic whites, who earned a higher annual income than non-Hispanic blacks, were more interested to quit smoking and were positively associated with a WTP (Dube, et al., 2016). Moreover, similar results were obtained from the study conducted by (Heredia-Pi, et al., 2012) where income was positively correlated to the WTP, however, only a few categories of income were significant in this study. According to Busch et al. (2004), low-income smokers were less likely to pay for smoking cessation treatments (OR: 0.490) at the significance of 5%. The WTP of respondents was high as they value their health with higher value (to quit smoking) or they were more health conscious (Package Facts, 2014).

The results of the study conducted by Aumann et al. (2016), regarding the awareness of treatments were consistent with this study. Respondents who had heard about treatments were more likely to pay for treatments as they were familiar with the usage, effectiveness, and side effects of the treatments. Additionally, the nicotine dependency level has been claimed to be an important variable that affects the WTP in many studies (Aumann, et al., 2016; Busch, et al., 2004; Ngan, et al., 2019; Marti, 2012), however, it was not significant in the present study, for all of the three treatments. Anyhow, health restrictions due to smoking were significant at 5% for bupropion and varenicline and 10% for nicotine patches. Smokers who had experienced health issues caused by smoking tended to be more willing to pay for smoking cessation treatments but this result opposed the results of the study conducted by Aumann et al. (2016). Additionally, smokers who had tried to quit smoking before were more likely to pay for treatments and this result was also supported by Aumann et al. (2016).

CONCLUSION AND RECOMMENDATIONS

This study focused on identifying the driving factors of the willingness-to-pay (WTP) for three smoking cessation treatments, namely; nicotine patches, bupropion and; varenicline. There are known limitations for this study as; the area covered in this research is not sufficiently wide to determine the WTP of all Malaysian's for smoking cessation treatment, as the collection of data was conducted only in the state of Selangor, Malaysia which is in central Malaysia. Besides, the sampling method that was used in the study was the convenient sampling method. This sampling method is a non-probability sampling method which may cause biases due to the unavailability of the sample frame, time and financial constraints. Therefore, it is recommended that any future research extends the location of data collection to cover the north and; south of peninsular Malaysia, and even east Malaysia if time and finances allow. Larger sample sizes could also be considered; however, a probability sampling method is strongly recommended. Future willingness-to-pay research could also be extended to examine the mean, or maximum, WTP of smokers for smoking cessation treatments, whilst, not limiting the examination to only the driving factors of the WTP. Besides, the willingness-to-use (WTU) of smokers for smoking cessation treatment is a recommended topic for future research.

Income was a factor that increased the WTP for smoking cessation treatments, as it indicated high-income smokers valued the treatments higher than the low-income smokers. The reasons being as high-income earners value their health higher than the amount spent on smoking cessation treatments and this is an act of health conscious (Package Facts, 2014). Therefore, policy-makers could target the low-income earner by promoting the benefits of smoking cessation treatments as well as the efficacy of the treatments which could improve their WTP (Aumann, et al., 2016). Moreover, smoker's awareness of the existence of smoking cessation treatments is still low. This is a crucial issue in improving the WTP of smokers for smoking cessation treatments, as they may be more willing to pay for something that they have heard of, rather than paying for something that they are unaware of. Starter packs for the various smoking cessation treatments could be recommended to smokers who had never tried to quit smoking before, as the experience of quitting smoking is certainly important to improve their WTP. Hospitals and medical centres which provide treatments for smoking-related-diseases (heart diseases or lung cancer) are recommended to provide smoking cessation treatments or to refer patients to the nearest mQuit centres as smokers were noted to be more willing to pay for smoking cessation treatments after they had experienced health issues caused by smoking. As males were more reluctant to pay for smoking cessation treatments, altruism, which promotes the benefits of quitting smoking to people (especially family members) may provide awareness to male smokers of how their actions affect their loved ones. This study complements the current knowledge gap regarding the factors that affect the WTP for smoking cessation treatments in Malaysia and has suggested policies to improve the WTP which may eventually increase the quit rate of smoking in the country.

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