

The Research on Residents' Attitude and Behavior towards Veggies & Fruits in Remote Areas— A study on Guanyin Township, Taoyuan County, Taiwan

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ABSTRACT

This research aims at exploring residents' attitudes and behavior towards veggies and fruits in Guanyin township, Taoyuan county in Taiwan by taking 397 residents attending "5 veggies and fruits everyday" hosted by Guanyin township as research objects and gaining samples via snowball sampling. It is concluded from the research results that residents' scores in attitudes in Guanyin township account for 43.4% composition of total and scores in behavior constitute 30.0% of total. The results analyzed by structured equation modeling (SEM) revealed that residents' attitudes towards veggies and fruits have no influence on behavior. It is thus advised that futuristic research concerning changing personal diet attitude and behavior shall take longer period of time.

Keywords: Attitude towards veggies and fruits, behavior towards veggies and fruits, remote areas.

INTRODUCTION

Due to medical technological progress and changes in social public's life styles, Taiwan residents' major diseases have evolved from traditional acute diseases to chronicle diseases. Most of top 10 death causes are chronicle diseases. Registration statistics from Dept. of Health, shows that cancer has been the number 1 death cause since 1982 of which the incidence rate and death rate have been rising annually. According to the data of World Health Organization, it is estimated that new cancer cases will total more than 15 million annually in 2020 and there will be 6 million people dead of cancer annually, accounting for 12% of total deaths (Bureau of Health Promotion, Dept. of Health, Executive Yuan, 2005).

Cancer incidence is highly relevant with people's life styles and diet patterns. The research made by Willer (1990) stated that there is a reserve relationship between digesting veggies and fruits and cancer incidence. The research made by Chen, Vontham and Groves (1991) also indicated that digesting 5 servings of fresh veggies and fruits can lower the probabilities suffering cancer, cardiovascular diseases, hypertension and stroke (Weisburger, 1991; Block, Patterson and Subar, 1992; Bazzano et al., 2002; Jansen et al., 2004; Yeh, Tao-Hung, 2005). A study on "5 a Day" campaign which has been held in USA since 1991 shows that after "5 a day" campaign have been fulfilled for 5 years in the USA encouraging social public to digest 5 servings of fresh veggies and fruits, the cancer incidence rate and death rate have been reducing by 0.7% and 0.5% respectively annually, representing a pretty prominent achievement.

In Taiwan, Dept. of Health suggests that the principle of "5 a day" shall be abided by including 3 servings of veggies and 2 servings of fruit every day. That is to digest at least 5 servings (about 600 grams) of fresh veggies and fruits every day as to reduce cancer incidence by reducing carcinogenic substances in diet and supplementing more protective nutrients. The research made by LEE, Lan (1995) concerning Taiwan adults revealed that 15.9% interviewees digested veggies and fruits less than 2 times per week, significantly lower than suggested allowance. Therefore, social public's attitudes and behavior towards on veggies and fruits are very important.

The researches in the recent years also showed that how important such research issues are. However, research results showed various and diversifying relationship between people's attitudes and behavior on nutrition. Most research results indicated that there is a significant positive relationship between attitudes on nutrition and behavior (Lee, Ting-Chen, 1991; Wei, Yen-Lan, 1992; Chen, Shu-Lin et al, 1995; Huang, Mei-Hui, 2001; Lee, Tzu-Ying, 2002);

However, some other researches showed that there is no significant relationship between those two (Wang, Shih-Min, 1992; Huang, Chau-Yan, 1993; Lin, Chia-Hua, 1997). It is a pity that there have been few researches on social public's attitudes and behavior towards veggies and fruits and the reason will be explained later in this research. As few researches available have explored residents in remote areas and the research method rarely adopted structural equation modeling (SEM), this research mainly aims at exploring residents' attitudes and behavior towards veggies and fruits by taking Guanyin township, Taoyuan county as the research object.

LITERATURE REVIEW

1. Attitudes towards veggies and fruits

The research made by Tung, Chia-Hsin (2004) indicated that female's attitudes towards veggies and fruits are better than male's; people without regular exercising have attitudes and behavior better than people with regular exercising; people who are aware of their own obesity have better attitudes and behavior than people regarding their own body shapes as normally fit and slim. Gil, Gracia and Sanchez (2000) ever explored Spanish consumers' attitudes on organic food by classifying their attitudes into both positive and negative attitudes. The positive attitudes emphasized quality, taste, health, attraction and non-injury of good and the negative attitudes emphasized whether somewhat fashionable food is relevant to expensive prices when general cognitions are taken for comparison. The research made by Huang, Pi-Yu(2006) concerning primary school teachers' attitudes towards organic food in Tainan and Kaohsiung regions indicated that most teacher bear highly positive attitudes towards organic food consumption and knowledge; the factors influencing teachers' attitudes for selecting organic food consumption included "gender", "religious believes", "family's monthly income", "habit of digesting organic food", "frequency for digesting organic food", "sources for purchasing info", "frequently digesting organic food", "knowledge for organic food", "knowledge for organic food certification", "high-quality orientated decision-making behavior", "price-orientated decision-making behavior", "fashion-orientated decision-making behavior" & "impulse decision-making behavior".

2. Behavior towards veggies and fruits

The research made by Chang, Yu-Feng (2001) stated that knowledge for veggie and fruit nutrition, understanding the benefits of digesting veggies and fruits, parents' encouraging for digesting veggies and fruits and market supply of veggies and fruits are positively relative to digesting veggies and fruits. The research made by Tung, Chia-Hsin (2004) indicated that female's attitudes on veggies and fruits are better than male's. There insignificant difference between those who with habits of regular exercise and those who without habits of regular exercise. Those who suffer obesity have better attitudes and behavior than those who treating their body shapes as normally fit or slim.

The researched made by that Liao, Chun-Mei (2005) explored on consumers' buying fruit by studying on apples indicated that among all influential factors for deciding to buying apples, consumers think the most important is food safety, followed by apple species attributes, prices attributes, functions attributes and production country attributes. The importance of apple species attributes varies significantly with different interviewees' personal attributes (the number of family members), and different consumption habits (such as purchase location, selection mode, info sources, buying frequency, buying quantity, usage, impression with advertisement and advertisement effects). The importance of apple production origin country attribute varies insignificantly with different interviewees' personal attributes and consumption habits.

3. The relevancy between the attitudes and behavior towards apples

There are few researches exploring social public's attitudes and behavior towards veggies and fruits. There is a positive relationship between the former and latter, such as the research made by Huang, Chao-Yen (1993) studying female's attitudes consumption behavior towards veggies, fruits, meat and fishery in Taiwan region; Huang, Chao-Yen (2000) studying residents' attitudes and behavior towards veggie and fruit brands in Taiwan metro areas;

the research made by Tung, Chia-Hsin (2004) studying restaurant-department students' attitudes and behavior in Taipei city and county vocational high schools all showed similar research results.

4. Factors influencing attitudes and behavior towards veggies and fruits

The research made by Huang, Chao-Yen (1995) indicated that, in term of how social status will influence attitudes and behavior on buying veggies and fruits, the females of low social status have the lowest performance in average. Millen et al (1996) stated that gender will cause significant difference on digestion behavior towards veggies and fruits. Wu, Hsing-Chuan (1998) deduced that Taiwan residents' gender varied with daily digestion of veggie and fruit types, such as females digest more veggies and fruit more than males. The research made by Tseng, Ming-Shu (1998) also proved that age and urbanization level in residence area will influence the frequency of digesting veggies and fruits. The research made by Chang, Feng-Yu (2001) stated that people regarding themselves as more healthier digest more veggies and fruits than those who regarding themselves as normally healthy. The research made by Wu, Ting-Hsuan (2006) studying selection on veggies and fruits in supermarkets indicated that cognitive value is the most influential factor for affecting consumers' spending intention. The research made by Wang, Hsueh-Tsung (2004) exploring consumers in Kaohsiung and Pingtung areas indicated that the cognitive quality of organic veggies and fruits will influence neither the whole value cognition nor buying intension.

The research made by You, Lan-Yu (2006) showed that the major concerns for consumers' selection on fruits include fragrance, sweet and humidity followed by outer appearance, size and quality grade and then sanitary, pest injury and pesticide residual. The research made by Wu, Min-Feng (2004) studying residents' consumer behavior in Kaohsiung and Pingtung areas indicated that consumers' cognitive value for organic veggies and fruits, health awareness and environment protection concern caused positive influence on buying intention. Different education backgrounds, vocations, average family's monthly income and consumers' buying intention for organic veggies and fruits in the researched area have insignificant effect on buying intention. The research made by Liao, Chun-Mei (2005) pointed out that consumers' decision-making factors for buying apples include such 5 sections as production country attribute, function attribute, species feature attribute, sale price attribute and food safety attribute.

RESEARCH METHOD

1. Research objects

The residents attending "5 a day" activity held by Guanyin Township, Taoyuan County, were used as the research objects in this research.

2. Sampling method

The snowball sampling method was adopted that the residents attending this activity issued questionnaires to their friends and relatives. The questionnaire investigation duration started from July 16th, 2008 and ended on August 25th and 400 questionnaires were issued in total in which effective samples amounted to 397 and sampling efficiency was 99.25%. Most of the samples were female, accounting for 69.9%. The biggest age group is between 45~54 years (31.6%), and the second is the age group of over 55 years old (26.9%) and the 3rd is between 35~44 years old (24.6%). In respect of education background, the biggest composition is and less than the high school or vocational high school, accounting for 77.1%. The biggest ratio of monthly income is less than NT\$50,000, accounting for 87%. The biggest ratio of marriage status is married, accounting for 85.4%. The biggest ratio of working is industrial manufacture, accounting for 40.8% (Please refer to Table 1).

Table 1. Personal Information Of samples

Variables		Number	Ratio
Gender	Male	119	30.1
	Female	277	69.9
Age	Aged Under 24	17	4.4
	25~34	48	12.4
	35~44	95	24.6

	45~54	122	31.6
	Over 55	104	26.9
Education Background	Less than primary school	88	22.3
	Junior high school	117	29.7
	High (vocational) school	99	25.1
	Junior College	43	10.9
	University	38	9.6
	Master degree or over	9	2.3
Average monthly income	Less than NT\$29,999	112	44.1
	NT\$30,000~49,999	109	42.9
	NT\$50,000~69,999	24	9.4
	NT\$70,000~89,999	7	2.8
	More than NT\$90,0000	2	0.8
Marriage status	Married	333	85.4
	Single	57	14.6
Working location	Manufacture	113	40.8
	Sales	40	14.4
	R & D	13	4.7
	Administration and Management	47	17.0
	Quality Control	9	3.2
	Finance	3	1.1
	Others	52	18.8

3. Research tools

This research aims at exploring residents' attitudes and behavior towards veggies and behavior mainly according to aforesaid reference documents and the data extracted from the research made by Tung, Chia-Hsin (2004) analyzing restaurant-department students' knowledge, attitudes and behavior towards veggies and fruits in Taipei city and county vocation high schools. The research structure thus includes 2 attitude indicators, health belief & veggie and fruit brands, and 2 behavior indicators, veggie and fruit digestion behavior, and veggie and fruit usage behavior. For measuring aforesaid 4 indicators, every evaluation question is evaluated by Likert Scale among which Scale 1 to 5 represents "Disagree Strongly", "Disagree", "Neutral", "Agree" and "Agree Strongly". Negative questions would be scored by negative feedback.

SPSS 15.0 software was used for conducting item analysis and the acceptance criteria for item-total correlation shall be more than 0.4. Cronbach's α value of each factor shall be within the acceptable range (Nunnally, 1978 pointed out that Cronbach's α value higher than 0.7 represents high reliability; item-total correlation value shall be more than 0.4). Applying such acceptance criteria resulted in 4 factors and 24 evaluation questions. Among all factors, the attitude included 2 factors, health belief and veggie and fruit brand with which each factor had 5 evaluation items. The behavior included 2 factors, veggie and fruit digestion and veggie and fruit digestion behavior and veggie and fruit usage behavior with which each has 6 and 8 evaluation questions. Cronbach's α value is between 0.78~0.89 and item-total correlation is more than 0.4. The research structure is shown as in Figure 1:

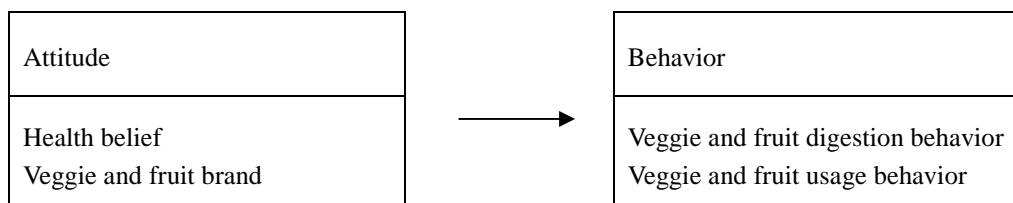


Figure 1. Research Structure

Confirmatory factor analysis (CFA) was then conducted to examine the reliability and validity among all research variables. Structural equation modeling technique (SEM) was finally used for exploring the relevance between residents' attitude and behavior towards veggies and fruits. LISREL 8.7 Version was also used for making

analysis. Each influential coefficient was calculated by using Maximum Likelihood Estimates (MLE). 8 indicators were used for evaluating model fitting of causality among all research factors: GFI value, AGFI value, RMR value, RMSEA value, NFI value, NNFI value, IFI value and CIF value.

4. Reliability and Validity Analysis

Confirmatory factory analysis (CFA) was conducted in this research to examine reliability, validity and goodness of it among all research variables and the results are shown in the following.

(1) Reliability

Composite reliability (CR) was used in this research to examine the reliability among all variables; CR value is composed of the total of all measured reliability values of variables which represents the internal consistence of composition indicator. The higher reliability shows that internal consistence of those indicators is also higher. Fornell & Larcker (1981) suggested the value shall be more than 0.6. It can be inferred from the Table 2 that CR value of this research is between 0.75~0.80 which means that high internal consistence of variables in this research. That is to say each potential variable in this research owns high reliability.

Table 2. Reliability and Validity Results

Research variables and questions	Standardized factor loading	Composite reliability	Cronbach's α value
Health Belief			
■ For controlling body weight, I would prefer to digest low-calorie veggie diet for long term	0.70 0.77		
■ I will digest veggies and fruits because of "health"		0.80	0.78
■ I will digest veggies and fruits because of "facial beauty"	0.57		
■ I think digesting veggies and fruits can reduce cholesterol	0.71		
■ I think eating apples can prevent constipation	0.58		
Veggie and Fruit Brand			
■ I think name brand veggies and fruits are more expensive	0.66		
■ I think the fruit quality of farmers' association is better	0.84		
■ Establishing veggie and fruit brands can help consumers distinguish quality	0.92	0.76	0.89
■ I think establishing veggie and fruit name brands can attract consumers to buy	0.85		
■ I think name brands can cause quality differential	0.66		
Veggie and fruit digestion behavior			
■ I digest various and change veggie and fruits regularly	0.71		
■ I digest organic veggies and fruits every day	0.60		
■ I digest fruits every day	0.66		
■ I digest 3 dishes of veggies (one dish is equal to 2/3 bowl of rice)	0.56	0.79	0.79
■ I can accept if friends tell me digesting veggies and fruits can benefit health	0.56		
■ I will notice veggie and fruit freshness	0.61		
Veggie and fruit usage behavior			
■ Refrigerate veggies and fruits	0.48		
■ I prefer to select organic veggies and fruits as food materials	0.56		
■ I would process food in a cuisine that would keep the nutrition	0.60		
■ I wouldn't prefer to use frozen or processed veggies and vegetables for cooking	0.62	0.75	0.82
■ I would prefer to process veggies and fruits by cooking, roasting, cold and dressed with sauce or uncooked rather than by fried, stirred-friend and stewing with seasonings	0.51		
■ I would cook with various and abundant veggies and fruits	0.81		
■ I would wash veggies and fruits under flowing water	0.61		
■ I would serve the veggies and fruits on the table immediately after slicing as to prevent nutrition loss	0.69		

(2) Validity Analysis

The standardized factor loading of all measured variables in this research are all between 0.48-0.92 (please refer to Table 2) which are almost all higher than the suggested value of 0.5 (Hair et al, 2006) and their factor loading, t-value is between 7.91~12.68, which are all bigger than the critical value of 1.96. It means that the measurement model in this research owns excellent convergent validity.

(3) Goodness of fit analysis

The analysis results of measurement models in this research are shown in Table 3 which shows that 6 indicators have all meet the standard requirements, AGFI, RMSEA, NFI, IFI, NNFI and CFI. Although RMR has not yet reached the suggested requirement, it is already very close. The examination results of GFI have not yet reached standard requirements but are pretty close to standard value. From the results that Baumgartner and Homburg (1996) researched on 184 documents on Journal of Marketing, Journal of Marketing Research, International Journal of Research in Market and Journal of Consumer Research published between 1977~1994, the ratio of GFI value lower than reference documents' average ratio is 24%, which is still within acceptable range. The goodness of fit analysis for measurement model in this research is still acceptable.

Table 3. Fit indices for measurement and structural model (n=397)

Fit indices	Suggested standard requirements	Testing results on measurement model	Testing results on structural model	Pass or fail
Goodness of fit index (GFI)	≥ 0.9	0.8	0.8	No
Adjusted goodness of fit index (AGFI)	≥ 0.8	0.8	0.8	Yes
Root mean square residual (RMR)	≤ 0.05	0.0756	0.0767	No
Root mean square error of approximation (RMSEA)	≤ 0.1	0.099	0.100	Yes
Normed fit index (NFI)	≥ 0.9	0.9	0.9	Yes
Incremental Fit Index (IFI)	≥ 0.9	0.9	0.9	Yes
Non-Normed Fit Index (NNFI)	≥ 0.9	0.9	0.9	Yes
Comparative fit index (CFI)	≥ 0.9	0.9	0.9	Yes

RESULTS AND DISCUSSION

Structural equation modeling (SEM) was conducted on people's attitudes and behavior towards veggies and fruits to make correlation analysis in this research. The research results indicated that after the goodness of fit indices for this model was compared with suggested requirement criteria (please refer to Table 3), the goodness of fit for the structural model in this research is within the acceptable range.

1. Scoring on attitude and behavior towards veggies and fruits

Table 4 shows that the scoring of people's attitude and behavior towards veggies and fruits were 2.17 and 1.50 respectively. The scorings account for 43.4% and 30.0% respectively of the composition. The average scoring (2.39) for people's attitude towards "veggie and fruit brand" is higher than the scoring (1.94) for people's "health belief". The average scores account for 47.8% and 38.8% of the composition. It means that people's attitude toward "veggie and fruit brand" is better than "health belief".

The behavior towards veggies and fruits shown in Table 4 indicates that the average scoring of "usage behavior" (2.25) is higher than that of "digestion behavior" (0.75). Their average scorings account for 45.0% and 15.0% of the composition respectively. It is thus able to deduce that people's "usage behavior" is better than "digestion behavior".

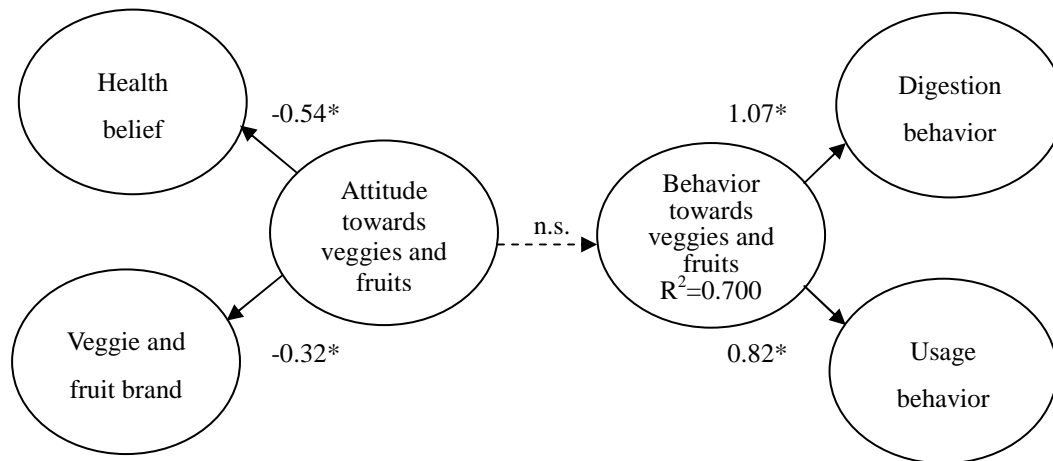
Table 4. Scoring of attitude and behavior towards veggies and fruits

Variables	Average score	Ratio of this composition (5%)
1. Attitudes towards veggies and fruits	2.17	43.4
(1) Health belief	1.94	38.8
(2) Veggie and fruit brand	2.39	47.8
2. Behavior towards veggies and fruits	1.50	30.0
(1) Digestion behavior	0.75	15.0
(2) Usage behavior	2.25	45.0

2. How attitude toward on veggies and fruits influences behavior

MLE was adopted for evaluating standardized path coefficient among all variables (please refer to Figure 2). Except that the path t value (t value=-1.87) of (attitude and behavior towards veggies and fruits) has not yet reached significant level ($\alpha=0.05$), the influential relationship among all other variables have all reached significant level. It means that attitude towards veggies and fruits versus health belief (path t value=-0.54), attitude towards veggies and fruits versus veggie and fruit brand (path t value=-0.32), behavior and digestion towards veggies and fruits (path t value=1.07), behavior versus usage veggies and fruits (path t value= 0.82) all have not yet reached significant level. Among all those values, the path t value of behavior versus usage towards veggies and fruits is the highest, and the behavior versus usage towards veggies and fruits ranks the 2nd.

As shown in Figure 2, potential dependent variable—variable explanation (R^2) of behavior towards veggies and fruits is: 0.700, more than 0.5 which means that this research model has reached excellent explanation towards variables.



★ Means that $p < 0.05$; n.s. means $p > 0.05$

Figure 2. The structural model of people’s attitudes towards vegetables and fruits and their behaviors

CONCLUSIONS AND SUGGESTIONS

1. Conclusion

By using residents attending “5 A Day” activity held by Guanyin township, Taoyuan county as research objects, this research aims at exploring how residents’ attitudes towards veggies and fruits influence their behavior. Data analysis and structural equation model establishment and verification results the major research conclusion as in the following:

The scoring of attitude and behavior towards veggies and fruits shows that people’s attitudes towards “veggie and fruit brand” are better than that towards “health belief”; people’s “usage behavior” is better than “digestion behavior”.

At the significant level ($\alpha=0.05$), except that attitudes towards veggies and fruits versus behavior has not yet reached significant level, the influential relationship among all other variables have all reached significant level. That result is similar to the research results made by Wang, Shih-Min (1992), and Huang, Chao-Yen (1993), and Lin, Cha-Hua (1997) exploring the relationship between people's attitudes and behavior towards nutrition (there is no significant relevancy between those two variables). Among the researches exploring the relationship between people's attitudes and behavior towards veggies and fruits, such as Huang, there are differences between the researches made by Huang, Chao-Yen (1993, 2000) and by Tung, Cha-Hsing (2004). It can thus deduce that the relationship between people's attitudes and behavior towards veggies and fruits in remote areas is different from other ethnics groups'. This conclusion can be used by relevant researchers as reference data.

2. Suggestions for futuristic research directions

- (1) First used in this research as a research instrument, this self-edited questionnaire still had some drawbacks which shall be improved. It is possible to make more complete research about knowledge towards veggies and fruits, relevant research about attitudes and behavior and the addition and deletion of variables and questions.
- (2) Due to limited human resources, materials and duration of time, this research was restricted to only exploring residents in Guanyin township, Taoyuan county, and the research results thus can't be applied to the whole country. Following researchers can expand sampling range by conducting researches in other regions or nationwide comparisons.

3. Community Residents

In addition to that community residents were taught correct cuisine skill in this seminar, relevant safety knowledge for veggies and fruits could be promoted in every community residents' meeting as to educate them how to cleanse veggies and fruits correctly, purify pesticide, and store correctly as to fulfill the idea of "5 A day, Health With Me".

4. Suggestions for competent authority

Info feedback can help understand that residents are highly interested at getting access to knowledge of veggie and fruit nutrition. Among the top 10 death causes publicized by government's health institutions, cardiovascular disease ranks the top 1. It is thus able to infer that fully advocating veggie and fruit nutrition knowledge shall be enhanced by the government. The feasible strategy is to fulfill such a policy by using the education dissemination of community education and also to promote health cuisine patterns as to encourage villagers to digest more veggies and fruits efficiently. Such policy budgets can be added into budget preparation.

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