

Determinants of Consumption Intention of Fresh Fruit and Vegetable: The Extended Theory of Planned Behavior

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ABSTRACT

The purpose of this study was to determine the predictors of Iranian consumers' intention to consume fresh fruit and vegetable. This study investigated the relationship among attitude, subjective norm, perceived behavioral control, health involvement, subjective health, and Iranian consumption intention by using the Theory of Planned Behavior. The Partial Least Square-Structural Equation Modeling was applied to estimate the model. The results revealed that subjective health ($\beta= 0.463$; $P< 0.001$) as a self-rating of overall health was an important predictor of Iranian consumers' intention to eat fresh fruit and vegetable. Consumers' health involvement ($\beta= 0.198$; $P< 0.001$) that shows the importance of health issues for individuals, had significant effect on consumption intention. Other variables such as subjective norms ($\beta= 0.175$; $P< 0.001$), positive attitude towards fresh fruit and vegetable consumption ($\beta= 0.125$; $P< 0.01$), and perceived behavioral control ($\beta= 0.110$; $P< 0.001$) were significant predictors of consumption intention, respectively. The results provide useful and important information about the main determinants of consumption intention for policy-makers to create effective and well-functioning public health policies aimed at increasing the consumption of fresh fruit and vegetable.

Keywords: Fresh fruit and vegetable, Health involvement, Subjective health, Theory of planned behavior.

INTRODUCTION

Fruit and vegetable are rich in minerals, vitamins, antioxidants, and several other crucial micronutrients, which play an important role in maintaining the immune system (Rondanelli *et al.*, 2021). Fruit and vegetable are essential components of nutritious and healthy diet that reduce the risk of non-communicable diseases such as cardiovascular diseases, diabetes, obesity, stroke, and some cancers (Afshin *et al.*, 2019; WHO, 2022). In addition, the adequate intake of fruit and vegetable plays an important role in increasing mental health and hence reducing depression and anxiety risk (Payne *et al.*, 2012; Fann *et al.*, 2022). Indeed, inadequate consumption of fruit and vegetable can contribute to increased

mortality, both from non-communicable diseases and infectious ones (Iddir *et al.*, 2020; Smith *et al.*, 2022). According to the World Health Organization (WHO, 2003) low fruit and vegetable intake was responsible for 19% of gastrointestinal cancers, 31% of ischemic heart diseases, and 11% of strokes. In this regard, WHO (2003) recommends the minimum intake of fruit and vegetable as 400 grams (i.e. 5 servings) per day to improve overall health.

The consumption of fruit and vegetable in Iran is low. Although the fruit and vegetable consumption increased to 205.2 kg capita⁻¹ (316.7 g capita⁻¹ d⁻¹) in 2021 compared to 71.5 kg capita⁻¹ (137.4 g capita⁻¹ d⁻¹) in 1961 (Fig. 1), it remains below the minimum recommended intake level (FAO, 2023). In addition, a sharp decline in fruit and

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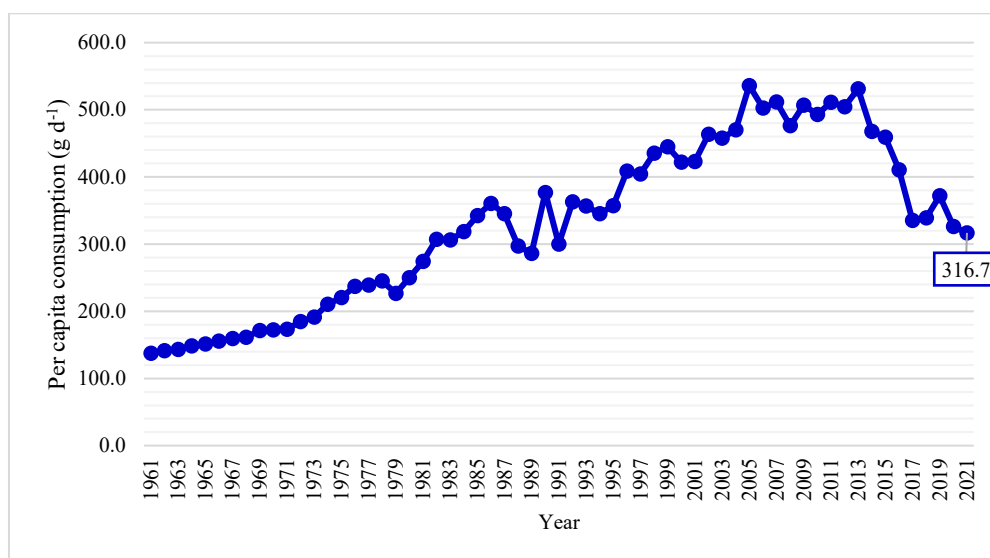


Figure 1. The per capita consumption of fruit and vegetable in Iran (FAO, 2023).

vegetable consumption is observed in the last decade. However, Iranians experienced an average consumption of 536.2 and 531.4 g capita⁻¹ d⁻¹ in 2005 and 2013, respectively. This suggests that fruit and vegetable consumption can be increased (FAO, 2023). Therefore, the understanding of determinants involved in regular consumption of fruit and vegetable in Iranians can be used to create appropriate policies to increase consumers' behavior intention.

In this regard, the purpose of this study was to predict the main determinants of behavioral intention to consume fresh fruit and vegetable in Iran. The findings are important for policy-makers and decision-makers to design public health policies to increase fresh fruit and vegetable consumption and to promote a healthy diet. To the best knowledge of the authors, so far, no empirical research has been done to determine the study's purpose in Iran. Therefore, this study used the extended theory of planned behavior to contribute to the growing body of literature to determine and predict the main factors influencing the consumption intention of fresh fruit and vegetable in Iran, as a developing country with low intake of fruit and vegetable.

Theoretical Framework and Literature Review

One of the most important theories to understand and predict consumption intention and behavior is the Theory of Planned Behavior (TPB) (Ajzen, 1991), which is widely accepted by scientific community. Based on TPB, people's behavioral intentions are predicted by attitude, subjective norm, and perceived behavior control. The TPB theory is extensively used to determine the consumption intentions of food products like seafood products (Menozzi *et al.*, 2023; Aminizadeh *et al.*, 2024), meat products (Llauger *et al.*, 2021; Thangavelu *et al.*, 2022), organic food (Yadav and Pathak, 2016; Bazhan *et al.*, 2024), as well as other foods (Sun and Moon, 2024; Andrés-Sánchez *et al.*, 2025).

Regarding the consumption of fruit and vegetable, some studies have applied TPB to analyze and determine the consumer's intention. Carfora *et al.* (2016) showed that Italian students' intention towards fruit and vegetable were influenced by consumers' attitude, perceived behavioral control, and self-identity. Their proposed TPB model explained 49% of the variance in consumers'

behavioral intention. Similarly, Canova *et al.* (2020) revealed that subjective norms, perceived behavioral control, past behavior, and self-identity have had significant influence on Italian intention towards eating fruit and vegetable in two samples of students and non-student adults. They found that the proposed TPB model explained 78% of the variance in students' intention and 81% of the variance in non-student adults' intention. Jung and Bice (2019) revealed that Alabama college students' intention towards fruit and vegetable consumption was significantly affected by attitude, perceived behavioral control, subjective norm, self-identity and past behavior. They showed that the proposed TPB model accounted for 68% of the variance of behavioral intention towards consuming fruit and vegetable. Miguel *et al.* (2022) indicated that fruit and vegetable consumption intention was influenced by attitude, perceived behavioral control, and consumer ethnocentrism in Portugal. Moreover, their TPB model accounted for 69% of the variance in consumers' behavioral intention.

Literature review revealed two important issues. First, the previous empirical studies focused on determinants of consumption intention towards fruit and vegetable in developed countries that have health-oriented dietary patterns, while developing countries have received less attention. Therefore,

information for academics and policy-makers. Secondly, Guillaumie *et al.* (2010) and Canova *et al.* (2020) express the TPB model could explain 30 to 81% of the variance in behavioral intention. Therefore, TPB theory is a useful conceptual framework to determine consumers' behavioral intentions towards fruit and vegetable. Hence, this study applies the extended TPB model to predict Iranian intentions to consume fruit and vegetable.

Research Framework

The TPB model is an advancement of the Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975). The TRA theory was used to analyze the relationships among belief, attitude, and behavior. The TPB framework is presented by adding the perceived behavior control construct. According to the TPB, an individual's intention is determined by three independent constructs: attitude, subjective norm, and perceived behavior control (Figure 2).

Attitude is one of the main determinants predicting consumers' intention, which indicates the beliefs of an individual about the likely consequences of conducting the behavior (Aminizadeh *et al.*, 2024; Bahraseman *et al.*, 2025). Previous research revealed that there is a strong association

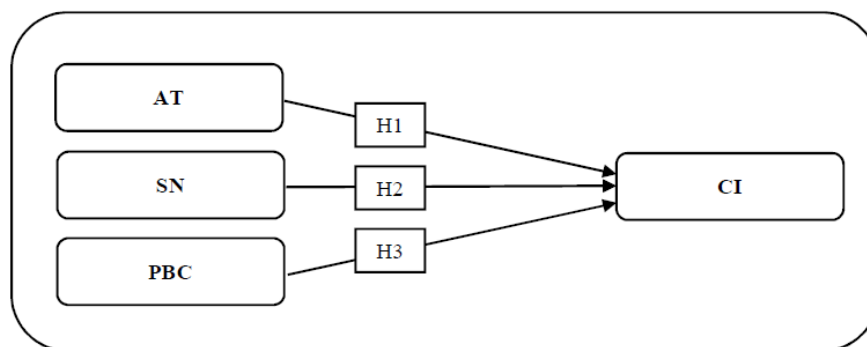


Figure 2. Theory of Planned Behavior (TPB). Notes: (1) CI, Consumption Intention; AT, Attitude; SN, Subjective Norm, PBC, Perceived Behavioral Control and (2) H1 to H3 are study Hypotheses.

determining Iranian intentions to consume fresh fruit and vegetable provide useful

between consumers' positive attitudes and their intentions towards healthy food



consumption (Bogers *et al.*, 2004; Menozzi *et al.*, 2023). Miguel *et al.* (2022) showed positive attitude has a significant influence on consumption intentions of domestic fruit and vegetable in Portugal. In addition, Carfora *et al.* (2016) revealed that attitude is a determinant of young people's intention to eat fresh fruit and vegetable in south of Italy. Similarly, Jung and Bice (2019) indicated positive attitudes plays a significant role in the college students' intention towards fruit and vegetable consumption. Thus, people with positive attitude more likely eat fresh fruit and vegetable. As a result, the following hypothesis is presented:

H1. Positive Attitude Influences Consumers' Intention towards Consuming Fresh Fruit and Vegetable.

Subjective norm is the second factor influencing consumption intention, which shows the perceived pressures from important people to a person to conduct a certain behavior (Ajzen, 2001). Most empirical studies showed that consumers' intention towards healthy food consumption like fruit and vegetable is influenced by subjective norm (Kothe *et al.*, 2012; Jung and Bice, 2019; Dorce *et al.*, 2021). However, some studies showed that there was no significant relationship between subjective norm and people's intention to consume fruit and vegetable (Emanuel *et al.*, 2012; Carfora *et al.*, 2016; Miguel *et al.*, 2022). In case of Iran, Aminizadeh *et al.* (2024) revealed that recommendations from family and best friends have positive significant influence on Iranian intention towards seafood consumption. Therefore, the subsequent hypothesis is proposed:

H2. Subjective Norm Positively Influences Consumers' Intention towards Consuming Fresh Fruit and Vegetable.

Perceived behavioral control is an essential determinant predicting consumption intention, indicating an individual perceived difficulty or ease of performing a particular behavior. In fact, perceived behavioral control reflects anticipated impediments as well as experience (Aminizadeh *et al.*, 2024; Castellini and Graffigna, 2024). Previous

studies showed that perceived behavioral control plays a vital role in consumers' intention towards fruit and vegetable consumption. For instance, Carfora *et al.* (2016) showed that perceived behavioral control is the strongest predictor of Italian young consumers' intention towards fruit and vegetable consumption. Similarly, Canova *et al.* (2020) revealed that perceived behavioral control plays a significant role in consumption intention of fruit and vegetable in two samples of no-student adults and Italian university students. Miguel *et al.* (2022) found similar results in Portugal. Accordingly, the following hypothesis is proposed:

H3. Perceived Behavioral Control Significantly Influences Consumers' Intention towards Consuming Fresh Fruit and Vegetable.

Although the standard TPB is an appropriate tool for predicting food consumption intention, the variance could be better predicted by including additional constructs. Therefore, this study investigates the research purpose by extending the standard TPB model with additional constructs, including health involvement and subjective health.

Health involvement plays an important role in determining consumption intention of healthy food, which shows the importance of health issues for individuals, based on their values, needs, and interests (Saba and Vassallo, 2012). According to the literature, consumers' health involvement has a significant positive influence on their intentions towards healthy eating (Olsen, 2003; Tomic *et al.*, 2016; Aminizadeh *et al.*, 2024). Therefore, the subsequent hypothesis is suggested:

H4. Health Involvement Positively Influences Consumers' Intention towards Consuming Fresh Fruit and Vegetable.

Subjective health is a self-rating of overall health, which is considered as an important indicator of personal health to analyze the food consumer intention (Baron-Epel and Kaplan, 2001). Pieniak *et al.* (2010) showed that consumers with high subjective health

were very interested in healthy eating. Similarly, Aminizadeh (2024) found that there was significant relationship between subjective health and healthy food consumption. Accordingly, the fifth hypothesis of this study is:

H5. Subjective Health Positively Influences Consumers' Intention towards Consuming Fresh Fruit and Vegetable.

Figure 3 presents the relationship among the research constructs in the proposed study framework.

MATERIALS AND METHODS

Constructs measure for consumption intention: attitude, subjective norm, perceived behavioral control, health involvement, and subjective health were based on previous empirical studies (Table 1). A five-point Likert scale was used for all research constructs, where 1 is “strongly disagree” and 5 is “strongly agree”.

Two items were adopted from Tomic *et al.* (2016) to measure people's intention. Greater values indicate more consumption intention of fresh fruit and vegetable. Three items of attitude were adopted from Mitterer-Daltoé, *et al.* (2013) and Aminizadeh *et al.* (2024). Greater values indicate more positive

greater perceived social pressures towards behavioral intention to consume fresh fruit and vegetable. Three items were adopted to measure perceived behavioral control taken from Tomic *et al.* (2016). Three items were adopted from Aminizadeh *et al.* (2024) to measure health involvement. Greater values reveal more involvement of consumers in health. Three items were adopted to measure subjective health taken from Pieniak *et al.* (2010). Greater values demonstrate more physical and mental health.

Data Collection

An online survey was designed and employed to collect data in 2022. Respondents were recruited by convenience and snowball sampling method via two popular and widely used social network applications: Instagram and Telegram. The use of convenience and snowball sampling method via social media were significantly increased in empirical research, particularly during and after the pandemic of COVID-19 (Folkvord *et al.*, 2021; Singh *et al.*, 2023; Cramer *et al.*, 2023). To minimize the sampling bias, this study used the sample seed diversity method (Etikan *et al.*, 2016).

In total, 410 individual responses were received from survey participants. According to Kline (2011), 10-20 observations per parameter are adequate to estimate the model

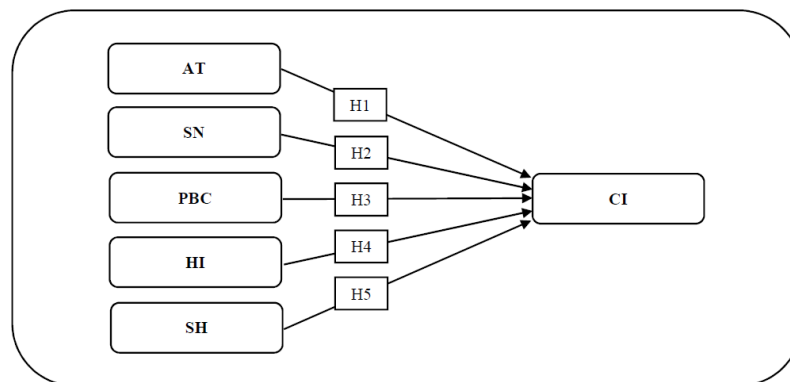


Figure 3. Study framework: (1) CI, Consumption Intention; AT, Attitude; SN, Subjective Norm, PBC, Perceived Behavioral Control; HI, Health Involvement; SH, Subjective Health. (2) H1 to H5 are study Hypotheses.

consumers' attitude towards eating fresh fruit and vegetable. Four items were adopted from Aminizadeh, *et al.* (2024) to measure subjective norm. Greater values demonstrate

and to test the hypotheses. Due to the 18 measured items, this study needs 180 respondent (18×10) to estimate the proposed



Table 1. Constructs and its items for analyzing the study hypotheses.

Construct	Item	Item texts	Reference
Attitude	AT1	Eating fresh fruit and vegetable is healthy.	Mitterer-Daltoé, <i>et al.</i> (2013); Aminizadeh <i>et al.</i> (2024)
	AT2	Eating fresh fruit and vegetable is nutritious.	
	AT3	I feel good sense after eating fresh fruit and vegetable.	
Subjective Norm	SN1	My family eats fresh fruit and vegetable.	Aminizadeh <i>et al.</i> (2024)
	SN2	My family thinks that eating fresh fruit and vegetable is necessary for me.	
	SN3	My friends eat fresh fruit and vegetable.	
	SN4	My friends think that eating fresh fruit and vegetable is necessary for me.	
Perceived Behavioral Control	PBC1	I have found it is easy for me to judge the quality and freshness of fresh fruit and vegetable.	Tomic <i>et al.</i> (2016)
	PBC2	When I buy fresh fruit and vegetable, the chance of making a bad choice is low.	
	PBC3	When I buy fresh fruit and vegetable, I know whether I make a good choice.	
Health Involvement	HI1	Healthy food is important for me.	Aminizadeh <i>et al.</i> (2024)
	HI2	I care about health very much.	
	HI3	I really appreciate food health.	
Subjective Health	SH1	Compared to people my age, my health is excellent.	Pieniak <i>et al.</i> (2010)
	SH2	Compared to people my age, my current physical health is excellent.	
	SH3	Compared to people my age, my current mental health is excellent.	
Consumption Intention	CI1	I intend to eat fresh fruit and vegetable at home in next two days.	Tomic <i>et al.</i> (2016)
	CI2	I will probably eat fresh fruit and vegetable at home in next two days.	

model. Therefore, 410 questionnaires are adequate for analyzing the data.

The hypothesized relationships among the constructs were analyzed using the Partial Least Square-Structural Equation Modeling (PLS-SEM). The SmartPLS software version 3 (Ringle *et al.*, 2015) was used to test the study hypotheses. To guarantee the stability of the data, this study conducted a complete bootstrapping procedure with 5000 subsamples (Hair *et al.*, 2014). Table 2 presents the characteristics of research sample. The study sample was young, with more than 75% between the ages of 18 and 40. In addition, although a large number of study sample (91%) had academic education, only approximately 22% of the sample had high income.

RESULTS AND DISCUSSION

The descriptive statistics of TPB constructs are presented in Table 3. Respondents showed high positive attitudes toward consuming fresh fruit and vegetable and high involvement in health. However, the

respondent perception was moderate for the subjective norm, subjective health, and perceived behavioral control. Respondents' perceptions showed that they had high intention to eat fresh fruit and vegetable in the next two days.

Table 4 shows the results of the measurement model. The findings show that the factors loading for each item were higher than 0.6, indicating that constructs had a close relationship with their items (Hair *et al.*, 2010). Cronbach's Alphas for all research constructs are greater than 0.7, revealing acceptable internal consistency (Hair *et al.*, 2021). The CR scores are greater than 0.7, the AVE scores are higher than 0.5, and the rho A scores are higher than 0.7, demonstrating that the reliability and validity for all constructs are satisfactory (Bagozzi and yi, 1988; Henseler *et al.*, 2016; Hair *et al.*, 2021). The findings reveal that the proposed research model explains 68.1% of the total variance in consumption intentions of fresh fruit and vegetable, indicating the model is a

Table 2. Sample's demographic characteristics.

Item	Group	Frequency (N= 410)	Percentage
Gender	Female	226	55.1
	Male	184	44.9
Marriage	Single	246	60.0
	Married	164	40.0
Age	18-30	229	55.9
	31-40	82	20.0
	41-50	57	13.9
	51-60	32	7.8
	+60	10	2.4
Education	Elementary and high school	37	9.0
	University	156	38.1
	Master	135	32.9
	PhD	82	20.0
Number of household members	1	28	6.8
	2	37	9.0
	3	92	22.5
	4	156	38.1
	5	71	17.3
	>5	26	6.3
Income	Very low (Income< 2880\$)	149	36.3
	Low (2880\$< Income< 4320\$)	109	26.6
	Average (4320\$< Income< 5760\$)	61	14.9
	High (5760\$< Income< 7200\$)	43	10.5
	Really high (Income> 7200\$)	48	11.7

Note. (1) 1 US dollar= 287,000 Iranian Rials.

Table 3. Descriptive statistics.

Items	N	Mean	Standard deviation	Min	Max
AT1	410	4.8	0.5	2	5
AT2	410	4.7	0.5	2	5
AT3	410	4.5	0.7	1	5
SN1	410	4.5	0.6	1	5
SN2	410	4.1	0.9	1	5
SN3	410	3.8	0.9	2	5
SN4	410	3.2	0.7	1	5
PBC1	410	3.9	0.9	1	5
PBC2	410	4.0	0.9	1	5
PBC3	410	3.9	0.9	1	5
HI1	410	4.4	0.7	1	5
HI2	410	4.2	0.8	1	5
HI3	410	4.3	0.8	1	5
SH1	410	4.3	0.8	1	5
SH2	410	4.0	0.8	1	5
SH3	410	3.7	0.9	1	5
CI1	410	4.3	0.8	1	5
CI2	410	4.3	0.9	1	5

Source: Research findings. **Note:** (1) Values 1 and 5 show strongly disagree and strongly agree, respectively.

reasonably good fit. Moreover, the results show that there was a good discriminant

validity between the research constructs based on Fornell and Larcker's criterion



Table 4. Measurement model results.

Constructs	Items	Factor loading	P-value	Cronbach's α	CR	AVE	rho_A
Attitude	AT1	0.826	0.000	0.758	0.860	0.672	0.763
	AT2	0.817	0.000	(0.000)	(0.000)	(0.000)	(0.000)
	AT3	0.815	0.000				
Subjective Norm	SN1	0.796	0.000	0.743	0.835	0.559	0.759
	SN2	0.758	0.000	(0.000)	(0.000)	(0.000)	(0.000)
	SN3	0.684	0.000				
	SN4	0.747	0.000				
Perceived Behavioral Control	PBC1	0.863	0.000	0.794	0.878	0.706	0.810
	PBC2	0.811	0.000	(0.000)	(0.000)	(0.000)	(0.000)
	PBC3	0.846	0.000				
Health Involvement	HI1	0.894	0.000	0.886	0.929	0.814	0.889
	HI2	0.887	0.000	(0.000)	(0.000)	(0.000)	(0.000)
	HI3	0.925	0.000				
Subjective Health	SH1	0.930	0.000	0.883	0.928	0.811	0.903
	SH2	0.832	0.000	(0.000)	(0.000)	(0.000)	(0.000)
	SH3	0.936	0.000				
Consumption Intention	CI1	0.937	0.000	0.853	0.932	0.872	0.855
	CI2	0.931	0.000	(0.000)	(0.000)	(0.000)	(0.000)

Source: Research findings; **Notes:** (1) CR= Composite Reliability; AVE = Average Variance Expected. (2) R-squared= 0.681, Adjusted R-squared= 0.677. (3) Model fit: SRMR (Standardized Root Mean Square Residual)= 0.068, NFI (Normed Fit Index)= 0.788.

Table 5. Discriminant validity.

Fornell-Lacker							
	AT	CI	HI	PBC	SH	SN	
AT	0.820						
CI	0.501	0.934					
HI	0.456	0.645	0.902				
PBC	0.232	0.442	0.414	0.840			
SH	0.407	0.741	0.560	0.357	0.900		
SN	0.410	0.564	0.490	0.319	0.445	0.747	
HTMT (Heterotrait–Monotrait) ratio							
	AT	CI	HI	PBC	SH	SN	
AT							
CI	0.614						
HI	0.545	0.739					
PBC	0.282	0.529	0.490				
SH	0.491	0.847	0.631	0.414			
SN	0.507	0.684	0.579	0.399	0.530		

Source: Research findings; **Note:** (1) The bold values indicate the square root of AVE.

(Fornell and Larcker, 1981), and HTMT (Heterotrait–Monotrait) ratio (Table 5).

Table 6 presents the findings of structural equation modelling. The results revealed that

consumers' positive attitudes towards eating fresh fruit and vegetable had a significant influence on consumption intention (β_{AT-CI} = 0.125; t = 2.993; P < 0.01) and, so, the first

Hypothesis (H1) is confirmed. This finding is in line with previous research (Carfora *et al.*, 2016; Jung and Bice, 2019; Pandey *et al.*, 2021), and indicates that an increase in consumers' attitudes towards eating fruit and vegetable will result in an increase in intention to consume fresh fruit and vegetable. Consumers who perceive fresh fruit and vegetable consumption to be healthy and nutritious had a stronger intention to eat them. Therefore, increasing consumers' knowledge by providing more information regarding the importance of fresh fruit and vegetable consumption on people health may further contribute to more positive attitudes.

Subjective norm ($\beta_{SN-CI} = 0.175$; $t = 4.446$; $P < 0.001$) shows a positive and significant effect on people's intention to consume fresh fruit and vegetable, and supports the second Hypothesis (H2). This means the behavior and opinions of close friends and family members influence the Iranian intentions to eat fresh fruit and vegetable. This result is consistent with the findings of Jung and Bice (2019) and Ubiparip Samek *et al.* (2023), showing that subjective norm has a significant positive influence on fruit and vegetable consumption intention. Moreover, Canova *et al.* (2020) showed that consumers' intention to consume fruit is significantly influenced by important people. Pandey *et al.* (2021) revealed that the consumption intention of vegetable is associated with individuals perceived pressures from family members. However, Carfora *et al.* (2016) found that there was no significant relationship between subjective norm and intention towards fruit and vegetable. As a result, family and friends' food patterns play an important role in consuming healthy foods. Thus, emphasizing the importance of fresh fruit and vegetable on meal planning by family members and friends may be beneficial for increasing the subjective norm.

Perceived behavioral control ($\beta_{PBC-CI} = 0.110$; $t = 3.610$; $P < 0.001$) has a significant influence on consumption intention of fresh fruit and vegetable, thereby confirming the third Hypothesis (H3). Consumers who do not have enough information about the

freshness and quality of fresh fruit and vegetable have a lower intention towards eating them. This finding confirmed the results of Carfora *et al.* (2016) and Canova *et al.* (2020), indicating that there is a significant relationship between perceived behavioral control and fruit and vegetable consumption intention. Considering these findings, providing new information about judging the quality and freshness of fruit and vegetable can contribute consumers in buying processed and eating intention towards them.

Health involvement has a significant positive influence on the Iranian consumption intention of fresh fruit and vegetable ($\beta_{HI-CI} = 0.198$; $t = 4.804$; $P < 0.001$), this confirms the fourth Hypothesis (H4). This means that Iranian intentions to consume fresh fruit and vegetable is influenced by health-related attributes of foods. Similar findings about the significant effect of health involvement on intention towards healthy and nutritious food were observed in previous studies (Tomic *et al.*, 2016; Aminizadeh *et al.*, 2024). Creating the belief among people that consuming fruit and vegetable is a healthy food consumption pattern can play an effective role in increasing consumers' intention to eat them.

According to the results, subjective health is the most important predictor on the Iranian behavioral intention to consume fruit and vegetable. Subjective health has a significant positive effect on fresh fruit and vegetable consumption intention ($\beta_{SH-CI} = 0.463$; $t = 18.845$; $P < 0.001$), thus supporting Hypothesis 5. The results suggest that people who consider themselves physically and mentally healthier than others have more intention to consume fresh fruit and vegetable. Therefore, it seems healthier people have a healthy food habit. Pieniak *et al.* (2010) showed that consumers with high subjective health were very interested in healthy eating and they evaluated themselves as very healthy and felt very satisfied with their lives.



Table 6. Structural model results.

Paths	Estimated coefficient	Std. dev.	t-Value	p-Value	Results
AT => CI	0.125	0.042	2.993	0.002	Confirmed
SN => CI	0.175	0.039	4.446	0.000	Confirmed
PBC => CI	0.110	0.030	3.610	0.000	Confirmed
HI => CI	0.198	0.041	4.804	0.000	Confirmed
SH => CI	0.463	0.043	10.845	0.000	Confirmed

Source: Research findings. **Notes:** (1) CI, Consumption Intention; AT, Attitude; SN, Subjective Norm, PBC, Perceived Behavioral Control; HI, Health Involvement; SH, Subjective Health.

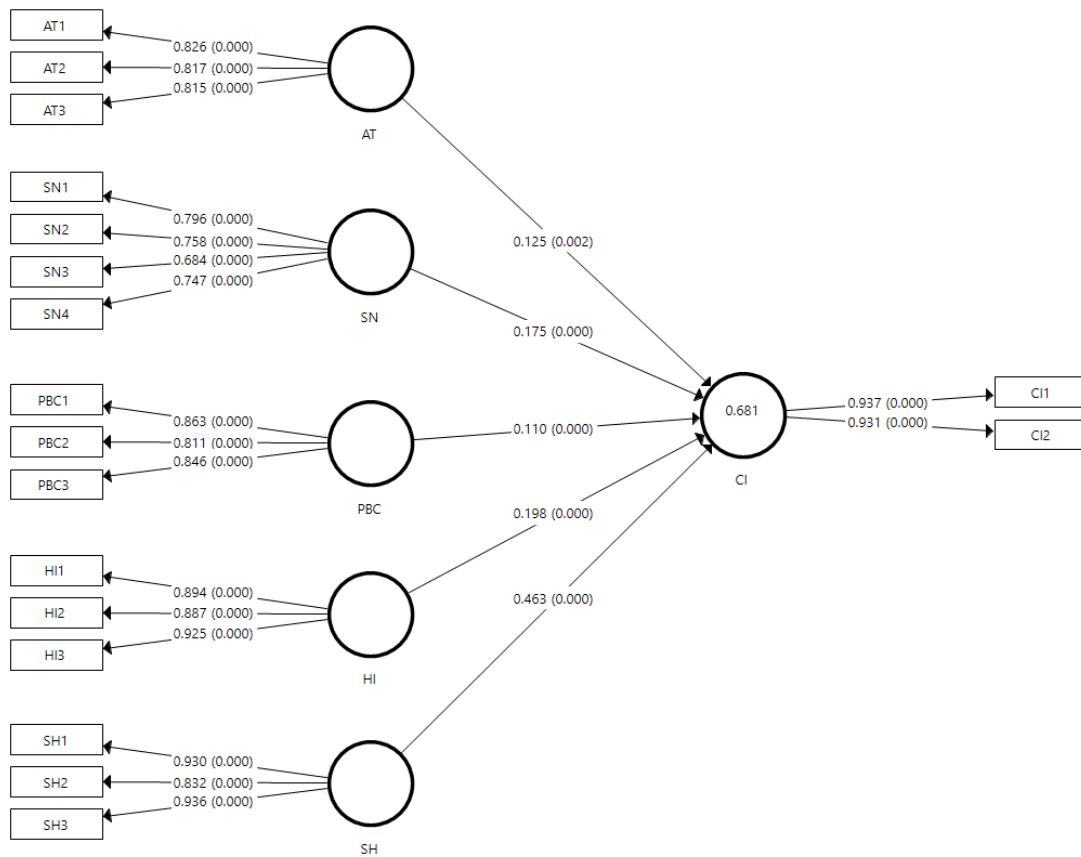


Figure 4. Structural model path coefficients. (1) CI, Consumption Intention; AT, Attitude; SN, Subjective Norm, PBC, Perceived Behavioral Control; HI, Health Involvement; SH, Subjective Health. (2) Number in the parentheses is the P-value. Source: Research findings.

CONCLUSIONS

The consumption of fresh fruit and vegetable is low and below the recommended intake in Iran. Therefore, this study has analyzed the applicability of TPB in predicting Iranian consumers' intention to consume fresh fruit and vegetable. The

results confirmed that a positive attitude toward consuming fruit and vegetable directly increases consumption intention. Hence, creating useful information and knowledge about the nutrition and health benefits of fresh fruit and vegetable consumption can positively affect the consumers' intention. In this regard, education programs about the nutritional

benefits of fruit and vegetable through communication media, like television and radio, as well as social media is useful for increasing public health knowledge. Perceived behavioral control of consumers significantly and directly influenced the consumption intention towards fresh fruit and vegetable. Therefore, providing clear information regarding the freshness, quality, and safety of fresh fruit and vegetable can positively affect the Iranian behavioral intention to eat them. For instance, social campaigns raising awareness about quality standards for fruit and vegetable can reduce mistakes in decision-making during in purchasing process. Health involvement and subjective health constructs had significant positive effect on behavioral intention to consume fresh fruit and vegetable. These results provide important and useful information for policy-makers to implement effective and well-functioning public health policies to improve nutritional awareness and knowledge aimed at increasing fresh fruit and vegetable consumption. Although this study provides new insights regarding the consumption intention of fresh fruit and vegetable, there are some limitations that need to be investigated in future studies. This study determined the predictors of consumption intention using extended TPB theory. However, future studies can use other popular theories to predict consumers' behavior such as information-motivation-behavioral skills model (Fleary et al., 2020), and other useful methods such as discrete choice models (Secer, 2023; Dharmayani et al., 2024; Chinyanga et al., 2024). Also, there are some variables like moral obligation and price that have not been examined and other researchers can determine their effect on consumption intention in future investigations. Besides, considering the factors influencing consumers' behavioral intention can be different between fruit and vegetable products: it is possible that health involvement and subjective health only explain the behavioral intention of fruit consumption but not vegetable consumption. Therefore, future research can predict the

determinants of behavioral intention to consume fruit and vegetable products separately, and create a deeper understanding to provide appropriate practical recommendation to policy-makers.

REFERENCES

1. Afshin, A., Sur, P. J., Fay, K. A., Cornaby, L., Ferrara, G., Salama, J. S., Mullany, E. C., Abate, K. H., Abbafati, C., Abebe, Z., Afarideh, M., Aggarwal, A., Agrawal, S., Akinyemiju, T., Alahdab, F., Bacha, U., Bachman, V. F., Badali, H., Badawi, A., Bensenor, I. M., Bernabe, E., Biadgilign, S. K. K., Biryukov, S. H., Cahill, L. E., Carrero, J. J., Cercy, K. M., Dandona, L., Dandona, R., Dang, A. K., Degefa, M. G., El Sayed Zaki, M., Esteghamati, A., Esteghamati, S., Fanzo, J., e Sá Farinha, C. F., Farvid, M. S., Farzadfar, F., Feigin, V. L., Fernandes, J. C., Flor, L. S., Foigt, N. A., Forouzanfar, M. H., Ganji, M., Geleijnse, J. M., Gillum, R. F., Goulart, A. C., Grosso, G., Guessous, I., Hamidi, S., Hankey, G. J., Harikrishnan, S., Hassen, H. Y., Hay, S. I., Hoang, C. L., Horino, M., Ikeda, N., Islami, F., Jackson, M. D., James, S. L., Johansson, L., Jonas, J. B., Kasaeian, A., Khader, Y. S., Khalil, I. A., Khang, Y. -H., Kimokoti, R. W., Kokubo, Y., Kumar, G. A., Lallukka, T., Lopez, A. D., Lorkowski, S., Lotufo, P. A., Lozano, R., Malekzadeh, R., März, W., Meier, T., Melaku, Y. A., Mendoza, W., Mensink, G. B. M., Micha, R., Miller, T. R., Mirarefin, M., Mohan, V., Mokdad, A. H., Mozaffarian, D., Nagel, G., Naghavi, M., Nguyen, C. T., Nixon, M. R., Ong, K. L., Pereira, D. M., Poustchi, H., Qorbani, M., Kumar Rai, R., Razo-García, C., Rehm, C. D., Rivera, J. A., Rodríguez-Ramírez, S., Roshandel, Gh., Roth, G. A., Sanabria, J., Sánchez-Pimienta, T. G., Sartorius, B., Schmidhuber, J., Schutte, A. E., Sepanlou, S. G., Shin, M., -J., Sorensen, R. J. D., Springmann, M., Szponar, L., Thorne-Lyman, A. L., Thrift, A. G., Touvier, M., Tran, B. X., Tyrovolas, S., Ukwaja, K. N., Ullah, I., Uthman, O. A., Vaezghasemi, M., Vasankari, T. J., Vollset, S. E., Vos, T., Vu,



- G. T., Vu, L. G., Weiderpass, E., Werdecker, A., Wijeratne, T., Willett, W. C., Wu, J. H., Xu, G., Yonemoto, N., Yu, C. and Murray, C. J. L. 2019. Health Effects of Dietary Risks in 195 Countries, 1990-2017: A Systematic Analysis for the Global Burden of Disease Study 2017. *Lancet*, **393(10184)**: 1958–1972.
2. Ajzen, I. 1991. The Theory of Planned Behavior. *Organ. Behav. Hum. Decis. Process*, **50(2)**: 179-211.
 3. Ajzen, I. 2001. Nature and Operation of Attitudes. *Annu. Rev. Psychol.*, **52(1)**: 27-58.
 4. Aminizadeh, M., Mohammadi, H., Karbasi, A. and Rafiee, H. 2024. Predicting Consumers' Intention towards Seafood Products: An Extended Theory of Planned Behavior. *Food Qual. Prefer.*, **113**: 1-15.
 5. Andrés-Sánchez, J. D., Puellas-Gallo, M., Souto-Romero, M. and Arias-Oliva, M. 2025. Importance-Performance Map Analysis of the Drivers for the Acceptance of Genetically Modified Food with a Theory of Planned Behavior Groundwork. *Foods*, **14(6)**: 1-24.
 6. Bagozzi, R.P., and Yi, Y. 1988. On the evaluation of structural equation models. *J. Acad. Mark. Sci.*, **16**: 74–94.
 7. Bahraseman, S. E., Dashtabi, M. D., Karbasi, A., Firoozzare, A., Boccia, F. and Nazeri, Z. H. 2025. Moving towards Novel and Sustainable Foods: Investigating Consumers' Intention to Consume Algae-Based Foods in a Developing Country. *Appetite*, **206**: 2-13.
 8. Baron-Epel, O. and Kaplan, G. 2001. General Subjective Health Status or Age-Related Subjective Health Status: Does It Make a Difference?. *Soc. Sci. Med.*, **53(10)**: 1373-1381.
 9. Bazhan, M., Shafiei Sabet, F. and Borumandnia, N. 2024. Factors Affecting Purchase Intention of Organic Food Products: Evidence from a Developing Nation Context. *Food Sci. Nutr.*, **12(5)**: 3469-3482.
 10. Bogers, R. P., Brug, J., van Assema, P. and Dagnelie, P. C. 2004. Explaining Fruit and Vegetable Consumption: The Theory of Planned Behaviour and Misconception of Personal Intake Levels. *Appetite*, **42(2)**: 157-166.
 11. Canova, L., Bobbio, A. and Manganelli, A. M. 2020. Predicting Fruit Consumption: A Multi-Group Application of the Theory of Planned Behavior. *Appetite*, **145**: 104490.
 12. Carfora, V., Caso, D. and Conner, M. 2016. The Role of Self-Identity in Predicting Fruit and Vegetable Intake. *Appetite*, **106**: 23-29.
 13. Castellini, G. and Graffigna, G. 2024. The Moderating Role of Food Involvement: An Application of the Theory of Planned Behaviour Model in Reducing Red Meat Consumption. *Food Qual. Prefer.*, **120**: 1-10.
 14. Chinyanga, E., Britwum, K., Gustafson, C. R. and Bernard, J. C. 2024. Did COVID-19 Influence Fruit and Vegetable Consumption? Explaining and Comparing Pandemic Peak and Post-Peak Periods. *Appetite*, **201**: 1-10.
 15. Cramer, L. A., Beaulieu, J., Doyle, J., Maldonado, M., Egna, H., Johnson, M. and Conway, F. D. 2023. The Importance of the Seafood Processing Sector to Coastal Community Resilience. *Mar. Policy*, **156**: 1-9.
 16. Dharmayani, P. N. A., Williams, M., Lopes, C. V. A., Ronto, R., Chau, J. Y., Partridge, S. R. and Mihrshahi, S. 2024. Exploring Reasons for High Levels of Food Insecurity and Low Fruit and Vegetable Consumption among University Students Post-COVID-19. *Appetite*, **200**: 1-10.
 17. Dorce, L. C., da Silva, M. C., Mauad, J. R. C., de Faria Domingues, C. H. and Borges, J. A. R. 2021. Extending the Theory of Planned Behavior to Understand Consumer Purchase Behavior for Organic Vegetables in Brazil: The Role of Perceived Health Benefits, Perceived Sustainability Benefits and Perceived Price. *Food Qual. Prefer.*, **91**: 1-10.
 18. Emanuel, A. S., McCully, S. N., Gallagher, K. M. and Updegraff, J. A. 2012. Theory of Planned Behavior Explains Gender Difference in Fruit and Vegetable Consumption. *Appetite*, **59(3)**: 693-697.
 19. Etikan, I., Alkassim, R. and Abubakar, S. 2016. Comparison of Snowball Sampling

- and Sequential Sampling Technique. *Biom. Biostat. Int. J.*, **3(1)**: 6-7.
20. Fann, L. Y., Huang, S. H., Huang, Y. C., Chen, C. F., Sun, C. A., Wang, B. L., Chien, W. C. and Lu, C. H. 2022. The Synergetic Impact of Physical Activity and Fruit and Vegetable Consumption on the Risk of Depression in Taiwanese Adults. *Int. J. Environ. Res. Public Health*, **19(12)**: 1-12.
 21. FAO. 2023. *Food and Agricultural Organization*. Available at <https://www.fao.org/faostat/en/#home>
 22. Fishbein, M., and Ajzen, I. 1975. Belief, Attitude, Intention and Behavior: An Introduction to the Theory and Research. Addison-Wesley, Reading, MA.
 23. Fleary, S. A., Joseph, P. and Chang, H. 2020. Applying the Information-Motivation-Behavioral Skills Model to Explain Adolescents' Fruit and Vegetable Consumption. *Appetite*, **147**: 1-9.
 24. Folkvord, F., Bergmans, N. and Pabian, S. 2021. The Effect of the Nutri-Score Label on Consumer's Attitudes, Taste Perception and Purchase Intention: An Experimental Pilot Study. *Food Qual. Prefer.*, **94**: 1-7.
 25. Fornell, C. and Larcker, D.F. 1981. Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *J. Mark. Res.*, **18**: 39-50.
 26. Guillaumie, L., Godin, G. and Vézina-Im, L. A. 2010. Psychosocial Determinants of Fruit and Vegetable Intake in Adult Population: A Systematic Review. *Int. J. Behav. Nutr. Phys. Act.*, **7**: 1-12.
 27. Hair Jr, J. F., Hult, G. T. M., Ringle, C. M. and Sarstedt, M. 2021. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. Sage Publications.
 28. Hair, J. F., Anderson, R. E., Babin, B. J. and Black, W. C. 2010. *Multivariate Data Analysis: A Global Perspective*. 7th Edition, Pearson, New York.
 29. Hair, J. F., Black, W. C., Babin, B. J., and Anderson, R. E. 2014. *Multivariate Data Analysis: Pearson New International Edition*. Pearson Education Limited, Essex, **1(2)**.
 30. Henseler, J., Hubona, G. and Ray, P. A. 2016. Using PLS Path Modeling in New Technology Research: Updated Guidelines. *Ind. Manag. Data Syst.*, **116(1)**: 2-20.
 31. Iddir, M., Brito, A., Dingo, G., Fernandez Del Campo, S. S., Samouda, H., La Frano, M. R. and Bohn, T. 2020. Strengthening the Immune System and Reducing Inflammation and Oxidative Stress through Diet and Nutrition: Considerations during the COVID-19 Crisis. *Nutrients*, **12(6)**: 1-39.
 32. Jung, S. E. and Bice, C. 2019. The Role of Self-Identity in Predicting College Students' Intention to Consume Fruit and Vegetable. *J. Nutr. Educ. Behav.*, **51(2)**: 173-181.
 33. Kline, R. B. 2011. Principles and Practice of Structural Equation Modeling (3. Baskı). Guilford, New York, NY, **14**: 1497-1513.
 34. Kothe, E. J., Mullan, B. A. and Butow, P. 2012. Promoting Fruit and Vegetable Consumption. Testing an Intervention Based on the Theory of Planned Behaviour. *Appetite*, **58(3)**: 997-1004.
 35. Llauger, M., Claret, A., Bou, R., Lopez-Mas, L. and Guerrero, L. 2021. Consumer Attitudes toward Consumption of Meat Products Containing Offal and Offal Extracts. *Foods*, **10(7)**: 1-17.
 36. Menozzi, D., Sogari, G., Simeone, C., Czajkowski, M., Zawadzki, W., Bazoche, P., Lucas, S., Mora, C. and Aanesen, M. 2023. Positive versus Negative Information: What Is Really Shifting Consumers' Intention to Eat Norwegian Salmon? Evidence from Three European Countries. *Food Qual. Prefer.*, **108**: 1-13.
 37. Miguel, L., Marques, S. and Duarte, A. P. 2022. The Influence of Consumer Ethnocentrism on Purchase of Domestic Fruit and Vegetable: Application of the Extended Theory of Planned Behaviour. *Br. Food J.*, **124(13)**: 599-618.
 38. Mitterer-Daltoé, M. L., Carrillo, E., Queiroz, M. I., Fiszman, S. and Varela, P. 2013. Structural Equation Modelling and Word Association as Tools for a Better Understanding of Low Fish Consumption. *Food Res. Int.*, **52(1)**: 56-63.
 39. Olsen, S. O. 2003. Understanding the Relationship between Age and Seafood



- Consumption. The Mediating Role of Attitude, Health Involvement and Convenience. *Food Qual. Prefer.*, **14(3)**: 199–209.
40. Pandey, S., Budhathoki, M. and Yadav, D. K. 2021. Psychosocial Determinants of Vegetable Intake among Nepalese Young Adults: An Exploratory Survey. *Front. Nutr.*, **8**: 1-9.
41. Payne, M. E., Steck, S. E., George, R. R., and Steffens. D. C. 2012. Fruit, Vegetable, and Antioxidant Intakes Are Lower in Older Adults with Depression. *J. Acad. Nutr. Diet.*, **112(12)**: 2022–2027.
42. Pieniak, Z., Verbeke, W., Olsen, S. O., Hansen, K. B. and Brunso, K. 2010. Health-Related Attitudes as a Basis for Segmenting European Fish Consumers. *Food Policy*, **35(5)**: 448-455.
43. Ringle, C. M., Wende, S. and Becker, J. M. 2015. *SmartPLS 3. SmartPLS GmbH, Boenningstedt*. <http://www.smartpls.com>
44. Rondanelli, M., Faliva, M. A., Barrile, G. C., Cavioni, A., Mansueto, F., Mazzola, G., Oberto, L., Patelli, Z., Pirola, M., Tartara, A., Riva, A., Petrangolini, G. and Peroni, G. 2021. Nutrition, Physical Activity, and Dietary Supplementation to Prevent Bone Mineral Density Loss: A Food Pyramid. *Nutrients*, **14**: 1-60.
45. Saba, A. and Vassallo, M. 2012. The Influence of Health Involvement and Satisfaction on Healthy Food Choices among People over 60 Years. *Int. J. Consum. Stud.*, **36(1)**: 44-53.
46. Secer, A. 2023. Factors Affecting Organic Food Consumption: Insights on Consumer Awareness and Behavioral Drivers. *J. Agric. Sci. Technol.*, **25(4)**: 803-815.
47. Singh, G., Slack, N. J., Sharma, S. and Dhir, A. 2023. Stockpiling Intentions and Customer Well-Being during the COVID-19 Pandemic. *J. Consum. Aff.*, **57(3)**: 1039-1065.
48. Smith, L., Lopez Sanchez, G.F., Veronese, N., Soysal, P., Oh, H., Barnett, Y., Keyes, H., Butler, L., Allen, P., Kostev, K., Jacob, L., Shin, J. I. and Koyanagi, A. 2022. Fruit and Vegetable Intake and Non-Communicable Diseases among Adults Aged ≥ 50 Years in Low- and Middle-Income Countries. *J. Nutr. Health Aging.*, **26(11)**: 1003–1009.
49. Sun, K. A. and Moon, J. 2024. The Theory of Planned Behavior and Antecedents of Attitude toward Bee Propolis Products Using a Structural Equation Model. *Foods*, **13(18)**: 1-11.
50. Thangavelu, K. P., Hyland, J. J., Henchion, M., Kerry, J. P. and Álvarez, C. 2022. Consumer Intention towards the Phosphate-Reduced Processed Meat Products Using the Extended Theory of Planned Behaviour. *Meat Sci.*, **193**: 1-11.
51. Tomić, M., Matulić, D. and Jelić, M. 2016. What Determines Fresh Fish Consumption in Croatia?. *Appetite*, **106**: 13-22.
52. Ubiparip Samek, D., Kovač, R., Pezo, L., Mastilović, J., Bajić, A. and Kevrešan, Ž. 2023. Fruit and Vegetable Consumption during the COVID-19 Lockdown in Serbia: An Online Survey. *Foods*, **13(1)**: 1-13.
53. WHO. 2003. *Diet, Nutrition and the Prevention of Chronic Diseases*. WHO Technical Report Series 916, World Health Organisation.
54. WHO. 2022. *Feature Stories. The Healthiest Option Should Be the Easiest Option: Promoting Healthier Diets in Montevideo*. World Health Organization. Retrieved from: <https://www.who.int/news-room/feature-stories/detail/the-healthiest-option-should-be-the-easiest-option---promoting-healthier-diets-in-montevideo>. Accessed March 14, 2024.
55. Yadav, R. and Pathak, G. S. 2016. Intention to Purchase Organic Food among Young Consumers: Evidences from a Developing Nation. *Appetite*, **96**: 122-128.

تعیین‌کننده‌های قصد مصرف میوه و سبزیجات تازه: نظریه توسعه یافته رفتار برنامه‌ریزی شده

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چکیده

هدف از این مطالعه تعیین پیش‌بین‌کننده‌های قصد مصرف میوه و سبزیجات تازه توسط مصرف‌کنندگان ایرانی بود. این مطالعه رابطه میان نگرش، هنجار ذهنی، کنترل رفتاری درک‌شده، درگیری با سلامت، سلامت ذهنی و قصد مصرف ایرانیان را با استفاده از نظریه رفتار برنامه‌ریزی‌شده بررسی کرد. برای برآورد مدل از روش مدل‌سازی معادلات ساختاری حداقل مربعات جزئی استفاده شد. نتایج نشان داد که سلامت ذهنی ($\beta = 0.463$; $P < 0.001$) به‌عنوان ارزیابی فردی از سلامت کلی، پیش‌بین‌کننده مهمی برای قصد مصرف میوه و سبزیجات تازه توسط مصرف‌کنندگان ایرانی است. درگیری با سلامت مصرف‌کنندگان ($\beta = 0.198$; $P < 0.001$) که نشان‌دهنده اهمیت مسائل سلامت برای افراد است، تأثیر معناداری بر قصد مصرف داشت. سایر متغیرها مانند هنجارهای ذهنی ($\beta = 0.175$; $P < 0.001$)، نگرش مثبت نسبت به مصرف میوه و سبزیجات تازه ($\beta = 0.125$; $P < 0.01$) و کنترل رفتاری درک شده ($\beta = 0.110$; $P < 0.001$) نیز به ترتیب پیش‌بین‌کننده‌های معناداری برای قصد مصرف بودند. این نتایج اطلاعات مفید و مهمی را درباره تعیین‌کننده‌های اصلی قصد مصرف برای سیاست‌گذاران فراهم می‌کند تا بتوانند سیاست‌های بهداشت عمومی مؤثر و کارآمدی را که هدفشان افزایش مصرف میوه و سبزیجات تازه است، تدوین کنند.