

Fruit and Vegetable Consumption Behaviour Model: An Implication for Health Education

I. Gede Mahatma Yuda Bakti^{1,2,*} and Sumardjo^{2,#}

¹*Indonesian Institute of Sciences, Jakarta Indonesia*

²*Faculty of Human Ecology, IPB University, Bogor, West Java Indonesia*

*E-mail: *<gede_tok@yahoo.co.id>, ¹<iged010@lipi.go.id>, #<sumardjo252@gmail.com>*

KEYWORDS Health Education. Non-communicable Diseases (NCDs). Fruits and Vegetables Consumption. Theory of Planned Behaviour (TPB). Health Belief Model (HBM)

ABSTRACT It is important to carry out public health education about fruits and vegetables consumption to improve healthy behaviour. This study aims to analyse the effect of perceived severity, perceived susceptibility, subjective norm, attitude, perceived behavioural control (PBC), and the intention to consume fruits and vegetables to the actual consumption of fruits and vegetables. The study used a quantitative research methodology with a survey research design. The survey was conducted in Jakarta, Indonesia. The number of samples of this study was 120 respondents. The researchers utilised some statistical analyses in this study, namely item-to-total correlation, Cronbach α analysis and Structural Equation Modelling (SEM) with Partial Least Square (PLS). This study found that the actual consumption of fruits and vegetables is influenced by perceived severity, perceived severity, attitude, PBC, and the intention to consume fruits and vegetables.

INTRODUCTION

One of the leading health problems in Indonesia is the occurrence of epidemiological transition. More specifically, from 1990 to 2015 Indonesia experienced an increase in the prevalence rate of non-communicable diseases (NCDs) and it exceeded the number of communicable diseases (Ministerial Regulation of National Development Planning Agency 11/2017). Nowadays, NCDs have become a major contributor to cases of death and illness in Indonesia (Ministerial Regulation of National Development Planning Agency 11/2017). The most prominent NCDs are stroke, heart-related diseases, cancer, hypertension, kidney-related diseases, and diabetes. This is a problem for Indonesians because the prevalence of NCDs will cause many losses, such as increasing state health costs, decreasing community productivity, and increasing mortality rates (WHO 2017).

Most of the NCDs are caused by unhealthy behaviour (Ezzati and Riboli 2013) like inadequate consumption of fruits and vegetables (Nawamawati et al. 2020). Unfortunately, previous studies have shown that this is exactly the problem in Indonesia, that is, relatively inadequate national consumption. A study by Hermina and Prihatini (2016) found that the average individual consumption

of vegetables in Indonesia was around 70.0 g per day while the average individual consumption of fruits was 38.8 g per day. The numbers indicated that Indonesia's consumption fell below the recommendation for a well-balanced diet. A study by Febriana and Sulaeman (2014) stated that ninety-nine percent of the elderly population in Depok has an exceptionally low level of fruits and vegetables consumption. Perdana et al. (2014) explained further that generally, women and men in Indonesia had not followed a balanced diet. Perdana and Hardinsyah (2013) discovered that only 0.5 percent of 3-5-year-old kids and 0.6 percent of 6-12-year-old kids consumed full meals at breakfast. A full meal constitutes of carbohydrates, protein, vegetables, fruits, and water.

To encourage healthy behaviour, it is important to carry out public health education. One of the health education programs was a fruits and vegetables consumption education (Lock et al. 2005; Rios et al. 2019). This health education is necessary for society because adequate consumption of fruits and vegetables would nourish one's bodies (Boeing et al. 2012; Jongenelis et al. 2018), and significantly reduce the risk of numerous NCDs (He et al. 2007; Boeing et al. 2012; Hu et al. 2014; Wang et al. 2014; Jongenelis et al. 2018; Sharps et al. 2020). Several countries have started fruits and vegetables consumption edu-

*Address for correspondence:

cation, such as Australia with “Go for 2&5” and US and UK with “5-a-day” (Jongenelis et al. 2018). The World Health Organisation (WHO 2013) also encouraged the same measure. Their recommended daily intake of fruits and vegetables is 400g (Rios 2019).

Problem Statements

In 2016, the Indonesian Government initiated a health education program that focused on increasing consumption of fruits and vegetables. This program aims to encourage people to reduce unhealthy foods and switch to healthy ones, specifically fruits and vegetables. The health education program is carried out with various types of communication, both mass and interpersonal communication. Unfortunately, the campaign has not been proven to reduce the prevalence rate of NCDs (Ministry of Health of the Republic of Indonesia 2018). Therefore, a study to analyse factors that affect citizens’ behaviours in consuming fruits and vegetables is needed so that the health education program can be effectively executed. These factors are expected to be a reference in making a good health education program.

According to the health belief model (HBM), there are two important factors that could affect citizens’ behaviours, which are perceived susceptibility and perceived severity (Rosenstock 1974). Several studies empirically proved the usefulness of HBM in explaining health-related behaviour changes (Yazdanpanah et al. 2015; Mou et al. 2016; Teng and Ahmed 2017; Jeong and Ham 2018). On the other hand, according to TPB from Ajzen (1991; 2002), there are other factors that must be considered, such as subjective norm, attitude, perceived behavioural control (PBC), and behavioural intention. This theory has also been supported by researchers, such as Kim and Chung (2011), Noor et al. (2014), Soon and Wallace (2017), and Yarimoglu et al. (2019). Unfortunately, studies that tested the integration between TPB and HBM in the context of fruits and vegetables consumption are relatively limited (Shaikh et al. 2008; Guillaumie et al. 2010). Previous researchers, such as Noor et al. (2014), Yazdanpanah et al. (2015), Soon and Wallace (2017), Jeong and Ham (2018), and Yarimoglu et al. (2019), have tested TPB and HBM, but they stopped at behaviour intention. They believed that behavioural intention was the

most the most proximal cognitive antecedent of actual behaviour (Abraham et al. 1999). However, some proved that behaviour intention did not always result in actual behaviour (Abraham et al. 1999; Tam et al. 2010). Therefore, it is important to investigate the actual behaviours of Indonesians in terms of fruits and vegetables consumption.

Research Objectives

To fill the gap in the literature, this study investigated the actual consumption of fruits and vegetables using a model that integrates two HBM variables (perceived severity and perceived susceptibility) and five TPB variables (attitude, subjective norm, PBC, behavioural intention, actual behaviour). This research aims to examine the causal relationship among perceived severity, perceived susceptibility, subjective norm, attitude, PBC, the intention to consume, and actual consumption of fruits and vegetables. More specifically, this research aims to answer some fundamental questions, which are:

- ◆ Does perceived susceptibility and perceived severity positively influence attitude toward consuming fruits and vegetables?
- ◆ Does perceived susceptibility, perceived severity, subjective norm, and PBC positively influence the intention to consume fruits and vegetables?
- ◆ Does perceived susceptibility, perceived severity, PBC, and intention to consume positively influence the actual consumption of fruits and vegetables?

Literature Review

Theory of Planned Behaviour (TPB)

The TPB is a theory that predicts and analyses individual behavioural changes (Soon and Wallace 2017). At this point, TPB is one of the most widely utilised theories by researchers to study behavioural model (Jalilvand and Samiei 2012). Some of the advantages of this theory are that the theory is robust (Kalafatis et al. 1999; Chan and Lau 2001; Bamberg 2003; Kim and Chung 2011), usable under many contexts (Bae and Kang 2008; Yin et al. 2018), and flexible when it comes to the addition of context-related vari-

ables (Park and Smith 2007; Sandberg and Conner 2008; Yin et al. 2018).

TPB was first introduced by Icek Ajzen (1991). The theory was an improvement of its predecessor, the Theory of Reasoned Action (TRA) (Fishbein and Ajzen 1975; Yin et al. 2018). TPB explains that individual actual behaviour can be predicted through intention, which flourishes when an individual believes that the act would be beneficial for him or her, when people he/she considers as important think that he/she must conduct the act, and when an individual judges that he/she has the capability and resources to act (Ajzen 2002). From the narration, it is implied that the most proximal determinant of a behaviour is a behavioural intention (Tenkasi and Zhang 2018). Behavioural intention is determined by three conceptually distinct predictors, which are attitude, subjective norm, and perceived behavioural control (PBC) (Ajzen 1991).

Health Belief Model (HBM)

One of the most prominent theories on health-related behaviour is the HBM (Sulat et al. 2018). HBM was introduced in the 1950s to help solve health-related behavioural problems associated with social psychology (Rosenstock 1974; Mou et al. 2016). HBM is a popular theory because it was deemed as theoretically and practically beneficial (Janz and Becker 1984; Sundstrom et al. 2018). A meta-analysis study by Carpenter (2010) found that HBM was currently the best prediction model for health-related behavioural changes (Sundstrom et al. 2018). Aside from that, the model is considered fascinating, simple, and useful by many professionals (Rimer 2008; Sandhu 2014).

The fundamental principle of HBM is an expectancy-value theoretical framework (Sundstrom et al. 2018). Specifically, the HBM explains that an individual's tendency to adopt a certain behaviour relies on perceived threats (measured through perceptions of severity and susceptibility) and outcome expectancies (represented by perceptions of benefits and barriers to action) (Mou et al. 2016). The definitions imply four main constructs that can change health-related behaviours, which are perceived severity ("the perception of the seriousness of a condition and its consequences"), perceived susceptibility ("the perception of

getting a condition"), perceived benefit ("the perception of receiving tangible and psychological benefits by performing the advised action to reduce risk or seriousness of impact"), and perceived barrier ("the perception of having to pay tangible and psychological costs of the advised action") (Paek et al. 2011).

Conceptual Framework

The conceptual framework of this research is a combination of TPB and HBM. This research model illustrates six determinants of actual fruits and vegetables consumption behaviours, which are behavioural intention, attitude, subjective norm, PBC, perceived severity and perceived susceptibility. According to TPB, behavioural intention is a direct antecedent of actual behaviour (Ajzen 1991). Behavioural intention is "the indication of an actor's willingness, readiness, or motivation to perform a behaviour," which in this case is the consumption of fruits and vegetables (Tenkasi and Zhang 2018). Behavioural intention is the function of three independent determinants, which are attitude, subjective norm and PBC. Attitude is defined as "the degree to which a person has a favourable or unfavourable evaluation or appraisal of the behaviour (fruits and vegetables consumption) in question" (Ajzen 1991). Further, subjective norm is defined as "the perceived social pressure to perform or not to perform the behaviour (fruits and vegetables consumption)" (Ajzen 1991). PBC is "the perceived ease or difficulty of performing the behaviour (fruits and vegetables consumption)" (Ajzen 1991). Previous researchers also supported the use of TPB in the healthy food-related context, such as the consumption of healthy food (Noor et al. 2014; Malek et al. 2017; Shimazaki et al. 2017), organic food consumption (Carfora et al. 2019; Canova et al. 2020; Sultan et al. 2020), and mobile health service adoption (Zhang et al. 2019).

Based on the HBM, health-related behaviour is determined by to what extent an individual feels that she or he is susceptible to contract a certain disease. In other words, when people feel like they are highly susceptible, their behaviours would tend to be health oriented (Mou et al. 2016). Therefore, higher perceived susceptibility to NCDs would lead to a higher tendency of fruits and vegetables consumption. Previous studies,

such as Wang and Li (2015), Mou et al. (2016), Rezai et al. (2017) and Teng and Ahmed (2017), also supported the argument. In this research, perceived susceptibility is defined as an individual's perception of how susceptible he or she is to NCDs (Janz and Becker 1984).

The HBM also explains that someone would avoid negative health-related behaviour because he or she feels a serious consequence stemmed from it (Mou et al. 2016). In other words, higher negative consequences would serve as a higher deterrent of negative behaviour. Thus, people would tend to consume fruits and vegetables. This logic has been empirically proven by previous researchers, like Mou et al. (2016) and Teng and Ahmed (2017). In this research, perceived severity is defined as an individual's feeling on the severity of the clinical consequences of NCDs (Janz and Becker 1984).

According to previous studies, perceived susceptibility and perceived severity could influence someone's behaviour. High perceived severity and susceptibility would lead to a more positive health-related behaviour. Weng et al. (2019) have investigated the relationship between perceived susceptibility, perceived severity, and health-related behaviour. Examining the consumption of imported soy-based dietary supplements, Chung et al. (2012) found that perceived susceptibility significantly affect behaviour. Rezai et al. (2017) also came to a similar conclusion in the context of natural functional foods.

Hypotheses Testing

In line with the conceptual framework, this research proposes 11 hypotheses, which were built upon the TPB and the HBM. It is explicitly depicted that this research aims to test the relationships between two HBM's components (perceived severity and perceived susceptibility), and five TPB's components (attitude, subjective norm, PBC, behavioural intention, and actual behaviour). Based on the explanation of these theories and previous studies, the hypotheses of this research are:

- H1: Perceived susceptibility positively influences the attitude toward consuming fruits and vegetables.
- H2: Perceived susceptibility positively influences the intention to consume fruits and vegetables.

- H3: Perceived susceptibility positively influences the actual consumption of fruits and vegetables.
- H4: Perceived severity positively influences the attitude toward consuming fruits and vegetables.
- H5: Perceived severity positively influences the intention to consume fruits and vegetables.
- H6: Perceived severity positively influences the actual consumption of fruits and vegetables.
- H7: Attitude positively influences the intention to consume fruits and vegetables.
- H9: Subjective norm positively influences the intention to consume fruits and vegetables.
- H9: Perceived behavioural control positively influences the intention to consume fruits and vegetables.
- H10: Perceived behavioural control positively influences the actual consumption of fruits and vegetables.
- H11: The intention to consume positively influences the actual consumption of fruits and vegetables.

METHODOLOGY

Research Design

This is quantitative research using a questionnaire as the survey instrument. The researchers crafted this research design because it can appropriately answer the research questions (Sekaran and Bougie 2010), the previous studies on healthy behaviour using TPB and HBM also used quantitative research method (Carfora et al. 2019; McArthur et al. 2018; Zhang et al. 2019; Sultan et al. 2020), and this research design is appropriate for a broader generalisation (Sekaran and Bougie 2010).

Location

This research data were collected in Jakarta. Jakarta is the capital city of Indonesia and one of the biggest and most dense cities in the world with a 661 km² (255 mile²) area (Cybriwsky and Ford 2001). According to the 2010 census, Jakarta was inhabited by 9,607,787 people (BPS – Sta-

tistics Indonesia). Jakarta is a metropolitan area, which acts as the centre of businesses, politics, and culture. It is a magnet for people from around Indonesia (Cybriwsky and Ford 2001). Therefore, Jakarta is a heterogeneous society representing Indonesia.

Jakarta was chosen as the research area because of two reasons. First, Jakarta has a heterogeneous culture due to migration from various parts of Indonesia. Jakarta is a miniature of Indonesia. Second, the prevalence rate of NCDs in Jakarta is high. According to a national survey by the Ministry of Health in 2018, Jakarta has seen a significant increase of NCDs between 2013 and 2018 (Ministry of Health of the Republic Indonesia 2018).

The specific locations were chosen through multiple stages. At the first stage, two districts were randomly selected from each municipality in Jakarta. In the second stage, two sub-districts were also randomly chosen from each district selected at the first stage. The results of the second stage were the actual location of data collection. Table 1 shows the data collection areas.

Respondents

The survey was conducted for three months from September to November 2019. The respondents were chosen through purposive sampling.

Table 1: Survey locations

	<i>Municipalities</i>		<i>Districts</i>		<i>Subdistricts</i>
1.	Central Jakarta	♦	Cempaka Putih	♦	Rawa Sari
		♦	Kemayoran	♦	Cempaka Putih Barat
		♦		♦	Utan Panjang
2.	North Jakarta	♦	Cilincing	♦	Kebon Kosong
		♦	Penjaringan	♦	Rorotan
		♦		♦	Semper Barat
3.	East Jakarta	♦	Jatinegara	♦	Pejagalan
		♦	Cakung	♦	Penjaringan
		♦		♦	Cipinang Besar Selatan
4.	South Jakarta	♦	Pasar Minggu	♦	Cipinang Muara
		♦	Tebet	♦	Penggilingan
		♦		♦	Cakung Barat
5.	West Jakarta	♦	Palmerah	♦	Pejaten Barat
		♦	Grogol Petamburan	♦	Jati Padang
				♦	Bukit Duri
				♦	Manggarai
				♦	Jatipulo
				♦	Palmerah
				♦	Wijaya Kesuma
				♦	Jelambar

The criteria used were age and area of residence. More specifically, the respondents must be above 17 years old and live in Jakarta. In this study the researchers obtained 120 respondents. All criteria were fulfilled, and no questions were missed. Further, this sample size is considered adequate and satisfactory in conducting SEM since the prerequisite sample size is 100 to 150 observations (Hair et al. 1998; Lee et al. 2010). Hence, all respondents can be analysed further. The data shows that fifty-three percent of the respondents were female and the majority aged 31-50 years old (49.1%). The demographic profile can be seen in Table 2.

Measurement Variables and Indicators

This research measured seven variables, which were perceived severity of NCDs, perceived susceptibility of NCDs, subjective norm, attitude, PBC, intention to consume, and actual consumption behaviour. According to previous studies, those variables are latent variables, which means they must be measured through indicators (Diamantopoulos et al. 2012). This research adopted indicators from relevant previous studies (Sekaran and Bougie 2010; Buil et al. 2012). The measurement of TPB variables was adapted from Ajzen (2002; 2006), Malek et al. (2017), and Carfo-

Table 2: Demographic profile

Criteria	Categories	%
<i>Sex</i>	• Male	46.7
	• Female	53.3
<i>Status</i>	• Married	24.2
	• Not married	70
	• Widow(er)	5.0
<i>Age</i>	• 17-20 years old	19.2
	• 21-30 years old	17.5
	• 31-40 years old	23.3
	• 41-50 years old	25.8
	• ≥51 years old	13.3
<i>Occupancy</i>	• Unemployed	11.8
	• Homemaker with no income	31.9
	• Freelancer	4.2
	• Student	9.2
	• Entrepreneur	6.7
	• Employee in private sector	34.5
	• Others	1.7
<i>Education</i>	• No formal school	1.7
	• Primary school	1.7
	• Junior high school	21.7
	• High school	70
	• College Diploma/ Bachelor's degree	2.5
	• 4-year bachelor's degree	2.5
	• Master's degree / Doctoral	0
<i>Monthly Income</i>	• No income	31.7
	• ≤Rp2,500,000	10.8
	• Rp2,500,001 – Rp5,000,000	51.7
	• Rp5,000,001 –Rp10,000,000	5.8
	• >Rp10,000,000	0

ra et al. (2019). Moreover, this study adapted the study of Becker et al. (1977), Park (2011), and Ahadzadeh et al. (2018) in measuring the HBM variables. The measurement of this study can be seen in Appendix A.

Variables to measure the consumption of fruits and vegetables were administered separately for the sake of respondents' convenience. However, in the hypotheses testing stage, the data were merged using the arithmetic mean. The indicators can be seen in the Appendix. The instrument used a 5-points Likert Scale for the perceived severity of NCDs, perceived susceptibility of NCDs, subjective norm, attitude, PBC, and intention to consume. Actual consumption behaviour, AC1, was measured using a 6-point scale (1= once a month; 2 = every 2-3 weeks; 3 = once a week; 4 = every 4-6 days; 5 = every 2-3 days, and 6 = every day) and AC2 was measured using a 4-point scale (1 = <100 grams; 2 = 100-149 grams; 3 = 150-249 grams; 4 = ≥ 250 grams).

Data Analysis

This research employed multiple types of statistical analysis. First, item-to-total correlation was used to test the validity of the research instrument. The instrument was deemed as valid if the results of the item-to-total correlation fell above 0.3 and significant in the five percent threshold (Nunnally and Bernstein 1994). Second, Cronbach's Alpha was used to measure reliability of the instrument. Variables were considered reliable if the results of Cronbach's Alpha generated values above 0.6 (Nunnally and Bernstein 1994). Third, Structural Equation Modelling (SEM) with Partial Least Square (PLS) was used to test the model and the hypotheses. The model in this research was deemed good if the model satisfied several model fit criteria (Kock 2015). Furthermore, the hypotheses were accepted if the p-values were lower than 0.1 (Kock 2015). The SEM analysis was conducted with the help of WarpPLS 5.0 software.

RESULTS

The Validity and Reliability of the Instrument

Since this research utilised multiple indicators, it was important to check the reliability and validity of the instrument. The purpose was to ensure that the variables used in this research were valid and reliable. In this research, the item-to-total correlation using Pearson Product Moment correlation shows that all indicators have adequate values (> 0.3) and all correlations were significant ($p < 0.05$) (Nunnally and Bernstein 1994). The results show that all indicators are valid. In other words, it indicated that all indicators were sufficient to measures their respective variables in this research. The results of the validity test can be seen in Table 3.

In this research, the values of Cronbach's Alpha were above 0.6 for perceived severity, perceived susceptibility, attitude, subjective norm, PBC, and consumption intention (Nunnally and Bernstein 1994). Hence, the instrument used has fulfilled the reliability criterion, which means the instrument consistently measures the variables of this research. The results of the reliability test can be seen in Table 4.

Table 3: The results of validity test

Variables	Indicators	ITC	FL-SEM
Perceived Severity	SV1	0.840*	0.604*
	SV2	0.903*	0.841*
	SV3	0.878*	0.738*
Perceived Susceptibility	SC1	0.907*	0.763*
	SC2	0.943*	0.856*
	SCP3	0.915*	0.755*
Attitude	AT1	0.815*	0.778*
	AT2	0.846*	0.806*
	AT3	0.744*	0.722*
Subjective Norm	SN1	0.861*	0.891*
	SN2	0.885*	0.891*
PBC	PBC1	0.811*	0.733*
	PBC2	0.815*	0.811*
	PBC3	0.723*	0.785*
Intention to Consume	ITC1	0.752*	0.762*
	ITC2	0.839*	0.831*
	ITC3	0.693*	0.692*
Actual Consumption	AC1	0.594*	0.541*
	AC2	0.457*	0.541*

Notes: *p ≥0.01; **p ≥0.05; ***p ≥0.10; ITC = Item-Total-Correlation; FL-SEM = Factor Loading SEM-PLS

Table 4: The results of reliability test

Variable	Cronbach's Alpha
Perceived severity	0.822
Perceived susceptibility	0.91
Attitude	0.721
Subjective norm	0.686
PBC	0.684
Intention to consume	0.642

Model and Hypotheses Testing

The results of SEM analysis are presented in Table 5. For the table, it can be seen that the p-values of average path coefficient (APC), aver-

age r-squared (ARS), and average adjusted r-square (AARS) are smaller than 0.01, which means the model fulfils the predictive validity criteria. The value of average block VIF (AVIF) and average full collinearity VIF (AFVIF) are ≤ 3.3 (for ideal model) and ≤ 5 (for acceptable model). The results indicate that the model is free from collinearity. Furthermore, the Tenenhaus Goodness-of-fit (TGoF) was 0.529 (≥ 0.36), which means the model has high acceptability. Other indices show that the model fulfils all required criteria (Kock 2015). Based on those results, the model used by this research is ideal and acceptable. In other words, it can be suggested that the structural model of this research has a good fit with the data collected.

The hypotheses testing result is depicted in Figure 1. The results show that four out of eleven hypotheses are not supported by the data. These hypotheses are H₂, H₃, H₈, and H₉. This was because the four hypotheses have p-values larger than 0.1. Hence, the result shows that perceived susceptibility of NCDs has no significant impact on the actual consumption of fruits and vegetables. In addition, the effects of perceived susceptibility of NCDs, subjective norm, and PBC on the intention to consume fruits and vegetables were also insignificant.

The hypotheses accepted in this research were H₁, H₄, H₅, H₆, H₇, H₁₀, and H₁₁. Figure 1 shows that perceived severity of NCDs directly and indirectly affected the actual consumption of fruits and vegetables. The indirect effect was mediated by attitude and intention to consume. Perceived susceptibility of NCDs only has an indirect effect on the actual consumption of fruits and vegetables through attitude and intention to

Table 5: Model fit and quality indices

No.	Criteria	Value	Cut-off	Results	Source
1	Average path coefficient (APC)	0.221 (P=0.003)	P<0.01	Good	Kock (2015)
2	Average R-squared (ARS)	0.485 (P<0.001)	P<0.01	Good	Kock (2015)
3	Average adjusted R-square (AARS)	0.0469 (P<0.001)	P<0.01	Good	Kock (2015)
4	Average block VIF (AVIF)	3.029	≤ 3.3	Ideal	Kock (2015)
5	Average full collinearity VIF (AFVIF)	4.006	≤ 5	Acceptable	Kock (2015)
6	Tenenhaus Goodness-of-fit (TGoF)	0.529	≥ 0.36	Acceptable	Kock (2015)
7	Sympson's paradox ratio (SPR)	1	1	Ideal	Kock (2015)
8	R-squared contribution ratio (RSCR)	1	1	Ideal	Kock (2015)
9	Statistical suppression ratio (SSR)	1	≥ 0.7	Acceptable	Kock (2015)
10	Nonlinear bivariate causality direction ratio (NLBCDR)	0.995	≥ 0.7	Acceptable	Kock (2015)

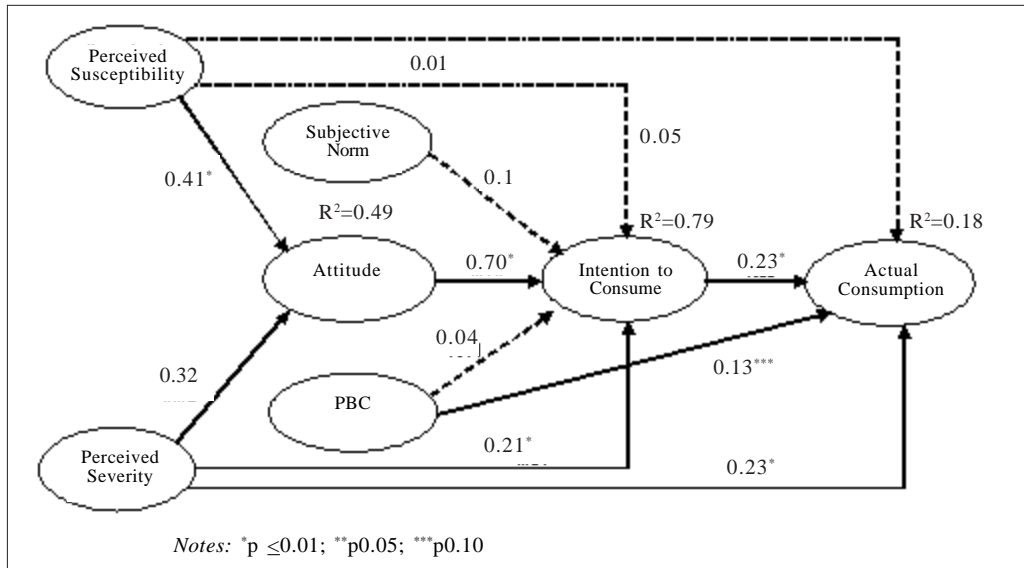


Fig. 1. The result of model testing

Source: Author

consume. PBC was also directly affected by the actual consumption of fruits and vegetables. Figure 1 shows that the most prominent variable is perceived severity. In addition, the determinant coefficient for actual consumption behaviour is 0.18, intention to consume is 0.79, and attitude is 0.49.

DISCUSSION

One of the efforts to suppress the prevalence rate of NCDs is to educate people to lead a healthy lifestyle. The consumption of fruits and vegetables is a part of a healthy lifestyle. Adequate consumption of fruits and vegetables would bring positive effects on one's body (Boeing et al. 2012; Jongenelis et al. 2018). The World Health Organisation (WHO 2013) also recommended it. They suggested the consumption of 400 grams of fruits and vegetables per day (Rios 2019).

In the existing literature, there was no study that investigated the integrated TPB and HBM to explain the actual consumption of fruits and vegetables. Given this, this research has fulfilled the gap in the literature by developing and testing the actual consumption of fruits and vegetables model. Specifically, this research has examined

the causal relationship among perceived severity, perceived susceptibility, subjective norm, attitude, PBC, and the intention to consume, and actual consumption of fruits and vegetables.

Perceived severity: This research found that perceived severity affected attitude, intention to consume, and actual behaviours. This finding indicates that an intense perception of severity would tend to create a positive attitude towards fruits and vegetables consumption, intention to consume, and eventually encourage actual consumption. This finding is similar with previous studies (Hanson and Benedict 2002; Lajunen and Rasanen 2004; Mou et al. 2016; Teng and Ahmed 2017; McArthur et al. 2018; Zhang et al. 2019).

Perceived susceptibility: Perceived susceptibility did not influence intention to consume and actual consumption. However, it has an impact on attitude. It is very likely that people do not fully realise that they contract an NCD because initially, it is relatively asymptomatic. This finding is supported by several previous studies, such as Lajunen and Rasanen (2004), Simsekoglu and Lajunen (2008), Buglar et al. (2010), and Weng et al. (2019).

Attitude: Attitude impacted people's intention to consume fruits and vegetables. A more posi-

tive attitude would create a higher intention to consume fruits and vegetables. This research strengthened the position of TPB in the context of fruits and vegetables consumption (Ajzen 1991). This finding is also supported by previous studies (Noor et al. 2014; Tenkasi and Zhang 2018; Carfora et al. 2019; Zhang et al. 2019; Sultan et al. 2020).

Subjective Norm. The data suggested that subjective norm did not affect intention to consume fruits and vegetables. A previous study by Soon and Wallace (2017), has also found a similar result. Shimazaki et al. (2017) also argued that in a certain condition, subjective norm did not alter behavioural intention.

Perceived Behavioural Control: According to the data, PBC did not influence intention to consume, but it directly impacted the actual consumption. This finding indicates that higher PBC would lead to higher actual consumption. This finding is supported by previous studies, such as Yin et al. (2018) and Sultan et al. (2020).

Intention to Consume: In this research, intention was found to be a significant predictor of actual consumption. When someone intends to consume fruits and vegetables, they tend to realise it. This strengthens the applicability of the TPB. Researchers, like Shimazaki et al. (2017), Tenkasi and Zhang (2018), Canova et al. (2020), and Sultan et al. (2020), also discovered similar findings.

Based on the results of this research, it has been empirically proven that TPB and HBM can be integrated to explain the actual consumption of fruits and vegetables. Furthermore, this research showed that there were several essential factors that need to be considered, which were perceived severity, perceived susceptibility, attitude, PBC, and intention to consume. This research also revealed that subjective norm did not contribute to the actual consumption model, which indicated that external environment has not been able to encourage the consumption of fruits and vegetables. Specifically, this model showed that society's role as a reference was weak. It might be due to the sample context. This study was conducted in Jakarta, a heterogeneous society, where influences were not strongly felt.

The model implied that information regarding the detrimental effects of NCDs might have significant impact on the actual consumption of fruits and vegetables. In other words, a healthy habit

of consuming fruits and vegetables could be built by educating the society of the negative effects of NCDs, such as increased health costs, overburdened family members, and they might lead to reduced income even termination. By instilling the dangers of NCDs, people might likely follow a healthier lifestyle. Another essential factor was the high risk of contracting NCDs if they did not maintain a healthy lifestyle. The anxiety over their susceptibility might encourage them to consume fruits and vegetables as an effective way to avoid NCDs. Another factor was consumers' ability to consume fruits and vegetables. They must be convinced that this behaviour was within their control and power financially and non-financially.

CONCLUSION

Generally, this research aims to test the TPB and the HBM in the context of fruits and vegetables consumption. This research found that the integrated model was ideal and acceptable. The model is valid to predict the consumption of fruits and vegetables. However, this study also discovered that the integrated model was not entirely applicable. Only five out of six independent variables were found to be significant to explain the actual consumption of fruits and vegetables. The independent variables were perceived severity, perceived susceptibility, attitude, PBC, and the intention to consume. In this research, subjective norm did not affect intentions to consume fruits and vegetables. Furthermore, these findings also confirmed that the HBM could complement the TPB in predicting consumers' behaviour because it was found that perceived severity and perceived susceptibility influenced attitude.

RECOMMENDATIONS

Based on the findings, this study proposes several recommendations for stakeholders, such as healthcare service providers, health educators and policymakers, who intend to educate a healthy lifestyle through fruits and vegetables consumption. First, when educating people, whether in mass media, formal socialisation, or trainings, the negative consequences of NCDs must be emphasised. The message should highlight the journey of an NCD patient to his or her deathbed. The aim of this effort is to build a sense

of urgency by communicating various negative impacts of NCDs. Secondly, the education material must emphasise the danger of NCDs and their susceptibility if they did not follow a healthy lifestyle. This message might create awareness and anxiety over the probability of contracting NCDs. The level of awareness and anxiety might encourage them to consume more fruits and vegetables. The message could include the number of NCDs patients and NCDs-related mortalities.

The third practical suggestion is that the content of health education programs must also inform the benefits of consuming fruits and vegetables. The material should highlight the importance of consuming fruits and vegetables to prevent NCDs. People would see the act of consuming fruits and vegetables as a positive behaviour if they understand the benefits. Fourth, it is essential for the government to ensure the availability and affordability of fresh fruits and vegetables. The government must control market prices so that its citizen can easily procure healthy foods and ensure the availability of fruits and vegetables. The aim was to make sure every citizen has a high opportunity to procure and consume fruits and vegetables needed for their bodies.

LIMITATIONS

Even though this research has generated some interesting findings, there are at least two limitations that need to be addressed. First, the sample is rather small, and the sampling technique used was convenience sampling. The results could not be generalised for the entire research population even though the data were randomly collected at the district and sub-district level. Future research could replicate the model with a more representative sample size and probability sampling technique. Second, in this model, the determination coefficient was relatively low (18%). Future studies need to incorporate additional variables from other theories, such as the social cognitive theory, social learning theory, and trans-theoretical model.

REFERENCES

Abraham C, Sheeran P, Norman P, Conner H, de Vries N, Otten W 1999. When good intention are not enough: Modeling postdecisional cognitive correlates of con-

- dom use. *Journal of Applied Social Psychology*, 29(12): 2591 – 2612.
- Ahadzadeh AS, Pahlevan Sharif S, Sim Ong F 2018. Online health information seeking among women: the moderating role of health consciousness. *Online Information Review*, 42(1): 58-72.
- Ajzen I 1991. The theory of planned behaviour. *Organizational Behaviour and Human Decision Processes*, 50(2): 179-211.
- Ajzen I 2002. Constructing a TPB Questionnaire: Conceptual and Methodological Considerations. From <<https://pdfs.semanticscholar.org/0574/b20bd58130dd5a961f1a2db10fd1fcbae95d.pdf>> (Retrieved on 8 August 2019).
- Ajzen I 2006. Constructing a Theory of Planned Behaviour Questionnaire. From <<http://people.umass.edu/ajzen/pdf/tpb.measurement.pdf>> (Retrieved on 8 August 2019).
- Bae HS, Kang S 2008. The influence of viewing an entertainment - education program on cornea donation intention: A test of the theory of planned behaviour. *Health Communication*, 23(1): 87-95.
- Bamberg S 2003. How does environmental concern influence specific environmentally related behaviours? A new answer to an old question. *Journal of Environmental Psychology*, 23(1): 21-32.
- Becker MH, Maiman LA, Kirscht JP, Haefner DP, Drachman, RH 1977. The Health Belief Model and prediction of dietary compliance: A field experiment. *Journal of Health and Social Behaviour*, 18(4): 348-366.
- Boeing H, Bechthold A, Bub A, Ellinger S, Haller D, Kroke A et al. 2012. Critical review: Vegetables and fruit in the prevention of chronic diseases. *European Journal of Nutrition*, 51(6): 637–663.
- Buil I, de Chernatony L, Martínez E 2012. Methodological issues in cross-cultural research: an overview and recommendations. *Journal of Targeting, Measurement and Analysis for Marketing*, 20(3-4): 223-234.
- Buglar ME, White KM, Robinson NG 2010. The role of self-efficacy in dental patients' brushing and flossing: Testing an extended Health Belief Model. *Patient Education and Counseling*, 78: 269–272.
- Canova L, Bobbio A, Manganelli AM 2020. Predicting fruit consumption: A multi-group application of the Theory of Planned Behaviour. *Appetite*, 145: 104490.
- Carfora V, Cavallo C, Caso D, Del Giudice, De Devitiis B, Viscecchia R, Nardone G, Cicia G 2019. Explaining consumer purchase behaviour for organic milk: Including trust and green self-identity within the theory of planned behaviour. *Food Quality and Preference*, 76: 1-9.
- Carpenter CJ 2010. A meta-analysis of the effectiveness of health belief model variables in predicting behaviour. *Health Communication*, 25(8): 661–669.
- Chan RY, Lau LB 2001. Explaining green purchasing behaviour: a cross-cultural study on American and Chinese consumers. *Journal of International Consumer Marketing*, 14(2/3): 9-40.
- Chung J, Stoel L, Xu Y, Ren J 2012. Predicting Chinese consumers' purchase intentions for imported soy-based dietary supplements. *British Food Journal*, 114(1): 143-161.

- Cybriwsky R, Ford LR 2001. City profile: Jakarta. *Cities*, 18(3): 199-201.
- BPS – Statistics Indonesia 2012. *Population of Indonesia: Results of Population Census 2010*. Jakarta: BPS – Statistics Indonesia.
- Diamantopoulos A, Sarstedt M, Fuchs C, Wilczynski P, Kaiser S 2012. Guidelines for choosing between multi-item and single-item scales for construct measurement: A predictive validity perspective. *Journal of the Academy of Marketing Science*, 40(3): 434-449.
- Ezzati M, Riboli E 2013. Behavioural and dietary risk factors for noncommunicable diseases. *The New England Journal of Medicine*, 369: 954-964.
- Febriana R, Sulaeman A 2014. Vegetable and fruit eating habits of mothers during pregnancy related to consumption of vegetable and fruit of pre school-aged children. *Journal of Nutrition and Food*, 9(2): 133-138.
- Fishbein M, Ajzen I 1975. *Belief, Attitude, Intention, and Behaviour: An Introduction to Theory and Research*. Reading, MA: Addison-Wesley Pub.
- Guillaumie L, Godin G, Vézina-Im LA 2010. Psychosocial determinants of fruit and vegetable intake in adult population: A systematic review. *The International Journal of Behavioural Nutrition and Physical Activity*, 7: 1 - 12
- Hair JF, Anderson RE, Tatham RL, Blank WC 1998. *Multivariate Data Analysis*. 5th Edition. Englewood Cliffs, New Jersey: Prentice Hall.
- Hanson JA, Benedict JA 2002. Use of the Health Belief Model to examine older adults' food-handling behaviours. *Journal of Nutrition Education and Behaviour*, 34: 25-30.
- He FJ, Nowson CA, Lucas M, MacGregor GA 2007. Increased consumption of fruit and vegetables is related to a reduced risk of coronary heart disease: Meta analysis of cohort studies. *Journal of Human Hypertension*, 21(9): 717-728.
- Hermina, Prihatini S 2016. Fruits and vegetables consumption of Indonesia population in the context of balanced nutrition: A further analysis of Individual Food Consumption Survey (SKMI) 2014. *Bulletin of Health Research*, 44(2): 205-218.
- Hu D, Huang J, Wang Y, Zhang D, Qu Y 2014. Fruits and vegetables consumption and risk of stroke: A meta-analysis of prospective cohort studies. *Stroke*, 45(6): 1613-1619.
- Jalilvand MR, Samiei N 2012. The impact of electronic word of mouth on a tourism destination choice: Testing the theory of planned behaviour (TPB). *Internet Research*, 22(5): 591-612.
- Janz NK, Becker MH 1984. The health belief model: A decade later. *Health Education Quarterly*, 11(1): 1-47.
- Jeong JY, Ham S 2018. Application of the Health Belief Model to customers' use of menu labels in restaurants. *Appetite*, 123: 208-215.
- Jongenelis MI, Scullyb M, Morleyb B, Pratta IS 2018. Vegetable and fruit intake in Australian adolescents: Trends over time and perceptions of consumption. *Appetite*, 129: 49-54.
- Kalafatis S, Pollard M, East R, Tsogas MH 1999. Green marketing and Ajzen's theory of planned behaviour: A cross-market examination. *Journal of Consumer Marketing*, 16(5): 441-460.
- Kim HY, Chung JE 2011. Consumer purchase intention for organic personal care products. *Journal of Consumer Marketing*, 28(1): 40-47.
- Kock N 2015. *WarpPLS 5.0 User Manual*. Laredo: Script-Warp Systems.
- Lajunen T, Rasanen M 2004. Can social psychological models be used to promote bicycle helmet use among teenagers? A comparison of the Health Belief Model, Theory of Planned Behaviour and the Locus of Control. *Journal of Safety Research*, 35(1): 115-123.
- Lee VH, Ooi KB, Tan BI, Chong AYL 2010. A structural analysis of the relationship between TQM practices and product innovation. *Asian Journal of Technology Innovation*, 18: 73-96.
- Lock K, Pomerleau J, Causer L, Altmann DR, McKee M 2005. The global burden of disease attributable to low consumption of fruit and vegetables: Implications for the global strategy on diet. *Bulletin of the WHO*, 83: 100-108.
- Malek L, Umberger WJ, Makrides M, ShaoJia Z 2017. Predicting healthy eating intention and adherence to dietary recommendations during pregnancy in Australia using the Theory of Planned Behaviour. *Appetite*, 116: 431-441.
- McArthur LH, Riggs A, Uribe F, Spaulding TJ 2018. Health Belief Model offers opportunities for designing weight management interventions for college students. *Journal of Nutrition Education and Behaviour*, 50(5): 485-493.
- Ministerial Regulation of National Development Planning Agency 11/2017 *Tentang Pedoman Umum Pelaksanaan Gerakan Masyarakat Hidup Sehat*, Jakarta, Indonesia.
- Ministry of Health of the Republic of Indonesia 2018. *Hasil Utama Riskesdas*. Jakarta: Kemenkes RI.
- Mou J, Shin D, Cohen J 2016. Health beliefs and the valence framework in health information seeking behaviours. *Information Technology & People*, 29(4): 876-900.
- Nawamawat J, Prasittichok W, Prompradit T, Chatchawanteerapong S, Sittisart V 2020. Prevalence and characteristics of risk factors for non-communicable diseases in semi-urban communities: Nakhonsawan, Thailand. *Journal of Health Research*, 34(4): 295-303.
- Noor NAM, Yap SF, Liew KH, Rajah E 2014. Consumer attitudes toward dietary supplements consumption. *International Journal of Pharmaceutical and Healthcare Marketing*, 8(1): 6-26.
- Nunnally JC, Bernstein IR 1994. *Psychometric Theory*. 3rd Edition. New York: McGraw-Hill.
- Paek H, Jun Bae B, Hove T, Yu H 2011. Theories into practice: A content analysis of anti smoking websites. *Internet Research*, 21(1): 5-25.
- Park DY 2011. Utilizing the Health Belief Model to predicting female middle school students' behavioural intention of weight reduction by weight status. *Nutrition Research and Practice*, 5(4): 337-348.
- Park HS, Smith SW 2007. Distinctiveness and influence of subjective norms, personal descriptive and injunctive norms, and social descriptive and injunctive norms on behavioural intent: a case of two behaviours critical

- to organ donation. *Human Communication Research*, 33(2): 194-218.
- Perdana SM, Hardinsyah, Damayanthi E 2014. Alternative of balanced diet index to assess nutritional quality of diet in Indonesian adult females. *Journal of Nutrition and Food*, 9(1): 43-50.
- Perdana F, Hardinsyah H 2013. Analysis of type, amount, and nutritional quality of breakfast among Indonesian children. *Journal of Nutrition and Food*, 8(1): 39-46.
- Rezai G, Teng P, Shamsudin M, Mohamed Z, Stanton J 2017. Effect of perceptual differences on consumer purchase intention of natural functional food. *Journal of Agribusiness in Developing and Emerging Economies*, 7(2): 153-173.
- Rimer BK 2008. Models of individual health behaviour. In: R Glanz, K Vishwanath (Eds.): *Health Behaviour and Health Education*. 4th Edition. San Francisco: Jossey-Bass, pp. 41-44.
- Rios LM, Serrano MM, Aguilar AJ, Chacón LB, Neria CMR, Monreal LA 2019. Promoting fruit, vegetable and simple water consumption among mothers and teachers of preschool children: An Intervention Mapping initiative. *Evaluation and Program Planning*, 76: 1-8.
- Rosenstock IM 1974. Historical origins of the health belief model. *Health Education and Behaviour*, 2(4): 328-355.
- Sandberg T, Conner M 2008. Anticipated regret as an additional predictor in the theory of planned behaviour: A meta-analysis. *British Journal of Social Psychology*, 47(4): 589-606.
- Sandhu K 2014. Historical trajectory of waste management: An analysis using the health belief model. *Management of Environmental Quality: An International Journal*, 25(5): 615-630.
- Sekaran U, Bougie R 2010. *Research Methods for Business: A Skill Building Approach*. 5th Edition. West Sussex: John Wiley & Sons Ltd.
- Shaikh AR, Yaroch AL, Nebeling L, Yeh M-C, Resnicow K 2008. Psychosocial predictors of fruit and vegetable consumption in adults: A review of the literature. *American Journal of Preventive Medicine*, 34(6): 535-543.
- Sharps MA, Thomas E, Blissett JM 2020. Using pictorial nudges of fruit and vegetables on tableware to increase children's fruit and vegetable consumption. *Appetite*, 144: 1-6.
- Shimazaki T, Bao H, Deli G, Uechi H, Lee YH, Miura K, Takenaka K 2017. Cross-cultural validity of the theory of planned behaviour for predicting healthy food choice in secondary school students of Inner Mongolia. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, 11: 497-501.
- Simsekoglu O, Lajunen T 2008. Social psychology of seat belt use: A comparison of theory of planned behavior and health belief model. *Transportation Research Part F: Traffic Psychology and Behavior*, 11(3): 181-191.
- Soon J, Wallace C 2017. Application of theory of planned behaviour in purchasing intention and consumption of Halal food. *Nutrition & Food Science*, 47(5): 635-647.
- Sulat JS, Prabandari YS, Sanusi R, Hapsari ED, Santoso B 2018. The validity of health belief model variables in predicting behavioural change: A scoping review. *Health Education*, 118(6): 499-512.
- Sultan P, Tarafder T, Pearson D, Henryks J 2020. Intention-behaviour gap and perceived behavioural control-behaviour gap in theory of planned behaviour: Moderating roles of communication, satisfaction and trust in organic food consumption. *Food Quality and Preference*, 81: 103838.
- Sundstrom B, Brandt HM, Gray L, Pierce JY 2018. It's my time: Applying the health belief model to prevent cervical cancer among college-age women. *Journal of Communication Management*, 22(2): 161-178.
- Tam L, Bagozzi RP, Spanjol J 2010. When planning is not enough: The self-regulatory effect of implementation intentions on changing snacking habits. *Health Psychology*, 29(3): 284-292.
- Teng J, Ahmed R 2017. Examining preconception care-related knowledge and attitudes among Chinese immigrants in Canada. *International Journal of Migration, Health and Social Care*, 13(1): 69-92.
- Tenkasi R, Zhang L 2018. A test of the Theory of Planned Behaviour: Influencing behavioural change to go "Green". *Research in Organizational Change and Development*, 26: 127-165.
- Wang E, Li Y 2015. The effect of stress and visible health problems on the intent to continue health food consumption. *British Food Journal*, 117(1): 302-317.
- Wang X, Ouyang Y, Liu J, Zhu M, Zhao G, Bao W, Hu FB 2014. Fruit and vegetable consumption and mortality from all causes, cardiovascular disease, and cancer: Systematic review and dose-response meta-analysis of prospective cohort studies. *BMJ*, 349: 1-14.
- Weng C, Matere I, Rathinasabapathi A, Chu A 2019. The myth of knowledge within a robust nutrition online training course. *Online Information Review*, 44(1): 162-180.
- World Health Organization (WHO) 2013. *Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013-2020*. Geneva: World Health Organization.
- World Health Organization (WHO) 2017. *Fact Sheets on Sustainable Development Goals: Health Targets - A Noncommunicable Disease*. Copenhagen: World Health Organization.
- Yarimoglu E, Kazancoglu I, Bulut ZA 2019. Factors influencing Turkish parents' intentions towards anti-consumption of junk food. *British Food Journal*, 121(1): 35-53.
- Yazdanpanah M, Forouzani M, Hojjati M 2015. The willingness of Iranian young adults to eat organic foods: Application of the Health Belief Model. *Food Quality and Preference*, 41: 75-83.
- Yin S, Li Y, Chen Y, Wu L, Yan J 2018. Public reporting on food safety incidents in China: intention and its determinants. *British Food Journal*, 120(11): 2615-2630.
- Zhang X, Liu S, Wang L, Zhang Y, Wang J 2019. Mobile health service adoption in China: Integration of theory of planned behaviour, protection motivation theory and personal health differences. *Online Information Review*, 44(1): 1-23.

Paper received for publication in October, 2020
 Paper accepted for publication in November, 2020

Appendix A: Measurement variables and indicators

<i>Variables</i>	<i>Statement indicators</i>
<i>Actual Consumption</i>	
AC1	The frequency of fruits [vegetables] consumption
AC2	The quantity of fruits [vegetables] consumed per day
<i>Intention to Consume</i>	
ITC1	I will consume fruits [vegetables]
ITC2	I will consume fruits [vegetables] regularly
ITC3	I intent to continuously consume fruits [vegetables]
<i>Attitude</i>	
AT1	Fruits [vegetables] are good for my body
AT2	Fruits [vegetables] are enjoyable to consume
AT3	I like fruits [vegetables]
<i>Subjective Norm</i>	
SN1	My family members want me to consume fruits [vegetables]
SN2	My friends suggest me to consume fruits [vegetables]
<i>Perceived Behavioural Control (PBC)</i>	
PBC1	I believe I can easily consume fruits [vegetables]
PBC2	I have enough money to consume fruits [vegetables]
PBC3	I can decide freely when to consume fruits [vegetables]
<i>Perceived Susceptibility NCDs</i>	
SC1	If I do not consume healthy foods, I'd contract NCDs, such as stroke, hypertension, diabetes, cancer, and heart failure.
SC2	I am susceptible to NCDs
SC3	I feel like I will contract NCDs in a few years
<i>Perceived Severity NCDs</i>	
SV1	NCDs will pose a serious negative effect on me
SV2	NCDs will create a long-term negative effect on me
SV3	If I contract NCDs, it will negatively affect my life in terms of friendship, work, daily activities, financial health, and family.