

DEVELOPMENT AND VALIDATION OF SCREENING TOOLS FOR
CLASSIFICATION CONSUMERS OF FOOD PRODUCTS BASED ON EATING
HEALTHY CRITERIA

by

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B.S., Kasetsart University, 1999
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AN ABSTRACT OF A DISSERTATION

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Department of Human Nutrition
College of Human Ecology

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Abstract

Because healthy food products do not have a specific tool used for consumer screening based on consumers' diet or degree of healthy eating habits, this study aimed to determine a set of questions that could classify consumers who belong in a different status according to the Stages of Change model, including those who have a different diet quality based on their Healthy Eating Index (HEI) score. The surveys were conducted in the United States (US) and Thailand in order to determine applicability to varying countries. The Food Neophobia Scale (FNS), Food Involvement Scale (FIS), and Health and Taste Attitude Scale (HTAS) were included in the questionnaire together with a set of Stages of Change questions and a 7-day, self-administered food recall questionnaire. The HEI interpretation of US and Thai consumer scores illustrated that the majority of both belonged to the Need Improvement group. The Stages of Change model indicated most consumers thought they had healthy diets. According to FNS, FIS, and HTAS, US consumers are more involved in food activities and are more open to trying new foods or unfamiliar foods than Thais. Furthermore, consumers who belong in different groups, according to the Stages of Change model, responded differently to some HTAS subscales. However, statements from FNS, FIS, and HTAS were not capable of distinguishing consumers belonging in different groups according to HEI scores or belonging in different stages according to the Stages of Change Model. Considering all possible methods from those listed above for screening consumers, the Stages of Change model may be the best way to segment consumers interested in healthier eating. Using the Stages of Change required less time and the least effort from consumers because there were only three questions; and interpreting results does not require calculation or analysis.

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Chapter 1 - Introduction and Rationale of the Study

Consumer testing is one important aspect in the product development process. This process consists of project planning which testing details and prior activities need to be completed prior to the actual test being executed, i.e., setting objectives, selecting an appropriate test method, product preparation, setting a test schedule, and screening consumers.

The normal criteria used for screening consumers for consumer testing are demographic characteristics, product preference, and frequency of use. When health products are examined specifically there are no special tools developed to evaluate how healthy consumers may be or how interested consumers are in health products. The easiest and fastest way to screen consumer is to ask consumers direct questions about their interest in health products. The problem with using direct questioning is most consumers would say that they are interested, and although there are other methods created to group consumers they are not specifically developed for screening purposes.

- The first option is using dietary assessment to capture what makes up consumers' diets. The information would help determine actual consumer purchases and consumption, however, using dietary assessment is very expensive and time consuming.
- The second option is to group consumers based on their beliefs of what they think their behaviors are. In this research, the well known stage theory, Stages of Change model, was selected to obtain this information. The drawback of grouping consumers based on their beliefs is what they think may not be the same as what they really do.
- The third option is using indirect questions to track consumers' behavior. These indirect questions must be able to group consumers in a quick and effective manner.

In addition the appropriate method for screening consumers should be able to distinguish consumers from different cultures because the screening tool would not be useful if modification and validation was needed every time research was conducted in different countries. Therefore, this research's goal is to discover what the best way to

screen consumers for health products from the available options, mentioned above, and can be effectively used in different countries. The research questions that resulted from the goal of this dissertation are as follows:

- What is the actual diet quality for both Thai and US consumers? (Answer derived as a result of finding from use of the dietary assessment in Chapter 3)
- What do consumers, both Thai and US, think/believe about their diets? (As according to findings from the use of Stages of Change model in Chapter 4.)
- What are the statements from selected food related psychographic scales that can predict consumers' actual diet? And can these statements be applied to different countries? (As according to the finding from Chapter 5: use of food related psychographic scales to group consumers based on their healthy eating behavior.)
- What are the statements from selected food related psychographic scales that can predict what consumers think/believe about their diet? And can the statements be applied to different countries? (According to Chapter 5's findings: use of food related psychographic scales to group consumers based on their healthy eating behavior)

Chapter 2 - Literature Review

This literature review includes information concerning the methodology used in this dissertation including dietary assessment, Stages of Change model, and food related psychographic scales. The Likert scale and categorical data analysis were also included in this chapter since they are the main responses and analysis used for this dissertation.

Dietary Assessment

Dietary assessment measures the total oral consumption of food and beverages (Rutishauser, 2005) and is a tool for nutritionists and other health professionals to assess, capture, and monitor the dietary intake status of a target population. A good assessment is crucial for promoting good health and preventing chronic degenerative diseases e.g., heart disease, obesity, stroke, and certain cancers (Green & Watson, 2006). There are three main dietary assessment methods including, Food Record or Food Diary, Food Recall, and Food Frequency Questionnaire (FFQ). Each method provides different strengths and weaknesses, thus when choosing an appropriate dietary assessment method for a project several factors need to be considered, i.e., target population characteristics, resources, and how much information is needed (Subar, 2004; Haftenberger et al., 2010).

Food Diary

The Food Record (Food Diary) method can obtain both descriptive and quantitative data by using either open or close ended questions. Consumers record foods and beverages together along with the amount of each food and beverage item consumed. Normally, a food diary is recorded for 3-4 days, and the maximum time is 7 days. To use Food Records, consumers need to know how to respond to the document format i.e., name of foods, portion sizes, preparation methods, and recipes. Food Record is known as the gold standard, thus is used to validate data for other assessment methods. Using Food Record does not rely on the consumer memory; therefore, Food Record is the most accurate method available. There are a few draw backs of using Food Record: cost of coding and analyzing data, decreased number of responding consumers when there is an increased number of reporting days, and underreporting actual dietary intake found in female and obese participants. Food Record can be done in three different ways: Menu

Record, Estimated Food Record, and Weighed Food Record (Thompson & Byers, 1994; Rutishauser, 2005).

Menu Record is the simplest method for consumer diet recording. Respondents only record the type and frequency of food consumed but not quantity. The advantage of using Menu Record is it can be kept for a longer period of time because it requires the least amount of effort from the consumer. This method's weakness is the impossibility to capture nutrient intake since the quantity of food is not a record requirement. Estimated Food Record is the most common method used for dietary assessment research; it can be used for 1-7 days. Respondents record the amount of food they eat using units of household items such as, spoons, cups, glasses, or plates. The alternative to using household item units is by providing portion size estimation aides (e.g., three dimensional food models or consumers take pictures of food before consuming it).

The most detailed method of Food Record is Weighed Food Record. Consumers are required to weigh their foods and beverages on a scale and record the amount eaten by subtracting leftover food from the original weight, then the exact amount of food consumed is recorded. Normally, Weighed Food Record is kept only 1-4 days because it interferes with consumer routine and requires a high level of cooperation (Freudenheim, Johnson, & Wardrop, 1987; Kristal, Feng, Coates, Oberman, & George, 1997; Rutishauser, 2005; Vereecken, Rossi, Giacchi, & Maes, 2008).

Food Recall

Food Recall is typically selected to apply to a large sample size study such as the Second National Health and Nutrition Examination Survey (NHANES II) (Klesger, Eck, & Ray, 1995). Various types of data can be obtained from this method including quantitative, semi-quantitative, and frequency. Consumers are asked to recall a specific length of time; it can be for one day or extended into years.

The 24-hour Food Recall method is the most widely used for diet assessment. Consumers are asked to give details on all foods and beverages consumed in the last 24-hr. Food Recall require an interview as the data collection method. There are several benefits to using the 24-hour Food Recall, including taking less time to collect data, requiring minimal effort from the consumer, and not interfering with consumer eating

habits. However, using interviews as a means to collect data also comes with some disadvantages because it requires trained and skilled interviewers to avoid leading consumer to give biased responses. Training interviewers takes time and is expensive; also, the data relies on consumer memory (Thompson & Byers, 1994; Rutishauser, 2005). Two examples of Food Recall methods are Three-pass recall method, and Five-step Multiple Pass Approach. Three-pass recall method uses interviews as a mean to obtain data. The interviewer will question a consumer to through three distinguishing sessions. During the first session consumers are asked to list all foods and beverages they consumed the day before, the interviewer should not interrupt while consumers are listing the food items. In session two, the interviewer asks consumers specific questions about each food item in order to obtain information on food descriptions, amounts consumed, and eating occasion (name and time). The last session is where food items are reported in chronological order from each occasion to help consumers remember additional food that might have been forgotten (Gibney, Vorster, & Kok, 2002; Raper, Perloff, Ingwersen, Steinfeldt, & Anand, 2004).

The Five-step Multiple Pass Approach is a recent tool developed from the basis of Three-pass recall method. There are several features included in this method, e.g., a new food portion estimation model booklet, food probe questions with automatic response routing, and specialized training for interviewers and coders. There are five steps in the data collection process; the first is “Quick list,” this step is aimed to collect a list of foods that a consumer had the previous day. The second, “Forgotten foods list”, is where the interviewer will ask questions about foods by categories that may have been left out, such as, nonalcoholic beverage, alcoholic beverage, sweets, snack, etc. The third step, “Time and occasion,” is where the consumer reports time and occasion when they consume each food item. Then the interviewer uses this information to sort food items in chronological order and group into eating occasion. The forth step, “Detail and review,” is used to record more detail on the amount of food consumed and review the information to obtain forgotten food items. The last step, “Final review,” is used for the consumer to add foods not remembered previously (Conway, Ingwersen, & Moshfegh, 2004; Raper et al., 2004).

Food Frequency Questionnaire

Food Frequency Questionnaire (FFQ) is the self-administrated form that is used to capture consumer dietary intake. It consists of a list of foods and beverages together with a section consumer can indicate how often they consume the listed items. FFQ can provide semi-quantitative data if the questionnaires collect the portion sizes of listed foods. (Haftenberger et al., 2010; Subar, 2004; Thompson et al., 2002) There are several FFQs that have been published and are available for use: Diet History Questionnaire (DHQ) (Thompson & Subar, 1994), Harvard FFQ (Willett et al., 1983), and Block FFQ (semi-quantitative) (Block, Woods, Potosky, & Clifford, 1990). Also, FFQs can be modified to make them more appropriate for specific researches, or a new questionnaire can be developed and validated for use (Subar, 2004).

Because FFQ is a self-administrated questionnaire it is less expensive and easier to execute when comparing it to Food Recall and Food Record; therefore, it is suitable for application in a large scale study (Haftenberger et al., 2010; Subar, 2004; Thompson & Byers, 1994). FFQ has been widely modified for use in different cultures; however, to use it in a different culture or on usual food items it needs to be developed and validated. In Japan FFQ was developed to assess Japanese dietary habits (Chiba, Okuda, Okayama, Kadowaki, & Ueshima, 2008). Also it was found that FFQ was a reliable tool used for assessing food consumption of a German adult population (Haftenberger et al., 2010). The FFQ method was modified by Vereecken, Rossi, Giacchi, and Maes (2008) for use in a study aimed to compare data from FFQ and Food Record methods used with Belgian, Flemish, and Italian children. Their results found that FFQ may give overestimations in results, although data from both methods were found to have some correlations (2008).

Because FFQ relies on a self-administered questionnaire it has some limitations on the study's feasibility since the questionnaire cannot include all food and beverage items. Even if FFQ can be modified or developed to be more appropriate for a target population, it must still be validated, and that is costly and time consuming (Haftenberger et al., 2010; Subar, 2004; Thompson & Byers, 1994).

Healthy Eating Index

Healthy Eating Index (HEI) was created by The Center for Nutrition Policy and Promotion (CNPP) in 1995 to study if US consumers' eating habits followed the Food Guide Pyramid. The report on HEI helped the United States Department of Agricultural (USDA) plan a more effective promotion of proper diet (Freedman, Guenther, Krebs-Smith, & Kott, 2008).

The original HEI consists of 10 components where components 1-5 measure how a person's diet conforms to the Food Guide Pyramid serving recommendations for grain, vegetable, fruit, milk, and meat groups. Components 6 and 7 measured total fat and saturated fat consumption, respectively, as a percentage of total food energy intakes. Components 8 and 9 measured total cholesterol and sodium intake, respectively, and component 10 reflected the amount of food variety in a person's diet over a 3-day period (USDA, 1995).

In 2005, the new Dietary Guideline was released. The guidelines were modified to capture new aspects including whole grain, various types of vegetables, specific types of fats, and discretionary calories. Discretionary calories refer to calories obtained from Solid Fat, Alcohol, and Added Sugar (SoFAAS). As a result, the revision of HEI was needed to assess new key diet-related recommendations of the new dietary guidelines. The revision of HEI is called HEI-2005 (Guenther, Reedy, Krebs-Smith, Reeve, & Basiotis, 2007). The maximum scores of each component 1, comparing between the original HEI and HEI-2005, are shown in Table 1.

Using HEI, consumers were asked to write down the number of servings of food they consumed for one week. Data was then converted to scores for each component (based on USDA recommendations) in order to obtain a total score (Freedman, Guenther, Krebs-Smith, & Kott, 2008). After the total score was calculated, it was used to classify diet quality. People who obtained a total score of less than 55 are considered as having Poor Diet. People who belong in the Need Improvement had scores between 55 and 80, and Good Diet contained people who had a total score of more than 80 (USDA, 1995).

Table 1 Original HEI and HEI-2005 components and their maximum scores

Component	Maximum score of each component	
	Original HEI	HEI-2005
Fruit/ Total Fruit	10	5
Whole Fruit	N/A	5
Vegetable/ Total Vegetables	10	5
Dark Green and Orange Vegetables and Legumes	N/A	5
Grains/ Total Grains	10	5
Whole Grains	N/A	5
Milk	10	10
Meat and Beans	10	10
Oils	N/A	10
Saturated Fat	10	10
Sodium	10	10
Calories from SoFAAS	N/A	20
Total Fat	10	N/A
Cholesterol	10	N/A
Variety	10	N/A

(Modified from HEI-2005)

Healthy Eating Index for Thais

Prior to the 1980s the main nutritional problems for Thais were related to malnutrition , e.g., underweight children, protein-energy malnutrition, vitamin A deficiency, iodine deficiency disorder, and iron deficiency anemia. During the 1980s and 1990s, a malnutrition problem, decrease in number of underweight children was reduced (Kosulwat, 2002). When obesity became a global problem Thailand faced both under and over-nutrition problems. In three years there was a 3-5% increase in the percentage of overweight and obese in urban areas. The same result was found in the adult population where 25.5% of men and 21.4% of women were considered as overweight and obese from the National Health Examination Survey (NHES). Therefore, it became essential to

understand daily dietary life and family food consumption practices in order to design appropriate eating guideline (Kosulwat, 2002; Sirichakwal & Sranacharoenpong, 2008). The Healthy Eating Index for Thais (THEI) was developed in 2008 by Taechangam, Pinitchun, and Pachotikarn from the Institute of Nutrition, Mahidol University, Thailand. THEI is used to evaluate and monitor overall diet quality based on Thai Recommendation Daily Intake (Thai RDI). This index was modified from the Healthy Eating Index (HEI) of the Center for Nutrition Policy and Promotion (CNPP), USDA. The THEI consists of 11 components. Components 1-5 assess how consumers' diet fit with the recommended serving sizes from Thai RDI of five food groups: rice and starch, vegetables, fruits, dairy, and meat. Components 6-8 measure Thais' consumption of total fat, saturated fat, and added sugar, respectively, in terms of total food energy intake. Components 9 and 10 evaluate total cholesterol and sodium, and component 11 is used to check variety in a person's diet. The scoring system of THEI was created by using Thai RDI, Dietary Reference Intake for Thais (DRI) and scientific research on diets and chronic diseases. Each component has a maximum score of 10 with an overall maximum score of 110. To classify dietary quality the overall THEI score was divided into three categories: Poor (less than 55), Need Improvement (55-66), and Good (over 66) (Taechangam, Pinitchun, & Pachotikarn, 2008).

According to the Taechangam, Pinitchun, and Pachotikarn study, the average THEI score belonged to the Need Improvement category (48.6%), although 69% of consumers obtained the THEI score of less than 55, (categorized as Poor diet quality). Twenty-two percent of participants were in the Need Improvement category, and only 8.3% were considered as having Good diet (2008).

Nutrition Environment Measures Survey (NEMS)

Apart from measuring dietary intake itself, the environment also was of interest because it affected consumers' choices. Nutrition Environment Measures Survey (NEMS) was created by the Rollins School of Public Health, Emory University. It is an observational measurement that used to capture what the community and consumer nutrition environments in food outlets are, especially in stores and restaurants (Glanz, Sallis, Saelens, & Frank, 2007; Saelens et al., 2007)

Nutrition Environment Measures Survey in Stores (NEMS-S) was developed specifically to capture the availability of healthful food choices, prices, and quality in food retail stores. According to Glanz et al. (2007), it was found that prices for healthy products such as lower fat, lower calorie, and whole grain were not significantly different from regular food items, but there was a significant difference in terms of stores type that carried these items (i.e., grocery stores had more available healthy food items than convenience stores).

The measurement developed specifically for restaurants was called Nutrition Environment Measurement Survey in Restaurants (NEMS-R), and it helped assess factors that contributed to consumers' food choices in the restaurant. There are four factors including: 1) availability of more healthy foods, 2) facilitators and barriers to healthful eating, 3) pricing, and 4) signage/promotion of healthy and unhealthy foods. It was found that there were some differences found between fast-food restaurants and sit-down restaurants. Fast-food restaurants were found to have healthier entrées and salads available, but in terms of number of food items, sit-down restaurants had more healthy main dishes and salads on their menus (Saelens et al, 2007).

Transtheoretical Model

The Transtheoretical Model (TTM) was introduced by Prochaska and Diclemente in 1981 and was first developed from a smoking intervention study where researchers observed and compared smokers who successfully quit smoking on their own and smokers who were in an intervention program. The findings indicate individuals have to go through a sequence of steps in order to change their behavior (Mhurchu, Margetts, & Speller, 1997). It is a stage theory because it specifies an ordered set of categories into which people can be classified, and it identifies factors that can induce transitions from one category to the next (Horwath, 1999). This classification is easy to apply and is popular when adapted, especially in dietary behavior studies. The advantages of TTM include easily designed questions and simple analysis methods; therefore, TTM was selected for further exploration in this study.

TTM has five stages including (Figure 1): Precontemplation, Contemplation, Preparation, Action, and Maintenance. Precontemplation is the stage where individuals

have no intention of changing behavior in the near future because they are unaware of their problems. These individuals seek help primarily because significant others make them aware of their problems. If individuals are aware of their problems and consider solving these problems (but are not yet committed to or in the process of changing their behavior) they are in the Contemplation stage. The third stage is Preparation, (combination of intention and behavioral stages) where individuals plan to take action within a month, or they have tried unsuccessfully to take action in the past year. The Action stage is when individuals adjust their behaviors, experiences, and environment to solve problems. The last stage is Maintenance where individuals try to maintain their actions to remain further from their problems for at least six months (Prochaska, & Norcross, 2001).

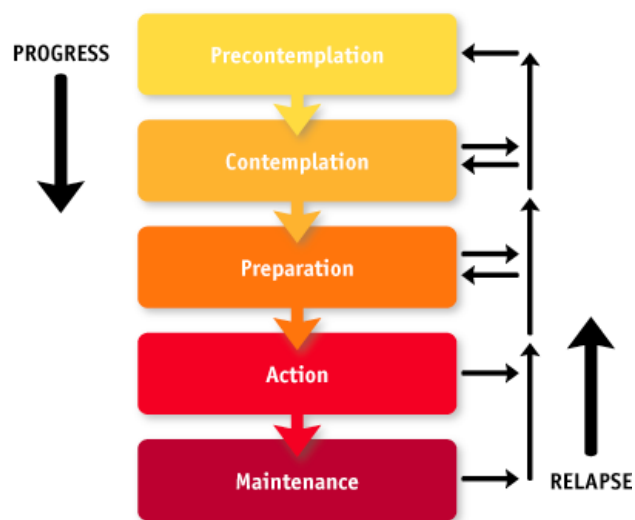


Figure 1 the Stages of Change Process
(Lily, 2007)

Figure 1 shows that behavior changes in the TTM concept is a dynamic process which involves movement through a sequence of discrete, yet qualitatively distinct stages. TTM's construct of the Stages of Change represents a temporal dimension and distinguishes five different stages. Individuals may move forward (progress) and

backward (relapse) through these Stages of Change (De Vet, De Nooijer, De Vries, & Brug, 2008).

Although TTM was developed for clinical conditions, it has been applied in many fields of study, especially the field of health (e.g., exercise change, blood donation, HIV prevention, and dietary change) (Povey, Conner, Sparks, James, & Shepherd, 1999). Previous studies included using the TTM model to explain dietary behavior and to evaluate dietary behavior or intervention (Spencer, Wharton, & Moyle, 2007). Some studies have been created specifically for fruit or fruit and vegetable intake. For fruit and vegetable intake, Precontemplation, Preparation, and Maintenance stages were validated in the TTM model studies on dietary change. Women and people with college degrees tend to be in the Action or Maintenance stage (Campbell et al., 1999). African Americans in either the Precontemplation or Preparation stages showed no differences in their increase of fruit and vegetable intake (Resnicow, McCarty, & Baranowski, 2003). Applying TTM to predict the change of fruit intake in a longitudinal study indicated the processes of change predicted stage transition for fruit intake but little difference from stage to stage: Precontemplation and Contemplation, Preparation, Action, and Maintenance in process of change (De Vet et al., 2008).

There are some recommendations and suggestions by Horwath (1999) to conduct future research using TTM:

- TTM should be used to investigate specific clearly understood food behaviors, not nutritional outcomes, i.e., dietary fat reduction.
- For classification purposes food based goals are more appropriate than nutrient-based goals. There is not enough evidence to demonstrate the validity of the model for dietary change through observing the association between stage and dietary intake.
- Valid questionnaires to measure all aspects of the TTM on the whole model are still not readily available, although single construct as stage, as well as study factors for distinguishing different stages are available.
- According to the previous cross-sectional studies, they normally support the predicted patterns of between-stage differences in decisional balance, self-efficacy, and processes of change.

Health and Taste Attitude Scales

The Health and Taste Attitude Scales (HTAS) was proposed by Roininen, Lähteenmäki, and Tuorila (1999), see Table 2. It was designed for measuring health, taste, and sensory related attitudes to monitor long term nutrition-related attitudes, or for consumer segmentation in the product development process. HTAS was first developed using an adapted laddering technique to determine how consumers perceived health and hedonic aspects of foods. Information from the adapted laddering technique and previous research were used to generate statements. The final 37 health related and 34 taste-related statements were tested by a national representative population from Finland. The statements were presented with a Likert type construct for consumers to rate the categories, ranging from “disagree strongly” to “agree strongly”. The final construct of HTAS consists of sets of statements divided into three health categories (General health interest, Light product interest, and Natural product interest) and three taste categories (Craving for sweet foods, Using food as a Reward, and Pleasure) (Roininen et al., 2001).

The HTAS were cross validated among Finnish, Dutch, and British consumers. Factor loading was used to determine differences in consumer responses from three countries, and findings illustrated that there were minor differences in factor loadings. Data from British consumers had lower factor loading than Finnish and Dutch consumers in the Natural product interest and Pleasure subscales. Finish consumers were found to have the most positive attitude against Light product interest subscales, whereas British and Dutch consumers scored Taste categories higher than Finnish consumers. The study proved that all the Health and two Taste sub-scales (Craving for sweet foods and Using food as a reward) were useful tools for characterizing consumer attitudes within and between countries (Roininen et al., 2001).

HTAS was also used by Roininen and Tuorila (1999) to predict choices among healthy and unhealthy snacks. In this study, apple was a representative for Healthy snack and chocolate bar was the representative for Unhealthy snack. It was found General health interest and Craving for sweet foods were good predictors of choice in the simple behavioral task and self-reported use frequencies of the products. Furthermore, Light product interest predicted choices, and Using food as a reward predicted the frequency of

use. In conclusion, several Health and Taste sub-scales proved to be useful in segmenting consumers (1999).

The relationship between HTAS and the dietary behavior from food frequency questionnaires was investigated by Zandstra, de Graaf, and Van Staveren (2001). Dietary behavior showed nutrient intake and various sources of food such as low-fat or high-fat foods. It was found that health sub-scales (General health interest and Light product interest) were good and useful predictors of dietary behavior. General health interest was associated with lower intake of fat, lower consumption of high-fat savory snacks and high-fat oils and fats, and increased consumption of vegetables and fruit. Light product interest was associated with higher consumption of low-fat dairy products and vegetables and fruit. The taste attitudes were not related to any type of dietary behavior, and only the taste sub-scale, Craving for sweet foods, predicted food consumption of high-fat sweet snacks. In conclusion, General health interest was related to a more healthy food consumption pattern. Healthier food choices were made by consumers according to nutrition education messages but only with respect to those foods where the fat content was easy for the consumers to see (2001).

Table 2 Health and Taste Attitude Scale Constructs

Category 1: General Health Interest

I am very particular about the healthiness of food.
I always follow a healthy and balanced diet.
It is important to me that my diet is low in fat.
It is important to me that my daily diet contains a lot of vitamins and minerals.
I eat what I like and I do not worry about the healthiness of food.
I do not avoid any foods, even if they may raise my cholesterol.
The healthiness of food has little impact on my food choices.
The healthiness of snacks makes no difference to me.

Category 2: Light Product Interest

In my opinion, the use of light products does not improve one's problem.
I do not think that light products are healthier than conventional products.
I believe that eating light products keeps one's cholesterol level under control.
In my opinion light products don't help to drop cholesterol levels.
I believe that eating light products keeps one's body in good shape.
In my opinion by eating light products one can eat more without getting too much calories.

Category 3: Natural Product Interest

I do not care about additives in my daily diet.
In my opinion, organically grown foods are no better for my health than those grown conventionally.
In my opinion, artificially flavored foods are not harmful for my health.
I try to eat foods that do not contain additives.
I would like to eat only organically grown vegetables.
I do not eat processed foods, because I do not know what they contain.

Category 4: Craving for Sweet Foods

In my opinion it is strange that some people have cravings for chocolate.
In my opinion it is strange that some people have cravings for sweet.
In my opinion it is strange that some people have cravings for ice cream.
I often have cravings for sweet.
I often have cravings for chocolate.
I often have cravings for ice cream.

Category 5: Using Food as a Reward

I reward myself by buying something really tasty.
I indulge myself by buying something really delicious.
When I am feeling down I want to treat myself with something really delicious.
I avoid rewarding myself with food.
In my opinion, comforting oneself by eating is self-deception.
I try to avoid eating delicious food when I am feeling down.

Category 6: Pleasure

I do not believe that food should always be a source of pleasure.
The appearance of food makes no difference for me.
It is important to me to eat delicious food on weekdays as well as weekend.
When I eat, I concentrate on enjoying the taste of food.
I finish my meal even when I do not like the taste of food.
An essential part of my weekend is eating delicious food.

(Roininen, et al., 2001)

Food Neophobia Scales

The Food Neophobia Scale (FNS) was developed by Pliner and Hobden in 1992 to use specifically for measuring willingness to try new or unfamiliar foods instead of using the General Neophobia Scale (GNS). Since GNS is concentrated on the situational determinants of neophobic behavior that are mostly used in a laboratory (Koivisto & Sjöden, 1996). The Food Neophobia Scales (FNS) indicate the degree of agreement and disagreement consumers have with 10 statements about foods or eating situations, i.e., ethnic foods and innovative foods (Ritchey, Frank, Hursti, & Tuorila, 2003). It includes five positive and five negative statements that consumers respond to using a 7-point scale ranging from disagree strongly to agree strongly. The positive items are reversed, therefore higher FNS scores reflect greater objection to trying new foods. The scale was determined to be an accurate predictor for novel foods and positively correlated with other fear and anxiety measures. It is negatively correlated with familiarity to foreign foods, finickiness, and sensation seeking (Henriques, King, & Meiselman, 2009). FNS has been used to characterize and compare consumers in different demographic groups, e.g., age groups and different countries. However, using FNS alone may not have the desired reliability. A study using FNS in the U S, Sweden, and Finland suggested that psychometric analyses are required to validate the FNS scale and help with comparing FNS scores across countries (Ritchey et al., 2003).

The FNS had been studied with “picky/fussy” eating consumer to create an understanding on the similarities and differences between the two in rejection and acceptance of fruits and vegetables in children. It was found that both FNS and “picky/fussy” eating affected rejection and acceptance of fruits and vegetables in children. There were other factors (e.g., age, tactile defensiveness, environment, and culture) that should be studied with FNS and “picky/fussy” eating because these elements affected the children’s attitudes towards fruits and vegetables. The study suggested that early life exposure helped promote acceptance and independent choice of fruits and vegetables in children (Dovey, Staples, Gibson, & Halford, 2008).

School children from two schools in Helsinki were observed over 1.5 years to determine effect of sensory education on food related-trait and responses. The study compared the control group to the treated group of children who were given sensory

lessons. It was found that education had stronger effect on the younger children; therefore, sensory lessons might be an effective method for encouraging children to try new foods and increase variety in their food choices (Mustonen & Tuorila, 2010). The study on the general population found that FNS scores decreased with an increase in education and with the degree of urbanization. Men were more neophobic than women, and the elderly (66–80 years) were more neophobic than other age groups. From factor analysis, FNS appeared to be a valid instrument for the characterization of consumer responses to unfamiliar foods (Tuorila, Lähteenmäki, Pohjalainen, & Lotti, 2001).

A study comparing FNS responses among Australian high school students from remote rural and cosmopolitan urban areas showed that exposure to diverse cultures and a high socio-economic status (SES) may affect the level of food neophobia. It was found that students from the urban area were less food neophobic than students from the rural area. City students were also more familiar with different foods and more willing to try unfamiliar foods because they had been exposed to diverse culture and have higher socioeconomic status which had provided knowledge of a variety of stimuli like foods (Flight, Leppard, & Cox, 2003). When comparing among American and Lebanese college students in the US, it was found that American students had lower degree of food neophobia. US students were also different in number of international trips, frequency of eating ethnic foods, and history of sickness after eating a new food. Students who were food neophilic had higher scores for familiarity and willingness to try for both familiar and novel foods subscale for both familiar and novel foods (Olabi, Najm, Baghdadi, & Morton, 2009).

When the difference among neophobic consumers and neophilic consumers, using novel flavored salad dressing, was studied findings indicated that neophobic consumers rated hedonic scores lower than neophiles for the novel salad dressings (Henriques, King, & Meiselman, 2009). However, ranking of hedonic scores for both groups were in the same order. The study suggested that the level of food neophobia may affect the magnitude of liking, but it may not affect product ranking based on hedonic scores. Thus, NFS helps product developers understand consumer psychographic profiles, but it may not give direction for the development of new products (2009).

Table 3 Food Neophobia and General Neophobia Constructs

Food Neophobia Scale Item

- I am constantly sampling new and different foods.
- I don't trust new foods.
- If I don't know what is in a food, I won't try it.
- I like foods from different countries.
- Ethnic foods look too weird to eat.
- At dinner parties I will try a new food.
- I am afraid to try things I know I have never had before.
- I am very particular about the foods I will eat.
- I will eat almost anything.
- I like to try new ethnic restaurants.

General Neophobia Scale Item

- I feel uncomfortable when I find myself in novel situations.
- Whenever I'm away I want to get home to my familiar surroundings.
- I am afraid of the unknown.
- I am very uncomfortable in new situations.
- Whenever I am on vacation I can't wait to get home.
- I avoid speaking to people I do not know when I go to a party.
- I feel uneasy in unfamiliar surroundings.
- I do not like sitting next to someone I don't know.

(Ritchey et al., 2003; Koivisto & Sjöden, 1996)

Food Involvement Scale

The Food Involvement Scale (FIS) was developed by Bell and Marshall (2003) and measures the characteristics of food involvement based on activities relating to food acquisition, food preparation, cooking, eating, and disposal. The final food involvement constructs (Table 4) were found to have a good test-retest reliability and internal consistency within two subscales (2003).

The study showed that consumers who have high levels of food involvement were able to discriminate food in both sensory evaluation and hedonic rating better than consumers with lower food involvement scores (2003). The high FIS consumers also tended to be healthier consumers. The data showed that healthy consumers have higher energy intake from fruits and vegetables than from fat and snacks.

A study of relationships between FIS and FNS showed that there is a significant, but low, intercorrelation among these two scales. It was found that consumers who have a high level of food involvement tend to be neophilic because they are more aware and willing to experience new foods (Marshall & Bell, 2004).

FIS was also used to study the eating behavior of women with different education levels, specifically with fruit and vegetable diets. The result showed that level of food involvement decreased with a lower education level. Women who had low scores on the food involvement scale also reported eating fruits and vegetables less frequently. (Eertmans, Victoir, Vansant, & Van den Bergh, 2005).

Table 4 Food Involvement Constructs

Food involvement scale item

I don't think much about food each day.

Cooking or barbequing is not much fun.

Talking about what I ate or am going to eat is something I like to do.

Compared with other daily decisions, my food choices are not very important.

When I travel, one of the things I anticipate most is eating the food there.

I do most or all of the clean-up after eating.

I enjoy cooking for others and myself.

When I eat out, I don't think or talk much about how the food tastes.

I do not like to mix or chop food.

I do most or all of my own food shopping.

I do not wash dishes or clean the table.

I care whether or not a table is nicely set.

(Bell & Marshall, 2003)

Data Analysis

The data in this dissertation are categorical data, i.e., data from FIS, FNS and HTAS using Likert scales, diet quality group from HEI scores, and categories from the Stages of Change model. Likert scale and diet quality group from HEI scores data were considered as ordinal data since they have the logical order. In the Likert scaling, the order ranged from strongly disagree to strongly agree. The order of diet quality obtained from HEI ranged from Poor diet, Need Improvement diet, and Good diet. The data from Stages of Change were treated as the nominal data because we aimed to group consumers based on their current stage according to the Stages of Change model.

The responses of typical logistic regression models can have multilevel; in the ordinal data case (e.g., diet group from HEI) or in the nominal data case there are the Stages of Change groups. For ordinal responses model functions, called cumulative logits, were obtained by performing ordered logistic regression using the proportional odds model. For nominal responses, generalized logit was formed and logistic analysis was performed with multiple logits per population in order to obtain the models. (Agresti, 1996; Stokes, Davis, & Koch, 2003)

Likert Scale

The Likert scale was created by Rensis Likert in 1932 to measure consumer attitudes. The scale was developed from the Thurstone scaling technique because when scores were compared between the Thurstone method, the Sigma method, and the Likert scale, findings indicated that the less complex method of Likert yielded higher reliabilities than the Thurstone method. In 1934 Likert conducted a study to prove the consistency of scale by comparing the Thurstone method with 10 different scales, e.g., attitude towards birth control, the Chinese, Communism, Evolution, the Germans, God (reality of), etc. This study confirmed that the Likert method had higher reliability than the Thurstone method and from correlation it showed the Likert method measures essentially what is measured by the Thurstone scoring method (Edmonson, 2005). In consumer tests, attitude towards the product can be asked. This is done by responding to the degree of agreement and disagreement statements about a product. This

information is mostly used for advertising claims on consumer perceptions about products, as well as defending any legal challenge (Lawless & Heymann, 1998). The Likert scale was applied to many food related psychographic measurements: FNS (Ritchey et al., 2003), FIS (Bell & Marshall, 2003), Health and Taste Attitude Scale (HTAS) (Roininen, et al., 2001), List of Value Scale (Chryssohoidis & Krystallis, 2005), and Food Related Life Style (O'Sullivan, Scholderer, & Cowan, 2005). The challenge of using the Likert scale is confusion on whether it is ordinal or interval. This confusion causes researchers to use inappropriate statistical methods to analyze data (Edmonson, 2005).

Responses to a single Likert scale item are usually treated as ordinal data. The nonparametric tests that have been used include: Wilcoxon's signed rank test, the Whitney-Mann-Wilcoxon test, the Kruskal-Wallis test, and Fieldman's test. In some cases responses to several Likert scale items are summed up and treated as interval data. Researchers need to make sure that the summed data are normally distributed. If the data are normally distributed then the parametric statistic methods can be applied to the summed data. However, the data transformation may be useful to make certain that parametric assumptions are not violated (Verbych, 2007).

There are parametric methods that have been proposed for analysis of ordinal data. The exact probability test to use with Likert-type data was proposed by Cooper (1976) and provided a table of critical values for small sample sizes. In the case of a large sample size normal approximation can be used but the analyst must be careful with issues such as:

- The points of the Likert scale are equally spaced.
- Consumers respond independently from each other
- Each category of scale has an equal opportunity to get the response from consumer (Cooper, 1976).
- Using the application of ordered probit model to treat with Likert ordinal data (Daykin & Moffatt, 2002).
- Use of cumulative logits for modeling ordinal response variables and cumulative link models for binary data (Verbych, 2007).

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Chapter 3 - Use of a Simplified Food Recall to Obtain Consumers' Healthy Eating Index Scores

Introduction

The Center of Nutrition Policy and Promotion (CNPP), United States Department of Agriculture (USDA), developed the original Healthy Eating Index (HEI) in 1995 using recommendations from the food guide pyramid to assess and monitor national diet quality (USDA, 1995). The HEI report has helped the USDA plan a more effective promotion of proper dietary habits by allowing study of United States (US) consumer eating habits (Freedman, Guenther, Krebs-Smith, & Kott, 2008).

HEI consisted of 10 components: Components 1-5 measure how a person's diet follows the Food Guide Pyramid serving recommendations including grain, vegetable, fruit, milk, and meat groups; Components 6 and 7 measure fat and saturated fat consumption as a percentage of total food energy intakes; Components 8 and 9 assess total cholesterol intake and sodium intake, respectively; Component 10 measures food variety in a person's diet within a three day period (USDA, 1995).

Using HEI, consumers were asked to write down the number of food servings they consumed in one day. The data was then converted to a score from 0-10 for each component based on USDA recommendations (Freedman et al., 2008). To calculate HEI overall scores the scores were combined from all 10 components making the maximum score 100. When categorizing diet quality, CNPP divided it into three groups separated by a HEI overall score: Poor Diet (less than 51), Need Improvement (between 51 and 80), and Good Diet (more than 80) (USDA, 1995). The original HEI was modified to include the new aspects of the 2005 Dietary Guideline and subsequently called HEI-2005. These revisions included adding whole grains, more vegetables, specific fats, and a discretionary calories component (calories obtained from solid fat, alcohol, and added sugar), thus a new score was assigned to each component (Guenther, Reedy, Krebs-Smith, Reeve, & Basiotis, 2007).

Thailand also has developed an instrument, Healthy Eating Diet for Thais (THEI), to measure diet quality. It was modified from the HEI by applying the scoring system based on the recommended diet from Thai Recommendation Diet Intake (Thai RDI). The THEI consisted of 11 components; its scoring system is based on the recommendations of Thailand Nutrition Flag. Components 1-5 measure how a person's diet follows the recommended servings by Thai RDI. Components 6-8 assess total fat, saturated fat, and added sugar, respectively, as a percentage of the total food energy intake. Components 9 and 10 measure total cholesterol and sodium intake, and Component 11 assesses diet variety. The maximum score of THEI is 110. There are three categories to describe the different quality levels of Thais' diet including: Poor Diet (less than 55), Need Improvement (55 to 66), and Good Diet (higher than 66). The three-day food record was used to collect food intake data for THEI, instead of HEI's 24-hr food recall method (Taechangam, Pinitchun, & Pachotikarn, 2008).

Different dietary intake assessments are used in the standard national HEI and THEI assessments in part because they provide different advantages and disadvantages. There are three main methods used to collect dietary intake data including the Food Frequency Questionnaire (FFQ), Food Record (Food Diary), and Food Recall. The FFQ is designed to gather information on consumers' consumption frequency and portion sizes of particular food items. It is convenient and only requires a one-time response from the consumer; therefore FFQ is inexpensive to use compared to other methods. However, there are some draw backs when using FFQ because it requires modification when conducted with different populations having different interest and actual food consumption habits. Furthermore, the number of food items included on the questionnaire is limited due to an appropriate length for the questionnaire (Subar, 2004; Haftenberger et al., 2010).

Thailand's Eating Index uses three day food records to collect data in order to obtain data based on a longer food intake period. The use of food records also provides more accurate data because it does not rely on consumer memory. To use the Food Record or Food Diary, it requires consumers to respond to the questionnaire or diary everyday for specific period of time (Bingham & Day, 1997). The disadvantages of using this method are: decrease in consumer responses when the days reported increase,

dependability of consumer records, and cost of treating the data before analyzing (Plummer & Kaaks, 2003; Schatzkin et al., 2003; Rutishauser, 2005).

As in the US, CNPP decided to use the Food Recall to obtain dietary intake data for HEI. Food recall can be applied to different lengths of time, and the most popular method is the 24-hr food recall where consumers are asked to recall what they have eaten in the past 24 hr to obtain HEI scores. When a 24-hr food recall method with a large enough sized consumer study is applied appropriately, this combination of methods can have results as accurate as those obtained from the Food Record method (Plummer & Kaaks, 2003; Schatzkin, et al., 2003). The 24-hr food recall is the easiest for the consumer because it uses interviewers to collect the data, therefore consumers do not need to respond to questionnaires. With trained and skilled interviewers they can complete the 24-hr food recall in about 30 minutes. However, using interviewers is expensive and prone to “reporting effect” because consumers tend to give healthy food items more responses than is accurate (Plummer & Kaaks, 2003; Schatzkin et al., 2003). Furthermore, food intake is not a stable quantity, and this method will not represent long term food intake habits. The HEI used in Thailand uses three day food records to collect data, thus it provides data based on a longer food intake period. However, food records are time consuming to collect and prone to underreporting because consumers forget to write down each food.

This study focused on compiling a modified food recall questionnaire for obtaining HEI scores by extending the length of the 24-hour food recall to a 7-day food frequency recall in order to capture longer term food intake habits from Thai and US consumers.

Materials and Methods

Subjects

This study was conducted in Thailand and the US, with at least 300 consumers from each country. In Thailand the test took place at the Department of Product Development, Kasetsart University, Bangkok and in the US at the Sensory Analysis Center, Kansas State University, Kansas. Both US and Thai consumers were at least 18 years old and did not have more than one nutrition course in an undergraduate level class, in order to eliminate expert bias. Graduation from high school was required in order to participate in the survey in Thailand.

Dietary assessment Instrument

The method used to collect dietary intake data was a 7-day food frequency recall questionnaire. The questionnaire included 62 food items representing commonly used foods from each food group as shown in Table 5 (USDA, 1992). The recommended serving size for each food item was provided as a reference amount for consumers; this example was intended to help consumers estimate the number of servings to include on each food item's response. In addition, consumers were asked to write down the number of servings of each food item eaten in one week. Questions on gender, age, education level, and income were included in the questionnaire to obtain demographic data.

Data Treatment and Analysis

A HEI score for each individual was calculated using the original HEI protocol. Consumer responses were for number of servings of each food item in one week. These numbers were divided by seven to obtain the number of servings per day. The recommended number of food guide pyramid servings per day of grains, vegetables, fruits, milk, and meat were 9, 4, 3, 2, and 2.4, respectively. These numbers are calculated based on an average energy intake of 2,200 kcal per day. Components 6-9 were calculated using the USDA's National Nutrient database to obtain total fat, saturated fat, cholesterol, and sodium for each food item before processing the data; this process follows original HEI protocol (USDA, 1995).

The US and Thai Healthy Eating Indexes treat calories from added sugar differently. In the US HEI discrete calories from added sugar, solid fat, and alcohol were added (SoFAAS) as a HEI component in HEI-2005. The recently developed HEI for Thais has calories from added sugar as a separate component incorporated into the original 10 US HEI. Therefore, a score with the added sugar component was computed and compared between Thai and US consumers.

T-tests using SAS® (Statistical Analysis System for Windows, Version 9.1, 2006, SAS Institute Inc., Cary, NC) were performed to test the differences in means of numerical scores of HEI components and total HEI component between US and Thai consumers. Within the same country, Pearson's Chi-square was used to test whether or not diet quality of consumers was different according to the demographic backgrounds (among different gender and different age groups) at p-value < 0.05.

Table 5 Commonly used foods for each food group from the food guide pyramid

Food item used in questionnaire	
Bread, Cereal, Rice, and Pasta	Vegetables
Cold or hot breakfast cereal	Vegetable salads or raw vegetables
Bread	Cooked vegetables (fresh, frozen, canned)
Hamburger roll, bagel, english muffin	Tomato sauce
Tortilla (7" diameter)	Avocado
Rice or pasta, cooked	Baked potato, small
Plain crackers, small	Potatoes, scalloped
Pancake 4" diameter	Potato salad
Croissant, 1 large	French fries
Doughnut, 1 medium	
Danish, 1 medium	Fruits
Cake, frosted	Fruit, fresh or dried
Cookies	Fruit juice
Pie, fruit, 2-crust	
Meat, Poultry, Fish, Dry Beans, Eggs, and Nuts	Fat, Oils, and Sweets
Beef	Butter, margarine
Bologna	Sour cream
Organ meats (liver, heart, kidney, etc)	Sugar, jam, Jelly
Meatball	Soft drink, Regular
Broiled chicken breast	Soft drink, Diet or Light
Fried chicken	Sherbet
Broiled fish	Fruit sorbet
Steak or prime rib	Salad dressing
Ham or roast beef (in deli sandwich)	Mayonnaise
Tuna salad	Nut butters (peanut butter)
Pork	Chips
Lamb	Chocolate or candy bars
Veal	Alcoholic drinks
Fish or Shellfish	Sweeten beverages, not including diet drinks (soft drinks, fruit drinks)
Bacon or Sausage	
Whole egg or Egg yolk	Milk, Yogurt, and Cheese
Dried bean, split beans or lentils	Milk, Skim milk
Nuts	Yogurt
	Natural cheddar cheese
	Processed cheese
	Mozzarella, part skim
	Ricotta, part skim
	Cottage cheese
	Ice cream

Results and Discussions

Healthy Index Components

Based on US HEI-2000 there are 10 components that capture different perspectives of healthy eating, and each component has a maximum score of 10. In the US study, the highest component score was from the meat and bean component (degree of consumer's diet conform to meat, nuts, and beans group based on the food guide pyramid) (Table 6). The next highest components were total sodium intake and dairy intake. All of those scores are higher than the CNPP HEI scores, indicating that the proposed survey tends to estimate meat, sodium, and dairy intake higher than a 24-hour recall. This may not be inaccurate since the 24-hour recall measures only two 24-hour dietary periods and the current survey is based on 7 days of dietary estimation. Averages over 7 days may be more accurate, or the survey may focus more on meats and dairy products that people eat most frequently.

The two lowest components in the calculated HEI score from this survey instrument were for fruit and vegetable intake, which is the same as was found using the US dietary data HEI (Table 6). Scores for the HEI from this survey and the standard US survey were within 1 point of each other indicating reasonable agreement.

The grain consumption component score (5.3) was lower than expected suggesting that our survey tended to underestimate grain consumption. In comparing data from the current survey and prior studies the number of grain products consumed was similar, but the portions consumed for rice and pasta in our survey appeared smaller. Thus, additional small size consumer survey (N=24) was conducted in both the US and Thailand to determine if consumers understood the serving size of cooked rice and cooked pasta. The test, which compared perceived portion size with and without a portion size estimation aid, showed that most consumers (67%) indicated they ate more rice or pasta when they had a portion size aid than when they did not. Because the dietary recall used to calculate the standard HEI index includes portion size aids for estimation this likely results in the lower index found with the proposed quick frequency/recall method when compared to that found in the US national survey 2001-2002 (Guenther et al., 2007).

The means of the three components (fat, saturated fat, and cholesterol) are close together: 7.1, 7.2, and 7.7, respectively and are similar to those calculated from the national survey. The mean of food variety component was 7.8 and the average total HEI score from the 10 components was 70.7. Table 6 illustrates the means and standard deviations of each component from this study compared with the findings of the National survey by CNPP 2001-2002 (Guenther et al., 2007).

Table 6 HEI component scores among finding from this study and the National Survey by CNPP in 2001-2002

HEI Component	HEI Scores \pm S.D.	HEI from NCPP survey
Meat and Beans	8.9 \pm 1.9	6.7
Dairy	8.3 \pm 2.5	5.7
Total Fruits	4.9 \pm 3.0	3.9
Total Vegetables	5.1 \pm 2.7	5.9
Grain	5.3 \pm 2.6	6.7
Total fat intake	7.1 \pm 4.0	6.7
Saturated fat intake	7.2 \pm 3.9	6.7
Cholesterol intake	7.7 \pm 3.9	7.7
Sodium intake	8.6 \pm 2.9	6.3
Variety	7.8 \pm 2.7	7.4
Total HEI	70.7 \pm 10.6	63.8

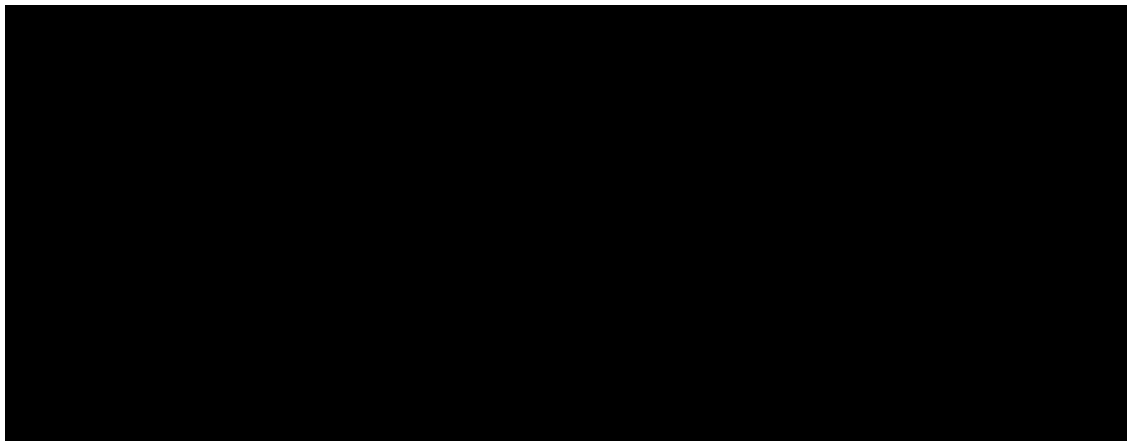
According to the Thai consumer study, high scoring components were saturated fat, sodium intake, and consumption of meat, beans, and nuts. The lowest score was total vegetable consumption; this score corresponded with findings from the Thailand National Examination Survey III. The survey found that only 68% of Thais ate vegetables daily and consumed only 1.78 servings per day (Satheannoppakao, Aekplakorn, & Pradipasen, 2009). Another reason for this low count may be the way Thai foods incorporate vegetables into meals. Some Thai foods, i.e., curry, stir fry, and traditional salad, mix

vegetables with other ingredients making it hard to estimate vegetable consumption, or consumers may not have taken those vegetables into account when answering the questions.

The same small scale survey on rice and pasta consumption, as in the US study, was conducted with 29 Thai consumers. Approximately 62% of Thai consumers rated a higher number of servings when presented with a serving size reference. This would explain the grain component's low numbers.

The comparison between Thai and US consumers for each HEI component and total HEI scores and total THEI scores are shown in Table 7.

Table 7 Comparison between Thai and US consumers for each HEI/THEI component and total scores



Note. * Indicates significant component from t-test at p-value 0.05

When comparing between Thai and US consumers, no significant differences were found in consumer consumption of meat, nuts, and bean; total fat intake, sodium intake, and added sugar intake. Although US consumer diets contained more dairy, fruit, vegetables, and grains with less cholesterol, and more variety, Thai consumers had better diets in terms of saturated fat intake. In this study the added sugar component was included because it appeared in both HEI-2005 and THEI. The means of added sugar components for US and Thai consumers were 1.0 ± 2.9 and 0.7 ± 2.5 from a total of 10 points,

respectively, and were not significantly different. The raw data from 263 consumers (87.1%) had a score of zero in this category. Only 19 consumers (6.3%) out of 302 obtained maximum scores for the added sugar component. Thai consumers had the same pattern as US consumers; there were 273 consumers (90.2%) from 306 that received a score of zero, and only 16 consumers (5.2%) received 10 out of 10 for this category.

Quality of Dietary Intake

There were 302 US consumers who participated in this study with equal distribution of gender and age. Most held a Bachelor's degree (34.1%) or had completed some college, technical school, or had an associate's degree (30.8%). Per year, approximately 31.5% of consumers earned \$25,000-\$50,000, 29.5 % earned below \$ 25,000, and 18.5% earned \$50,001-\$80,000 (Table 8). According to total HEI scores (using HEI-2000 standards) most US consumers in this survey belonged to the Need Improvement group (approximately 77.5%), followed by Good Diet (18.9%) and Poor Diet (3.6%). When compared with the findings from the HEI rating of US population (1999-2000), similar results were found. The CNPP in 2001-2002 survey concluded that 74% of US consumers were in Need Improvement, 16% belonged to Poor Diet, and 10% belonged to Good Diet.

Table 8 US Consumer demographic information and distribution of HEI in each category (n=302)

Demographic	Number of consumers	% of consumers within group		
		Poor	Improvement	Good
Gender				
Female	165	1.8	77.6	20.6
Male	137	5.8	77.4	16.8
Age				
18-25	76	5.3	78.9	15.8
26-40	76	2.6	80.3	17.1
42-55	69	2.9	81.2	15.9
56-65	81	3.7	70.4	25.9
Education				
Some high school or less	2	0.0	50.0	50.0
High school graduate or GED	27	7.4	74.1	18.5
Completed some college, associate degree or technical school	93	4.3	78.5	17.2
College graduate (Bachelor's degree)	103	2.9	84.5	12.6
Post-graduate degree	77	2.6	68.8	28.6
Income per year				
Below \$25,000	89	9.0	74.2	16.8
\$25,000-\$50,000	95	1.1	83.2	15.7
\$50,000-\$80,000	55	0.0	80.0	20.0
Above \$80,000	41	2.4	78.0	19.5
Do not know or do not wish to respond	22	4.5	59.1	36.4

In the Thailand study there were 306 consumers who responded to the survey and had similar distributions of gender and age range as the US survey; most had finished an undergraduate degree. The total THEI score of Thai consumers was calculated based on THEI standards to classify quality of dietary intake. The findings indicated that 19.9% of consumers belonged in the Poor Diet category, 37.6% in Need Improvement, and 42.5% in Good Diet (Table 9). The total THEI mean score was 63.2 and was considered as Need Improvement. A study by Taechangam et al. (2008) showed a much higher percentage of people in the Poor Diet category (69%), 22% in Need Improvement, and 11% in Good Diet with a total mean score of 48.6. However, that survey had many more rural participants than this survey, and it is surprising that those authors found such a high percentage of the population with poor diets considering the life expectancy in Thailand is over 69 years of age.

Table 9 Thai consumer's demographic information and distribution of THEI for each category (n=306)

Demographic	Number of consumers	% of consumers within group		
		Poor	Need Improvement	Good
Gender *				
Female	157	22.3	30.6	47.1
Male	149	17.4	45	37.6
Age				
18-25	99	19.2	37.4	43.4
26-40	85	18.9	37.6	43.5
42-55	91	22.2	38.9	38.9
56-65	26	19.4	35.5	45.1
Education				
High school graduate or GED	71	21.1	36.6	42.3
Completed some college, associate degree or technical school	24	41.7	33.3	25.0
College graduate (Bachelor's degree)	144	18.1	41.7	40.3
Post-graduate degree	67	15.0	31.3	53.7
Income per month				
10,000 Baht or less	66	24.2	36.4	39.4
10,001-25,000 Baht	84	25.0	33.3	41.7
25,001-40,000	71	18.4	40.8	40.8
40,001-55,000 Baht	31	16.1	38.7	45.2
Higher than 55,000 Baht	54	11.1	40.7	48.2

Note. * Indicates the factor found to be significantly different with P-Value at 0.05

Based on analysis from US consumer data, no significant differences were found in quality of dietary intake for consumers with different demographic backgrounds. In Thailand, males and females had differing qualities of dietary intake (Chi-square = 6.75, P-value = 0.03). When each cell of the Chi-square was examined (Table 10), it was found that male and female consumers in the Need Improvement group show the greatest differences because their cell Chi-square values (Chi-square value of male in Need Improvement = 2.2 and female = 2.1) are the main contributor to the overall Chi-square (Table 10. The cell chi-square of females and males who belong in the Need Improvement group was about 30% and 32% of Pearson's Chi-square value, respectively.

The opposite finding was shown in the Good Diet group, even though the cell Chi-square value of male and female in this category was not as high as the Need Improvement group (about 11% of Pearson's Chi-square for females and 12% for male consumers). It was found that the observed number of females in the Good Diet category was higher than the expected value, but the expected value was higher for male consumers than the observed number. The main different between males and females is in the Need Improvement category. The other categories are not contribution very much to male and female differences. It can be inferred from the study that female consumers have a better quality of diet than male consumers (Table 10).

Table 10 Cell Chi-square of different dietary quality group separated by gender

	Female			Male		
	Poor	Need Improvement	Good	Poor	Need Improvement	Good
Observed Value	48.0			67.0		
Expected Value	59.0			3.3		
Cell Chi-square	2.1			0.8		

Conclusion

Thai and US consumers need to improve their eating behaviors because most consumers belong to the Need Improvement or Poor Diet groups. Each component score of HEI illustrates that US consumers need to eat more fruits and vegetables but also need to reduce fat intake and added sugar in their diets. Thai consumers should increase dairy, fruits, and vegetable intake and should avoid foods that provide total fat, cholesterol, and added sugar, as well as eat a greater variety of foods. There should be some modification on cooked rice and cooked pasta items by placing them separately in the questionnaire for both countries. In terms of demographic background there was no demographic factor that contributed a greater influence on US consumers than any other. However, quality of dietary intake among male and female consumers was found to be significantly different in Thai consumers. Even though the US HEI scores obtained from the simplified food recall questionnaire were different from the national survey in 2005, it still indicated the HEI components that need improvement are fruits, vegetables, fat intake, and added sugar. The average total score representing overall dietary intake quality of both Thai and US consumers belongs to the Need Improvement group. The information obtained in this session will be used in Chapter 5.

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Chapter 4 - Group Consumers Based on Their Responses to a Set of the Stages of Change Model Questions

Introduction

The Stages of Change model was proposed by Prochaska and Diclemente in 1982. It was developed to use in the clinical study by first used in a clinical study on smoking intervention study. The researcher observed and compared smokers who successfully quit smoking on their own with smokers that had to go through an intervention program. The research indicated that individuals must go through stages in order to change their behavior (Mhurchu, Margetts, & Speller, 1997).

The Stages of Change model consists of five stages: precontemplation, contemplation, preparation, action, and maintenance.

- Precontemplation: is where individuals have no intention to change their behavior because they are unaware of their problem or do not care about those problems.
- Contemplation: is where the individual knows about their problems, consider solving them but are not yet committed change.
- Preparation: is where individuals plan to take action within a month, or they have tried to take action before in the past year but were not successful.
- Action: is where individuals adjust their behaviors, experiences, and environment to solve problems.
- Maintenance: is where individuals are trying to maintain their behavior in order to remain further from their problems for at least six months (Prochaska, & Norcross, 2001).

Although Stages of Change was developed for clinical studies, it has been used in many field studies since because it is easy to design questions and requires simple analysis methods. Examples of the Stages of Change model being used are in exercise change, blood donation, HIV prevention, and dietary change (Povey, Conner, Sparks, James, & Shepherd, 1999).

According to previous studies, the Stages of Change has been used to explain dietary behavior, evaluate dietary behavior or intervention (Spencer, Wharton, Moyle, & Adams,

2007). Some studies investigated specifically for fruit or fruit and vegetable intakes, i.e., Campbell et al. (1999) showed that women and people with college degrees tend to be in action or maintenance stage. Resnicow, McCarty, and Baranowski (2003) found that African Americans in either the Precontemplation or Preparation stages showed no differences in their increase of fruit and vegetable intake. Because there are evidences indicating that Stages of Change can be used to group consumers based on their consumption, this part of the dissertation was aimed to classify consumers according to their status in the Stages of Change model.

Materials and Methods

Subjects

This study was conducted in both Thailand and the United States (US) in order to determine applicability to alternative countries. There were at least 300 consumers from each country that participated in the study. In Thailand the survey was conducted at the Department of Product Development, Kasetsart University, Bangkok and in the US at the Sensory Analysis Center, Kansas State University, Kansas. The screening criteria used in the study consisted of consumers being at least 18 years old and had not taken more than one nutrition course at an undergraduate level. Additional criterion (consumers had to finish at least high school) was added to the study in Thailand.

Procedure

After consumers passed the screening process, they answered a self-administrated questionnaire. Consumers responded to a series of questions created based on the Stages of Change model. These questions were used to classify consumers into different stages that represented where they thought they belonged in terms of overall healthy diet. The first question asked was if consumers thought that they usually had a healthy diet. If the response was “no” then consumers were asked if they planned to change their diet to be healthier. If the answer was “no” then they will be considered to be in the Precontemplation stage. If they planned to change their diet to be healthier in 1 or 6 months, they would be considered in the Preparation or Contemplation stages, respectively. Consumers who answered “yes” to the first question responded to different

questions than the consumers who gave “no” as an answer. Consumers who thought they already had a healthy diet were asked how long it had been since they changed their diet and started eating healthier. If they started a healthier diet longer than 6 months previously, they were in the Maintain stage. If their changes started less than 6 months prior, they were in the Action stage.

Results and Discussions

Stages of Change of Thai and US consumers

Both Thai and US consumers who thought they already had a healthy diet for more than 6 months were categorized as belonging to the Maintain stage. The second highest category was Action stage where the consumers thought that they had changed to a more healthy diet less than 6 months prior (Table 11).

Table 11 Percentage of consumer who belong to each Stages of Change

Stages of Change	Thailand	US
Precontemplation	8.0	5.5
Contemplation	4.8	9.4
Preparation	9.3	14.2
Action	22.4	21.0
Maintenance	55.5	49.8

Conclusions

Most of Thai and US consumer belonged to the Maintenance and Action stages. They believed that they have a healthy diet. The information obtained from this chapter will be used further in Chapter 5.

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Chapter 5 - Using food related psychographic scales to group consumers based on their healthy eating behavior

Introduction

For reliable consumer studies on food products the most important step is determining the target population from which to collect representative data, and the normal screening criteria are demographics, the product's frequency of use, and product preference (Meilgaard, Civille, & Carr, 2006). However, in terms of healthy food products no specific tool is used to evaluate how healthy consumers are or how interested consumers may be in health products.

One way to find out how healthy consumers eat is by using a method of dietary assessment. Three main dietary assessment methods are Food Recall, Food Record (Food Diary), and Food Frequency Questionnaire (FFQ) (Subar, 2004; Haftenberger et al., 2010). Each method provides different advantages and disadvantages. In selecting what method to use researchers need to consider the objectives and limitations of their study. The method most often used among the three is the 24-hour Food Recall; it was used as a way to collect Healthy Eating Index data by The Center for Nutrition Policy and Promotion (CNPP), United State Department of Agricultural (USDA) (USDA, 1995). Although the 24-hr Food Recall method can be completed in less time than other methods, it still is not an appropriate tool for recruiting participants for consumer testing because it requires interviewers to collect data (Thompson & Byers, 1994; Rutishauser, 2005).

One stage theory applied to dietary behavior studies is the Transtheoretical Model (TTM) introduced by Prochaska and DiClemente (1982). TTM was used mainly to classify individuals into five different groups based on their readiness to change to better behaviors. There are five stages including Precontemplation, Contemplation, Preparation, Action, and Maintenance (Prochaska & Norcross, 2001; Spencer, Wharton, & Moyle, 2007). Prior studies showed the evidence of TTM was able to differentiate consumers based on their eating habits, specifically fruit and vegetable intakes (Campbell et al.,

1999; Resnicow, McCarty, & Baranowski, 2003; De Vet, De Nooijer, De Vries, & Brug, 2008).

The other approach for grouping consumers on their attitudes towards food is by using food related psychographic scales. There are several food related psychographic scales applied to dietary behavior study, i.e., Food Involvement Scale (FIS), Food Neophobia Scale (FNS), and Health and Taste Attitude Scale (HTAS).

FIS was developed (Bell & Marshall, 2003) to capture how much consumers are involved with foods in term of setting, preparation, eating, and disposal. According to Bell and Marshall (2003), FIS can distinguish consumers with different healthiness levels. It was found that consumers who obtained high FIS scores tended to have healthier eating habits (Marshall & Bell, 2004; Eertmans, Victoir, Vansant, & Van den Bergh, 2005).

FNS, proposed by Pliner and Hobden (1992), is a tool for measuring degree of agreement and disagreement of consumers on food or eating situations, i.e., ethnic foods and innovativeness of foods (Ritchey, Frank, Hursti, & Tuorila, 2003). The study on FIS and FNP (Marshall & Bell, 2004) showed the interrelationship between FNP and FIS's subscales. It was found that consumers having high levels of food involvement tend to be neophilic because they have a heightened awareness and willingness to experience new foods (2004).

Health and Taste Attitude Scale (HTAS), developed by Roininen, Lähteenmäki, and Tuorila (1999), assesses consumer's health, taste, and sensory related attitudes for use in the product development process and consumer segmentation (Roininen et al., 2001). A study conducted (Roininen & Tuorila, 1999) on prediction choices among healthy and unhealthy snacks showed that General Health Interest, Craving for Sweet Foods, and Light Product Interest subscales predicted choices. Using Food as a Reward subscale predicted the frequency of use, therefore, the study showed that Health and Taste sub-scales proved to be useful in segmenting consumers (1999).

Because there were evidences that food related psychographic models and scales can differentiate consumers who have different eating behaviors, this study was designed to determine a set of questions from FIS, FNP, and HTAS that could classify consumers

belonging in different groups based on both a Healthy Eating Index (HEI) score and the Stages of Change model for healthful eating.

Materials and Methods

Subjects

This study was conducted in both Thailand and the United States (US) in order to determine applicability to alternative countries. There were at least 300 consumers from each country that participated in the study. In Thailand the survey was conducted at the Department of Product Development, Kasetsart University, Bangkok and in the US at the Sensory Analysis Center, Kansas State University, Kansas. The screening criteria used in this study consisted of consumers being at least 18 years old and had not taken more than one nutrition course at an undergraduate level. Additional criterion (consumers had to finish at least high school) was added to the study in Thailand.

Procedure

After the screening process, consumers answered a self-administrated questionnaire. The questionnaire consisted of four parts including a set of Stages of Change questions, a 7-day self-administrated food recall, food related psychographic scales (FIS, FNS, and HTAS), and demographic questions (gender, age, education level, and income).

Data Analysis

The numeric score of Data analysis process of this study was divided into four steps: difference test (Step 1), independence test (Step 2), model selection (Step 3), and external validation (Step 4). The statistic program used in this study was SAS® (Statistical Analysis System for Windows, Version 9.2, 2008, SAS Institute Inc., Cary, NC)

Step 1 was the difference test. Difference tests were performed to determine variations between Thai and US consumers for Food Involvement Scale, Food Neophobia Scale, and Health and Taste Attitude Scale at p-value < 0.05.

The dependent test (Step 2) was divided into two parts. Part one was the analysis used to determine the independence between the level of diet quality from HEI (for US consumers) and THEI (for Thai consumers) with the responses from FIS, FNP, and HTAS. Therefore, the first part of Step 2 was aimed to assess if level of diet quality was dependent on any consumer responses to the statements from FIS, FNP, and HTAS. The analysis used in the second part was the same method as in the first part, but it determined the independence between consumers' current Stages of Change with FIS, FNP, and HTAS. The aim of the independence test was to select statements from FIS, FNP, and HTAS that were related to diet quality and Stages of Change for use in Step 3 (model selection). The independence test between the Stages of Change group and using the SAS[®] FREQ procedure was applied to the data in order to select the significant questions from FIS, FNP, and HTAS to use in model selection. The analysis was run with two-thirds of the data (approximately 200 consumers); therefore, another 100 consumers were left for Step 4 (external validation).

The model selection (Step 3) was done using proc logistic with option of glogit as the link function for nominal response categories and logit for ordinal response categories. The glogit option was used when Stages of Change data were treated as the dependent variable, and logit option was used when diet quality data were treated as the dependent variable in this study. The models obtained from glogit and logit option were used to calculate the estimated probability for each response category. Step 4, external validation, was done with the remaining data (consumers \cong 100). The validation was separated into two parts, validation for diet quality predicted models and validation for Stages of Change predicted models.

The diet quality data were considered as ordinal data, therefore cumulative logit was applied in the probability calculation. Each consumer obtained three probability values from the calculation including probability of belonging in Poor Diet group, Need Improvement Diet group, and Good Diet group. Consumers were classified into a diet group according to which diet group obtained their highest probability. The result from predicted model of each consumer was compared with the result from actual diet quality (obtained from HEI or THEI).

The same protocol was used for the Stages of Change data, but generalized logit was utilized to calculate probabilities. The original Stages of Change obtained five probabilities for precontemplation, contemplation, preparation, action, and maintain. Consumers were put into the stage that obtained highest probability, and then compared the result from actual Stages of Change with the result from predicted model. The outcomes of Step 4 are classification tables. The table showed how accurate the predicted models were, when compared with the actual diet quality and Stages of Change for each consumer. The formulas used for probability calculation was shown in Appendix B.

Results and Discussions

Food related psychological characteristics of Thai and US consumers

Food Neophobia Scale (FNS)

It was found from t-test that there was a significant difference between Thai and US consumers in terms of willingness to try new or unfamiliar foods. US consumers' mean scores (50.8 ± 11.5) were higher than Thai consumers (45 ± 10.2) thus it can be inferred that US consumers are more willing to try new or unfamiliar foods than Thai consumers overall.

Food Involvement Scale (FIS)

Table 12 summarizes the result from the two subscales for FIS. It was found that US consumers were more involved with food than Thai consumers. When examining two subscales of FIS (Preparation and Eating subscale and Setting and Disposal subscale) US consumers had significantly higher scores in both subscales than Thai consumers (Table 12).

Table 12 Means of subscales and overall Food Involvement Scale

Subscale	Thai \pm S.D.	US \pm S.D.
Preparation and Eating subscale*	4.8 \pm 1.0	5.2 \pm 0.9
Setting and Disposal Subscale*	5.0 \pm 1.2	5.3 \pm 1.2
Total FIS*	4.9 \pm 0.9	5.2 \pm 0.9

Note. * Indicates the factor was found to be significantly different with P-Value at 0.05 using t-test (PROC TTEST).

Health and Taste Attitude Scale

There are six subscales: General Health Interest, Light Product Interest, Natural Product Interest, Craving for Sweet, Using Food as a Reward, Pleasure in Health and Taste Attitude Scale (HTAS). Comparing Thai and US consumers, it was found that Thai consumers scored higher in Light Product Interest, Natural Product Interest, and Using Food as a Reward subscales, whereas, US consumers scored higher in General Health Interest and Craving for Sweet subscales (Table 13). There is no significant difference in the HTAS subscale for either US or Thai consumers.

Table 13 Means of subscales of Health and Taste Attitude Scale

Subscale	Thai \pm S.D.	US \pm S.D.
General Health Interest*	4.6 \pm 1.1	4.9 \pm 1.2
Light Product Interest*	4.9 \pm 1.0	4.0 \pm 1.1
Natural Product Interest*	4.7 \pm 0.9	3.9 \pm 0.9
Craving for sweet*	4.5 \pm 1.2	5.3 \pm 1.3
Using food as a reward*	4.7 \pm 1.1	4.1 \pm 1.2
Pleasure	4.7 \pm 0.9	4.8 \pm 0.8

Note. * Indicates the factor was found to be significantly different with P-Value at 0.05 using t-test (PROC TTEST).

Predicting consumers' diet quality from responses to Food Neophobia Scale, Food Involvement Scale, and Health and Taste Attitude Scale

The FREQ procedure was used to initially select predictor variables for inclusion in the model selection (Step 3). Each country had the X^2 test of independence performed for diet quality level (HEI) and statements from FIS, FNP, and HTAS. The responses (7-point Likert scale) from FIS, FNS, and HTAS were collapsed into “agree” and “disagree” by putting “neither agree nor disagree” with the disagree group. The significant statements were put into the model selection step.

According to the model selection step, it was found that no statements from FNS were selected for both Thai and US consumers. One statement from FIS was selected for US consumers, and there were differences in selected statements from HTAS between Thai and US consumers. The prediction model for Thai consumers included statements from General Health Interest, Natural Product Interest, Craving for Sweet, and Pleasure subscales. The statement from Light Product Interest, Natural Product Interest, and Using Food as a Reward subscale were used to predicted US consumer diet quality. Intercepts and constants of each statement are shown in Table 14.

Table 14 Estimates of intercepts and regression coefficients for HEI categories as response variable. (n=203 for Thai; and n=202 for US)

Constant from Model Selection	Thai	US
Intercept 1 (Used for calculating probability for responses of Poor Diet quality group)	0.143	-5.205
Intercept 2 (Used for calculating probability for responses of Need Improvement diet quality group)	0.570	0.570
Food Involvement Scale (FIS)		
I do not like to mix or chop food.	---	1.078
Health and Taste Attitude Scale (HTAS)		
I always follow a healthy and balanced diet.	-0.887	---
In my opinion by eating light products one can eat more without getting too much calories.	---	-1.302
I try to eat foods that do not contain additives.	-0.834	---
I do not eat processed foods because I do not know what they contain.	---	1.568
I often have cravings for chocolate.	0.701	---
I avoid rewarding myself with food.	---	1.563
I finish my meal even when I do not like the food's taste.	-1.066	---

Note. The coefficients were significant at P-Value at 0.05. Models were fitted using FREQ procedure

For external validation, the remaining consumer data (approximately 100 consumers) were put into the models obtained from the model selection step (Step 4) to obtain predicted categories for HEI. There was only a 55% correct prediction from the model of Thai consumers when compared with the actual response from the HEI data. The US prediction model had a 77% match with the actual responses.

Since the number of consumers belonging to the Poor diet category was very low, it was removed from the analysis. US consumers were re-analyzed without the Poor diet group by the same process. The final result from model selection showed that all selected statements from Proc Freq were removed from the model. Therefore, there was no evidence that statements from FIS, FNS, and HTAS could help predict a consumer's diet group.

Table 15 External validation, classification table of HEI diet quality group (n=101 for Thai; and n=100 for US)

Country	Actual HEI diet quality group		Predicted HEI diet group		
			Poor	Need Improvement	Good
Thailand	Poor	N	14.0	12.0	---
		%	53.8	46.2	---
	Need Improvement	N	5.0	39.0	3.0
		%	10.6	83.0	6.4
	Good	N	2.0	23.0	3.0
		%	7.1	82.1	10.8
US	Poor	N	---	3.0	---
		%	---	100.0	---
	Need Improvement	N	---	76.0	1.0
		%	---	98.7	1.3
	Good	N	---	17.0	1.0
		%	---	94.4	5.6

Predicting consumers' Stages of Change from their responses to Food Neophobia Scale, Food Involvement Scale, and Health and Taste Attitude Scale

The same procedure for using HEI diet quality group were applied to Stages of Change data for both Thai and US consumers. The data were analyzed three times: 1) using the original five stages from the Stages of Change model including precontemplation, contemplation, preparation, action, and maintain as the responses of dependent variable; 2) five stages were collapsed into two groups (precontemplation-contemplation and preparation-action-maintain); and 3) had three groups (precontemplation-contemplation, preparation-action, and maintain). The 7-point Likert scale was collapsed into a 3-point scale with disagree, neutral, and agree as the scale's points.

US Consumers

Most statements in the selected model were from HTAS, especially from General Health Interest subscale. There were no statements from FNS selected in the model selection step. When using the original five stages from Stages of Change model to run the model selection, it was found that there was only 13.9% correct classification from the external validation process (Table 16). There was no correct classification for precontemplation, contemplation, and action category. The detail of classification obtained from external validation are shown in Table 17.

When collapsing the categories of Stages of Change from five categories to three categories (by placing precontemplation with contemplation and preparation with action) as shown in Table 18, the percentage of correct classification was increase to 53.1%. Furthermore, the percentage of correct classification (71.3%) increased again when the original five categories of Stages of Change were collapsed into two categories including Category 1 (precontemplation, contemplation, and preparation) and Category 2 (action and maintain).

Table 16 Estimates of intercepts and regression coefficients for original five Stages of Change as response variable.
(n=202 for US)

Constant from Model Selection	Precontemplation	Contemplation	Preparation	Action
Intercept	5.341	-0.708	2.056	-1.792
Health and Taste Attitude Scale (HTAS)				
I always follow a healthy and balanced diet.	-0.956	-1.122	-0.725	0.042
It is important to me that my diet is low in fat.	-1.452	0.017	0.343	0.861
It is important to me that my daily diet contains a lot of vitamins and minerals.	0.051	-0.021	-0.719	-1.264
I eat what I like and do not worry about healthiness of the food.	-0.803	-0.912	-0.609	0.287
In my opinion by eating light products one can eat more without getting too much calories.	-0.584	0.865	-0.312	0.238
When I am feeling down I want to treat myself with something really delicious.	-0.254	0.777	0.558	0.392

Note. The coefficients were significant at P-Value at 0.05. Models were fitted using FREQ procedure

Table 17 External validation classification table of each category from the original Stages of Change model—US consumers

Actual Stage of Change group		Predicted Stages of Change group				
		Precontemplation	Contemplation	Preparation	Action	Maintain
Precontemplation	N	---	---	5.0	---	---
	%	---	---	100.0	---	---
Contemplation	N	---	---	9.0	---	---
	%	---	---	100.0	---	---
Preparation	N	---	7.0	6.0	1.0	---
	%	---	50.0	42.9	7.1	---
Action	N	---	2.0	18.0	---	1.0
	%	---	9.5	85.7	---	4.8
Maintain	N	---	---	39.0	2.0	8.0
	%	---	---	79.6	4.1	16.3

Table 18 Estimates of intercepts and regression coefficients for three collapsed categories of Stages of Change as response variable. (n=202 for US)

	Precontemplation -Contemplation	Preparation- Action
Constant from Model Selection		
Intercept	2.315	1.234
Food Involvement scale (FIS)		
I care whether or not a table is nicely set.	0.101	0.568
Health and Taste Attitude Scale (HTAS)		
I always follow a healthy and balanced diet.	-1.062	-0.273
It is important to me that my daily diet contains a lot of vitamins and minerals.	-0.419	-0.709
I eat what I like and do not worry about healthiness of the food.	-0.840	-0.182
I reward myself by buying something really tasty.	0.520	0.531

Note. The coefficients were significant at P-Value at 0.05. Models were fitted using FREQ procedure

Table 19 External validation classification table of each category when Stages of Change were collapsed into three categories—US consumers

Actual Stage of Change group	Predicted Stages of Change group			
	Precontemplation- Contemplation	Preparation-Action	Maintain	
Precontemplation-Contemplation	N	6.0	---	8.0
	%	42.9	---	57.1
Preparation-Action	N	15.0	12.0	5.0
	%	46.9	37.5	15.6
Maintain	N	---	17.0	33.0
	%	---	34.0	66.0

Table 20 Estimates of intercepts and regression coefficients for two collapsed categories of Stages of Change as response variable. (n=202 for US)

	Precontemplation- Contemplation-Action
Constant from Model Selection	
Intercept	1.492
Health and Taste Attitude Scale (HTAS)	
I always follow a healthy and balanced diet.	-0.862
It is important to me that my diet is low in fat.	-0.736

Note. The coefficients were significant at P-Value at 0.05. Models were fitted using FREQ procedure

Table 21 External validation classification table of each category when Stages of Change were collapsed into two categories—US consumers

Actual Stage of Change group	Predicted Stages of Change group	
	Precontemplation- Contemplation-Preparation	Action- Maintain
Precontemplation- Contemplation-Preparation	N ---	29
	% ---	100
Action-Maintain	N ---	81
	% ---	100

Thai Consumers

According to the model selection step, statements from FIS and HTAS were included in the models and there was no statement from FNS selected.

The models obtained from using the original categories from the Stages of Change model could predict correctly about 67.6%. There was no correction found in the prediction of contemplation and action category. When five Stages of Change categories were collapsed into three categories it was found that the model provided approximately 57.4% correct classification. Furthermore, the correct prediction was increased to 88% when Stages of Change categories were collapsed into two categories.

**Table 22 Estimates of intercepts and regression coefficients for original five Stages of Change as response variable.
(n=203 for Thai)**

Constant from Model Selection	Precontemplation	Contemplation	Preparation	Action
Intercept	5.869	3.658	1.898	-0.736
Food Involvement scale (FIS)				
I don't think much about food each day.	-0.860	-0.866	0.335	-0.033
Health and Taste Attitude Scale (HTAS)				
I always follow a healthy and balanced diet.	-1.516	-1.265	-1.678	-0.025
It is important to me that my daily diet contain a lot of vitamins and minerals.	-1.263	-0.540	-0.301	-0.022

Note. The coefficients were significant at P-Value at 0.05. Models were fitted using FREQ procedure

Table 23 External validation classification table of each category from the original Stages of Change model—Thai consumers

Actual Stage of change group		Predicted Stages of Change group				
		Precontemplation	Contemplation	Preparation	Action	Maintain
Precontemplation	N	5.0	---	2.0	---	---
	%	71.4	---	28.6	---	---
Contemplation	N	4.0	---	1.0	---	---
	%	80.0	---	20.0	---	---
Preparation	N	2.0	---	4.0	---	3.0
	%	22.2	---	44.4	---	33.4
Action	N	2.0	---	3.0	---	16.0
	%	9.5	---	14.3	---	76.2
Maintain	N	---	---	---	---	60.0
	%	---	---	---	---	100.0

Table 24 Estimates of intercepts and regression coefficients for three collapsed categories of Stages of Change as response variable. (n=203 for Thai)

Constant from Model Selection	Precontemplation- Contemplation	Preparation- Action
Intercept	6.427	-0.289
Food Involvement scale (FIS)		
I don't think much about food each day.	-0.998	0.034
I do not wash dishes or clean the table.	-0.533	0.462
Health and Taste Attitude Scale (HTAS)		
I always follow a healthy and balanced diet.	-1.316	-0.612
It is important to me that my daily diet contain a lot of vitamins and minerals.	-1.137	-0.077
In my opinion, artificially flavored foods are not harmful to my health.	-0.038	-0.661
I reward myself by buying something really tasty.	0.471	0.749

Note. The coefficients were significant at P-Value at 0.05. Models were fitted using FREQ procedure

Table 25 External validation classification table of each category when Stages of Change were collapsed into three categories—Thai consumers

Actual Stage of change group		Predicted Stages of Change group		
		Precontemplation- Contemplation	Preparation-Action	Maintain
Precontemplation-Contemplation	N	11.0	---	1.0
	%	91.7	---	8.3
Preparation-Action	N	6.0	6.0	17.0
	%	20.7	20.7	58.6
Maintain	N	3.0	16.0	41.0
	%	5.0	26.7	68.3

Table 26 Estimates of intercepts and regression coefficients for two collapsed categories of Stages of Change as response variable. (n=203 for Thai)

Constant from Model Selection	Precontemplation- Contemplation-preparation
Intercept	8.021
Food Involvement scale (FIS)	
I don't think much about food each day.	-1.011
I do not wash dishes or clean the table.	-0.734
Health and Taste Attitude Scale (HTAS)	
I always follow a healthy and balanced diet.	-0.892
It is important to me that my diet is low in fat.	-1.101
I try to eat foods that do not contain additives.	-0.690

Note. The coefficients were significant at P-Value at 0.05. Models were fitted using FREQ procedure

Table 27 External validation classification table of each category when Stages of Change were collapsed into two categories—Thai consumers

Actual Stage of Change group	Predicted Stages of Change group	
	Precontemplation- Contemplation- Preparation	Action-Maintain
Precontemplation- Contemplation-Preparation	N	14.0
	%	66.7
Action-Maintain	N	5.0
	%	6.2

Conclusion

Thai and US consumers had the same overall diet quality. Both countries had the majority of consumers in the Need Improvement group when the Healthy Eating Index of their country was used to categorize their diets. However, when using the Stages of Change model to determine what consumers thought about their diet, it showed that most considered themselves as having a healthy diet (action or maintain stage) for both countries. When reviewing consumer responses on the FNS, FIS, and HTAS, differences in attitudes towards foods between Thai and US consumers were found. According to the scale's results, US consumers are more involved in food activities and more open to try new foods or unfamiliar foods than Thais. It was found that consumers who belonged in different groups (per the Stages of Change model) responded differently to some HTAS subscales (i.e., General Health Interest, Using Food as a Reward, and Natural Product Interest).

The idea of using statements from FNS, FIS, and HTAS to classify consumers who belong in different groups (based on both diet quality and the Stages of Change model for healthful eating) was explored. The predicted model for US consumers' diet quality included the statements from HTAS (Light Product Interest, Natural Product Interest, and Using Food as a Reward subscale), and one statement from FIS. The predicted model for diet quality of Thai consumers included only subscales from HTAS (General Health Interest, Natural Product Interest, Craving for Sweet, and Pleasure subscales). When using Stages of Change model together with FNS, FIS, and HTAS the same findings were discovered. Statements from HTAS, especially from General Health Interest, were in the predicted model for both Thai and US consumers. However, the results from external validation for both Thai and US consumers illustrated that using these statements was not an accurate method for predicting consumers' HEI or Stages of change.

Considering the methods examined in this research to determine their interaction with healthful eating for screening consumers, the Stages of Change model may do the best job of segmenting consumers. Using Stages of Change required a short time and little effort from the consumers because there were only three questions for consumers to answer. Moreover, to interpret the result it does not require calculation or analysis.

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Chapter 6 - Conclusion and Future Studies

This dissertation was focused on three available options (using dietary assessment to capture actual diets, using Stages of Change to group consumers based on what they thought about their diet, and using indirect questions in order to track consumer behavior) that may be used to group consumers for screening purposes. It was found that using Stages of Change may be the best approach for the validation study because it can be executed, obtain results in a very short time, and not require any analysis.

However, the Stages of Change model was never proposed to use for consumer screening. The future study should concentrate on confirming that Stages of Change actually is useful as a prediction for segmenting consumers into those who are more interested in new healthful products and those who are not.

- First the studies need to be conducted with actual products to examine data from the consumer subgroups of the Stages of Change model.
- For each product the future research should investigate if consumers who were classified in one group have different acceptance for new healthful products than consumers in other groups. The findings from this future research will connect if consumers, who belong in a different category according to Stages of Change model, have a different attitude towards the specific health product.
- Within the same product the future research should investigate if consumers in one group have different purchasing behavior for new healthful products than those in other groups. This research will tie consumer beliefs with behaviors. The findings from this research will show if grouping consumers based on the Stages of Change model can differentiate consumers who have different buying behaviors.

Consumer Survey Material in English and Thai Used in Chapters 3, 4, and 5

Questionnaire – English

Consumer # _____

Date _____

Part1: Please read the questions and make an X in the box that is closest to your own opinion and behavior.

1. Do you think you usually eat a healthy diet overall?

Yes, I do (please continue to question no. 3) No, I do not (please continue to question no. 2)

2. Do you plan to change your diet to be healthier?

Yes, I am considering changing my overall diet in the **next month** to be more healthful (please continue to the question in Part2)

Yes, I am considering changing my overall diet in the **next 6 month** to be more healthful (please continue to the questions in Part2)

No, I have no plans to change my overall diet to increase its healthfulness (please go to questions in Part2)

3. How long ago did you change and start eating a healthier diet overall?

I made serious changes in my overall diet to be more healthful in the past 6 month

I made changes to a more healthful diet and have eaten that way for 6 months or more

Part2: Please read the questions and make X in the box that most applies to your behavior.

	Not at all	Rarely	Occasionally	sometimes	usually	often	always
I try to reduce cholesterol in my diet							
I try to reduce fat in my diet							
I try to reduce sugar in my diet							
I try to reduce salt in my diet							
I try to reduce saturated fat in my diet							

Part 3: Please read the statement and make X in the box that most applies to your opinion and behavior.

	Not at all true	Hardly true	Moderately true	Exactly true
I can always manage to solve difficult problems if I try hard enough.				
If someone opposes me, I can find the means and ways to get what I want.				
It is easy for me to stick to my aims and accomplish my goals.				
I am confident that I could deal efficiently with unexpected events.				
Thanks to my resourcefulness, I know how to handle unforeseen situations.				
I can solve most problems if I invest the necessary effort.				
I can remain calm when facing difficulties because I can rely on my coping abilities.				
When I am confronted with a problem, I can usually find several solutions.				
If I am in trouble, I can usually think of a solution.				
I can usually handle whatever comes my way.				

Part4: For each of the food lists; please indicate how many servings per week you have eaten (usually) in the past month. (If you ate a food less than once a week, write “0” in the space provided)

Food Item	number of servings	note: serving size
Beef		3 oz.
Bologna		1 oz., 2 slices
Organ meats (liver, heart, kidney, etc.)		3 oz.
Meatball		2-3 oz.
Broiled chicken breast		2-3 oz.
Fried chicken		2-3 oz.
Broiled fish		2-3 oz.
Steak or prime rib		2-3 oz.
Ham or roast beef (in deli sandwich)		2-3 oz.
Tuna salad		2-3 oz.
Pork		3 oz.
Lamb		3 oz.
Veal		3 oz.
Fish or Shellfish (dried fish snack)		4 oz. OR 1/2 can (1oz.)
Bacon or Sausages		2 pieces
Whole egg or Egg yolk		1 egg/yolk
Milk, Skim milk		1 cup
Yogurt		1 cup/ 8 oz.
Natural cheddar cheese		1-1/2 oz.
Processed cheese		2 oz.
Mozzarella, part skim		1-1/2 oz
Ricotta, part skim		1/2 cup
Cottage cheese		1/2 cup
Ice cream		1/2 cup (1 scoop)
Fruit, fresh or dried		1 whole fruit or 1 cup cut-up fruit
Fruit juice		½ cup. or 4 oz.
Vegetable salads or raw vegetables		1 cup
Cooked vegetables (fresh, frozen, canned)		1/2 cup
Tomato sauce		1/2 cup
Avocado		1/4 whole
Baked potato, small		2.25 oz.
Potatoes, scalloped		1/2 cup
Potato salad		1/2 cup
French fries		10 pieces

Dried bean, split beans or lentils		3/4cup (cooked)
Cold or hot breakfast cereal		1 medium bowl, 12 oz.
Bread (steamed bun)		1 slice
Hamburger roll, bagel, english muffin		1 piece = 2 serving
Tortilla (7" diameter)		1 piece
Rice or pasta, cooked (noodle)		1/2 cup
Plain crackers, small		3 or 4 pieces
Pancake 4"diameter		1 piece
Croissant, 1 large		2 oz., 1 large = 2 servings
Doughnut, 1 medium		2 oz., 1 medium = 2 servings
Danish, 1 medium		2 oz., 1 medium = 2 servings
Cake, frosted		Average slice
Cookies		2 medium pieces
Pie, fruit, 2-crust		1/6 of 8" pie = 2 servings
Butter, margarine		1 tsp.
Sour cream		2 tbsp.
Sugar, jam, jelly		1 tsp.
Soft drink, Regular		12 oz.
Soft drink, Diet or Light		12 oz.
Sherbet		1/2 cup
Fruit sorbet		1/2 cup
Salad dressing		2 tbsp.
Mayonnaise		1 tbsp.
Nut butters (peanut butter)		2 tbsp.
Nuts		1/3 cup
Chips (rice cracker)		1 cup
Chocolate or candy bars		1 candy bar / 1 oz.
Alcoholic drinks		1 drink, 1 can beer, 1 glass wine
Sweeten beverages, not including diet drinks (soft drinks, fruit drinks)		1 large glass, 1 can

Part 5: Please read the question and make an X in the box that most applies to your opinion and behavior.

	Disagree strongly	Disagree moderately	Disagree slightly	Neither agree nor disagree	Agree slightly	Agree moderately	Agree strongly
I am constantly sampling new and different foods.							
I don't trust new foods.							
If I don't know what a food is, I won't try it.							
I like foods from different cultures.							
Ethnic food looks too weird to eat.							
At dinner parties I will try new foods.							
I am afraid to eat things I never have had before.							
I am very particular about the food I eat.							
I will eat almost everything.							
I like to try new ethnic restaurants.							
I don't think much about food each day.							
Cooking or barbequing is not much fun.							
Talking about what I ate or am going to eat is something I like to do.							
Compared with other daily decisions, my food choices are not very important.							
When I travel, one of the things I anticipate most is eating the food there.							
I do most or all of the clean up after eating.							
I enjoy cooking for others and myself.							
When I eat out, I don't think or talk much about how the food tastes.							
I do not like to mix or chop food.							
I do most or all my own food shopping.							
I do not wash dishes or clean the table.							
I care whether or not a table is nicely set.							

I am very particular about the healthiness of food.							
I always follow a healthy and balanced diet.							
It is important to me that my diet is low in fat.							
It is important to me that my daily diet contains a lot of vitamins and minerals.							
I eat what I like and do not worry about the healthiness of food.							
I do not avoid any foods even if they may raise my cholesterol.							
The healthiness of food has little impact on my food choices.							
The healthiness of snacks makes no difference to me.							
In my opinion, the use of light products does not improve one's problem.							
I do not think that light products are healthier than conventional products.							
I believe that eating light products keeps one's cholesterol level under control.							
In my opinion light products don't help to drop cholesterol levels.							
I believe that eating light products keeps one's body in good shape.							
In my opinion, by eating light products one can eat more without getting too many calories.							
I do not care about additives in my daily diet.							
In my opinion, organically grown foods are no better for my health than those grown conventionally.							
In my opinion, artificially flavored foods are not harmful to my health.							
I try to eat foods that do not contain additives.							
I would like to eat only organically grown vegetables.							
I do not eat processed foods because I do not know what they contain.							
In my opinion, it is strange that some people have cravings for chocolate.							
In my opinion, it is strange that some people have cravings for sweet.							
In my opinion, it is strange that some people have cravings for ice cream.							

I often have cravings for sweets.							
I often have cravings for chocolate.							
I often have cravings for ice cream.							
I reward myself by buying something really tasty.							
I indulge myself by buying something really delicious.							
When I am feeling down I want to treat myself with something really delicious.							
I avoid rewarding myself with food.							
In my opinion, comforting oneself by eating is self-deception.							
I try to avoid eating delicious foods when I am feeling down.							
I do not believe that food should always be a source of pleasure.							
The appearance of food makes no difference for me.							
It is important to me to eat delicious foods on weekdays, as well as the weekend.							
When I eat I concentrate on enjoying the taste of the food.							
I finish my meal even when I do not like the taste of the food.							
An essential part of my weekend is eating delicious food.							

Please make an X in the box for your response to each question.

1. Are you?

Female

Male

2. Which **age** group are you in?

Under 18

41-55

18-25

56 and older

26-40

3. Which of the categories below best describes your **ethnicity**?

White, Non-Hispanic

African American

Hispanic or Latino

American Indian

Asian or Pacific Islander

Multiple from previous categories

Other, please describe _____

4. Mark the **highest level of education** you have completed:

Some high school or less

High school graduate or GED

Completed some college, associate degree or technical school

College graduate (Bachelor's degree)

Post-graduate degree

5. Which of the following categories best describes your income?

Below \$25,000

Above \$80,000

\$25,000 – \$50,000

Do not know or do not wish to respond

\$50,001 - \$80,000

Questionnaire – Thai

ส่วนที่ 1 กรุณาอ่านคำถามและทำเครื่องหมาย X ในช่องว่างที่ใกล้เคียงกับความเห็นและพฤติกรรมของคุณมากที่สุด

1. คุณคิดว่าโดยรวมแล้ว คุณรับประทานอาหารที่มี(เพื่อสุขภาพ)ประโยชน์ต่อสุขภาพหรือไม่

ใช่ (กรุณาข้ามไปตอบคำถามที่สาม)

ไม่ใช่ (กรุณาตอบคำถามข้อสอง)

2. คุณวางแผนที่จะเปลี่ยนการรับประทานอาหารของคุณมารับประทานอาหารที่มีประโยชน์ต่อสุขภาพมากขึ้นหรือไม่

ใช่ คุณพิจารณาที่จะเปลี่ยนการรับประทานอาหารโดยรวมของคุณ มารับประทานอาหารที่มีประโยชน์ต่อสุขภาพมากขึ้นภายในหนึ่งเดือนข้างหน้า

ใช่ คุณพิจารณาที่จะเปลี่ยนมารับประทานอาหารโดยรวมของคุณ มารับประทานอาหารที่มีประโยชน์ต่อสุขภาพมากขึ้นภายในหกเดือนข้างหน้า

ไม่ คุณไม่มีแผนที่จะเปลี่ยนมาการรับประทานอาหารโดยรวมของคุณ ให้มีประโยชน์เพื่อสุขภาพมากขึ้น (กรุณาข้ามไปตอบคำถามในส่วนที่สอง)

3. คุณเปลี่ยนมารับประทานอาหารที่มีประโยชน์ต่อสุขภาพสุขภาพโดยรวมมานานเท่าใด

คุณเปลี่ยนการรับประทานอาหารโดยรวมของคุณ มารับประทานเพื่อสุขภาพมากขึ้นอย่างจริงจังมาภายในหกเดือนที่ผ่านมา

คุณเปลี่ยนการรับประทานอาหารโดยรวมของคุณ มารับประทานเพื่อสุขภาพมากขึ้นและรับประทานแบบนี้มานานหกเดือนหรือมากกว่าหกเดือน

ส่วนที่ 2 กรุณาอ่านคำถามและทำเครื่องหมาย X ในช่องว่างที่ใกล้เคียงกับความเห็นและพฤติกรรมของคุณมากที่สุด

	ไม่เคย พยายาม	แทบจะไม่เคย พยายาม	พยายามเป็นบาง โอกาส	พยายามเป็น บางครั้งคราว	พยายาม บ่อยครั้ง	พยายามเกือบ เป็นประจำ	พยายาม เป็นประจำ
1. คุณพยายามลดปริมาณคลอเรสเตอรอล ในอาหารที่คุณรับประทาน							
2. คุณพยายามลดปริมาณไขมันใน อาหาร ที่คุณรับประทาน							
3. คุณพยายามลดปริมาณน้ำตาลใน อาหารที่คุณรับประทาน							
4. คุณพยายามลดปริมาณเกลือในอาหาร ที่คุณรับประทาน							
5. คุณพยายามลดปริมาณไขมันอิ่มตัวใน อาหารที่คุณรับประทาน							

ส่วนที่ 3 กรุณาอ่านคำถามและทำเครื่องหมาย X ในช่องว่างที่ใกล้เคียงกับความเห็นและพฤติกรรมของคุณมากที่สุด

	ไม่เป็นจริงเลย	ค่อนข้างที่จะไม่จริง	เป็นจริงบางครั้ง	เป็นจริงเสมอ
1. คุณสามารถจัดการแก้ปัญหาต่างๆได้เสมอถ้าคุณพยายามมากพอ				
2. ถ้ามีใครมาคัดค้าน, ขัดแย้งกับคุณ คุณสามารถหาวิธีหรือหนทางที่จะทำให้ได้สิ่งที่คุณต้องการ				
3. การจู้จี้กับเป้าหมายและทำให้บรรลุเป้าหมายนั้นเป็นเรื่องง่ายสำหรับคุณ				
4. คุณมั่นใจว่าคุณสามารถรับมือกับเหตุการณ์ที่ไม่คาดคิดได้อย่างมีประสิทธิภาพ				
5. เพราะความฉลาดและความสามารถของคุณ คุณรู้วิธีที่จะจัดการกับสถานการณ์ที่ไม่คาดคิด				
6. คุณสามารถแก้ปัญหาได้เกือบทุกปัญหาถ้าคุณใช้ความพยายามที่เพียงพอ				
7. คุณสามารถควบคุมอารมณ์ของคุณเมื่อคุณเผชิญหน้ากับความยุ่งยาก เพราะคุณมีความสามารถในการจัดการกับสถานการณ์ต่างๆภายใต้ความกดดัน				
8. เมื่อคุณต้องเผชิญหน้ากับปัญหา คุณสามารถหาทางแก้ไขได้หลายวิธี				
9. เมื่อคุณมีปัญหา คุณสามารถคิดหาทางแก้ไขได้เป็นประจำ				
10. คุณสามารถรับมือกับทุกอย่างที่ผ่านเข้าไปในชีวิตของคุณ				

ส่วนที่ 4 กรณารอกจำนวนหนึ่งหน่วยบริโภคของอาหารแต่ละข้อที่คุณรับประทานเฉลี่ยในหนึ่งสัปดาห์ภายในหนึ่งเดือนที่ผ่านมา

(หากท่านรับประทานอาหารชนิดนั้นๆ น้อยกว่าหนึ่งครั้งต่อสัปดาห์ กรณารอก “0” สำหรับอาหารชนิดนั้น)

ประเภทของอาหาร	จำนวนหนึ่งหน่วยบริโภคที่ คุณรับประทานในเวลาหนึ่งสัปดาห์	ปริมาณอาหารต่อหนึ่งหน่วยบริโภค
เนื้อวัว		85 กรัม (ขนาดชิ้นประมาณสำหรับไฟ)
ไส้กรอกโบโลญญา		28 กรัม, ประมาณ 2 ชิ้น
เครื่องใน		85 กรัม
เนื้อบดก้อน		57-85 กรัม (ขนาดชิ้นประมาณสำหรับไฟ)
เนื้อหน้าอกไก่อบ		57-85 กรัม (ขนาดชิ้นประมาณสำหรับไฟ)
ไก่ทอด		57-85 กรัม (ขนาดชิ้นประมาณสำหรับไฟ)
ปลาอบ		57-85 กรัม (ขนาดชิ้นประมาณสำหรับไฟ)
เสต็ก		57-85 กรัม (ขนาดชิ้นประมาณสำหรับไฟ)
แฮม, เนื้อย่าง		57-85 กรัม (ขนาดชิ้นประมาณสำหรับไฟ)
ทูน่าสด, สลัดปลาทูน่า		57-85 กรัม
เนื้อหมู		85 กรัม (ขนาดประมาณสำหรับไฟ)
เนื้อแกะ		85 กรัม (ขนาดประมาณสำหรับไฟ)
เนื้อลูกวัว		85 กรัม (ขนาดประมาณสำหรับไฟ)
ปลา, หอย ปู กุ้ง		114 กรัม, อาหารทะเลกระป๋องประมาณครึ่งกระป๋อง

ประเภทของอาหาร	จำนวนหนึ่งหน่วยบริโภคที่ คุณรับประทานในเวลาหนึ่งสัปดาห์	ปริมาณอาหารต่อหนึ่งหน่วยบริโภค
เบคอน หรือ ไส้กรอก		2 ชิ้น
ไข่ หรือ ไข่แดง		1 ฟอง
นม, นมพร่องมันเนย		1 ถ้วยตวง (240 มิลลิลิตร), 1 กล่อง
เชดดาร์ชีสแบบธรรมชาติ		32 กรัม
ชีสที่ผ่านการแปรรูป		57 กรัม ประมาณ 1.5 ชิ้น (slice)
มอสซาเรลล่าชีส		ครึ่งถ้วยตวง
ริคคอตต้าชีส		ครึ่งถ้วยตวง
คอตเทจชีส		ครึ่งถ้วยตวง
ไอศกรีม		ครึ่งถ้วยตวง (1 สคู๊ป)
ผลไม้สด หรือ ผลไม้แห้ง		1 ผล หรือ 1 ถ้วยตวง
น้ำผลไม้		3/4 ถ้วยตวง (180 มิลลิลิตร), ประมาณ 1 กล่อง
สลัดผัก หรือ ผักสด		1 ถ้วยตวง
ผักสุก		ครึ่งถ้วยตวง
มะเขือเทศบดละเอียดสำหรับประกอบอาหาร ที่เป็นส่วนประกอบของอาหาร		ครึ่งถ้วยตวง
อะโวคาโด		1/4 ผล
มันฝรั่งอบ		64 กรัม (ขนาดเล็ก 1 หัว)
มันฝรั่งผาน		ครึ่งถ้วยตวง

ประเภทของอาหาร	จำนวนหนึ่งหน่วยบริโภคที่ คุณรับประทานในเวลาหนึ่งสัปดาห์	ปริมาณอาหารต่อหนึ่งหน่วยบริโภค
สลัดมันฝรั่ง		ครึ่งถ้วยตวง
มันฝรั่งทอด (เฟรนฟราย)		10 ช้อน
ถั่วแห้ง, ถั่วเขียว, ถั่วแขกชนิดเมล็ดแดงและเหลือง แบบสุก		3/4 ถ้วยตวง
อาหารประเภทธัญพืช (ซีเรียลแบบร้อนหรือเย็น)		3/4 ถ้วยตวง, 30 กรัม
ขนมปัง		1 ช้อน
ขนมปังสำหรับแอมเบเกอร์ เบเกิล อิงลิชมัฟฟิน		1 ช้อน
แป้งทอเทียล (เส้นผ่านศูนย์กลางประมาณเจ็ดนิ้ว)		1 ช้อน
ข้าวสุก หรือ พาสต้าสุก		1/2 ถ้วยตวง
แคล็กเกอร์แบบจืด (ขนาดเล็ก)		3-4 ช้อน
แพนเค้ก (เส้นผ่านศูนย์กลางประมาณ สี่นิ้ว)		1 ช้อน
ควีนของ		1 ช้อน ขนาดใหญ่, 57 กรัม
โดนัท		1 ช้อน ขนาดกลาง, 57 กรัม
เดนิส		1 ช้อน ขนาดกลาง, 57 กรัม
เค้กแบบที่มีครีมเคลือบ		1 ช้อน (ขนาดปกติตามร้านค้า)
คุกกี้		2 ช้อน ขนาดกลาง
พายผลไม้แบบที่มีแป้งพายประกอบทั้งด้านล่างและด้านบน		1 ช้อนจาก 6 ช้อนที่ตัดจากพายที่มีเส้นผ่านศูนย์กลาง 8 นิ้ว
เนยสด หรือ เนยเทียม		1 ช้อนชา
ชาวดครีม		2 ช้อนโต๊ะ

ประเภทของอาหาร	จำนวนหนึ่งหน่วยบริโภคที่ คุณรับประทานในเวลา หนึ่งสัปดาห์	ปริมาณอาหารต่อหนึ่งหน่วยบริโภค
น้ำตาล, แยม แยมผลไม้		1 ช้อนชา
น้ำอัดลม		1 กระป๋อง, 350 มิลลิลิตร
น้ำอัดลมแบบไดเอ็ต หรือ น้ำอัดลมแบบลด		1 กระป๋อง, 350 มิลลิลิตร
ไอศกรีมเชอร์เบท (ไอศกรีมผลไม้ที่มีส่วนผสมของนม)		1/2 ถ้วยตวง
ไอศกรีมผลไม้แบบที่ไม่มีนมผสม		1/2 ถ้วยตวง
น้ำสลัด		2 ช้อนโต๊ะ
มายองเนส		1 ช้อนโต๊ะ
เนยถั่ว		2 ช้อนโต๊ะ
ถั่ว		1/3 ถ้วยตวง
ขนมขบเคี้ยวแบบกรอบ		1 ถ้วยตวง
ชีสค็อกแลต หรือ ขนมหวานแบบแท่ง		1 แท่ง (28 กรัม)
เครื่องดื่มแอลกอฮอล์ เครื่องดื่มมีนเมา		1 แก้ว ค็อกเทล หรือ ไวน์, เบียร์ 1 กระป๋อง,

ส่วนที่ 5 กรุณาอ่านข้อความในแต่ละข้อ แล้วทำเครื่องหมาย X ในช่องที่ใกล้เคียงกับความคิดเห็นและพฤติกรรมของคุณ

		ไม่เห็นด้วย อย่างยิ่ง	ไม่เห็นด้วยปาน กลาง	ค่อนข้าง ไม่ เห็นด้วย	บอกไม่ได้ ว่าเห็นด้วย หรือไม่เห็นด้วย	ค่อนข้าง เห็นด้วย	เห็นด้วย ปาน กลาง	เห็นด้วย อย่างยิ่ง
1	คุณลองอาหารที่ใหม่และแตกต่างเป็นประจำ							
2	คุณไม่ไว้ใจผลิตภัณฑ์อาหารใหม่							
3	หากคุณไม่รู้จักอาหารประเภทใด คุณจะลองรับประทานอาหารประเภทนั้น							
4	คุณชอบอาหารที่มาจากหลายๆ วัฒนธรรมที่แตกต่าง							
5	อาหารต่างชาติดูแปลกเกินกว่าที่จะรับประทาน							
6	คุณจะลองรับประทานอาหารใหม่ในงานเลี้ยงสังสรรค์							
7	คุณกลัวที่จะลองรับประทานอาหารที่คุณไม่เคยรับประทานมาก่อน							
8	คุณเฉพาะเจาะจงกับอาหารแต่ละชนิดที่คุณรับประทานที่คุณรับประทานอย่างมาก							
9	คุณรับประทานอาหารเกือบทุกประเภท							
10	คุณชอบที่จะลองร้านอาหารต่างชาติ							
11	คุณไม่ได้คิดเกี่ยวกับอาหารมากนักในแต่ละวัน							
12	ทำอาหารไม่ได้เป็นเรื่องสนุก							
13	คุณชอบที่จะพูดถึงอาหารที่คุณรับประทาน หรือ อาหารที่คุณกำลังจะรับประทาน							
14	อาหารที่คุณตัดสินใจเลือกรับประทานไม่สำคัญเมื่อเปรียบเทียบ เรื่องอื่นที่คุณต้องตัดสินใจในแต่ละวัน							

		ไม่เห็นด้วย อย่างยิ่ง	ไม่เห็นด้วยปาน กลาง	ค่อนข้าง ไม่ เห็นด้วย	บอกไม่ได้ว่า เห็นด้วย หรือ ไม่เห็นด้วย	ค่อนข้าง เห็นด้วย	เห็นด้วย ปาน กลาง	เห็นด้วย อย่างยิ่ง
15	เมื่อคุณเดินทางมารับประทานอาหาร ณ ที่นั้น เป็นเรื่องหนึ่ง ที่คุณจดจ่อหรือคอยมากที่สุด							
16	คุณมักจะเป็นคนรับผิดชอบทำความสะอาดทั้งหมดหรือเกือบ ทั้งหมดหลังจากรับประทานอาหารเสร็จ							
17	คุณสนุกกับการทำอาหารสำหรับคุณเองและคนอื่นๆ							
18	เมื่อคุณรับประทานอาหารนอกบ้าน คุณไม่คิดหรือพูดถึงรสชาติของอาหาร							
19	คุณไม่ชอบที่จะผสมหรือสับอาหาร							
20	คุณเป็นคนเป็นคนรับผิดชอบซื้ออาหารสำหรับตัวคุณเองทั้งหมด หรือเกือบทั้งหมด							
21	คุณไม่ล้างจาน หรือ ทำความสะอาดโต๊ะอาหาร							
22	คุณให้ความสำคัญกับโต๊ะอาหารว่า โต๊ะอาหารนั้นถูกจัดอย่างดีหรือไม่							
23	คุณเฉพาะเจาะจงเกี่ยวกับอาหารเพื่อสุขภาพอย่างมาก							
24	คุณปฏิบัติตามการรับประทานอาหารที่สมดุลและเพื่อสุขภาพอย่างสม่ำเสมอ							
25	การรับประทานอาหารที่มีไขมันต่ำเป็นเรื่องที่สำคัญมาก สำหรับคุณ							
26	การรับประทานอาหารที่มีวิตามินและเกลือแร่สูงในแต่ละวันเป็นเรื่องที่สำคัญสำหรับคุณ							
27	คุณรับประทานอาหารที่คุณชอบและไม่กังวลเกี่ยวกับอาหารว่าอาหารนั้นดีต่อสุขภาพหรือไม่							

		ไม่เห็นด้วย อย่างยิ่ง	ไม่เห็นด้วยปาน กลาง	ค่อนข้าง ไม่ เห็นด้วย	บอกไม่ได้ว่าเห็นด้วย หรือ ไม่เห็นด้วย	ค่อนข้างเห็น ด้วย	เห็นด้วยปาน กลาง	เห็นด้วย อย่างยิ่ง
28	คุณไม่หลีกเลี่ยงอาหารประเภทใดเลย ถึงแม้ว่าอาหารประเภทนั้นจะทำให้คอเลสเตอรอลของคุณสูงขึ้น							
29	อาหารเพื่อสุขภาพมีผลน้อยมากเกี่ยวกับการตัดสินใจเกี่ยวกับ อาหารของคุณ							
30	คุณเห็นว่าอาหารว่างเพื่อสุขภาพแตกต่างจากอาหารว่างทั่วไป							
31	ในความเห็นของคุณ รับประทานผลิตภัณฑ์อาหารประเภทพลังงานต่ำหรือไขมันต่ำไม่ช่วยให้ปัญหาสุขภาพดีขึ้น							
32	คุณไม่คิดว่าผลิตภัณฑ์ประเภทพลังงานต่ำหรือไขมันต่ำดีต่อสุขภาพมากกว่าผลิตภัณฑ์อาหารทั่วไป							
33	คุณเชื่อว่าการรับประทานประเภทพลังงานต่ำหรือไขมันต่ำช่วยควบคุมระดับคอเลสเตอรอล							
34	ในความเห็นของคุณ ผลิตภัณฑ์ประเภทพลังงานต่ำหรือไขมันต่ำไม่ช่วยลดระดับคอเลสเตอรอล							
35	คุณเชื่อว่าจะรับประทานอาหารประเภทพลังงานต่ำหรือไขมันต่ำช่วยให้ร่างกายอยู่ในสภาพที่ดี							
36	ในความเห็นของคุณ หากรับประทานอาหารประเภทพลังงานต่ำหรือไขมันต่ำ คุณสามารถรับประทานอาหารนั้นได้มากขึ้นโดยไม่ทำให้ร่างกายรับพลังงานมากเกินไป							
37	คุณไม่ให้ความสำคัญเกี่ยวกับสารปรุงแต่งที่เติมในอาหารที่คุณรับประทาน							

		ไม่เห็นด้วย อย่างยิ่ง	ไม่เห็นด้วยปาน กลาง	ค่อนข้าง ไม่ เห็นด้วย	บอกไม่ได้ว่าเห็นด้วย หรือ ไม่เห็นด้วย	ค่อนข้างเห็น ด้วย	เห็นด้วยปาน กลาง	เห็นด้วย อย่างยิ่ง
38	ในความเห็นของคุณอาหารที่ปลูกแบบอินทรีย์ไม่ได้ดีกว่าอาหารที่ผ่านการปลูกแบบปกติ							
39	ในความเห็นของคุณอาหารที่มีส่วนผสมของสารแต่งกลิ่นรสสังเคราะห์ไม่มีอันตรายต่อสุขภาพ							
40	คุณพยายามรับประทานอาหารที่ไม่มีสารปรุงแต่ง							
41	คุณต้องการที่จะรับประทานผักที่ปลูกแบบอินทรีย์เท่านั้น							
42	คุณไม่รับประทานอาหารที่ผ่านแปรรูป เพราะคุณไม่ทราบว่าอะไรในอาหารนั้น							
43	ในความเห็นของคุณ เป็นเรื่องแปลกที่บางคนมีความอยากที่จะรับประทานช็อคโกแลต							
44	ในความเห็นของคุณ เป็นเรื่องแปลกที่บางคนมีความอยากที่จะรับประทานของหวาน							
45	ในความเห็นของคุณ เป็นเรื่องแปลกที่บางคนมีความอยากที่จะรับประทานไอศกรีม							
46	คุณมีความอยากที่จะรับประทานขนมหวานอยู่บ่อยๆ							
47	คุณมีความอยากที่จะรับประทานช็อคโกแลตอยู่บ่อยๆ							
48	คุณมีความอยากที่จะรับประทานไอศกรีมอยู่บ่อยๆ							
49	คุณให้รางวัลกับตัวเองโดยการซื้ออาหารที่มีรสชาติดีมาก ๆ							
50	คุณมักตามใจตัวเองโดยการซื้ออาหารอร่อยๆ							
51	เมื่อคุณรู้สึกแย่ คุณต้องการที่จะช่วยให้ตัวคุณรู้สึกดีขึ้นโดยการรับประทานอาหารอร่อยๆ							
52	คุณพยายามหลีกเลี่ยงที่จะให้รางวัลตัวเองด้วยอาหาร							

		ไม่เห็นด้วย อย่างยิ่ง	ไม่เห็นด้วยปาน กลาง	ค่อนข้าง ไม่ เห็นด้วย	บอกไม่ได้ว่าเห็นด้วย หรือ ไม่เห็นด้วย	ค่อนข้างเห็น ด้วย	เห็นด้วยปาน กลาง	เห็นด้วย อย่างยิ่ง
53	ในความเห็นของคุณ การรับประทานอาหารเช้าให้ รู้สึกดีขึ้นเมื่อรู้สึกหงุดหงิดเป็นการหลอกตัวเอง							
54	คุณพยายามหลีกเลี่ยงอาหารที่อร่อยเมื่อคุณรู้สึกแย่							
55	คุณไม่เชื่อว่าอาหารความเป็นสิ่งที่ให้ความสุขเสมอไป							
56	ลักษณะปรากฏของอาหารไม่มีผลกับคุณ							
57	การรับประทานอาหารเช้าระหว่างวันทำงานเช่นเดียวกับ อาหารที่คุณรับประทานวันเสาร์ อาทิตย์เป็นเรื่องสำคัญสำหรับคุณ							
58	คุณใส่ใจกับความเพลิดเพลินกับรสชาติที่คุณได้รับเมื่อคุณ รับประทานอาหารนั้นๆ							
59	คุณรับประทานอาหารเช้าทั้งจนถึงแม้ว่าคุณไม่ชอบรสชาติของ อาหารนั้น							
60	ส่วนสำคัญของวันหยุดของคุณคือรับประทานอาหารเช้าอร่อยๆ							

แบบสอบถาม

ข้อมูลผู้ทดสอบ

เพศ

ชาย

หญิง

อายุ

ต่ำกว่า 18 ปี

18 – 25 ปี

26 – 40 ปี

41 – 55 ปี

56 ปี หรือมากกว่า

3

ท่านจบการศึกษาระดับใด

มัธยมศึกษาตอนปลาย

ปวช .,ปวส .,หรือ อนุปริญญา

ปริญญาตรี

สูงกว่าปริญญาตรี

5

รายได้ของครอบครัวต่อเดือน

10,000 บาท หรือ น้อยกว่า

10,001 – 25, 000 บาท

25,001 – 40,000 บาท

40,001 – 55, 000 บาท

มากกว่า 55,000 บาท

การสำรวจผู้บริโภคเกี่ยวกับทัศนคติและพฤติกรรมในการรับประทานอาหาร

คำชี้แจง แบบสอบถามชุดนี้เป็นส่วนหนึ่งของงานวิจัยร่วมระหว่าง ภาควิชาผลิตภัณฑ์ คณะอุตสาหกรรมเกษตร มหาวิทยาลัยเกษตรศาสตร์ และ SENSORY

ANALYSIS CENTER ของ KANSAS STATE UNIVERSITY ดังนั้นจึงขอความร่วมมือกับท่านได้โปรดให้ข้อมูลที่แท้จริง การวิเคราะห์ข้อมูลจะ

กระทำ โดยรวมโดยไม่อ้างอิงตัวบุคคล ดังนั้นข้อมูลของท่านจะถูกเก็บเป็นความลับ

ขอขอบพระคุณทุกท่านที่ได้ให้ความร่วมมือในการตอบแบบสอบถามครั้งนี้

ขอขอบพระคุณในความร่วมมือ

ผู้ทำวิจัย

External Validation: the Predicted Model for Consumer's Diet Quality Level (Healthy Eating Index)

The model expression for the cumulative probabilities:

$P(Y \leq j) = \exp(\alpha_j + \beta x) / [1 + \exp(\alpha_j + \beta x)]$; where x was 0 and 1 for disagree and agree.

US consumers

#	Actual group from Food Recall data	Statements from FIS, FNS, and HTAS				Calculated probability to be classified			HEI group from predicted model	Validation
		FIS9	LP6	NP6	RE4C	Poor	Need Improvement	Good		
272	1	disagree	agree	disagree	agree	0.007	0.683	0.310	2	incorrect
299	1	disagree	agree	disagree	agree	0.007	0.683	0.310	2	incorrect
300	1	agree	disagree	disagree	disagree	0.016	0.823	0.161	2	incorrect
12	2	agree	disagree	disagree	agree	0.070	0.891	0.040	2	correct
13	2	agree	agree	disagree	disagree	0.004	0.581	0.415	2	correct
15	2	agree	agree	disagree	agree	0.020	0.847	0.133	2	correct
16	2	agree	disagree	agree	disagree	0.072	0.890	0.039	2	correct
18	2	disagree	disagree	disagree	disagree	0.005	0.633	0.361	2	correct
26	2	agree	disagree	agree	disagree	0.072	0.890	0.039	2	correct
29	2	agree	disagree	disagree	disagree	0.016	0.823	0.161	2	correct
30	2	agree	disagree	disagree	disagree	0.016	0.823	0.161	2	correct
31	2	agree	disagree	agree	disagree	0.072	0.890	0.039	2	correct
32	2	agree	agree	disagree	agree	0.020	0.847	0.133	2	correct
39	2	agree	agree	disagree	agree	0.020	0.847	0.133	2	correct
40	2	agree	disagree	agree	agree	0.264	0.728	0.009	2	correct
41	2	disagree	disagree	disagree	disagree	0.005	0.633	0.361	2	correct
42	2	agree	disagree	disagree	agree	0.070	0.891	0.040	2	correct
43	2	disagree	disagree	disagree	disagree	0.005	0.633	0.361	2	correct
53	2	disagree	disagree	disagree	agree	0.025	0.866	0.109	2	correct
55	2	agree	disagree	agree	agree	0.264	0.728	0.009	2	correct
59	2	disagree	disagree	agree	agree	0.109	0.867	0.025	2	correct
62	2	agree	agree	disagree	disagree	0.004	0.581	0.415	2	correct
70	2	agree	disagree	disagree	agree	0.070	0.891	0.040	2	correct
71	2	agree	disagree	disagree	agree	0.070	0.891	0.040	2	correct
72	2	agree	agree	disagree	disagree	0.004	0.581	0.415	2	correct
73	2	agree	agree	disagree	disagree	0.004	0.581	0.415	2	correct
75	2	agree	disagree	agree	agree	0.264	0.728	0.009	2	correct
81	2	agree	agree	disagree	agree	0.020	0.847	0.133	2	correct
82	2	agree	agree	disagree	agree	0.020	0.847	0.133	2	correct
83	2	agree	disagree	disagree	disagree	0.016	0.823	0.161	2	correct
85	2	agree	agree	disagree	disagree	0.004	0.581	0.415	2	correct
86	2	disagree	agree	disagree	agree	0.007	0.683	0.310	2	correct

95	2	agree	agree	disagree	disagree	0.004	0.581	0.415	2	correct
99	2	agree	disagree	disagree	disagree	0.016	0.823	0.161	2	correct
101	2	disagree	disagree	disagree	agree	0.025	0.866	0.109	2	correct
102	2	agree	disagree	disagree	disagree	0.016	0.823	0.161	2	correct
103	2	agree	disagree	disagree	disagree	0.016	0.823	0.161	2	correct
110	2	agree	agree	disagree	disagree	0.004	0.581	0.415	2	correct
111	2	disagree	agree	disagree	disagree	0.001	0.323	0.675	3	incorrect
112	2	agree	agree	disagree	disagree	0.004	0.581	0.415	2	correct
115	2	disagree	agree	disagree	agree	0.007	0.683	0.310	2	correct
117	2	agree	disagree	disagree	agree	0.070	0.891	0.040	2	correct
125	2	disagree	agree	agree	disagree	0.007	0.690	0.303	2	correct
126	2	disagree	disagree	disagree	disagree	0.005	0.633	0.361	2	correct
127	2	agree	agree	disagree	agree	0.020	0.847	0.133	2	correct
128	2	agree	disagree	agree	agree	0.264	0.728	0.009	2	correct
129	2	disagree	disagree	disagree	disagree	0.005	0.633	0.361	2	correct
137	2	disagree	agree	disagree	disagree	0.001	0.323	0.675	2	correct
138	2	agree	disagree	disagree	disagree	0.016	0.823	0.161	2	correct
139	2	agree	agree	disagree	agree	0.020	0.847	0.133	2	correct
140	2	agree	disagree	disagree	disagree	0.016	0.823	0.161	2	correct
141	2	agree	disagree	disagree	agree	0.070	0.891	0.040	2	correct
148	2	agree	disagree	disagree	disagree	0.016	0.823	0.161	2	correct
149	2	agree	disagree	disagree	agree	0.070	0.891	0.040	2	correct
150	2	agree	agree	disagree	disagree	0.004	0.581	0.415	2	correct
151	2	agree	disagree	disagree	agree	0.070	0.891	0.040	2	correct
152	2	agree	disagree	disagree	disagree	0.016	0.823	0.161	2	correct
161	2	agree	agree	disagree	disagree	0.004	0.581	0.415	2	correct
162	2	agree	agree	disagree	disagree	0.004	0.581	0.415	2	correct
164	2	disagree	disagree	disagree	agree	0.025	0.866	0.109	2	correct
165	2	disagree	disagree	disagree	agree	0.025	0.866	0.109	2	correct
167	2	disagree	agree	disagree	agree	0.007	0.683	0.310	2	correct
175	2	agree	disagree	agree	disagree	0.072	0.890	0.039	2	correct
178	2	agree	disagree	agree	disagree	0.072	0.890	0.039	2	correct
179	2	agree	disagree	disagree	disagree	0.016	0.823	0.161	2	correct
180	2	agree	disagree	disagree	disagree	0.016	0.823	0.161	2	correct
181	2	disagree	disagree	disagree	agree	0.025	0.866	0.109	2	correct
189	2	agree	disagree	agree	agree	0.264	0.728	0.009	2	correct
190	2	agree	agree	agree	disagree	0.021	0.851	0.129	2	correct
192	2	agree	disagree	disagree	disagree	0.016	0.823	0.161	2	correct
193	2	agree	disagree	disagree	disagree	0.016	0.823	0.161	2	correct
194	2	agree	disagree	disagree	disagree	0.016	0.823	0.161	2	correct
201	2	agree	disagree	disagree	disagree	0.016	0.823	0.161	2	correct
202	2	agree	disagree	agree	disagree	0.072	0.890	0.039	2	correct
202	2	disagree	agree	disagree	agree	0.007	0.683	0.310	2	correct
203	2	disagree	disagree	disagree	disagree	0.005	0.633	0.361	2	correct
205	2	agree	disagree	disagree	agree	0.070	0.891	0.040	2	correct
206	2	disagree	agree	disagree	agree	0.007	0.683	0.310	2	correct
207	2	disagree	agree	disagree	agree	0.007	0.683	0.310	2	correct
208	2	disagree	disagree	disagree	disagree	0.005	0.633	0.361	2	correct
9	3	disagree	agree	disagree	agree	0.007	0.683	0.310	2	incorrect
10	3	agree	disagree	disagree	disagree	0.016	0.823	0.161	2	incorrect
17	3	agree	disagree	agree	agree	0.264	0.728	0.009	2	incorrect

28	3	agree	disagree	disagree	agree	0.070	0.891	0.040	2	incorrect
51	3	agree	agree	agree	agree	0.089	0.880	0.031	2	incorrect
64	3	disagree	agree	disagree	disagree	0.001	0.323	0.675	3	correct
64	3	agree	agree	disagree	agree	0.020	0.847	0.133	2	incorrect
67	3	agree	disagree	agree	disagree	0.072	0.890	0.039	2	incorrect
84	3	agree	disagree	disagree	disagree	0.016	0.823	0.161	2	incorrect
94	3	disagree	disagree	disagree	agree	0.025	0.866	0.109	2	incorrect
113	3	agree	disagree	disagree	disagree	0.016	0.823	0.161	2	incorrect
146	3	agree	disagree	agree	disagree	0.072	0.890	0.039	2	incorrect
154	3	agree	disagree	disagree	disagree	0.016	0.823	0.161	2	incorrect
155	3	disagree	disagree	disagree	disagree	0.005	0.633	0.361	2	incorrect
170	3	agree	disagree	disagree	disagree	0.016	0.823	0.161	2	incorrect
171	3	agree	disagree	disagree	disagree	0.016	0.823	0.161	2	incorrect
176	3	agree	disagree	disagree	agree	0.070	0.891	0.040	2	incorrect
177	3	disagree	agree	disagree	agree	0.007	0.683	0.310	2	incorrect

Note:

FIS9 statement: I do not like to mix or chop food.

LP6 statement: In my opinion by eating light products one can eat more without getting too many calories.

NP6 statement: I do not eat processed foods because I do not know what they contain.

REC4 statement: I avoid rewarding myself with food.

Thai consumers

#	Actual group from Food Recall data	Statements from FIS, FNS, and HTAS				Calculated probability to be classified			HEI group from predicted model	Validation
		GH2	NP4	CS5	PL5C	Poor	Need Improvement	Good		
34	1	disagree	disagree	disagree	disagree	0.536	0.385	0.079	1	correct
39	1	disagree	disagree	agree	disagree	0.699	0.260	0.041	1	correct
41	1	agree	agree	agree	disagree	0.294	0.514	0.192	2	incorrect
43	1	agree	disagree	disagree	disagree	0.322	0.505	0.173	2	incorrect
61	1	disagree	disagree	disagree	disagree	0.536	0.385	0.079	1	correct
63	1	agree	agree	agree	disagree	0.294	0.514	0.192	2	incorrect
69	1	disagree	agree	agree	disagree	0.503	0.408	0.089	1	correct
78	1	agree	disagree	disagree	disagree	0.322	0.505	0.173	2	incorrect
93	1	disagree	disagree	disagree	disagree	0.536	0.385	0.079	1	correct
100	1	disagree	agree	disagree	disagree	0.334	0.501	0.165	2	incorrect
108	1	agree	agree	disagree	disagree	0.171	0.505	0.324	2	incorrect
119	1	disagree	disagree	agree	disagree	0.699	0.260	0.041	1	correct
130	1	disagree	disagree	agree	disagree	0.699	0.260	0.041	1	correct
131	1	disagree	agree	agree	disagree	0.503	0.408	0.089	1	correct
133	1	disagree	disagree	disagree	disagree	0.536	0.385	0.079	1	correct
135	1	disagree	disagree	disagree	disagree	0.536	0.385	0.079	1	correct
162	1	agree	disagree	disagree	disagree	0.322	0.505	0.173	2	incorrect
163	1	agree	agree	agree	agree	0.125	0.466	0.409	2	incorrect
164	1	disagree	agree	disagree	agree	0.147	0.488	0.365	2	incorrect
165	1	disagree	agree	disagree	disagree	0.334	0.501	0.165	2	incorrect
201	1	disagree	disagree	agree	disagree	0.699	0.260	0.041	1	correct
204	1	disagree	disagree	agree	disagree	0.699	0.260	0.041	1	correct
209	1	agree	agree	agree	agree	0.125	0.466	0.409	2	incorrect
210	1	agree	disagree	agree	disagree	0.489	0.417	0.094	1	correct
219	1	agree	agree	agree	disagree	0.294	0.514	0.192	2	incorrect
220	1	disagree	agree	agree	disagree	0.503	0.408	0.089	1	correct
3	2	agree	disagree	disagree	agree	0.141	0.482	0.377	2	correct
5	2	disagree	agree	agree	disagree	0.503	0.408	0.089	2	correct
6	2	disagree	disagree	agree	disagree	0.699	0.260	0.041	2	correct
8	2	agree	agree	disagree	agree	0.066	0.351	0.582	3	incorrect
9	2	disagree	agree	disagree	agree	0.147	0.488	0.365	2	correct
20	2	agree	agree	disagree	disagree	0.171	0.505	0.324	2	correct
23	2	agree	agree	disagree	disagree	0.171	0.505	0.324	2	correct
24	2	agree	agree	disagree	disagree	0.171	0.505	0.324	2	correct
26	2	agree	agree	agree	disagree	0.294	0.514	0.192	2	correct
27	2	agree	agree	disagree	disagree	0.171	0.505	0.324	2	correct
36	2	agree	agree	disagree	disagree	0.171	0.505	0.324	2	correct
37	2	disagree	agree	disagree	disagree	0.334	0.501	0.165	2	correct
38	2	agree	agree	disagree	disagree	0.171	0.505	0.324	2	correct
45	2	agree	agree	disagree	disagree	0.171	0.505	0.324	2	correct
46	2	agree	agree	disagree	disagree	0.171	0.505	0.324	2	correct
57	2	disagree	agree	agree	disagree	0.503	0.408	0.089	1	incorrect
60	2	disagree	agree	disagree	disagree	0.334	0.501	0.165	2	correct
62	2	agree	agree	disagree	agree	0.066	0.351	0.582	3	incorrect

65	2	disagree	disagree	agree	disagree	0.699	0.260	0.041	1	incorrect
66	2	agree	agree	disagree	disagree	0.171	0.505	0.324	2	correct
77	2	agree	agree	agree	disagree	0.294	0.514	0.192	2	correct
81	2	disagree	agree	agree	disagree	0.503	0.408	0.089	1	incorrect
84	2	agree	agree	agree	disagree	0.294	0.514	0.192	2	correct
89	2	agree	agree	agree	agree	0.125	0.466	0.409	2	correct
92	2	agree	agree	agree	disagree	0.294	0.514	0.192	2	correct
104	2	agree	agree	disagree	disagree	0.171	0.505	0.324	2	correct
106	2	agree	agree	disagree	agree	0.066	0.351	0.582	3	incorrect
107	2	agree	disagree	agree	agree	0.248	0.521	0.231	2	correct
109	2	agree	agree	disagree	disagree	0.171	0.505	0.324	2	correct
110	2	agree	agree	disagree	disagree	0.171	0.505	0.324	2	correct
129	2	agree	agree	disagree	disagree	0.171	0.505	0.324	2	correct
132	2	agree	disagree	disagree	disagree	0.322	0.505	0.173	2	correct
134	2	agree	agree	disagree	disagree	0.171	0.505	0.324	2	correct
137	2	agree	agree	disagree	disagree	0.171	0.505	0.324	2	correct
145	2	agree	agree	disagree	disagree	0.171	0.505	0.324	2	correct
169	2	disagree	agree	disagree	disagree	0.334	0.501	0.165	2	correct
170	2	agree	agree	disagree	disagree	0.171	0.505	0.324	2	correct
172	2	agree	disagree	disagree	disagree	0.322	0.505	0.173	2	correct
175	2	agree	disagree	agree	agree	0.248	0.521	0.231	2	correct
179	2	disagree	agree	disagree	disagree	0.334	0.501	0.165	2	correct
218	2	disagree	agree	agree	disagree	0.503	0.408	0.089	1	incorrect
222	2	disagree	agree	agree	disagree	0.503	0.408	0.089	1	incorrect
225	2	disagree	agree	disagree	disagree	0.334	0.501	0.165	2	correct
229	2	agree	agree	disagree	disagree	0.171	0.505	0.324	2	correct
235	2	agree	agree	disagree	disagree	0.171	0.505	0.324	2	correct
237	2	agree	agree	agree	agree	0.125	0.466	0.409	2	correct
238	2	agree	agree	agree	disagree	0.294	0.514	0.192	2	correct
4	3	agree	agree	disagree	agree	0.066	0.351	0.582	3	correct
13	3	disagree	agree	disagree	agree	0.147	0.488	0.365	2	incorrect
15	3	disagree	agree	disagree	disagree	0.334	0.501	0.165	2	incorrect
16	3	agree	disagree	disagree	disagree	0.322	0.505	0.173	2	incorrect
47	3	agree	agree	disagree	disagree	0.171	0.505	0.324	2	incorrect
50	3	agree	agree	agree	agree	0.125	0.466	0.409	2	incorrect
52	3	disagree	agree	disagree	agree	0.147	0.488	0.365	2	incorrect
58	3	agree	agree	disagree	disagree	0.171	0.505	0.324	2	incorrect
88	3	agree	disagree	disagree	disagree	0.322	0.505	0.173	2	incorrect
90	3	disagree	agree	agree	disagree	0.503	0.408	0.089	1	incorrect
91	3	agree	agree	disagree	disagree	0.171	0.505	0.324	2	incorrect
94	3	disagree	disagree	agree	disagree	0.699	0.260	0.041	1	incorrect
115	3	agree	agree	disagree	disagree	0.171	0.505	0.324	2	incorrect
117	3	agree	agree	disagree	agree	0.066	0.351	0.582	3	correct
118	3	agree	disagree	disagree	agree	0.141	0.482	0.377	2	incorrect
120	3	disagree	disagree	disagree	agree	0.285	0.516	0.200	2	incorrect
150	3	disagree	agree	disagree	agree	0.147	0.488	0.365	2	incorrect
154	3	agree	agree	disagree	agree	0.066	0.351	0.582	3	correct
171	3	agree	disagree	disagree	disagree	0.322	0.505	0.173	2	incorrect
228	3	agree	agree	disagree	disagree	0.171	0.505	0.324	2	incorrect
231	3	agree	agree	agree	agree	0.125	0.466	0.409	2	incorrect
233	3	agree	disagree	disagree	disagree	0.322	0.505	0.173	2	incorrect

234	3	disagree	agree	disagree	agree	0.147	0.488	0.365	2	incorrect
307	3	agree	agree	agree	disagree	0.294	0.514	0.192	2	incorrect
310	3	agree	agree	disagree	agree	0.066	0.351	0.582	3	correct
314	3	disagree	disagree	disagree	disagree	0.536	0.385	0.079	2	incorrect
315	3	agree	agree	agree	disagree	0.294	0.514	0.192	2	incorrect

Note:

GH2 statement: I always follow a healthy and balanced diet.

NP4 statement: I try to eat foods that do not contain additives.

CS5 statement: I often have cravings for chocolate.

PL5 statement: I finish my meal even when I do not like the food's taste.

External Validation: the Predicted Model for Consumer's Stages of Change Model Used in Chapter 5

The model expression for the cumulative probabilities:

$P(Y \leq j) = \exp(\alpha_j + \beta x) / [1 + \exp(\alpha_j + \beta x)]$; where x was 1, 2, and 3 for disagree, neutral, and agree, respectively.

US consumers with the original five stages from the Stages of Change model

#	Actual TTM group	Statements from FIS, FNS, and HTAS						Calculated probability to be classified					TTM group from predicted model	Validation
		GH2	GH3	GH4	GH5C	LP6	RE3	Precontemplation	Contemplation	Preparation	Action	Maintain		
29	1	disagree	disagree	disagree	disagree	disagree	disagree	10.82	0.94	84.60	0.82	2.82	3	incorrect
135	1	disagree	disagree	disagree	disagree	disagree	disagree	10.82	0.94	84.60	0.82	2.82	3	incorrect
221	1	disagree	disagree	disagree	disagree	disagree	neutral	10.48	2.55	81.93	1.52	3.53	3	incorrect
239	1	disagree	disagree	disagree	disagree	disagree	agree	9.79	6.68	76.57	2.70	4.25	3	incorrect
266	1	disagree	disagree	disagree	disagree	neutral	agree	7.62	22.13	59.55	4.78	5.93	3	incorrect
17	2	disagree	disagree	disagree	disagree	agree	agree	4.17	51.52	32.56	5.94	5.81	2	correct
53	2	disagree	disagree	disagree	neutral	disagree	disagree	11.30	0.04	88.30	0.10	0.26	3	incorrect
66	2	disagree	disagree	disagree	agree	disagree	disagree	11.32	0.01	88.49	0.06	0.12	3	incorrect
76	2	disagree	disagree	disagree	agree	disagree	agree	11.29	0.05	88.24	0.22	0.20	3	incorrect
178	2	disagree	disagree	agree	disagree	disagree	agree	10.18	6.01	79.61	0.20	3.99	3	incorrect
205	2	disagree	disagree	agree	disagree	disagree	agree	10.18	6.01	79.61	0.20	3.99	3	incorrect
233	2	disagree	neutral	neutral	disagree	disagree	neutral	8.65	8.51	67.64	3.39	11.81	3	incorrect
286	2	disagree	neutral	agree	agree	disagree	neutral	11.26	0.07	88.00	0.08	0.59	3	incorrect
312	2	disagree	neutral	agree	agree	disagree	agree	11.21	0.19	87.68	0.16	0.76	3	incorrect
7	3	disagree	agree	disagree	agree	disagree	agree	8.89	0.75	69.52	17.98	2.85	3	correct
34	3	disagree	agree	disagree	agree	agree	agree	4.58	7.00	35.80	47.90	4.72	4	incorrect
60	3	disagree	agree	neutral	disagree	agree	disagree	1.62	44.76	12.67	17.38	23.57	2	incorrect
77	3	disagree	agree	neutral	neutral	neutral	neutral	8.70	5.72	68.02	9.38	8.18	3	correct
103	3	disagree	agree	neutral	agree	disagree	agree	10.26	0.80	80.24	5.57	3.13	3	correct
115	3	disagree	agree	neutral	agree	agree	neutral	8.66	4.38	67.67	12.72	6.57	3	correct
136	3	disagree	agree	agree	disagree	disagree	agree	3.43	38.28	26.82	6.95	24.51	2	incorrect

141	3	disagree	agree	agree	disagree	disagree	agree	3.43	38.28	26.82	6.95	24.51	2	incorrect
156	3	disagree	agree	agree	disagree	disagree	agree	3.43	38.28	26.82	6.95	24.51	2	incorrect
177	3	disagree	agree	agree	disagree	disagree	agree	3.43	38.28	26.82	6.95	24.51	2	incorrect
192	3	disagree	agree	agree	disagree	disagree	agree	3.43	38.28	26.82	6.95	24.51	2	incorrect
248	3	disagree	agree	agree	disagree	agree	neutral	0.96	69.18	7.50	5.27	17.09	2	incorrect
303	3	disagree	agree	agree	neutral	disagree	agree	9.90	3.99	77.36	2.40	6.35	3	correct
316	3	disagree	agree	agree	neutral	disagree	agree	9.90	3.99	77.36	2.40	6.35	3	correct
6	4	disagree	agree	agree	agree	disagree	disagree	11.06	0.10	86.47	0.44	1.92	3	incorrect
12	4	disagree	agree	agree	agree	disagree	agree	10.72	0.78	83.83	1.56	3.10	3	incorrect
23	4	disagree	agree	agree	agree	disagree	agree	10.72	0.78	83.83	1.56	3.10	3	incorrect
24	4	disagree	agree	agree	agree	disagree	agree	10.72	0.78	83.83	1.56	3.10	3	incorrect
49	4	disagree	agree	agree	agree	disagree	agree	10.72	0.78	83.83	1.56	3.10	3	incorrect
70	4	disagree	agree	agree	agree	neutral	agree	10.02	3.11	78.35	3.32	5.20	3	incorrect
81	4	disagree	agree	agree	agree	agree	disagree	10.25	1.72	80.17	2.12	5.73	3	incorrect
82	4	neutral	disagree	neutral	disagree	agree	agree	4.34	42.29	33.92	4.50	14.95	2	incorrect
99	4	neutral	disagree	neutral	neutral	disagree	agree	11.16	0.22	87.28	0.27	1.08	3	incorrect
113	4	neutral	disagree	agree	agree	agree	agree	11.07	0.66	86.58	0.22	1.47	3	incorrect
125	4	neutral	neutral	neutral	disagree	disagree	neutral	7.01	5.84	54.80	7.45	24.90	3	incorrect
127	4	neutral	neutral	agree	disagree	neutral	agree	3.69	34.15	28.83	4.56	28.77	2	incorrect
129	4	neutral	neutral	agree	neutral	disagree	agree	10.69	0.84	83.59	0.70	4.18	3	incorrect
131	4	neutral	neutral	agree	agree	disagree	disagree	11.19	0.02	87.48	0.12	1.19	3	incorrect
158	4	neutral	agree	neutral	neutral	disagree	neutral	8.62	1.13	67.41	11.08	11.76	3	incorrect
160	4	neutral	agree	neutral	agree	disagree	disagree	10.30	0.09	80.54	4.16	4.91	3	incorrect
185	4	neutral	agree	agree	agree	disagree	neutral	10.38	0.23	81.18	2.15	6.06	3	incorrect
198	4	agree	disagree	agree	disagree	neutral	disagree	8.34	1.91	65.18	0.76	23.81	3	incorrect
229	4	agree	neutral	neutral	disagree	disagree	agree	3.54	7.02	27.71	19.49	42.23	5	incorrect
256	4	agree	neutral	neutral	agree	disagree	disagree	10.85	0.02	84.81	1.18	3.15	3	incorrect
267	4	agree	neutral	agree	disagree	agree	disagree	2.70	11.45	21.11	5.66	59.08	5	incorrect
4	5	agree	neutral	agree	disagree	agree	agree	1.16	38.73	9.07	8.85	42.20	5	correct
9	5	agree	neutral	agree	neutral	agree	agree	7.04	8.49	55.03	6.43	23.01	3	incorrect
10	5	agree	neutral	agree	agree	disagree	disagree	10.96	0.02	85.69	0.32	3.02	3	incorrect
11	5	agree	agree	neutral	disagree	disagree	agree	0.81	6.95	6.31	44.84	41.09	4	incorrect
13	5	agree	agree	neutral	agree	disagree	agree	6.70	0.38	52.39	26.73	13.80	3	incorrect
22	5	agree	agree	neutral	agree	agree	disagree	5.38	0.70	42.05	30.46	21.42	3	incorrect
25	5	agree	agree	neutral	agree	agree	agree	2.70	2.75	21.08	55.62	17.85	4	incorrect
26	5	agree	agree	agree	disagree	disagree	disagree	2.33	2.37	18.18	9.51	67.61	5	correct

27	5	agree	agree	agree	disagree	disagree	agree	1.25	10.00	9.76	18.61	60.38	5	correct
28	5	agree	agree	agree	disagree	agree	agree	0.26	37.56	2.02	19.94	40.22	5	correct
42	5	agree	agree	agree	disagree	agree	agree	0.26	37.56	2.02	19.94	40.22	5	correct
44	5	agree	agree	agree	disagree	agree	agree	0.26	37.56	2.02	19.94	40.22	5	correct
46	5	agree	agree	agree	disagree	agree	agree	0.26	37.56	2.02	19.94	40.22	5	correct
50	5	agree	agree	agree	disagree	agree	agree	0.26	37.56	2.02	19.94	40.22	5	correct
51	5	agree	agree	agree	neutral	disagree	agree	6.56	1.90	51.31	11.71	28.52	3	incorrect
62	5	agree	agree	agree	neutral	neutral	agree	4.57	5.62	35.70	18.53	35.58	3	incorrect
63	5	agree	agree	agree	agree	disagree	disagree	9.71	0.06	75.94	2.85	11.43	3	incorrect
67	5	agree	agree	agree	agree	disagree	disagree	9.71	0.06	75.94	2.85	11.43	3	incorrect
67	5	agree	agree	agree	agree	disagree	disagree	9.71	0.06	75.94	2.85	11.43	3	incorrect
68	5	agree	agree	agree	agree	disagree	disagree	9.71	0.06	75.94	2.85	11.43	3	incorrect
90	5	agree	agree	agree	agree	disagree	disagree	9.71	0.06	75.94	2.85	11.43	3	incorrect
92	5	agree	agree	agree	agree	disagree	disagree	9.71	0.06	75.94	2.85	11.43	3	incorrect
94	5	agree	agree	agree	agree	disagree	disagree	9.71	0.06	75.94	2.85	11.43	3	incorrect
95	5	agree	agree	agree	agree	disagree	disagree	9.71	0.06	75.94	2.85	11.43	3	incorrect
101	5	agree	agree	agree	agree	disagree	disagree	9.71	0.06	75.94	2.85	11.43	3	incorrect
132	5	agree	agree	agree	agree	disagree	disagree	9.71	0.06	75.94	2.85	11.43	3	incorrect
134	5	agree	agree	agree	agree	disagree	neutral	9.16	0.17	71.63	5.14	13.90	3	incorrect
137	5	agree	agree	agree	agree	disagree	neutral	9.16	0.17	71.63	5.14	13.90	3	incorrect
138	5	agree	agree	agree	agree	disagree	agree	8.41	0.44	65.71	9.00	16.45	3	incorrect
139	5	agree	agree	agree	agree	disagree	agree	8.41	0.44	65.71	9.00	16.45	3	incorrect
152	5	agree	agree	agree	agree	disagree	agree	8.41	0.44	65.71	9.00	16.45	3	incorrect
154	5	agree	agree	agree	agree	disagree	agree	8.41	0.44	65.71	9.00	16.45	3	incorrect
155	5	agree	agree	agree	agree	disagree	agree	8.41	0.44	65.71	9.00	16.45	3	incorrect
157	5	agree	agree	agree	agree	disagree	agree	8.41	0.44	65.71	9.00	16.45	3	incorrect
159	5	agree	agree	agree	agree	disagree	agree	8.41	0.44	65.71	9.00	16.45	3	incorrect
174	5	agree	agree	agree	agree	disagree	agree	8.41	0.44	65.71	9.00	16.45	3	incorrect
176	5	agree	agree	agree	agree	disagree	agree	8.41	0.44	65.71	9.00	16.45	3	incorrect
180	5	agree	agree	agree	agree	disagree	agree	8.41	0.44	65.71	9.00	16.45	3	incorrect
181	5	agree	agree	agree	agree	disagree	agree	8.41	0.44	65.71	9.00	16.45	3	incorrect
184	5	agree	agree	agree	agree	disagree	agree	8.41	0.44	65.71	9.00	16.45	3	incorrect
193	5	agree	agree	agree	agree	disagree	agree	8.41	0.44	65.71	9.00	16.45	3	incorrect
197	5	agree	agree	agree	agree	neutral	agree	6.67	1.49	52.18	16.25	23.41	3	incorrect
201	5	agree	agree	agree	agree	agree	disagree	7.02	0.85	54.90	10.67	26.56	3	incorrect
204	5	agree	agree	agree	agree	agree	disagree	7.02	0.85	54.90	10.67	26.56	3	incorrect

206	5	agree	agree	agree	agree	agree	neutral	5.91	2.00	46.17	17.13	28.80	3	incorrect
215	5	agree	agree	agree	agree	agree	agree	4.63	4.39	36.21	25.64	29.13	3	incorrect
216	5	agree	agree	agree	agree	agree	agree	4.63	4.39	36.21	25.64	29.13	3	incorrect
217	5	agree	agree	agree	agree	agree	agree	4.63	4.39	36.21	25.64	29.13	3	incorrect
218	5	agree	agree	agree	agree	agree	agree	4.63	4.39	36.21	25.64	29.13	3	incorrect
219	5	agree	agree	agree	agree	agree	agree	4.63	4.39	36.21	25.64	29.13	3	incorrect

Note:

GH2 statement: I always follow a healthy and balanced diet.

GH3 statement: It is important to me that my diet is low in fat.

GH4 statement: It is important to me that my diet contains a lot of vitamins and minerals.

GH5 statement: I eat what I like and do not worry about the healthiness of food.

LP6 statement: In my opinion, by eating light products one can eat more without getting too many calories.

RE1 statement: When I am feeling down I want to treat myself with something really delicious.

Thai consumers with the original five stages from the Stages of Change model

#	Actual TTM group	Statements from FIS, FNS, and HTAS			Calculated probability to be classified					TTM group from predicted model	Validation
		FIS1C	GH2	GH4	Precontemplation	Contemplation	Preparation	Action	Maintain		
34	1	disagree	disagree	disagree	63.18	18.25	8.77	3.01	6.80	1	correct
102	1	disagree	disagree	disagree	63.18	18.25	8.77	3.01	6.80	1	correct
153	1	disagree	disagree	disagree	63.18	18.25	8.77	3.01	6.80	1	correct
229	1	disagree	disagree	disagree	63.18	18.25	8.77	3.01	6.80	1	correct
267	1	disagree	disagree	disagree	63.18	18.25	8.77	3.01	6.80	1	correct
124	2	disagree	disagree	disagree	63.18	18.25	8.77	3.01	6.80	1	incorrect
177	2	disagree	disagree	disagree	63.18	18.25	8.77	3.01	6.80	1	incorrect
245	2	disagree	disagree	disagree	63.18	18.25	8.77	3.01	6.80	1	incorrect
323	2	disagree	disagree	neutral	39.94	23.78	14.51	6.58	15.19	1	incorrect
16	3	disagree	disagree	neutral	39.94	23.78	14.51	6.58	15.19	1	incorrect
37	3	disagree	disagree	neutral	39.94	23.78	14.51	6.58	15.19	1	incorrect
64	3	disagree	disagree	agree	19.63	24.10	18.66	11.19	26.42	5	incorrect
86	3	disagree	disagree	agree	19.63	24.10	18.66	11.19	26.42	5	incorrect
140	3	disagree	disagree	agree	19.63	24.10	18.66	11.19	26.42	5	incorrect
50	4	disagree	disagree	agree	19.63	24.10	18.66	11.19	26.42	5	incorrect
78	4	disagree	disagree	agree	19.63	24.10	18.66	11.19	26.42	5	incorrect
95	4	disagree	neutral	neutral	22.04	16.87	6.81	16.11	38.18	5	incorrect
98	4	disagree	neutral	neutral	22.04	16.87	6.81	16.11	38.18	5	incorrect
108	4	disagree	neutral	agree	8.30	13.10	6.71	21.01	50.87	5	incorrect
109	4	disagree	neutral	agree	8.30	13.10	6.71	21.01	50.87	5	incorrect
110	4	disagree	neutral	agree	8.30	13.10	6.71	21.01	50.87	5	incorrect
122	4	disagree	neutral	agree	8.30	13.10	6.71	21.01	50.87	5	incorrect
130	4	disagree	neutral	agree	8.30	13.10	6.71	21.01	50.87	5	incorrect
172	4	disagree	agree	disagree	21.07	10.05	2.12	19.77	46.99	5	incorrect
174	4	disagree	agree	disagree	21.07	10.05	2.12	19.77	46.99	5	incorrect
196	4	disagree	agree	neutral	7.47	7.35	1.96	24.27	58.95	5	incorrect
12	5	disagree	agree	neutral	7.47	7.35	1.96	24.27	58.95	5	correct
13	5	disagree	agree	neutral	7.47	7.35	1.96	24.27	58.95	5	correct
39	5	disagree	agree	neutral	7.47	7.35	1.96	24.27	58.95	5	correct
68	5	disagree	agree	agree	2.33	4.73	1.61	26.22	65.11	5	correct
71	5	disagree	agree	agree	2.33	4.73	1.61	26.22	65.11	5	correct
79	5	disagree	agree	agree	2.33	4.73	1.61	26.22	65.11	5	correct

81	5	disagree	agree	agree	2.33	4.73	1.61	26.22	65.11	5	correct
82	5	disagree	agree	agree	2.33	4.73	1.61	26.22	65.11	5	correct
85	5	disagree	agree	agree	2.33	4.73	1.61	26.22	65.11	5	correct
116	5	disagree	agree	agree	2.33	4.73	1.61	26.22	65.11	5	correct
120	5	disagree	agree	agree	2.33	4.73	1.61	26.22	65.11	5	correct
148	5	disagree	agree	agree	2.33	4.73	1.61	26.22	65.11	5	correct
184	5	disagree	agree	agree	2.33	4.73	1.61	26.22	65.11	5	correct
195	5	disagree	agree	agree	2.33	4.73	1.61	26.22	65.11	5	correct
215	5	disagree	agree	agree	2.33	4.73	1.61	26.22	65.11	5	correct
236	5	disagree	agree	agree	2.33	4.73	1.61	26.22	65.11	5	correct
238	5	disagree	agree	agree	2.33	4.73	1.61	26.22	65.11	5	correct
241	5	disagree	agree	agree	2.33	4.73	1.61	26.22	65.11	5	correct
253	5	disagree	agree	agree	2.33	4.73	1.61	26.22	65.11	5	correct
254	5	disagree	agree	agree	2.33	4.73	1.61	26.22	65.11	5	correct
300	5	disagree	agree	agree	2.33	4.73	1.61	26.22	65.11	5	correct
303	5	disagree	agree	agree	2.33	4.73	1.61	26.22	65.11	5	correct
135	4	neutral	disagree	disagree	42.64	22.32	19.56	4.64	10.84	1	incorrect
197	4	neutral	disagree	disagree	42.64	22.32	19.56	4.64	10.84	1	incorrect
217	4	neutral	agree	neutral	3.36	6.00	2.92	24.98	62.73	5	incorrect
43	5	neutral	agree	neutral	3.36	6.00	2.92	24.98	62.73	5	correct
66	5	neutral	agree	agree	1.01	3.73	2.31	26.06	66.89	5	correct
182	5	neutral	agree	agree	1.01	3.73	2.31	26.06	66.89	5	correct
212	5	neutral	agree	agree	1.01	3.73	2.31	26.06	66.89	5	correct
239	5	neutral	agree	agree	1.01	3.73	2.31	26.06	66.89	5	correct
240	5	neutral	agree	agree	1.01	3.73	2.31	26.06	66.89	5	correct
305	5	neutral	agree	agree	1.01	3.73	2.31	26.06	66.89	5	correct
11	1	agree	disagree	disagree	27.38	7.82	41.52	6.82	16.46	3	incorrect
61	1	agree	disagree	disagree	27.38	7.82	41.52	6.82	16.46	3	incorrect
48	2	agree	disagree	disagree	27.38	7.82	41.52	6.82	16.46	3	incorrect
59	3	agree	disagree	disagree	27.38	7.82	41.52	6.82	16.46	3	correct
165	3	agree	disagree	neutral	11.70	6.89	46.44	10.08	24.88	3	correct
220	3	agree	disagree	neutral	11.70	6.89	46.44	10.08	24.88	3	correct
294	3	agree	disagree	neutral	11.70	6.89	46.44	10.08	24.88	3	correct
8	4	agree	disagree	agree	4.33	5.26	44.96	12.90	32.55	3	incorrect
15	4	agree	disagree	agree	4.33	5.26	44.96	12.90	32.55	3	incorrect
29	4	agree	disagree	agree	4.33	5.26	44.96	12.90	32.55	3	incorrect
44	4	agree	neutral	disagree	15.38	5.65	19.84	17.01	42.12	5	incorrect

47	4	agree	neutral	neutral	5.36	4.06	18.11	20.52	51.94	5	incorrect
176	4	agree	neutral	neutral	5.36	4.06	18.11	20.52	51.94	5	incorrect
14	5	agree	neutral	neutral	5.36	4.06	18.11	20.52	51.94	5	correct
17	5	agree	neutral	neutral	5.36	4.06	18.11	20.52	51.94	5	correct
20	5	agree	neutral	agree	1.70	2.65	15.01	22.48	58.16	5	correct
38	5	agree	neutral	agree	1.70	2.65	15.01	22.48	58.16	5	correct
41	5	agree	neutral	agree	1.70	2.65	15.01	22.48	58.16	5	correct
45	5	agree	agree	disagree	5.01	2.37	5.50	24.61	62.50	5	correct
58	5	agree	agree	disagree	5.01	2.37	5.50	24.61	62.50	5	correct
65	5	agree	agree	disagree	5.01	2.37	5.50	24.61	62.50	5	correct
80	5	agree	agree	disagree	5.01	2.37	5.50	24.61	62.50	5	correct
89	5	agree	agree	neutral	1.52	1.48	4.36	25.77	66.88	5	correct
117	5	agree	agree	neutral	1.52	1.48	4.36	25.77	66.88	5	correct
118	5	agree	agree	agree	0.44	0.89	3.34	26.10	69.23	5	correct
119	5	agree	agree	agree	0.44	0.89	3.34	26.10	69.23	5	correct
147	5	agree	agree	agree	0.44	0.89	3.34	26.10	69.23	5	correct
149	5	agree	agree	agree	0.44	0.89	3.34	26.10	69.23	5	correct
150	5	agree	agree	agree	0.44	0.89	3.34	26.10	69.23	5	correct
180	5	agree	agree	agree	0.44	0.89	3.34	26.10	69.23	5	correct
181	5	agree	agree	agree	0.44	0.89	3.34	26.10	69.23	5	correct
183	5	agree	agree	agree	0.44	0.89	3.34	26.10	69.23	5	correct
200	5	agree	agree	agree	0.44	0.89	3.34	26.10	69.23	5	correct
201	5	agree	agree	agree	0.44	0.89	3.34	26.10	69.23	5	correct
202	5	agree	agree	agree	0.44	0.89	3.34	26.10	69.23	5	correct
203	5	agree	agree	agree	0.44	0.89	3.34	26.10	69.23	5	correct
210	5	agree	agree	agree	0.44	0.89	3.34	26.10	69.23	5	correct
211	5	agree	agree	agree	0.44	0.89	3.34	26.10	69.23	5	correct
221	5	agree	agree	agree	0.44	0.89	3.34	26.10	69.23	5	correct
251	5	agree	agree	agree	0.44	0.89	3.34	26.10	69.23	5	correct
252	5	agree	agree	agree	0.44	0.89	3.34	26.10	69.23	5	correct
257	5	agree	agree	agree	0.44	0.89	3.34	26.10	69.23	5	correct
302	5	agree	agree	agree	0.44	0.89	3.34	26.10	69.23	5	correct
304	5	agree	agree	agree	0.44	0.89	3.34	26.10	69.23	5	correct

Note:

FIS1 statement: I don't think much about food each day.

GH2 statement: I always follow a healthy and balanced diet.

GH4 statement: It is important to me that my diet contains a lot of vitamins and minerals.

US consumers with the collapsed three stages from the Stages of Change model (precontemplation-contemplation, preparation-action, and maintain group)

#	Actual TTM group	Statements from FIS, FNS, and HTAS					Calculated probability to be classified			TTM group from predicted model	Validation
		FIS12	GH2	GH4	GH5C	RE1	Precontemplation-Contemplation	Preparation-Action	Maintain		
29	1	agree	agree	agree	agree	neutral	2.34	34.23	63.43	3	incorrect
135	1	agree	agree	agree	agree	agree	3.13	46.36	50.51	3	incorrect
221	1	agree	agree	agree	agree	agree	3.13	46.36	50.51	3	incorrect
239	1	agree	agree	agree	agree	agree	3.13	46.36	50.51	3	incorrect
266	1	agree	agree	agree	agree	agree	3.13	46.36	50.51	3	incorrect
53	1	neutral	disagree	disagree	disagree	agree	47.83	43.93	8.24	1	correct
66	1	neutral	disagree	disagree	disagree	agree	47.83	43.93	8.24	1	correct
76	1	neutral	disagree	agree	disagree	agree	52.31	26.87	20.81	1	correct
178	1	neutral	disagree	agree	disagree	agree	52.31	26.87	20.81	1	correct
205	1	neutral	disagree	agree	neutral	agree	34.32	34.05	31.63	1	correct
233	1	neutral	disagree	agree	agree	agree	19.80	37.94	42.26	3	incorrect
286	1	neutral	neutral	neutral	disagree	agree	30.60	46.25	23.16	2	incorrect
312	1	neutral	neutral	agree	disagree	agree	30.48	34.46	35.06	3	incorrect
313	1	neutral	neutral	agree	agree	neutral	6.43	26.82	66.75	3	incorrect
7	2	agree	agree	agree	agree	agree	3.13	46.36	50.51	3	incorrect
34	2	agree	agree	agree	agree	agree	3.13	46.36	50.51	3	incorrect
60	2	agree	agree	agree	agree	agree	3.13	46.36	50.51	3	incorrect
77	2	agree	agree	agree	agree	agree	3.13	46.36	50.51	3	incorrect
103	2	agree	agree	agree	agree	agree	3.13	46.36	50.51	3	incorrect
115	2	agree	agree	agree	agree	agree	3.13	46.36	50.51	3	incorrect
136	2	agree	agree	agree	agree	agree	3.13	46.36	50.51	3	incorrect
141	2	agree	agree	agree	agree	agree	3.13	46.36	50.51	3	incorrect
156	2	agree	agree	agree	agree	agree	3.13	46.36	50.51	3	incorrect

177	2	agree	agree	agree	agree	agree	3.13	46.36	50.51	3	incorrect
192	2	agree	agree	agree	agree	agree	3.13	46.36	50.51	3	incorrect
248	2	agree	agree	agree	agree	agree	3.13	46.36	50.51	3	incorrect
303	2	agree	agree	agree	agree	agree	3.13	46.36	50.51	3	incorrect
6	2	disagree	disagree	disagree	disagree	disagree	47.54	26.80	25.65	1	incorrect
12	2	disagree	disagree	disagree	disagree	neutral	52.89	30.14	16.96	1	incorrect
23	2	disagree	disagree	disagree	disagree	agree	56.60	32.61	10.79	1	incorrect
49	2	disagree	disagree	disagree	neutral	disagree	29.95	32.61	37.43	3	incorrect
70	2	disagree	disagree	disagree	agree	disagree	16.68	35.06	48.26	3	incorrect
81	2	disagree	disagree	neutral	agree	neutral	19.22	30.54	50.24	3	incorrect
82	2	disagree	disagree	agree	disagree	agree	56.74	18.28	24.98	1	incorrect
99	2	disagree	disagree	agree	disagree	agree	56.74	18.28	24.98	1	incorrect
113	2	disagree	disagree	agree	disagree	agree	56.74	18.28	24.98	1	incorrect
125	2	disagree	disagree	agree	agree	disagree	11.28	13.27	75.44	3	incorrect
127	2	disagree	disagree	agree	agree	agree	21.91	26.33	51.75	3	incorrect
129	2	disagree	neutral	neutral	disagree	neutral	29.87	28.02	42.10	3	incorrect
131	2	disagree	neutral	neutral	neutral	neutral	16.46	29.82	53.72	3	incorrect
158	2	disagree	agree	neutral	agree	agree	4.59	35.74	59.66	3	incorrect
160	2	disagree	agree	agree	disagree	disagree	7.72	11.80	80.48	3	incorrect
185	2	disagree	agree	agree	disagree	agree	16.02	25.01	58.97	3	incorrect
198	2	disagree	agree	agree	agree	disagree	1.60	9.10	89.30	3	incorrect
229	2	disagree	agree	agree	agree	neutral	2.50	14.40	83.09	3	incorrect
256	2	disagree	agree	agree	agree	neutral	2.50	14.40	83.09	3	incorrect
267	2	disagree	agree	agree	agree	agree	3.77	21.91	74.32	3	incorrect
4	3	neutral	agree	neutral	agree	agree	3.98	49.34	46.68	3	correct
9	3	neutral	agree	agree	disagree	agree	14.68	36.51	48.81	3	correct
10	3	neutral	agree	agree	disagree	agree	14.68	36.51	48.81	3	correct
11	3	neutral	agree	agree	agree	disagree	1.65	14.99	83.36	3	correct

13	3	neutral	agree	agree	agree	disagree	1.65	14.99	83.36	3	correct
22	3	neutral	agree	agree	agree	agree	3.56	33.00	63.44	3	correct
25	3	agree	disagree	disagree	disagree	disagree	34.80	49.87	15.33	2	incorrect
26	3	agree	disagree	disagree	disagree	agree	38.17	55.89	5.94	2	incorrect
27	3	agree	disagree	disagree	agree	agree	13.71	74.85	11.44	2	incorrect
28	3	agree	disagree	disagree	agree	agree	13.71	74.85	11.44	2	incorrect
42	3	agree	disagree	neutral	disagree	disagree	36.48	39.09	24.43	2	incorrect
44	3	agree	disagree	neutral	disagree	neutral	40.30	43.66	16.04	2	incorrect
46	3	agree	disagree	neutral	neutral	neutral	24.92	52.12	22.96	2	incorrect
50	3	agree	disagree	neutral	agree	agree	15.74	64.29	19.97	2	incorrect
51	3	agree	disagree	agree	disagree	neutral	41.41	33.55	25.04	1	incorrect
62	3	agree	disagree	agree	disagree	agree	45.90	37.59	16.50	1	incorrect
63	3	agree	disagree	agree	neutral	agree	29.29	46.32	24.39	2	incorrect
67	3	agree	disagree	agree	agree	disagree	10.59	31.64	57.78	3	correct
67	3	agree	disagree	agree	agree	neutral	13.76	41.59	44.65	3	correct
68	3	agree	disagree	agree	agree	agree	16.72	51.05	32.23	2	incorrect
90	3	agree	disagree	agree	agree	agree	16.72	51.05	32.23	2	incorrect
92	3	agree	disagree	agree	agree	agree	16.72	51.05	32.23	2	incorrect
94	3	agree	disagree	agree	agree	agree	16.72	51.05	32.23	2	incorrect
95	3	agree	neutral	neutral	neutral	agree	13.82	64.30	21.88	2	incorrect
101	3	agree	neutral	neutral	agree	disagree	4.96	43.59	51.46	3	correct
132	3	agree	neutral	agree	neutral	agree	14.52	50.53	34.95	2	incorrect
134	3	agree	neutral	agree	agree	disagree	4.28	28.16	67.56	3	correct
137	3	agree	neutral	agree	agree	agree	7.52	50.55	41.93	2	incorrect
138	3	agree	agree	neutral	disagree	agree	12.08	64.05	23.88	2	incorrect
139	3	agree	agree	neutral	disagree	agree	12.08	64.05	23.88	2	incorrect
152	3	agree	agree	neutral	agree	disagree	1.99	38.42	59.59	3	correct
154	3	agree	agree	neutral	agree	disagree	1.99	38.42	59.59	3	correct

155	3	agree	agree	agree	disagree	disagree	7.47	28.99	63.54	3	correct
157	3	agree	agree	agree	disagree	disagree	7.47	28.99	63.54	3	correct
159	3	agree	agree	agree	disagree	agree	12.54	49.76	37.70	2	incorrect
174	3	agree	agree	agree	disagree	agree	12.54	49.76	37.70	2	incorrect
176	3	agree	agree	agree	disagree	agree	12.54	49.76	37.70	2	incorrect
180	3	agree	agree	agree	disagree	agree	12.54	49.76	37.70	2	incorrect
181	3	agree	agree	agree	neutral	agree	6.40	49.04	44.56	2	incorrect
184	3	agree	agree	agree	neutral	agree	6.40	49.04	44.56	2	incorrect
193	3	agree	agree	agree	neutral	agree	6.40	49.04	44.56	2	incorrect
197	3	agree	agree	agree	agree	disagree	1.64	23.69	74.67	3	correct
201	3	agree	agree	agree	agree	disagree	1.64	23.69	74.67	3	correct
204	3	agree	agree	agree	agree	disagree	1.64	23.69	74.67	3	correct
206	3	agree	agree	agree	agree	disagree	1.64	23.69	74.67	3	correct
215	3	agree	agree	agree	agree	disagree	1.64	23.69	74.67	3	correct
216	3	agree	agree	agree	agree	disagree	1.64	23.69	74.67	3	correct
217	3	agree	agree	agree	agree	disagree	1.64	23.69	74.67	3	correct
218	3	agree	agree	agree	agree	disagree	1.64	23.69	74.67	3	correct
219	3	agree	agree	agree	agree	disagree	1.64	23.69	74.67	3	correct
220	3	agree	agree	agree	agree	disagree	1.64	23.69	74.67	3	correct

Note:

FIS12 statement: I care whether or not a table is nicely set.

GH2 statement: I always follow a healthy and balanced diet.

GH3 statement: It is important to me that my diet is low in fat.

GH4 statement: It is important to me that my diet contains a lot of vitamins and minerals.

GH5 statement: I eat what I like and do not worry about the healthiness of food.

RE1 statement: When I am feeling down I want to treat myself with something really delicious.

Thai consumers with the collapsed three stages from the Stages of Change model (precontemplation-contemplation, preparation-action, and maintain group)

#	Actual TTM group	Statements from FIS, FNS, and HTAS						Calculated probability to be classified			TTM group from predicted model	Validation
		FIS1	FIS11C	GH2	GH4	NP3C	RE1	Precontemplation-Contemplation	Preparation-Action	Maintain		
11	1	disagree	disagree	disagree	neutral	agree	agree	88.58	4.87	6.56	1	correct
34	1	disagree	disagree	disagree	agree	agree	agree	71.98	11.41	16.61	1	correct
61	1	disagree	disagree	agree	disagree	neutral	disagree	52.68	4.39	42.94	1	correct
102	1	disagree	disagree	agree	neutral	agree	agree	44.35	9.97	45.68	3	incorrect
153	1	disagree	disagree	agree	agree	disagree	agree	16.05	36.20	47.75	3	incorrect
229	1	disagree	disagree	agree	agree	agree	neutral	15.08	7.41	77.51	3	incorrect
267	1	disagree	neutral	disagree	disagree	agree	agree	91.58	4.71	3.71	1	correct
48	1	disagree	neutral	neutral	neutral	agree	neutral	50.49	11.48	38.02	1	correct
124	1	disagree	neutral	agree	agree	agree	neutral	9.02	11.98	79.00	3	incorrect
177	1	disagree	agree	disagree	disagree	disagree	neutral	68.11	24.93	6.96	1	correct
245	1	disagree	agree	disagree	disagree	disagree	agree	64.63	31.24	4.13	1	correct
323	1	disagree	agree	disagree	disagree	disagree	agree	64.63	31.24	4.13	1	correct
16	2	disagree	agree	disagree	disagree	agree	agree	82.79	11.51	5.71	1	incorrect
37	2	disagree	agree	disagree	disagree	agree	agree	82.79	11.51	5.71	1	incorrect
59	2	disagree	agree	disagree	disagree	agree	agree	82.79	11.51	5.71	1	incorrect
64	2	disagree	agree	disagree	disagree	agree	agree	82.79	11.51	5.71	1	incorrect
86	2	disagree	agree	disagree	neutral	agree	disagree	56.16	12.92	30.91	1	incorrect
140	2	disagree	agree	disagree	neutral	agree	agree	61.88	24.83	13.29	1	incorrect
165	2	disagree	agree	disagree	agree	agree	disagree	29.59	19.65	50.77	3	incorrect
220	2	disagree	agree	disagree	agree	agree	neutral	33.91	29.74	36.35	3	incorrect
294	2	disagree	agree	disagree	agree	agree	agree	35.37	40.95	23.68	2	correct
8	2	disagree	agree	disagree	agree	agree	agree	35.37	40.95	23.68	2	correct

15	2	disagree	agree	neutral	neutral	agree	disagree	28.42	13.23	58.35	3	incorrect
29	2	disagree	agree	neutral	agree	neutral	agree	12.87	56.20	30.93	2	correct
44	2	disagree	agree	neutral	agree	agree	disagree	11.44	15.36	73.20	3	incorrect
47	2	disagree	agree	neutral	agree	agree	disagree	11.44	15.36	73.20	3	incorrect
50	2	disagree	agree	neutral	agree	agree	neutral	14.77	26.19	59.04	3	incorrect
78	2	disagree	agree	neutral	agree	agree	agree	17.12	40.11	42.77	3	incorrect
95	2	disagree	agree	agree	disagree	agree	disagree	26.43	8.62	64.94	3	incorrect
98	2	disagree	agree	agree	neutral	agree	agree	17.76	29.16	53.08	3	incorrect
108	2	disagree	agree	agree	neutral	agree	agree	17.76	29.16	53.08	3	incorrect
109	2	disagree	agree	agree	neutral	agree	agree	17.76	29.16	53.08	3	incorrect
110	2	disagree	agree	agree	agree	disagree	disagree	3.07	29.01	67.92	3	incorrect
122	2	disagree	agree	agree	agree	disagree	agree	3.83	63.10	33.07	2	correct
130	2	disagree	agree	agree	agree	disagree	agree	3.83	63.10	33.07	2	correct
135	2	disagree	agree	agree	agree	disagree	agree	3.83	63.10	33.07	2	correct
172	2	disagree	agree	agree	agree	neutral	neutral	4.54	30.35	65.12	3	incorrect
174	2	disagree	agree	agree	agree	neutral	agree	5.32	46.99	47.70	3	incorrect
176	2	disagree	agree	agree	agree	neutral	agree	5.32	46.99	47.70	3	incorrect
196	2	disagree	agree	agree	agree	neutral	agree	5.32	46.99	47.70	3	incorrect
197	2	disagree	agree	agree	agree	agree	disagree	3.63	9.85	86.53	3	incorrect
217	2	disagree	agree	agree	agree	agree	agree	6.64	31.47	61.89	3	incorrect
12	3	disagree	agree	agree	agree	agree	agree	6.64	31.47	61.89	3	correct
13	3	disagree	agree	agree	agree	agree	agree	6.64	31.47	61.89	3	correct
14	3	disagree	agree	agree	agree	agree	agree	6.64	31.47	61.89	3	correct
17	3	disagree	agree	agree	agree	agree	agree	6.64	31.47	61.89	3	correct
20	3	disagree	agree	agree	agree	agree	agree	6.64	31.47	61.89	3	correct
38	3	disagree	agree	agree	agree	agree	agree	6.64	31.47	61.89	3	correct
39	3	neutral	disagree	agree	agree	agree	agree	8.67	15.79	75.54	3	correct
41	3	neutral	neutral	agree	neutral	agree	disagree	7.05	6.90	86.05	3	correct

43	3	neutral	agree	disagree	disagree	agree	agree	63.40	24.74	11.86	1	incorrect
45	3	neutral	agree	disagree	disagree	agree	agree	63.40	24.74	11.86	1	incorrect
58	3	neutral	agree	agree	neutral	agree	neutral	5.72	19.97	74.31	3	correct
65	3	neutral	agree	agree	agree	disagree	agree	1.42	65.43	33.15	2	incorrect
66	3	neutral	agree	agree	agree	neutral	agree	2.00	49.46	48.54	2	incorrect
68	3	neutral	agree	agree	agree	agree	disagree	1.36	10.39	88.25	3	correct
71	3	neutral	agree	agree	agree	agree	disagree	1.36	10.39	88.25	3	correct
79	3	neutral	agree	agree	agree	agree	agree	2.53	33.60	63.87	3	correct
80	3	agree	disagree	disagree	disagree	agree	agree	75.48	11.32	13.20	1	incorrect
81	3	agree	neutral	disagree	neutral	agree	agree	32.28	37.75	29.97	2	incorrect
82	3	agree	agree	disagree	disagree	disagree	agree	18.95	72.14	8.91	2	incorrect
85	3	agree	agree	disagree	disagree	agree	disagree	34.15	21.45	44.40	3	correct
89	3	agree	agree	disagree	disagree	agree	agree	38.42	42.08	19.50	2	incorrect
116	3	agree	agree	disagree	neutral	agree	neutral	16.88	40.40	42.73	3	correct
117	3	agree	agree	disagree	neutral	agree	neutral	16.88	40.40	42.73	3	correct
118	3	agree	agree	disagree	agree	agree	disagree	5.30	27.73	66.97	3	correct
119	3	agree	agree	disagree	agree	agree	agree	6.64	60.60	32.75	2	incorrect
120	3	agree	agree	disagree	agree	agree	agree	6.64	60.60	32.75	2	incorrect
147	3	agree	agree	neutral	disagree	neutral	neutral	14.20	44.40	41.40	2	incorrect
148	3	agree	agree	neutral	neutral	neutral	agree	5.38	64.09	30.53	2	incorrect
149	3	agree	agree	neutral	neutral	agree	agree	7.52	48.10	44.38	2	incorrect
150	3	agree	agree	neutral	neutral	agree	agree	7.52	48.10	44.38	2	incorrect
180	3	agree	agree	neutral	neutral	agree	agree	7.52	48.10	44.38	2	incorrect
181	3	agree	agree	neutral	agree	agree	neutral	2.25	31.46	66.28	3	correct
182	3	agree	agree	neutral	agree	agree	neutral	2.25	31.46	66.28	3	correct
183	3	agree	agree	neutral	agree	agree	agree	2.64	48.76	48.60	2	incorrect
184	3	agree	agree	agree	disagree	neutral	agree	6.19	51.73	42.08	2	incorrect
195	3	agree	agree	agree	disagree	agree	disagree	4.62	11.86	83.52	3	correct

200	3	agree	agree	agree	disagree	agree	agree	7.97	35.73	56.29	3	correct
201	3	agree	agree	agree	neutral	agree	disagree	1.54	11.44	87.01	3	correct
202	3	agree	agree	agree	neutral	agree	agree	2.78	35.98	61.23	3	correct
203	3	agree	agree	agree	agree	disagree	disagree	0.42	31.23	68.35	3	correct
210	3	agree	agree	agree	agree	disagree	agree	0.51	66.78	32.71	2	incorrect
211	3	agree	agree	agree	agree	neutral	disagree	0.48	19.00	80.53	3	correct
212	3	agree	agree	agree	agree	neutral	agree	0.73	50.94	48.33	2	incorrect
215	3	agree	agree	agree	agree	agree	disagree	0.50	10.80	88.69	3	correct
216	3	agree	agree	agree	agree	agree	disagree	0.50	10.80	88.69	3	correct
221	3	agree	agree	agree	agree	agree	agree	0.94	34.91	64.16	3	correct
236	3	agree	agree	agree	agree	agree	agree	0.94	34.91	64.16	3	correct
238	3	agree	agree	agree	agree	agree	agree	0.94	34.91	64.16	3	correct
239	3	agree	agree	agree	agree	agree	agree	0.94	34.91	64.16	3	correct
240	3	agree	agree	agree	agree	agree	agree	0.94	34.91	64.16	3	correct
241	3	agree	agree	agree	agree	agree	agree	0.94	34.91	64.16	3	correct
251	3	agree	agree	agree	agree	agree	agree	0.94	34.91	64.16	3	correct
252	3	agree	agree	agree	agree	agree	agree	0.94	34.91	64.16	3	correct
253	3	agree	agree	agree	agree	agree	agree	0.94	34.91	64.16	3	correct
254	3	agree	agree	agree	agree	agree	agree	0.94	34.91	64.16	3	correct
257	3	agree	agree	agree	agree	agree	agree	0.94	34.91	64.16	3	correct
300	3	agree	agree	agree	agree	agree	agree	0.94	34.91	64.16	3	correct
302	3	agree	agree	agree	agree	agree	agree	0.94	34.91	64.16	3	correct
303	3	agree	agree	agree	agree	agree	agree	0.94	34.91	64.16	3	correct

Note:

FIS1 statement: I don't think much about food each day.

FIS11 statement: I do not wash dishes or clean the table.

GH2 statement: I always follow a healthy and balanced diet.

GH4 statement: It is important to me that my diet contains a lot of vitamins and minerals.

NP3 statement: In my opinion, artificially flavored foods are not harmful to my health.

RE1 statement: When I am feeling down I want to treat myself with something really delicious.

**US consumers with the collapsed two stages from the Stages of Change model
(precontemplation-contemplation-preparation and action-maintain group)**

#	Actual TTM group	Statements from FIS, FNS, and HTAS		Calculated probability to be classified		TTM group from predicted model	Validation
		GH2	GH3	Precontemplation-Contemplation-Preparation	Action-Maintain		
29	1	disagree	disagree	47.37	52.63	2	incorrect
135	1	disagree	disagree	47.37	52.63	2	incorrect
221	1	disagree	disagree	47.37	52.63	2	incorrect
239	1	disagree	disagree	47.37	52.63	2	incorrect
266	1	disagree	disagree	47.37	52.63	2	incorrect
17	1	disagree	disagree	47.37	52.63	2	incorrect
53	1	disagree	disagree	47.37	52.63	2	incorrect
66	1	disagree	disagree	47.37	52.63	2	incorrect
76	1	disagree	disagree	47.37	52.63	2	incorrect
178	1	disagree	disagree	47.37	52.63	2	incorrect
205	1	disagree	disagree	47.37	52.63	2	incorrect
233	1	disagree	neutral	30.13	69.87	2	incorrect
286	1	disagree	neutral	30.13	69.87	2	incorrect
312	1	disagree	neutral	30.13	69.87	2	incorrect
313	1	disagree	agree	17.13	82.87	2	incorrect
7	1	disagree	agree	17.13	82.87	2	incorrect
34	1	disagree	agree	17.13	82.87	2	incorrect
60	1	disagree	agree	17.13	82.87	2	incorrect
77	1	disagree	agree	17.13	82.87	2	incorrect
103	1	disagree	agree	17.13	82.87	2	incorrect
115	1	disagree	agree	17.13	82.87	2	incorrect
136	1	disagree	agree	17.13	82.87	2	incorrect
141	1	disagree	agree	17.13	82.87	2	incorrect
156	1	disagree	agree	17.13	82.87	2	incorrect
177	1	disagree	agree	17.13	82.87	2	incorrect
192	1	disagree	agree	17.13	82.87	2	incorrect
248	1	disagree	agree	17.13	82.87	2	incorrect
303	1	disagree	agree	17.13	82.87	2	incorrect
316	1	disagree	agree	17.13	82.87	2	incorrect
6	2	disagree	agree	17.13	82.87	2	correct
12	2	disagree	agree	17.13	82.87	2	correct
23	2	disagree	agree	17.13	82.87	2	correct
24	2	disagree	agree	17.13	82.87	2	correct
49	2	disagree	agree	17.13	82.87	2	correct
70	2	disagree	agree	17.13	82.87	2	correct
81	2	disagree	agree	17.13	82.87	2	correct
82	2	neutral	disagree	27.54	72.46	2	correct
99	2	neutral	disagree	27.54	72.46	2	correct
113	2	neutral	disagree	27.54	72.46	2	correct
125	2	neutral	neutral	15.41	84.59	2	correct
127	2	neutral	neutral	15.41	84.59	2	correct
129	2	neutral	neutral	15.41	84.59	2	correct

131	2	neutral	neutral	15.41	84.59	2	correct
158	2	neutral	agree	8.03	91.97	2	correct
160	2	neutral	agree	8.03	91.97	2	correct
185	2	neutral	agree	8.03	91.97	2	correct
198	2	agree	disagree	13.83	86.17	2	correct
229	2	agree	neutral	7.14	92.86	2	correct
256	2	agree	neutral	7.14	92.86	2	correct
267	2	agree	neutral	7.14	92.86	2	correct
4	2	agree	neutral	7.14	92.86	2	correct
9	2	agree	neutral	7.14	92.86	2	correct
10	2	agree	neutral	7.14	92.86	2	correct
11	2	agree	agree	3.55	96.45	2	correct
13	2	agree	agree	3.55	96.45	2	correct
22	2	agree	agree	3.55	96.45	2	correct
25	2	agree	agree	3.55	96.45	2	correct
26	2	agree	agree	3.55	96.45	2	correct
27	2	agree	agree	3.55	96.45	2	correct
28	2	agree	agree	3.55	96.45	2	correct
42	2	agree	agree	3.55	96.45	2	correct
44	2	agree	agree	3.55	96.45	2	correct
46	2	agree	agree	3.55	96.45	2	correct
50	2	agree	agree	3.55	96.45	2	correct
51	2	agree	agree	3.55	96.45	2	correct
62	2	agree	agree	3.55	96.45	2	correct
63	2	agree	agree	3.55	96.45	2	correct
67	2	agree	agree	3.55	96.45	2	correct
67	2	agree	agree	3.55	96.45	2	correct
68	2	agree	agree	3.55	96.45	2	correct
90	2	agree	agree	3.55	96.45	2	correct
92	2	agree	agree	3.55	96.45	2	correct
94	2	agree	agree	3.55	96.45	2	correct
95	2	agree	agree	3.55	96.45	2	correct
101	2	agree	agree	3.55	96.45	2	correct
132	2	agree	agree	3.55	96.45	2	correct
134	2	agree	agree	3.55	96.45	2	correct
137	2	agree	agree	3.55	96.45	2	correct
138	2	agree	agree	3.55	96.45	2	correct
139	2	agree	agree	3.55	96.45	2	correct
152	2	agree	agree	3.55	96.45	2	correct
154	2	agree	agree	3.55	96.45	2	correct
155	2	agree	agree	3.55	96.45	2	correct
157	2	agree	agree	3.55	96.45	2	correct
159	2	agree	agree	3.55	96.45	2	correct
174	2	agree	agree	3.55	96.45	2	correct
176	2	agree	agree	3.55	96.45	2	correct
180	2	agree	agree	3.55	96.45	2	correct
181	2	agree	agree	3.55	96.45	2	correct
184	2	agree	agree	3.55	96.45	2	correct
193	2	agree	agree	3.55	96.45	2	correct
197	2	agree	agree	3.55	96.45	2	correct
201	2	agree	agree	3.55	96.45	2	correct
204	2	agree	agree	3.55	96.45	2	correct
206	2	agree	agree	3.55	96.45	2	correct
215	2	agree	agree	3.55	96.45	2	correct

216	2	agree	agree	3.55	96.45	2	correct
217	2	agree	agree	3.55	96.45	2	correct
218	2	agree	agree	3.55	96.45	2	correct
219	2	agree	agree	3.55	96.45	2	correct

Note:

GH2 statement: I always follow a healthy and balanced diet.

GH4 statement: It is important to me that my diet is low in fat.

Thai consumers with the collapsed two stages from the Stages of Change model (precontemplation-contemplation-preparation and action-maintain group)

#	Actual TTM group	Statements from FIS, FNS, and HTAS					Calculated probability to be classified		TTM group from predicted model	Validation
		FIS1C	FIS11C	GH2	GH4	NP4	Precontemplation-Contemplation-Preparation	Action-Maintain		
11	1	disagree	disagree	disagree	neutral	disagree	92.37	7.63	1	correct
34	1	disagree	disagree	disagree	agree	agree	50.31	49.69	1	correct
61	1	disagree	disagree	agree	disagree	agree	60.59	39.41	1	correct
102	1	disagree	disagree	agree	neutral	neutral	50.50	49.50	1	correct
153	1	disagree	disagree	agree	agree	neutral	25.34	74.66	2	incorrect
229	1	disagree	disagree	agree	agree	agree	14.54	85.46	2	incorrect
267	1	disagree	neutral	disagree	disagree	neutral	89.75	10.25	1	correct
48	1	disagree	neutral	neutral	neutral	neutral	54.42	45.58	1	correct
124	1	disagree	neutral	agree	agree	agree	7.55	92.45	2	incorrect
177	1	disagree	agree	disagree	disagree	disagree	89.34	10.66	1	correct
245	1	disagree	agree	disagree	disagree	disagree	89.34	10.66	1	correct
323	1	disagree	agree	disagree	disagree	neutral	80.78	19.22	1	correct
16	1	disagree	agree	disagree	disagree	neutral	80.78	19.22	1	correct
37	1	disagree	agree	disagree	disagree	neutral	80.78	19.22	1	correct
59	1	disagree	agree	disagree	disagree	agree	67.82	32.18	1	correct
64	1	disagree	agree	disagree	disagree	agree	67.82	32.18	1	correct
86	1	disagree	agree	disagree	neutral	neutral	58.30	41.70	1	correct
140	1	disagree	agree	disagree	neutral	agree	41.21	58.79	2	incorrect
165	1	disagree	agree	disagree	agree	agree	18.91	81.09	2	incorrect
220	1	disagree	agree	disagree	agree	agree	18.91	81.09	2	incorrect
294	1	disagree	agree	disagree	agree	agree	18.91	81.09	2	incorrect
8	2	disagree	agree	disagree	agree	agree	18.91	81.09	2	correct
15	2	disagree	agree	neutral	neutral	agree	22.32	77.68	2	correct
29	2	disagree	agree	neutral	agree	disagree	27.55	72.45	2	correct
44	2	disagree	agree	neutral	agree	agree	8.73	91.27	2	correct
47	2	disagree	agree	neutral	agree	agree	8.73	91.27	2	correct
50	2	disagree	agree	neutral	agree	agree	8.73	91.27	2	correct

78	2	disagree	agree	neutral	agree	agree	8.73	91.27	2	correct
95	2	disagree	agree	agree	disagree	agree	26.15	73.85	2	correct
98	2	disagree	agree	agree	neutral	neutral	19.02	80.98	2	correct
108	2	disagree	agree	agree	neutral	agree	10.54	89.46	2	correct
109	2	disagree	agree	agree	neutral	agree	10.54	89.46	2	correct
110	2	disagree	agree	agree	agree	disagree	13.49	86.51	2	correct
122	2	disagree	agree	agree	agree	disagree	13.49	86.51	2	correct
130	2	disagree	agree	agree	agree	agree	3.77	96.23	2	correct
135	2	disagree	agree	agree	agree	agree	3.77	96.23	2	correct
172	2	disagree	agree	agree	agree	agree	3.77	96.23	2	correct
174	2	disagree	agree	agree	agree	agree	3.77	96.23	2	correct
176	2	disagree	agree	agree	agree	agree	3.77	96.23	2	correct
196	2	disagree	agree	agree	agree	agree	3.77	96.23	2	correct
197	2	disagree	agree	agree	agree	agree	3.77	96.23	2	correct
217	2	disagree	agree	agree	agree	agree	3.77	96.23	2	correct
12	2	disagree	agree	agree	agree	agree	3.77	96.23	2	correct
13	2	disagree	agree	agree	agree	agree	3.77	96.23	2	correct
14	2	disagree	agree	agree	agree	agree	3.77	96.23	2	correct
17	2	disagree	agree	agree	agree	agree	3.77	96.23	2	correct
20	2	disagree	agree	agree	agree	agree	3.77	96.23	2	correct
38	2	disagree	agree	agree	agree	agree	3.77	96.23	2	correct
39	2	neutral	disagree	agree	agree	agree	5.83	94.17	2	correct
41	2	neutral	neutral	agree	neutral	agree	8.20	91.80	2	correct
43	2	neutral	agree	disagree	disagree	neutral	60.46	39.54	1	incorrect
45	2	neutral	agree	disagree	disagree	agree	43.40	56.60	2	correct
58	2	neutral	agree	agree	neutral	agree	4.11	95.89	2	correct
65	2	neutral	agree	agree	agree	disagree	5.37	94.63	2	correct
66	2	neutral	agree	agree	agree	agree	0.52	99.48	2	correct
68	2	neutral	agree	agree	agree	agree	0.52	99.48	2	correct
71	2	neutral	agree	agree	agree	agree	0.52	99.48	2	correct
79	2	neutral	agree	agree	agree	agree	0.52	99.48	2	correct
80	2	agree	disagree	disagree	disagree	neutral	70.73	29.27	1	incorrect
81	2	agree	neutral	disagree	neutral	neutral	27.84	72.16	2	correct
82	2	agree	agree	disagree	disagree	disagree	52.60	47.40	1	incorrect
85	2	agree	agree	disagree	disagree	disagree	52.60	47.40	1	incorrect
89	2	agree	agree	disagree	disagree	disagree	52.60	47.40	1	incorrect
116	2	agree	agree	disagree	neutral	disagree	26.97	73.03	2	correct
117	2	agree	agree	disagree	neutral	disagree	26.97	73.03	2	correct
118	2	agree	agree	disagree	agree	disagree	10.94	89.06	2	correct

119	2	agree	agree	disagree	agree	agree	3.00	97.00	2	correct
120	2	agree	agree	disagree	agree	agree	3.00	97.00	2	correct
147	2	agree	agree	neutral	disagree	disagree	31.27	68.73	2	correct
148	2	agree	agree	neutral	neutral	agree	3.67	96.33	2	correct
149	2	agree	agree	neutral	neutral	agree	3.67	96.33	2	correct
150	2	agree	agree	neutral	neutral	agree	3.67	96.33	2	correct
180	2	agree	agree	neutral	neutral	agree	3.67	96.33	2	correct
181	2	agree	agree	neutral	agree	agree	1.25	98.75	2	correct
182	2	agree	agree	neutral	agree	agree	1.25	98.75	2	correct
183	2	agree	agree	neutral	agree	agree	1.25	98.75	2	correct
184	2	agree	agree	agree	disagree	disagree	15.72	84.28	2	correct
195	2	agree	agree	agree	disagree	neutral	8.55	91.45	2	correct
200	2	agree	agree	agree	disagree	agree	4.48	95.52	2	correct
201	2	agree	agree	agree	neutral	agree	1.54	98.46	2	correct
202	2	agree	agree	agree	neutral	agree	1.54	98.46	2	correct
203	2	agree	agree	agree	agree	disagree	2.02	97.98	2	correct
210	2	agree	agree	agree	agree	disagree	2.02	97.98	2	correct
211	2	agree	agree	agree	agree	neutral	1.02	98.98	2	correct
212	2	agree	agree	agree	agree	agree	0.52	99.48	2	correct
215	2	agree	agree	agree	agree	agree	0.52	99.48	2	correct
216	2	agree	agree	agree	agree	agree	0.52	99.48	2	correct
221	2	agree	agree	agree	agree	agree	0.52	99.48	2	correct
236	2	agree	agree	agree	agree	agree	0.52	99.48	2	correct
238	2	agree	agree	agree	agree	agree	0.52	99.48	2	correct
239	2	agree	agree	agree	agree	agree	0.52	99.48	2	correct
240	2	agree	agree	agree	agree	agree	0.52	99.48	2	correct
241	2	agree	agree	agree	agree	agree	0.52	99.48	2	correct
251	2	agree	agree	agree	agree	agree	0.52	99.48	2	correct
252	2	agree	agree	agree	agree	agree	0.52	99.48	2	correct
253	2	agree	agree	agree	agree	agree	0.52	99.48	2	correct
254	2	agree	agree	agree	agree	agree	0.52	99.48	2	correct
257	2	agree	agree	agree	agree	agree	0.52	99.48	2	correct
300	2	agree	agree	agree	agree	agree	0.52	99.48	2	correct
302	2	agree	agree	agree	agree	agree	0.52	99.48	2	correct
303	2	agree	agree	agree	agree	agree	0.52	99.48	2	correct

Note:

FIS1 statement: I don't think much about food each day.

FIS11 statement: I do not wash dishes or clean the table.

GH2 statement: I always follow a healthy and balanced diet.

GH4 statement: It is important to me that my diet contains a lot of vitamins and minerals.

NP4 statement: I try to eat foods that do not contain additives.