## HOW DOES KNOWLEDGE AND UTILIZATION OF NUTRITION LABELS DIFFER AMONG INTERNATIONAL AND NON-INTERNATIONAL COLLEGE STUDENTS?

A thesis submitted to the Kent State University College of Education, Health, and Human Services in partial fulfillment of the requirements for the degree of Master of Science

By

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# HOW DOES KNOWLEDGE AND UTILIZATION OF NUTRITION LABELS DIFFER AMONG INTERNATIONAL AND NON-INTERNATIONAL COLLEGE STUDENTS? (124 pp.)

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The purpose of this study was to compare the knowledge and utilization of nutrition labels among international versus non-international college students. It was expected that there would be a difference in knowledge of the nutrition labels between the international and non-international college students. Also, it was expected that there would be a difference in utilization of nutrition labels among international and noninternational college students. An electronic questionnaire was completed by undergraduate and graduate students at Kent State University (n=176). Descriptive statistics were utilized to describe frequencies, standard deviations, and means of all participants' responses. A t test was used to compare the means of the three subscales (nutrition knowledge, nutrition label use, and attitude toward nutrition labels) among the demographic variables. A P-value was selected a priori 0.05 for significance. Correlation between age and the three scales was used to analyze the relationship between age and scores on each of the three scales. A significant difference was demonstrated in the summed total knowledge scores between non-international and International students (P=.001). This study demonstrated a lack of overall nutrition label knowledge and use among college students, suggesting nutritional-related educational strategies for college students are needed.

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## **CHAPTER I**

## **INTRODUCTION**

Increasing numbers of international college students are coming to the United States to pursue their education in different fields of study. Approximately 820,000 international students were enrolled at the United States of America (USA) colleges and universities in the 2012-2013 academic year (DeSilver, 2013). Since the 1960s, the USA has been the main recipient of international college students. In addition, the foreign student numbers are growing rapidly. The State Department issued 65,000 international students visas in 1971, whereas in 2000 they issued 315,000 student visas (Borjas, 2002).

International college students may face new challenges in different lifestyle aspects. One of these challenges is to be responsible for their own nutrition. A number of sociocultural and demographic factors might cause changes in dietary habits of individuals after migration, and some of these factors may cause health complications (Wandel, Råberg, Kumar & Holmboe-Ottesen, 2008). A research study examined gender differences in dietary intake with 19,298 college students from 23 countries. The results showed that females from almost all countries were more likely than males to state avoiding foods with high fat, consuming fruit and fibers, and limiting salt in almost all countries. In addition, women tended to diet more, and care more about healthy eating than men (Wardle, Haase, Steptoe, Nillapun, Jonwutiwes & Bellisle, 2004).

The National College Health Assessment (Hoban, 2009) and the College Health Risk Behavior Survey show that dietary intake and physical activity levels of numerous number of college students do not meet the recommended guidelines; in addition, self-reported weight and height data of college students showed that 29.9% of them are either overweight or obese (Douglas, Collins, Warren, Kann, Gold, Clayton ... & Kolbe, 1997). The rapid increase of obesity among college age individuals is concerning; this raises a need for ways to motivate students to select healthier foods when meal planning and grocery shopping (Berning, Chouinard, Manning, McCluskey, ...& Sprott, 2010).

The highest increase in overweight and obesity has been seen among noninternational adults aged 18-29 years (Mokdad, Serdula, Dietz, Bowman, Marks & Koplan, 1999). This age range is the age of greater than 10 million full-time university students in the USA ("Total fall enrollment," 2003). According to a study, women college students' weight increased during the year period from freshman to senior by 3.7  $\pm$  9.9 pounds, and men gained 9.2  $\pm$  14.1 pounds. Weight changes were extremely variable among students, yet ranging from –29.1 pounds to +46.0 pounds (Racette, Deusinger, Strube, Highstein & Deusinger, 2008).

One way to maintain nutrition health is by using the nutrition labels on packaged foods. The nutrition facts panel has become a necessary tool to use when purchasing foods because of the increase in diet related disease (Drichouti, Lazaridis & Nayga, 2006). According to a research study, most undergraduate students are not aware of the high content of calories, fat, saturated fat, and sodium in foods served by restaurants (Burton, Creyer, Kees & Huggins, 2006). In addition, college female students select lower calorie foods when calorie information is shown than when it is not shown on the

packaged foods, yet males' choices are unaffected (Gerend, 2009). Interestingly, they found that college students prefer foods with nutrition labels, and they use them while purchasing foods in university cafeterias (Kolodinsky, Green, Michahelles & Harvey-Berino, 2008). Another research study found that 95% of college students stated that the nutrition labels are useful; however, many of them disbelieved the nutrition claims. In addition, 70% read the nutrition labels when purchasing a packaged food for the first time only (Marietta, Welshimer & Long Anderson, 1999). According to a study, more than 80% of non-international adults stated paying attention to the nutrition labels; however, less than three-fourths reported using them. In addition, consumers who use the labels are more likely to be younger (25-34), female, white, educated, and following a doctor prescribed low cholesterol or low fat diet (Bender & Derby, 1992). On the other hand, although many people in the European countries seem to understand the nutrition labels, they do not use them often, which may mean that the lack of nutrition labels use is not only due to lack of understanding the labels but also due to lack of motivating individuals to use them (Grunert, Fernández-Celemín, Wills, Bonsmann & Nureeva, 2010).

#### **Problem Statement**

Significant changes in lifestyle occur in college aged young adults (Ha & Caine-Bish, 2009). The food habits young adults adopt when starting college years may influence their own health status and their future families' health (Brown, Dresen & Eggett, 2005). As a result, poor dietary patterns among college students may have a negative effect on their health status, and may lead to diet- related chronic disease (Winkleby & Cubbin , 2004). Apparently, many college students practice unhealthful eating habits such as skipping meals (Huang, Song, Schemmel & Hoerr, 1994), having high energy foods for snacks (Liebman, Cameron, Carson, Brown & Meyer, 2001), and practicing poor dietary patterns to lose weight (Bull, 1988).

In the last several years the colleges and universities in the USA have witnessed dramatic increase in the enrollment of international students. According to DeSilver 2013, there are 819,644 international students at the USA colleges and universities in the 2012-2013 academic year (DeSilver, 2013). Being away from home makes international students responsible for their own nutrition. They may be the one who prepare their own meals or dependent on eating fast food and pre-prepared foods. Depending on fast foods and pre-prepared meals for nutrition may lead the international college students to adopt poor dietary habits which may affect international students' health status later in life.

The aim of the nutrition labeling is to help consumers make healthy dietary choices (Levy & Fein, 1998). However, many people do not use the labels, and those consumers who use nutrition labels use them to avoid specific food components instead of using labels to guide them to healthful eating patterns (Bender & Derby, 1992). Also, nutrition labeling in the USA might not be clear to international students because labeling differs from one country to another. As a result, this may lead to not reading the nutrition labels because the difficulty international students face in understanding the food labels. Often the nutrition knowledge is limited among college students including international college students (Perez-Cueto, Verbeke, Lachat & Remaut-De Winter, 2009). Lack of nutrition knowledge may reduce the effectiveness of nutrition labels use among international and non-international college students (Guthrie, Fox, Cleveland & Welsh, 1995). Currently, there are no studies that focus on international and non-international college students understanding and utilization of nutrition labels which poses a need for studying the issue.

## **Purpose Statement**

The purpose of this study is to compare the knowledge and utilization of nutrition labels among international versus non-international university students.

## Hypothesis

H1: There is a difference in knowledge of the nutrition labels between the international and non-international college students.

H2: There is a difference in utilization of nutrition labels among international and non-international college students.

#### **Operational Definitions**

- Non-international college students: undergraduate or graduate full time American college students.
- International college students: undergraduate or graduate full time foreign college students (worldwide).
- Utilization of Nutrition Labels: college students' use of nutrition labels by answering questions 18-41of the study survey which assess the label use among the participants.

• Knowledge of Nutrition labels: the accuracy of college students to answer the knowledge questions for questions 1-17 of the study survey.

## **CHAPTER II**

## **REVIEW OF LITERATURE**

#### **Overview of Nutrition Labels**

Nutrition labels were innovated to help consumers make healthier food choices (Bonsmann, Celemín & Grunert, 2010). The nutrition labeling on food packages was initiated in the 1970s by the Food and Drug Administration (FDA). It was first used in part due to worries about nutrient deficiencies. In addition, applying nutrition labels on food products was optional except if they added a specific nutrient in a food, or they made any nutrition claim (Taylor & Wilkening, 2008). In 1990, the Nutrition Labeling and Education Act (NLEA) developed regulations to make nutrition labeling mandatory on most food products (Nutrition Labeling and Education Act of 1990, 1990). By 1994, the nutrition labeling that is provided on most food packages became mandatory in the USA. Under the regulations of the NLEA, a 'Nutrition Facts' panel shows nutritional characteristics of nutrients like calories (energy), cholesterol, total and saturated fats, and sodium in a unified format (Variyam, 2008).

### Front-of-pack (FOP) Labeling

FOP was developed to help consumers recognize the nutritional attributes of packed food in a glance (Drewnowski, Moskowitz, Reisner & Krieger, 2010). FOP symbols provide the consumer with the overall nutritional quality of food, while nutrientspecific symbols are intended to show the consumer the information about selected nutrients, such as calories, sugar, fats and sodium (Food and Drug Administration, 2008). In addition, the FOP is not regulated by the FDA (Front-of-Package, 2013).

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## **Organic Labeling**

The Organic Foods Production Act and the National Organic Program (NOP) make sure that the organic food products are produced and certified to meet national organic standards. Food products that contain the term "organic" must meet specific guidelines (Anderson, Young & Perryman, 2010). To consider a food product "100 percent organic", the food must contain only organic ingredients, except for water and salt. Food products that are labeled as "organic" must have at least 95% organic ingredients, except for water and salt ("Organic standards ," 2013). Products that have at least 70% organically produced ingredients consider as "made with organic ingredients" and must list the three organic elements on the principal display panel ("Organic standards ," 2013).

## The Back of the Package

The nutrition facts panel, which is placed on the back of the food products, provides nutrition information, such as saturated fat, trans fat, cholesterol, dietary fiber, and other nutrients that are considered as a major health concern among the population (Anderson, Young & Perryman, 2010) as illustrated in figure 1. Nutrition panels include mandatory and voluntary dietary information. The mandatory nutrition information is total fat, saturated fat, cholesterol, total carbohydrate, dietary fiber, protein, vitamin A, vitamin C, sodium, calcium, and iron. In addition, to the right of each nutrient, the amount of each nutrient is presented for per serving in grams or milligrams. On the other hand, the voluntary dietary information on the food label includes calories from saturated fat, polyunsaturated fat, monounsaturated fat, soluble fiber, insoluble fiber, potassium, sugar alcohol, other carbohydrate, and other vital vitamins and minerals ("A food labelign, 1999). Nutrition facts panel may be provided in many formats, depending on the nutrient content in the product, and the size of the food package ("Nutrition labeling; questions," 2013).

#### **List of Ingredients**

All ingredients in the food must be presented on the nutrition label, as well as standardized foods. Also, the FDA-certified color additives must be included on the labels by name. Ingredients are presented in descending order sorting by weight. Some specific nutrient information is presented, such as source of protein ("A food labelign," 1999). In addition, the food manufacturers should provide information about the top eight food allergies if any of them is included in the food, such as milk, fish, eggs, peanuts, tree nuts, soy, shellfish, and wheat (Anderson, Young & Perryman, 2010).

The Center for Food Safety and Applied Nutrition (CFSAN) of the Food and Drug Administration (FDA) has been studying nutrition labels by using the Food Label and Packaging Survey (FLAPS) (Legault, Brandt, McCabe, Adler, Brown & Brecher, 2004). FLAPS is part of the National Nutrition Monitoring and Related Research Program, which contains activities that give timely information about US populations' nutrient and food intake and nutritional status (Nutrition Monitoring in the United States. Washington DC, 1992).

A study finds that an estimated 96.5% of food products sold yearly regulated by the FDA has nutritional labeling. However, 3.4% of products were exempt from nutrition labeling regulations. An estimated 39% of products had nutrient content claims, and 4.2% of the food products had a health claim (Brecher & Bender, 2000).

## Generally Recognized as Safe (GRAS)

GRAS" is an abbreviation for the phrase Generally Recognized as Safe. Any substance that is purposely added to any food is a food additive, which will be subject to be approved by FDA, except if the substance is generally recognized, among qualified experts, as being safe, or if the use of the substance is excluded from the definition of a food additive. The food substance may be GRAS either through scientific events or, for a substance that was used in food before 1958, through experience based on common use in food (Generally Recognized as Safe, 2014). For instance: FDA consider some common ingredients, such as sugar, salt, vinegar, pepper, baking powder, and monosodium glutamate as safe for their intentional use. For these ingredients to be GRAS substances they have to be made and used with good manufacturing or feeding practice (Substances Generally Recognized as Safe, 2013).

#### **Food Allergy Labels**

The Food Allergen Labeling and Consumer Protection Act (FALCPA), which was founded in January 1, 2006, requires that the food labels on packaged foods containing major food allergens, such as milk, eggs, fish, crustacean shellfish, peanuts, tree nuts, wheat and soy, show the allergen in the ingredient list in parentheses for example, "albumin (egg)" or the word "Contains" followed by the name of the major ingredient allergen for example, "Contains milk, wheat". Such foods must be listed if they exist in any amount, even in colors, flavors, or spice blends. Moreover, industrialists must mention the specific nut (e.g., almond, walnut, cashew) or seafood (e.g., tuna, salmon, shrimp, lobster) that is present in the food (Food labels, 2014).

## Footnote

The Footnote is on the bottom of the nutrition facts label. In Footnote there is some information that tells the consumers that the %DV is based on a 2,000 calorie diet. This statement must be on all nutrition labels; however, the remaining information in the footnote (e.g., total fat, saturated fat, cholesterol, sodium, total CHO, and dietary fiber) may not be on the packaged foods if the size of the nutrition label is too small. The full footnote will always be the same in all food packages because it provides the recommended dietary guidance for all Americans (How to Understand, 2000).

### **Daily Value**

The levels of vitamins and minerals in foods are identified as percentages of the Daily Values (DVs) in the Nutrition Facts panel on food labels in the USA. The DV on the food labels provides the consumers with information about their daily diet and can help consumers to compare different food products. In addition, the DV is used as the basis for health and nutrient content claims found on packaged foods. The DVs shown on current food labels are based on the 1968 National Academy of Sciences RDAs for most vitamins and minerals (Murphy, Spungen, Barraj, Bailey & Dwyer, 2013).

## **Serving Sizes**

Serving sizes on nutrition labels are based on -but not necessarily equal to- the amount of food usually eaten at one time ( which is called the "reference amount") as described by the nationwide food consumption surveys. Serving sizes are based on reference amounts. For example, the nutrition labels use common terms such as table spoon and cup at an amount that is closest to the reference amount for that food. However, for foods which are usually divided when consuming them, such as pizza or cake, the Serving size is a fractional amount the food (e.g., "1/4 pizza"). Foods that are defined as units, such as eggs are typically shown as the number of whole units that are most closely to the reference amount (Herring, Britten, Davis, & Tuepker, 2002). The serving size on the packaged foods influences the number of calories and all the nutrient amounts shown on the top part of the nutrition label (How to Understand, 2000)

## **Voluntary/Exempt Labeling**

Nutrition labels are required for most food products, such as breads, cereals, frozen and canned foods, desserts, snacks, drinks, desserts, etc. (Martha, 2003). On the other hand, voluntary labeling is provided by the FDA in the form of posters (e.g., a medium sized peach contains X amount of fat, calories, etc.) for the 20 most commonly consumed fruit, vegetables and fish. Nutrition information in this case is provided by the grocery stores as posters or leaflets at the point of purchase ("Background information on," 2009). Foods that are exempt from nutrition labeling are, foods without nutrition significance such as plain coffee, tea, and most spices, foods served in restaurants, foods sold in bulk (not for sale proposes), foods served in hospitals, cafeterias, or airplanes, prepared foods on site in the stores (bakery, deli, and candy prepared in stores), food provided by vendors (walkway vendors, cookie counters), foods that are in less than 12 square, yet the seller should provide phone number or an address in order the consumer needs to contact them, and medical foods(Martha, 2003).

## Meat, Poultry and Fish

The Food Safety and Inspection Service (FSIS) edited its labeling regulations on November 7, 2013 to expand the conditions in which particular types of labels and labeling are confirmed. This regulation will be effective by 6<sup>th</sup> of January 2014 and only particular types of labeling will have to be presented to the Agency to get their approval and evaluation ("Labeling that needs," 2013). FSIS is requiring the Federal meat and poultry products to label the single ingredient, uncooked poultry and meat unless if an exception is applied. Also, FSIS is requiring food labeling on all chopped or ground meat and poultry. In addition, if the ground or chopped meat or poultry does not meet the criteria to be shown in the label as "low fat", they may include the lean percentage on the nutrition label with the fat parentage that meets the specific criteria (Almanza, 2010).

## **Dietary Supplements**

The Federal Food, Drug, and Cosmetic Act was amended by the Nutrition Labeling and Education Act of 1990 by making nutrition labels mandatory for most foods including supplements. In 1994 the DSHEA added specific labeling requirements for supplements. FDA implemented the DSHEA on September 23, 1997 by issuing regulations for dietary supplement labeling. The final regulation was published by the FDA on July 11, 2003 that stated labeling requirements for supplements and conventional foods, that will make the appearance of trans fat compulsory in food labels. Five label statements are required on the packages and containers of dietary supplements, which are, the declaration of identity, the net quantity of the dietary supplement, the nutritional labeling, the ingredient list, and the name and site of the producer, packer, or distributor ("Dietary supplement labeling," 2005).

## **New Nutrition Labelling**

The U.S. Food and Drug Administration is updating the Nutrition Fact labels for packaged foods. The updated information reflects the latest scientific data on the association between nutrition and chronic diseases such as obesity and heart disease (Food Labeling, 2014). Some of the proposed updates of food labels are:

- Adding the amount of "added sugars" in a food product
- Updating the serving size requirements to reflect the amounts individuals presently eat
- Adding "dual column" labels to show both "per serving" and "per package" calorie and nutrition information for larger food packages that could be eaten in one sitting or multiple sittings.
- declaring the amounts of potassium and vitamin D on the labels; In addition, vitamins A and C would no longer be required on the food label (CSPI Supports Proposed, 2014)
- Revising the Daily Values for a some nutrients such as sodium, dietary fiber and Vitamin D
- Removing "Calories from Fat" and keeping the information on fat types, such as "Total Fat," "Saturated Fat," and "Trans Fat" on the label
- Emphasizing some elements, such as calories, serving sizes and Percent Daily Value (proposes updates, 2014)

Adding the amount of "added sugars" is because individuals should consume fewer calories from added sugars as they can reduce the consumption of nutrient-rich nutrients while increasing calorie intake (Food labeling: Revision, 2014). The update daily values for nutrients, such as sodium, dietary fiber and Vitamin D. To calculate the Percent Daily Value showed on the food label, the daily values are used, which help individuals in understanding the nutrition information of a total daily diet. In addition, the manufacturers are require to state the amount of potassium and Vitamin D on the nutrition label, because they appear to be the new "nutrients of public health significance." As calcium and iron would remain to be required on the label; vitamins A and C could be shown on the label in a voluntary basis (Proposed changes, 2014). "Total Fat," "Saturated Fat," and "Trans Fat" will be continuing to be required on the food label; however, "Calories from Fat" would be removed since research indicate that the type of fat is more essential than the amount (Food labeling: Revision, 2014).

Changes in the serving size requirements in the new labeling is to reflect how individuals eat and drink these days, which has changed from 20 years ago ,when serving sizes were first established. The food label information on serving sizes should be based on what individuals really consume, not on what they "should" be consuming (Food labeling: Serving Sizes, 2014).

Moreover, it is required that packaged foods, including drinks, which may be consumed in one sitting be considered as a single serving; also, that calorie and nutrient information be shown for the whole packaged food. Manufacturers would have to apply "dual column" for some packaged foods that are larger and could be eaten in either in one sitting or multiple sittings to show both "per serving" and "per package" calories and nutrient information (Proposed changes, 2014).

	Nutrition F	acts	
Start here	Serving Size 1 slice (47g) Servings Per Container 6		
	Amount Per Serving		
Check the 🔶	Calories 160 Calorie	es from Fat 90	
total calories		% Daily Value*	
per serving	Total Fat 10g	15%	
	Saturated Fat 2.5g	11%	
Limit these	Trans Fat 2g		
nutrients	Cholesterol Omg	0%	
	Sodium 300mg	12%	
	Total Carb 15g	5%	
122100000000000000000000000000000000000	Dietary Fiber less than 1g	3%	
Get enough of	Sugars 1g		
	Protein 3g		
	Vitamin A 0%	Vitamin C 4%	
	Calcium 45%	Iron 6%	
	Thiamin 8%	Riboflavin 6%	
	Niacin 6%		
Quick Guide to % Daily Value: 5% or less is low 20% or more	*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.		

*Figure 1:* A sample nutrition facts label, with instructions from the American Heart Association. ("Reading food nutrition," 2013)

### **Nutrition Claims**

There are three types of claims that can be applied on the nutrition labels of food and supplements, which are: the health claims, the nutrient content claims, and the structure/function claims ("Label claims," 2003).

## **Health Claims**

Health claims refers to a relationship between food and certain disease or health disorders. Pre-1984 period, some researchers reported that health claims were oftentimes incomplete, deceptive and caused harmful nutrition knowledge among people (Silverglade, 1991). The NLEA implemented rules that effectively limited the type and number of packaged foods that may have health claim information (Ippoli & Mathio, 1991). FDA must approve the health claims that may be applied on the packages ("A food labeling guide," 1999). An example of a health claim is 'low sodium food may decrease the risk of hypertension' ("Guidance for industry," 2009). A study shows that participants who read the health claims that are presented in the front of the food packages do not care to read the other nutrition information presented in the back of the packages. In addition, when there is a health claim on a food product, the respondents state that the product is healthy and they are more likely to get it (Roe, Levy & Derby, 1999). The data in Appendix A shows the requirements of those health claims that have been accepted for use on food packages and dietary supplement labels.

## **Nutrient Content Claims**

Nutrient content claims show the amount of nutrient or dietary substance in the packaged foods by applying terms like free, high, and low, or by comparing a specific

nutrient in two different products by using expressions such as more, reduced, and lite ("A food labeling guide," 1999). Nutrient content claims may give information in a quantitative form for instance, '300 mg of calcium'. Also, it can be in a form such as "only 100 mg of sodium" ("Guidance for industry:," 2009). In this case it is characterizing the level of the nutrient as low; thus, it needs to follow the criteria of a proper nutrient content claim or include a disclosure. Generally, nutrient content claim rules are used only for nutrients or dietary substances that have Reference Daily Intake (RDI) or Daily Reference Value (DRV) ("Guidance for industry:," 2009). The regulation defines healthy as an implied nutrient content claim that describes a food product that have a healthy amounts of fat, saturated fat, cholesterol and sodium ("Guidance for industry:," 2009). Another category of nutrient content claims is Percentage. These claims characterize the percentage level of an ingredient with no Daily Value. Including simple percentage claims and comparative percentage claims ("Claims that can," 2003). In general, nutrient content claims can be used when the food meets particular nutrient requirements, and it must be approved by the FDA ("Guidance for industry:," 2009).A study with 1,468 participants aged 20 years and older examined peoples thoughts about the reliability of nutrient content claims on packaged foods like, "low cholesterol", "low fat", "healthy" etc. The results shows that older adults with less education, men, and less likely to care about nutrition when grocery shopping are less likely to think that the nutrient content claims are truthful (Rodolfo & Nayga, 2000). The data in Appendix B demonstrates the examples of the Nutrient Content Claims. In addition, Appendix C gives some examples and definitions of the Nutrient Content Claims.

## **Structure/Function Claims**

Structure/Function Claims are the dietary instructions, such as recommendations, and dietary patterns that support health and will being that are provided on labels of packaged foods and dietary supplements, e.g. "calcium builds strong bones" ("A food labeling," 1999). However, these statements are not related to a disease or a health related situations. For instance, "calcium builds strong bones" is a structure/function claim, but "calcium reduces the risk of osteoporosis" is a health claim (Agarwa, Hordvik & Morar, 2006). FDA's approval is not required for these claims as long as they are true and not misleading. However, dietary supplement labels should go through some regulatory procedures when applying such claims ("Guidance for industry" 2002).

#### **Content of Nutrition Fact Label**

The information on the nutrition label is based on one serving size. Furthermore; the information in the top section of the label can vary from one product to another; it shows specific information about the product, including serving size, calories, and nutrient information. The bottom part has a footnote which provides the Daily Values (DVs) for 2,000 and 2,500 calorie diets. The footnote states the recommended dietary intake information for essential nutrients, such as fats, sodium, and fiber. The footnote is provided only on large food packages and remains the same in all food products that have it ("How to understand," 2013).

### **Nutrition Labels for Other Countries**

Based on statutory regulations on nutrition labels, countries could be divided into two broad categories: 1. Mandatory: countries which make nutrition labels mandatory are European Union (EU) member states, United States, Canada, Mexico, Argentina, Brazil, Chile, Colombia, Ecuador, Paraguay, Uruguay, Israel, India, Indonesia, China, Hong Kong, South Korea, Malaysia, Taiwan, Australia and New Zealand. They define what nutrients must be on the labels and on what basis (e.g. per 100 g/per serving). Also, they allow providing voluntary additional nutrition information.2. Voluntary: countries that provide state-sponsored rules to be followed voluntarily, such as Gulf Cooperation Council countries, Venezuela, Turkey, Singapore, Philippines, Thailand, Japan, Kenya, Mauritius, Nigeria and South Africa They define what nutrients must be on the labels and on what basis; however, labelling is not required unless a health or nutrition claim is on the packaged foods or unless the food is for special nutritional uses (Global Update on nutrition labeling, 2013). In all the countries mentioned above, food manufacturers must add the ingredient list on the food labels, in most cases in decreasing order of weight. In addition, few countries require listing the percentage of some of the ingredients (Hawkes, 2004). Based on the Codex guidelines, Costa Rica and the Dominican Republic mandate Quantitative Ingredient Declaration (QUID) when an important ingredient is listed on the label, and when the label shows that a food product has a small amount of an ingredient (Costa Rica Food, 2003) (Dominican Republic Food, 2003). Based on the European Commission Directive 2000/13/EC, European Union Countries mandate a quantitative statement for ingredients in the name of the food product, or for ingredients that are associated with the name of the packaged foods, or stressed in words, pictures or graphics (DIRECTIVE 2000, 2000). Guatemala mandates the percentage of any ingredient to be shown on the food label (Guatemala Food, 2003). In the Republic of Korea, the name of

the main ingredient must be listed on the food label as well as the names of at least the next four major ingredients. These should be shown in descending percentage order (Republic of Korea, 2003). Food labeling in Thailand requires a quantitative declaration of ingredients on all prepackaged foods (Thailand food, 2003). Nutrition labelling became mandatory in Brazil in 2001as an anti-obesity strategy. The Ministry of Health in Brazil ANVISA (the Brazilian Sanitary Surveillance Agency) mandated the declaration of ten nutrients, which are: energy, carbohydrates, protein, total fats, saturated fat, cholesterol, dietary fiber, calcium, iron and sodium (Hawkes, 2004). In December 2003, Brazil passed a new resolution by excluding cholesterol, calcium and iron from the nutrition label and including trans fatty acids. In addition, percentage daily value was changed from 2500 Kcal to 2000 (Resolução, 2003). In Malaysia the Nutrition labelling regulations started in 1985. Nutrition labels were mandatory only for infant formula, children's processed foods, foods for special dietary uses and fortified foods (Tee E-S et al, 2002). In 2000, The Ministry of Health In Malaysia passed new regulations (Malaysia Food, 2003) which required to include the four basic nutrients (energy, protein, carbohydrate and fat) on the label if there is a nutrition claim on the packaged food and on some foods, such as prepared cereal foods; breads; milk and milk products, including sweetened condensed milk and evaporated milk; flour-based foods such as cakes and pastries; canned meats, fish, vegetables, fruit and some fruit juices; salad dressing and mayonnaise; and different types of soft drinks. Also, labelling is required for total sugars per gram of product on soft drinks and sugar confectionery. Labelling of monounsaturated, polyunsaturated, saturated and trans fatty acids is required if there is a

claim regarding fatty acids. However, information of dietary fiber, fatty acids, and cholesterol is voluntary if there is no health claim made. The quantity of nutrients is shown by 100g/100ml, or per package if a packaged food contains a single portion. Moreover, the nutrient expression as per the nutrient reference value set by the Codex instead of the recommended daily intake (Hawkes, 2004).Codex guidelines recommend energy, fat, protein and carbohydrate to be shown on the nutrition labels. Dietary fiber should be listed if a claim is made for dietary fiber and sugars if a claim is made for carbohydrates (Codex Guidelines, 1993)

## **Recommended Dietary Intake of Adults**

Calorie needs of an adult each day vary depending on some factors, such as height, weight, age, gender, and physical activity levels. Estimated total energy needs for female adults ranges from 1,600 to 2,400 and for male adults 2,000 to 3,000 calories each day, depending on physical activity level and age ("Dietary Guidelines for,"2010).

The American Heart Association (AHA) highly recommends adults to consume five or more servings of fruits and vegetables per day as snacks and meals especially dark green, deep yellow or orange fruits and vegetables because fruits and vegetables contain less calories and high amount of nutrients and fiber. Also, AHA recommends adults to consume six or more servings of grain products containing whole grains per day to provide their body with complex carbohydrates, fiber, minerals and vitamins (Krauss, Eckel, Howard, Appel, Daniels, Deckelbaum... & Bazzarre ..., 2000).

Adequate Intake (AI) of trans fatty acids for adults is no more than 2.00 g/day based on 2,000 calorie diet. Daily intake of saturated fats should not exceed 8% of

energy; in addition the majority intake of fatty acids should be obtained from monounsaturated fatty acids (Simopoulos, Leaf & Salem, 1999). According to AHA, adults should consume oily fish at least twice a week. Cholesterol intake should be limited to 300 mg/day by consuming lean meats and vegetable substitutes, skimmed milk or low-fat (1% fat) and reducing the consumption of partially hydrogenated fats (Lichtenstein, Appel, Brands, Carnethon, Daniels, Franch... & Wylie-Rosett, 2006).

The estimated RDA for protein intake for normal adults is 0.8 g protein/kg/day (Trumbo, Schlicker, Yates & Poos, 2002). There is no specific RDI for protein consumption among active individuals; however, the International Society of Sports Nutrition indicates that protein needs for exercising adults' is between 1.4 and 2.0 g/kg/day, depending on type and intensity of the workout, quality of protein, and total calorie and carbohydrate consumption (Fox, McDaniel, Breitbach & Weiss, 2011).

Dietary reference intake (DRI) values for fiber for male adults aged between 19 to 30 years old is 38g/day, and for female adults is 25 g/day. Individuals can obtain theses values by increasing the consumption of fruits, vegetables, whole grains, and legumes which help in reducing obesity in developed countries (Slavin, 2005).

Vitamins and minerals are essential for proper body function. Micronutrients needs differ by age and gender (Drake, 2011). The Adequate Intake (AI) of calcium for adults between 19-50 years is 1000 mg/day. Phosphorus RDA for adults is 700 mg/day. Also, female adults' recommendation of magnesium is 320 mg/day and males requirements is 420 mg. Vitamin D Adequate Intake (AI) recommendations for individuals through age 50 is 5 mg/day (200 IU) (Dickins, 2002). The RDA of Iron

intake for females is 18 mg/day and for males is 8 mg/day. Folate intake according to RDA is 400 mcg for males and females. Recommendations for vitamin A are 3,000 IU/day for females, and 2,333 IU for males. Female adult RDA for vitamin C is 90mg/day, and for male is 75 mg (Drake, 2011).

According to Dr. Kleiner, typical sedentary adult male should consume minimum of 2,900 mL (12 c) fluid each day, and the typical sedentary adult female at least 2,200 mL (9 c) fluid each day, excluding caffeinated and alcoholic beverages (Kleiner, 1999).

USDA recommends all adults to be physically active. In addition, adults should be active for at least 150 min per week (2 hr and 30 min) of moderate intensity, or 75 min per week (1 hr and 15 min) of high intensity aerobic activity or a combination of moderate- and high intensity aerobic activity (Royall, Troiano, Johnson, Kohl, Fulton & Fulton, 2008).

#### Actual Dietary Intake Among College Students

College students may not have an adequate dietary intake (Brevard & Ricketts, 1996). According to a study investigating the dietary habits of students in the medical field, the dietary intake of these students was high in total fat, saturated fat, cholesterol, fiber, and sodium (Troyer, Ullrich, Yeater & Hopewell, 1990). In addition, a research study with 630 participants assessed the nutrition intake of non-international college students by using a questionnaire that assessed their weight status and dietary intake. The results indicated that most of the students did not meet their dietary requirements of food groups per day. Approximately 18% of the students reported eating five servings of fruits and vegetables per day, 7% reported having six or more grain products in their diets, 53% reported consuming two or more dairy products, and 27% stated never or rarely consuming fast foods (DeBate, Topping & Sargent, 2001).

## Non-international College Students' Dietary Intake

Male and female graduate students consumed more grain products high in dietary fiber and fewer amounts of polished grain products than nonstudents. Vegetable intake was low in college students, college graduates, and nonstudents and did not meet the Food Guide Pyramid recommendation of three to five servings each day. For fruits, most adults had juice, such as lemonade, Tang, and orange juice. Male and female nonstudents consumed more high fat meats than students and graduates (Georgiou, Betts, Hoerr, Keim, Peters, Stewart & Voichick, 1997).

Specifically, college female students who joined aerobics classes had nutritionally adequate diets, but may exceeded the recommendations for fat, sugar, and sodium; in addition, most of the participants were following at least one of seven dietary guidelines; nevertheless, no participant was following all dietary guidelines (Jenna, Richard & Boss, 2001).

The majority of college students did not meet dietary and exercise guidelines. Moreover, greater than 96% of students consumed less than five servings of fruits and vegetable each day. Also, more than 67% ate less than 20 g of fiber each day. In addition, students exercised less than 3 days per week (Huang, Harris, Lee, Nazir, Born & Kaur, 2003). Moreover, Racette et al reported that 29% of freshman students had at minimum five servings of fruits and vegetables per day; in addition, fried foods and high in fat fast foods were consumed by 50% of the participants twice a week. By senior year 25% of senior students were not physically active in a regular basis, besides 71% remained eating less than the recommendations of fruit and vegetables (Racette, Deusinger, Strube, Highstein & Deusinger, 2008)

A research study examined the eating habits of college students to improve health education and nutrition programs. 1912 college students participated in the study. The results indicated that 22%, 8%, and 5% of the participants skipped breakfast, lunch, and dinner, respectively; in addition, 80% of the students stated consuming their snacks at least once a day. Most often 40 foods were consumed frequently for meals and snacks which included carbonated beverages, yet few amount of vegetables and fruits. Chicken or turkey, and skimmed milk were ranked in the top 40 foods chosen by the participants while high fat meats and whole milk were not. Moreover, males had more calorie dense and high fat diets, more fast food consumption, yet less vegetable intakes than females (Huang, Song, Schemmel & Hoerr, 1994). In addition, 76% of students consumed the same kind of foods day after day. College students living on campus were more probably to consume the same kind of foods day after day than students living off-campus. Furthermore, 80% of the students' intakes of grains, fruits and vegetables, and dairy products were below the recommendations. Fifty-two percent of the adults limited the intake of fat, and 53.6% avoided fried foods. Females were more likely to limit fat consumption than males (Haberman & Luffey, 1998).

Few differences were observed between eating and exercise habits of freshmen/sophomores and juniors/seniors students aged between 19-25 years old. Generally, 57.1% stated consuming breakfast; 19.9% reported having morning snack;

87.4% said eating lunch; 54.4% stated eating afternoon snack; 95.0% said that they eat dinner; and 72.8% reported getting evening snack. Water, milk, juice, regular sodas, low calorie beverages and sport beverages were consumed in a similar frequency in both groups. In addition, water was the most regularly consumed drink in both groups. Ninety-five percent of freshmen/sophomores students and 91.9% of juniors/seniors students stated consuming meals from fast food restaurants six to eight times every week (Driskell, Kim & Goebel, 2005). Twenty-nine percent of college students during freshman and sophomore years stated not exercising at the freshman year. In addition, 70% consumed less than five servings of fruits and vegetables per day, and greater than 50% of the students consumed fried or high-fat fast foods (Racette, Deusinger, Strube, Highstein & Deusinger, 2005).

Four year college students stated consuming meals more often and having healthier dietary patterns than did two year college students and nonstudents (Nelson, Larson, Barr-Anderson, Barr-Anderson, Neumark-Sztainer & Story, 2009).

Significantly higher percentage of females than males had tried Weight Watchers, reduced fat diets, reduced carbohydrate diets and vegetarian diets. Moreover, significantly greater percentage of males than females stated having never tried a specific diet (Davy, Benes & Driskell, 2006).

#### **International Students Dietary Intake**

Number of sociocultural and demographic factors might cause changes in dietary habits of individuals after migration, and some of these factors may cause health complications (Wandel, Råberg, Kumar & Holmboe-Ottesen, 2008). A study with
sample size of 40,209 university students aged between 18- to 25-year-old showed that full time students were more likely to consume fruit and vegetables than part time students. Also, African American students stated significantly less fruit and vegetable consumption than did Caucasian or Asian participants; moreover, African American and Hispanic participants had lower intake of fruit and vegetables than did other racial/ethnic individuals (Adams & Colner, 2008). On the other hand, a research study surveyed international students from 60 countries reported that the dietary intake of the international students studying at Ghent University in Belgium increased by 35%, 29% and 37% in fruits and vegetables, low fat milk or dairy products and fiber, respectively; moreover, 34% of the respondents stated reducing the consumption of soft drinks, 20% stated decreasing the intake of processed foods, 28% reported eating less red meat and 33% stated consuming less fried foods, sweets, and sugar (Perez-Cueto, Verbeke, Lachat & Remaut-De Winter, 2009).

Female international students were more likely than males to state avoiding foods with high fat, consuming fruit and fibers, and limiting salt in all most all countries. In addition, women tend to diet more, and cared more about healthy eating then men (Wardle, Haase, Steptoe, Nillapun, Jonwutiwes & Bellisle, 2004)

Generally, young Vietnamese, Chinese, and Japanese adults consumed less dietary zinc and calcium compared to the RDAs of their ages. Calcium and dietary fiber intake was low in young and old Asian immigrants. Also, higher fat and cholesterol intake were seen among the young Asians; in addition, the younger population ate at the restaurants three times more than the old Asian population. Moreover, young Asian consumed more Americanized foods, such as fast foods, and drank more juices than the other group. As a result of acculturation, younger Asian replaced the positive dietary habits of their food by the negative dietary patterns of the Western diets, including foods high in fat and cholesterol, and low in fiber (Wu-Tso, I-Li & Tam, 1995). Asian immigrant individuals' diet post immigration was relatively low in fat, high in carbs and fiber. When comparing the individuals' diet pre-immigration and post-immigration, they found significant increase in the consumption of cholesterol, saturated fat, and monounsaturated fat; on the other hand, they noticed a decrease in the consumption of carbohydrate and fiber. Although the intake of fat and cholesterol increased among Asian immigrants, their diet is relatively low in fat, and high in carbohydrate and fiber when comparing it with non-international college students' diet (Yang & Read, 1996). Forty-six percent of Asian college students skipped breakfast due to their university schedules. Most of the students were eating more sweet and salty snacks. When eating out, they selected American style foods. The consumption of fats, sweets, fruits, and milk products increased significantly, whereas the consumption of vegetables and meat/meat alternatives significantly decreased after living in the USA (Pan, Dixon, Himburg & Huffman, 1999)

Specifically, individuals from Thailand living in the USA had significantly decreased the number of meals and snacks eaten each day, and food eaten outside the home changed from Thai to American. The Mean daily intake frequency of food groups while living in the USA were 3.8 vegetables; 2.2 fruits; 3.5 bread; 3.9 fats and sweets; 1.6 milk; 3.6 meat; 2.2 beverages; and 0.9 Thai foods. Thai population behaved similarly to

the individuals from other countries living in the U.S.A, and they appeared to be adjusting well nutritionally (Sukalakamala & Brittin, 2006).

Kuwait female college students, aged between 20-30 years nutrient intake met the two thirds of the RDA levels recommendations for all nutrients except, vitamin D, zinc, folacin, and iron. Also, on average, most of the female students met or exceeded their intake of vitamin C, vitamin A, riboflavin, thiamin, vitamin B6, niacin, protein, and phosphorus. In addition, the students diet were low in fiber, high in sugar, caffeine, and slightly high in cholesterol (Al-Shawi, 1992).

The dietary habits of female college students from United Arab Emirates was measured indicating that 15.8% of the students skipped breakfast, 11.2% skipped lunch, and 7% skipped dinner. Most of the students (66.5%) skipped the morning snack, and around 38% of them skipped the evening snack (Musaiger & Radwan, 1995). In addition, many Emirati young adults consumed energy dense foods while watching television and did not exercise in a regular basis (Musaiger, Lloyd, Al-Neyadi & Bener, 2003). Generally, Emirati males and females over 20 years old consumed low amount of fresh fruit, vegetables, and milk. In addition, traditional foods were eaten the most by the older people. The consumption of vegetables, chicken, eggs, bread, cheese, and tea with milk were significantly higher among females than males (Musaiger & Abuirmeileh, 1998).

Many Saudi Arabian college students had breakfast at least three times each week. The majority of students (55.7%) consumed two meals each day, whereas 31.4% of the students consumed three meals a day. Thirty-one percent of the students had

snacks in a daily bases. Dates were consumed at least three times weekly by 60.5% of the students. In addition, 32.2% of the students reported rarely eating vegetables, and 36% reported hardly consuming fruits. Fried foods were consumed by 46.8% of the students at least three times a week (Al-Rethaiaa, Fahmy & Al-Shwaiyat, 2010). Female college students aged between 17-25 years from nursing program from Saudi Arabia and neighboring Gulf countries consumed diets rich in calories and carbohydrates, such as regular soda, chocolates, and sweets and low in protein, fiber, and minerals. Fruit and vegetables were rarely consumed by them, while fast food consumption was high among this group (Rasheed, 1999).

Unhealthy eating and being physically inactive were one of the most frequently occurred risk behaviors among college students at University of Beirut. Seventy-five percent of the adults consumed less than five servings of vegetables and fruits daily. Also, 64.5% of the students did not consume more than two servings of milk or dairy products. Thirty-seven percent of them consumed two or more servings of sweet daily (Shediac-Rizkallah, Afifi Soweid, Farhat & Yeretzian, 2001).

A research assessed the dietary intake of 119 female nutrition students in São Paulo, Brazil. The results showed inadequate consumption of folate, zinc, calcium, and copper (Morimoto, Marchioni & Fisberg, 2006).

Food intake frequency differed by country and sex. The intake of snacks, sweets, cakes, and fast food was higher in Bulgarian adults than in Germany and Poland. The intake of cakes and sweets was more common among females, whereas the consumption of fast food was higher among males. Consumption of fruit, vegetables, dairy products,

and cereals was slightly higher among women, while the intake of soda/lemonade, fish, and meat was more common among men (Mikolajczyk, El Ansari & Maxwell, 2009). Furthermore, a research surveyed college students from 13 European countries in 1990 and repeated the survey in 2000. In 1990, 49% of males and 64% of females consumed fruit every day; however, by 2000 the percentage fell to 42 and 54%. Changes in fat consumption were slighter. In general, 27% of males and 46% of females stated limiting fats in 1990; on the other hand, 24 and 46% stated limiting fats in 2000. The most reduction in fat intake was found among males from Germany, females from The Netherlands, and males and females. In general, 76% of males and 65% of females had exercised no less than once over two weeks in 2000, and 72% males and 62% females in 1990 (Steptoe, Wardle, Cui, Bellisle, Zotti, Baranyai & Sanderman, 2002).

Undergraduate nutrition department students from Dunedin, New Zealand had high protein consumption, especially males. Around 34% of the energy intake came from fat in their diets. Intake of fiber, cholesterol, and alcohol were higher among males than females. Nutrient intake among males was above the recommendations. However, among females, mean consumption of calcium, iron, magnesium, zinc, copper, and vitamin B6 were below the recommendations. Dietary supplements were consumed regularly no less than once a week by 7% of males and 16% of females (Horwath, 1991).

Moving from home did not have a measureable impact on the dietary patterns of a sample of Greek undergraduate college students. Although the participants, who left their families home, made some good changes in their diets, they reduced the intake of

fish, seafood, fruits, raw and cooked vegetables, olive oil, and increased the consumption of fast foods, sugar, alcohol, and wine. Students who moved from home developed more negative eating patterns than students living with their families (Papadaki, Hondros, A. Scott & Kapsokefalou, 2007).

Many Sri Lankans adults who are living in Norway increased their intake of butter, margarine, milk, meat, and potatoes. On the other hand, about the half of immigrants from Pakistan increased intake of potatoes, fish, meat, and oil. In addition, both groups reduced the consumption of bean and lentil (Wandel, Råberg, Kumar & Holmboe-Ottesen, 2008).

Asian Indian immigrants prefer Indian foods, yet they still consume American foods. They mostly have American foods when they are with their non-international friends because they fear that their non-international friends will not like Indian meals. In addition, Indian populations who have been in the USA longer time consumed more American foods (Mehta & Belk, 1991).

# Concerns of Poor Dietary Intake and Lack of Nutritional Knowledge Effect of Poor Diet

In the past several decades the rate of obesity increased rapidly among adults in the USA (Ollberding, Wolf & Contento, 2010). It is well documented that weight gain in young adults as a result of poor diets may increase the risk of chronic diseases, such as cardio vascular disease and diabetes in males and females (Hubert, Feinleib, McNamara & Castelli, 1983). The weight gain seen in college freshmen is significantly greater than that detected in the general population (Levitsky1, Halbmaier1 & Mrdjenovic, 2004). In general, the combination of genetic factors and lifestyle including low physical activity levels and high calorie intake leads to obesity (Sowers, 2003).

Snacks with high fat have been seen as a main source of fat consumption among non-international adults (Block, Dresser, Hartman & Carroll, 1985). People most often crave energy dense snacks, such as sweets, chocolates, and high in fat, high in sodium snacks which may be hard for some individuals to curtail their consumption of snacks (Rodin, Mancuso, Granger & Nelbach, 1991) (Weingarten & Elston, 1991).

Poor diets and low physical activity levels might soon overtake smoking as the leading cause of mortality (Mokdad, Marks, Stroup & Gerberding, 2004). Significant weight gain has been seen among freshman college students as a result of changes in their dietary habits (Levitsky, Halbmaier & Mrdjenovic, 2004).

#### Lack of Nutritional Knowledge

Lack of basic nutrition knowledge about energy requirements has been documented among many individuals regardless of race, level of education, age, or being in a health related area (Headrick, Rowe, Kendall, Zitt, Bolton & Langkamp-Henken, 2013).

In 1988, individuals with greater nutrition knowledge were those who were more educated, white, old adults, and those who were following low cholesterol diets. Overall, people's knowledge about fats and cholesterol was poor (Levy, Fein & Stephenson, 1993). Individuals with lower education levels may face more barriers to healthy eating than those with higher education. In addition, people with lower nutrition knowledge believe that it is difficult to follow healthy eating patterns (Harnack, Block, Subar, Lane & Brand, 1997).

According to a study, nutrition knowledge is significantly associated with healthy eating patterns. Individuals with higher nutrition education are 25 times more likely to get their requirements of fruit, vegetables, and fat consumption than those with lower nutrition knowledge (Wardle, Parmenter & Waller, 2000). In general, most people underestimate their calorie requirements; however, obese people, men, current dieters, individuals with low activity levels underestimate their energy needs to the greatest extent (Headrick, Rowe, Kendall, Zitt, Bolton & Langkamp-Henken, 2013).

Health cares need to pay more attention to educate individuals on nutrition and healthy eating to help them reach their personal food goals that enable people to have healthier and higher quality of life (Worsley, 2002).

#### **Purchase Behaviors and Food Choices**

# **Purchase Behaviors**

Consumers prefer easy nutrition information on food packages (Mö, ser, Hoefkens, Camp & Verbeke, 2010). In two studies, the effect of eight front-of-pack food labelling formats that differed in complexity was examined across four European countries. Participants spent significantly less time reading simpler front-of-pack labelling compared to the more complex food labelling format. Therefore, simpler frontof-pack labelling formats seem to be more suitable in a grocery shopping environment (Feunekes, Gortemaker, Willems, Lion & van den Kommer, 2008). Consumers when grocery shopping take few minutes to choose between similar products for final dissection, and usually they use shortcuts (e.g., "light"claim) because they are more clear and quick to understand when reading the labels (Gracia, Loureiro & Nayga, 2009). In addition, they found that women prefer using the nutrition labels more than men in Germany and Belgium (Mö, ser, Hoefkens, Camp & Verbeke, 2010).

There are several factors that may determine consumers' attention to the nutrition labels on food packages which are, display size, colors, familiarity with the nutrition labels and their locations on the food products (Bialkova & van Trijp, 2010). In addition, most individuals use nutrition labels to compare the nutrients of two or more food packages of the same type (Higginson, Kirk, Rayner & Draper, 2002).

Consumer's utilization of nutrition labels increase when the nutrition information is presented and nutrition claim is provided only if the product is less healthy. If the claim on a food package provides information already known by the consumer, the utilization of this claim became non-significant. Therefore, the health claim should provide extra information (Barreiro-Hurle, Gracia & de-Magistris, 2010).

Consumers value food products with nutrition labels more than products with no nutrition information. In addition, consumers' valuation of food products with nutrition labels can vary depending on the kind or amount of information on the nutrition label. Moreover, prices of the food products may affect consumers' valuation of the products (Drichoutis, Lazaridis & Nayga, 2009).

Asian Indian consumers prefer familiar packaged foods when purchasing foods. They have more positive attitudes toward packed foods like dairy products, soda, cereals, snacks, and backed products; however, they do not prefer to purchase foods like processed meat, fruits, or vegetables (Choo, Chung & Pysarchik, 2004).

# **Food Choices**

There are many factors that influence food choices among people, such as interpersonal, individual, institutional, and macro system influences (Nelson, Story, Larson, Neumark-Sztainer & Lytle, 2008).

According to a study, one half of the participants consumed more than their requirement of grains, while they consumed less than their requirements of fruit, vegetables, and dairy. In addition, most of the people consume more than their needs of salt, and prefer to eat salty foods (Dorresteijn, Graaf, Spiering & Visseren, 2013). Also, men tended to eat more protein than women. Females' consumed less portion than their requirements, yet males exceeded their requirements of protein (Kolodinsky, Harvey-Berino, Berlin, Johnson & Reynolds, 2007).

Asian college students in the USA consume more sweet and salty foods for snacks. In addition, they prefer to choose American foods when eating out (Pan, Dixon, Himburg & Huffman, 1999). Particularly, Japanese individual's intake of meat is high; however, fruit and vegetable consumption is lower than the requirements, and grain consumption, such as rice and cereals seemed to be low. In addition, Japanese population prefers processed foods with high fat, protein and sodium, and most of them cook using pure vegetable oils (Ko, Lee, Guldan, Chan, Chan, Hui... & Shing, 1995).

College students' consume less fruit and vegetables, and lots of soda beverages. They prefer to eat chicken or turkey more than high fat meats; also, they prefer to consume low fat milk rather than whole milk. In addition, males consume less vegetable and more fast foods than females (Huang, Song, Schemmel & Hoerr, 1994). Many college students eat foods from the university dining halls, and consume fast foods and high dense snacks (Levitsky, Halbmaier & Mrdjenovic, 2004). In the freshman year, most students prefer to eat fried and high fat fast foods, and fewer prefer to eat five servings of fruit and vegetables (Racette, Deusinger, Strube, Highstein & Deusinger, 2005). When comparing the food choices of college students and nonstudents adults, they found that college adults consumed more grain products high in fiber, more fruit and vegetables, especially dark green vegetables, and consumed more reduced-fat milk and protein than nonstudents (Georgiou, Betts, Hoerr, Keim, Peters, Stewart & Voichick, 1997).

A study looked at the underling factors of food choices. They found that food choices had a moderate correlation with familiarity, ethics, health concerns, mood, weight control, price and convenience (Steptoe, Pollard & Wardle, 1995).

#### **Use of Nutrition Labels**

Nutrition labels are provided on food packages to promote healthy eating by providing nutrition facts so that consumers can make the best dietary choices (Lin, Lee, Yen & Yen, 2004). When calorie information is provided on food packages, females tend to choose lower calorie foods; however, males' selection is not effected (Gerend, 2009). A study showed that college students were interested in having the nutrition information on food provided by the university food court. In addition, they were mostly looking at the calories and fat content in the foods; also, price and convenience were important to them as will (Kolodinsky, Green, Michahelles & Harvey-Berino, 2008). Limited individuals use the specific information provided on food labels; in addition, most often nutrition information used by people are total fat, energy from fat, energy, and serving size; on the other hand, the least likely used information are vitamin A, iron, and fiber (Misra, 2007).

According to a research, 78% of the college students read the nutrition labels when they bought packaged foods. Food labels use was significantly higher among females, older, highly educated, and obese individuals. The strongest psychosocial predictors of food label use were eating healthy, strongly believing in the relationship between diet and cancer, and losing weight. In addition, most label users had greater fruit and vegetable intake and lower fat consumption (Satia, Galanko & Neuhouser, 2005). On the other hand, a study showed that people do not pay attention to the nutrition labels; therefore, they don't help in choosing healthy food. In addition, they found that trafficlight labels particularly logos improve healthy food product choice, even when customers are in hurry (Van Herpen & van Trijp, 2011).

The utilization of nutrition labels on the fact panel or the claim labels influence consumer's selection by choosing healthier food products (Barreiro-Hurlé, Gracia & de-Magistris, 2010). According to Variyam, individuals who use nutrition labels have healthier intakes of all nutrients then those who don't use them except for energy and sodium intake. In addition, the investigator reported that the benefits cannot be fully attributed to their usage of the nutrition labels (Variyam, 2008). Moreover, another study investigated the association between the consumption of total fat, saturated fat, and cholesterol and psychological or demographic factors and the search of these three nutrients on nutrition labels. The Psychology literature of the study suggests no association between consumption of these nutrients and the probability of looking for their information on nutrition labels. Results of the study suggest that individuals, who have high intake of total fat, saturated fat, and cholesterol, are less likely to search for the three nutrients, respectively (Lin, Lee, Yen & Yen, 2004).

Individuals with type2 diabetes, high presser, and hyperlipidemia, or any combination of these diseases tend to read nutrition labels more than individuals with no disease. Persons with these disease who had been advised by their doctors or any other health provider to reduce their calorie intake or lose weight were significantly more likely to use the food labels than those who had not been advised (Post, Mainous, Diaz, Matheson & Everett, 2010). Across six European countries, understanding of food labels seems to be more prevalent than use, suggesting that lack of nutrition knowledge is not the only reason to not use the nutrition labels but also motivation (Grunert, Fernández-Celemín, Wills, Bonsmann & Nureeva, 2010).

Some consumers evaluate the food as healthier if it has a health claim, and this may prevent them from looking for more detailed information. In addition, consumers do not clearly differentiate between nutrient content, structure-function, and health claims (Williams, 2005). Also, health claims may enhance the quality of food choices and the knowledge of diet related disease relationships (Williams, 2005). Consumers do not infer any other health advantages from health claims and the health claim is not likely to affect any unrealistic positive implications in the food product quality (Lähteenmäki, Lampila,

Grunert, Boztug, Ueland, Åström & Martinsdóttir, 2010). A study reported that most consumers (78%) compared between two different products accurately, (58%) accurately assessed the nutrient level claims, and (20%) calculated the influence of a single food to a daily food intake accurately (Levy & Fein, 1998).

A study found that providing nutrition information on restaurant menus drew the attention of the consumers to have healthier food choices. Consumers were looking mostly for foods low in fat, and they were willing to pay more for healthier meals when the nutrition information was presented (Hwang & Lorenzen, 2008). Although the majority of adults think that nutrition labels are useful and easy to understand, many distrust the truthfulness and accuracy of the labels (Misra, 2007).

In summary, Food labels use is significantly greater among females, individuals younger than 35 years, and individuals with higher than high school education. Moreover, nutrition label use is significantly associated with lower fat consumption; however, is not associated with the intake of fruit and vegetables (Neuhouser, Kristal & Patterson, 1999).

#### **Reasons of Not Reading the Nutrition Labels**

Reading the Nutrition Labels can help people make wise choices; however, some people face combination of factors that distract their grocery shopping, such as large number of food products, time and noise (Feunekes, Gortemaker, Willems, Lion & van den Kommer, 2008). A reason that was existed in1989 may also be the case in the present, that the nutrition labels were difficult to interpret by the public, not provided in all foods; thus, not very useful. Also, many consumers use the labels to compare between two or more food brands instead of using them to improve their diet's quality (Guthrie, Fox, Cleveland & Welsh, 1995). Sociodemographic characteristics and economic conditions are also factors that may affect the use of the food labels (Besler, Buyuktuncer & Uyar, 2012).

Some individual characteristics seem to effect reading the nutrition labels. Younger individuals, males, and individuals with lower education levels are less likely to read the nutrition labels (Satia, Galanko & Neuhouser, 2005). On the other hand, a study showed that well educated, young, and females may value and use the nutrition labels more when shopping for foods (Rodolfo & Nayga, 2000). In addition, people who do not care about nutrition when shopping for food are less likely to trust the reliability of the nutrient content claims (Rodolfo & Nayga, 2000). In general, consumers do not prefer complex and long, scientifically written claims on food packages; yet they like more split claims with a brief statement of the claim on the front of the food package (Williams, 2005).

Lack of nutrition knowledge among individuals reduces the effectiveness of nutrition labels use. In addition, many people use the labels to avoid specific food components rather than following healthy eating patterns (Bender & Derby, 1992).

A research showed that participants did not like complex flags on food packages which included references of daily needs or physical activity needs and the flags with phrases referring to balanced diets. Also, some of the individuals could not understand the nutrition labels of other nations (Kleef, Trijp, Paeps & Ferna ndez-Celemin, 2007). Consumers who consume more total fat, saturated fat, and cholesterol are less likely to search for these nutrients. Moreover, the use of labels is related to individuals knowledge of nutrition and facts, individuals ability to use the labels, the importance of nutrition when shopping for foods, the importance of following a healthy diet, and the awareness of relating between excessive consumption of some nutrients and health consequences (Lin, Lee, Yen & Yen, 2004).

Some individuals think that there is no need to use the nutrition labels, and they can trust their ability to choose nutritious food items without using the food labels. Also, some people believe that they do not have time to read the information on the food labels when shopping for foods, and they usually buy certain brand-name food products (Klopp & MacDonald, 1981). Others think that detailed information on food labels is confusing (Feunekes, Gortemake, Willems, Lion & Kommer, 2008).

Interestingly, some consumers do not use the food labels because they think that the information on the labels will not change their minds about the food items they usually select (Driskell, Schake & Detter, 2008). In addition, individuals are more likely to have foods that they think are "tasty" (Glanz, Basil, Maibach, Goldberg & Snyder, 1998) and this impact their food selections regardless of the food labels (Driskell, Schake & Detter, 2008).

# **CHAPTER III**

#### **METHODS**

The purpose of this study was to compare the knowledge and utilization of nutrition labels among international versus non-international college students. The research hypotheses are:

H1: There is a difference in knowledge of the nutrition labels between the international and non-international college students.

H2: There is a difference in utilization of nutrition labels among international and non-international college students.

# **Research Design**

The study was a quantitative investigation with a two group post-test only design. The study compared the knowledge and utilization of the nutrition labels between the two groups (i.e., non-international college students and international college students). Independent variable was Nationality (with two levels non-international and international). Dependent variables were knowledge and utilization of nutrition labels.

#### **Data Collection Instrument**

An internet based questionnaire (Appendix D) was used to collect participant responses using Qualtrics Survey Software. The questionnaire was prepared based on a previous research paper conducted by Misra (2007) with some modifications to be suitable for this study.

The questionnaire consisted of four parts which were nutrition knowledge, nutrition label use, attitude toward nutrition labels, and demographic Information.

# Part One

Nutrition knowledge was the first section which included the first 17 questions of the survey utilized by the Label Reading Survey (Marietta, Welshimer & Long Anderson, 1999). In addition, other questions were added to this section to ask the participants about energy per gram, % Daily Value, serving size and ingredient list to make the questions more comprehensive for assessing participants' nutrition knowledge.

# Part Two

Nutrition label use was the second section which included questions 18-41. It consisted of questions which measured college students' use of nutrition labels and specific information from the Nutrition Facts panel. The question "Do you look at nutritional facts labels on foods when you buy food packages?" was used to assess the general utilization of nutrition labels. Specific items used from the labels by the respondents were identified by listing some items (e.g. serving size, sugar, total fiber) so that the respondents picked the ones that they looked for by choosing one of the following options, (0 never, rarely1, occasonally2, often3, always4) based on the Label Reading Survey (Marietta, Welshimer & Long Anderson, 1999). The higher the score was the higher the use of that specific item was.

# Part Three

Attitude toward nutrition labels was the third section which included questions 42-46. This section of the questionnaire measured college students attitude toward the labels by using a Likert scale with five items (where 5 was strongly agree and 1 was

strongly disagree) with respect to the precision, trustiness and usefulness of the labels based on the Label Reading Survey (Marietta, Welshimer & Long Anderson, 1999) and summed up the scores for attitude assessment; the positive attitude toward nutrition labels was represented by a higher score.

# **Part Four**

The last section included demographic information such as self-reported sex, age, education degree, weight, height, smoking status (0 none, 1 occasionally, and 2 frequently), physical activity levels (0 no, 1 occasionally, 2 one to three times/week, and 3 at least five times/week). Also, the question "Do you use the Nutrition Labels in your home country?" was included to assess the international students' use of nutrition labels in their home countries. The last section also included the question "have you ever read, heard, or been taught how to use food label information?" to assess the prior nutrition education by answering with yes or no. The last question of the survey asked the participants if they heard about the new updates of the nutrition labels, and if they did, did they like it better than the current one.

#### Sampling

Convenience sampling was used in this research to sample number of students studying at Kent State University (KSU) (half non-international students and the other half International students). Due to the variety of methods used to recruit participants; there is not an accurate count of numbers contacted. Respondents for the noninternational college students group were recruited through an e-mail which included a link that gave the participant access to the survey. The students' emails were obtained through the help of graduate and undergraduate studies departments. Participants for the international students group were obtained through the help of the Office of Global Education at KSU, and through internet social media, such as Facebook where international college students of KSU participate. Participants were assured that their participation was anonymous.

Non-international (American) and international (worldwide) educated young adults enrolled in full time undergraduate and graduate programs at KSU were eligible to participate in the study. Participants who were nutrition major students were excluded.

#### Procedure

One hundred and seventy-six undergraduate and graduate students completed the study survey (108 non-international college students and 68 international students) at KSU after getting the projects approval from the Institutional Review Board (IRB) of KSU (Appendix E). Informed consent was obtained from each participant before enrollment in the study (Appendix F). Data was collected using a self-administered questionnaire. The questionnaire was in English and was electronic based using Qualtrics Survey Software (2014, Version 58,612). The participation in the study was voluntary and anonymous. Twenty randomly selected participants had a chance to win a \$5 reward card after providing their email addresses.

#### **Scoring of Questionnaire**

The Nutrition label questionnaire consisted of four parts which were nutrition knowledge, nutrition label use, attitude toward nutrition labels, and demographic information.

# Part One

Nutrition knowledge was the first section which included the first 17 questions of the survey. Total knowledge scores were calculated by summing the number of correct responses to questions 1-17. Higher scores indicated more knowledge about nutritional information, with maximum score of 17 if the participant got all the answers right.

# Part Two

Nutrition label use was the second section. Labels utilization scores were calculated by summing the responses from questions 18-41. Higher scores indicated a higher level of utilization of the nutrition labels with maximum score of 96 in case the participant answered all of the utilization questions by choosing "always".

# Part Three

Attitude toward nutrition labels was the third section. It was calculated by summing the scores of questions 42-46. The items were recorded, so higher scores indicated more agreement with the statements with maximum score of 25 in case the participant chose "Strongly agree" in all of the five parts of the attitude questions.

# **Part Four**

Demographic information was the last section of the survey. Descriptive statistics were utilized to describe frequencies, standard deviations, and means of participants' responses for demographic data.

#### **Data Analysis**

Demographic data, participants' nutrition knowledge, nutrition label use, and attitude toward nutrition labels summed scores were entered into the SPSS software version 21.0 (IBM, New York) with a P-value selected a priori 0.05 for significance.

An independent *t* test was used to compare the means of the three subscales among the demographic variables which were nutrition knowledge, nutrition label use, and attitude toward nutrition labels. Person Correlation between age and the three scales (nutrition knowledge, nutrition label use, and attitude toward nutrition labels) were used to analyze the relationship between age and scores on each of the three scales.

Descriptive statistics were utilized to describe frequencies, standard deviations, and means of participants' responses for demographic data, nutrition knowledge, nutrition label use, and attitude toward nutrition labels scores between groups and as whole.

#### **CHAPTER IV**

#### JOURNAL ARTICLE

#### Introduction

Significant changes in lifestyle occur in college aged young adults (Ha & Caine-Bish, 2009). The food habits young adults adopt when starting college years may influence their own health status and their future families' health (Brown, Dresen & Eggett, 2005). The highest increase in overweight and obesity has been seen among adults aged 18-29 years (Mokdad, Serdula, Dietz, Bowman, Marks & Koplan, 1999). This age range is the age of greater than 10 million full-time university students in the USA ("Total fall enrollment," 2003). Poor dietary patterns among college students may have a negative effect on their health status, and may lead to diet- related chronic disease (Winkleby & Cubbin, 2004).

In the last several years the colleges and universities in USA have witnessed dramatic increase in the enrollment of international students. According to DeSilver 2013, there are 819,644 numbers of international students at the USA colleges and universities in the 2012-2013 academic years (DeSilver, 2013). International College students may face new challenges in different lifestyle aspects. One of these challenges is to be responsible for their own nutrition. A number of sociocultural and demographic factors might cause changes in dietary habits of individuals after migration, and some of these factors may cause health complications (Wandel, Råberg, Kumar & Holmboe-Ottesen, 2008). Currently, there are no studies that focus on international and non-

international college students understanding and utilization of nutrition labels which poses a need for studying the issue.

One way to maintain nutrition health is by using the nutrition labels on packaged foods. Nutrition fact panel has become a necessary tool to use when purchasing foods because of the increase in diet related disease (Drichouti, Lazaridis & Nayga, 2006). The aim of the nutrition labeling is to help consumers make healthy dietary choices (Levy & Fein, 1998). However, many people do not use the labels, and those consumers who use nutrition labels use them to avoid specific food components instead of using labels to guide them to healthful eating patterns (Bender & Derby, 1992). In addition, nutrition labeling in the USA might not be clear to international students because nutrition labels differs from one country to another. As a result, this may lead the international students to not read the nutrition labels because of the difficulties they may face in understanding the American food labels. Moreover, the nutrition knowledge is limited among college students including international and non-international college students (Perez-Cueto, Verbeke, Lachat & Remaut-De Winter, 2009). Thus, lack of nutrition knowledge may reduce the effectiveness of nutrition labels use among international and non-international college students (Guthrie, Fox, Cleveland & Welsh, 1995).

The purpose of this study was to compare the knowledge and utilization of nutrition labels among international versus non-international college students. In the present study, the research hypotheses were (1) that there would be a difference in knowledge of the nutrition labels between the international and non-international college students; and (2) there would be a difference in utilization of nutrition labels among international and non-international college students.

#### Methodology

During the spring and fall of 2014, 176 college students between the ages of 18 and 43 years who were enrolled in Kent State University (KSU) classes participated in the study (graduate and undergraduate students). Non-international (American) and international (worldwide) educated young adults enrolled in full time undergraduate and graduate programs at KSU were eligible to participate in the study. Participants who were nutrition major students were excluded. The study population consisted of undergraduate and graduate students from various majors. Participants were told that the purpose of the study was to obtain data to compare between the knowledge and utilization of the nutrition labels between the two groups which were non-international college students and international college students.

This research was approved by the KSU Institutional Review Board, and informed consent was obtained from each participant before enrollment in the study. The study was a quantitative investigation. Post-test only design was used to compare between the knowledge and utilization of nutrition labels between the two groups. Independent variable was nationality (with two levels non-international and international). Dependent variables were knowledge and utilization of nutrition labels. An internet based questionnaire was used to collect participant responses using Qualtrics Survey Software. The questionnaire was prepared based on a previous research paper conducted by Misra (2007) with some modifications to be suitable for this study.

The questionnaire consisted of four parts which were nutrition knowledge, nutrition label use, attitude toward nutrition labels, and demographic Information.

# Part One

Nutrition knowledge was the first section which included the first 17 questions of the survey utilized by the Label Reading Survey (Marietta, Welshimer & Long Anderson, 1999). In addition, other questions were added to this section to ask the participants about energy per gram, % Daily Value, serving size and ingredient list to make the questions more comprehensive for assessing participants' nutrition knowledge.

# Part Two

Nutrition label use was the second section which included questions 18-41. It consisted of questions which measured college students' use of nutrition labels and specific information from the Nutrition Facts panel. The question "Do you look at nutritional facts labels on foods when you buy food packages?" was used to assess the general utilization of nutrition labels. Specific items used from the labels by the respondents were identified by listing some items (e.g. serving size, sugar, total fiber) so that the respondents picked the ones that they looked for by choosing one of the following options, (0 never, rarely 1, occasionally 2, often 3, always 4) based on the

Label Reading Survey (Marietta, Welshimer & Long Anderson, 1999). The higher the score was the higher the use of that specific item was.

# **Part Three**

Attitude toward nutrition labels was the third section which included questions 42-46. This section of the questionnaire measured college students attitude toward the labels by using a Likert scale with five items (where 5 was strongly agree and 1 was strongly disagree) with respect to the precision, trustiness and usefulness of the labels based on the Label Reading Survey (Marietta, Welshimer & Long Anderson, 1999) and summed up the scores for attitude assessment; the positive attitude toward nutrition labels was represented by a higher score.

# **Part Four**

The last section included demographic information such as self-reported sex, age, education degree, weight, height, smoking status (0 none, 1 occasionally, and 2 frequently), physical activity levels (0 no, 1 occasionally, 2 one to three times/week, and 3 at least five times/week). Also, the question "Do you use the Nutrition Labels in your home country?" was included to assess the international students' use of nutrition labels in their home countries. The last section also included the question "have you ever read, heard, or been taught how to use food label information?" to assess the prior nutrition education by answering with yes or no. The last question of the survey asked the participants if they heard about the new updates of the nutrition labels, and if they did, did they like it better than the current one.

#### **Scoring of Questionnaire**

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# Part Two

Nutrition label use was the second section. Labels utilization scores were calculated by summing the responses from questions 18-41. Higher scores indicated a higher level of utilization of the nutrition labels with maximum score of 96 in case the participant answered all of the utilization questions by choosing "always".

# Part Three

Attitude toward nutrition labels was the third section. It was calculated by summing the scores of questions 42-46. The items were recorded, so higher scores indicated more agreement with the statements with maximum score of 25 in case the participant chose "Strongly agree" in all of the five parts of the attitude questions.

#### **Part Four**

Demographic information was the last section of the survey. Descriptive statistics were utilized to describe frequencies, standard deviations, and means of participants' responses for demographic data.

#### **Data Analysis**

Demographic data, participants' nutrition knowledge, nutrition label use, and attitude toward nutrition labels summed scores were entered into the SPSS software version 21.0 (IBM, New York) with a P-value selected a priori 0.05 for significance.

An independent *t* test was used to compare the means of the three subscales among the demographic variables which were nutrition knowledge, nutrition label use, and attitude toward nutrition labels. Person Correlation between age and the three scales (nutrition knowledge, nutrition label use, and attitude toward nutrition labels) were used to analyze the relationship between age and scores on each of the three scales.

Descriptive statistics were utilized to describe frequencies, standard deviations, and means of participants' responses for demographic data, nutrition knowledge, nutrition label use, and attitude toward nutrition labels scores between groups and as whole.

# Results

Table 1 depicts the demographic distributions for the participants in the study. The study was conducted among students at KSU, aged 18-43 years old. The majority of the population was female (n=124, 70.5%), non-international (n=108, 61.4%), undergraduate students (n=100, 57.1%) living in off campus houses or apartments

(n=144, 83.7%) with a mean age of  $24.3 \pm 4.7$ . years.

Table 1. Demographic Data of Educated Young College Age Adults That Completed a<br/>Nutrition Labels Questionnaire (n=176)

Demographics	% (n)
Gender	
Male	29.5 (52)
Female	70.5 (124)
Nationality	
Non-international	61.4 (108)
International	38.6 (68)
Students Status	
Graduate	42.9 (75)
Undergraduate	57.1 (100)
Living situation	
Residence Hall/Dormitory	9.3 (16)
On-campus apartments	3.5 (6)
Off-campus house or apartment	83.7 (144)
Other	3.5 (6)

%=percentage as defined by frequency

Table 2 shows the differences of total knowledge, utilization, and nutrition facts attitude score between genders. Females demonstrated significantly higher knowledge of nutrition labels than males ( $P \le .001$ ). In addition, females scored significantly higher than males in the utilization of the nutrition labels (P=.025). No significant differences were found in the nutrition facts attitude between males and females.

Mean differences of total knowledge, utilization, and nutrition facts attitude score between non-international and international students are shown in Table 3.

Non-international students had significantly higher knowledge of nutrition labels than

international students (P=.001). However, there were no significant differences in

utilization and nutrition facts attitude between the non-international and international

students.

Table 2. Total Knowledge, Utilization, and Nutrition Facts Attitude Score means ( $\overline{x} \pm$ SD) of Male and Female College Age Students (n=176)

	Male (n=52)	Female (n=124)	<i>P</i> -value*
Knowledge <sup>a</sup>	4.1±1.6	5.3±1.5	.001*
Utilization <sup>b</sup>	61.7±20.3	69.1±19.6	.025*
<b>Nutrition Facts Attitude</b> <sup>c</sup>	16.3±3.3	15.9±4.2	.548

\*Shows statistical significant difference between males and females where statistical significance was set at  $P \le 0.05$ <sup>a</sup> Knowledge calculated by summing the number of correct responses; higher scores

indicated more knowledge- maximum score of 17.

<sup>b</sup> Utilization calculated by summing the scores of the utilization questions; higher scores indicated higher levels of utilization- maximum score of 96. <sup>c</sup> Nutrition facts Attitude calculated by summing the scores; higher scores indicated more

agreement with the statements- maximum score of 25.

Table 3. Total Knowledge, Utilization, and Nutrition Facts Attitude Score means ( $\overline{x} \pm$ SD) between non-international and International College Age Students (n=176)

	Non-international (n=108)	International (n=68)	P-value*
Knowledge <sup>a</sup>	5.5±1.5	4.1±1.6	.001*
Utilization <sup>b</sup>	67.5±19.7	66.0±20.6	.616
<b>Nutrition Facts Attitude</b> <sup>c</sup>	15.8±3.9	16.3±4.1	.445

\*Shows statistical significant difference between non-international and international where statistical significance was set at  $P \le 0.05$ <sup>a</sup> Knowledge calculated by summing the number of correct responses; higher scores

indicated more knowledge- maximum score of 17.

Utilization calculated by summing the scores of the utilization questions; higher scores indicated higher levels of utilization- maximum score of 96.

<sup>°</sup> Nutrition facts Attitude calculated by summing the scores; higher scores indicated more agreement with the statements- maximum score of 25.

Table 4 illustrates the mean differences of total knowledge, utilization, and nutrition facts attitude score between graduate and undergraduate students. There were no statistically significant differences between the graduate and undergraduate participants on any of the three measures which were total knowledge, utilization, and nutrition facts attitude.

Table 4. *Total Knowledge, Utilization, and Nutrition Facts Attitude Score means*  $(\overline{x} \pm SD)$  between Graduate and Undergraduate Students (n=175)

	Graduate (n=75)	Undergraduate (n=100)	P-value*
Knowledge <sup>a</sup>	4.9±1.6	5.0±1.7	.634
Utilization <sup>b</sup>	67.7±20.3	$66.4{\pm}20.0$	.667
<b>Nutrition Facts Attitude</b> <sup>c</sup>	16.2±4.0	15.8±4.0	.588

\*Shows statistical significant difference between Graduate and Undergraduate where statistical significance was set at  $P \leq 0.05$ 

Knowledge calculated by summing the number of correct responses; higher scores indicated more knowledge- maximum score of 17.

<sup>b</sup> Utilization calculated by summing the scores of the utilization questions; higher scores indicated higher levels of utilization- maximum score of 96. <sup>c</sup> Nutrition facts Attitude calculated by summing the scores; higher scores indicated more

agreement with the statements- maximum score of 25.

Participants also were asked if they have ever been instructed of how to use the

food labels. Approximately, 55% of the participants had been taught how to use the food

labels, and they demonstrated significantly higher knowledge of nutrition labels (t=4.06,

p=.001), yet there were no significant differences in the utilization of the labels (t=1.46,

p=.145). Moreover, there were no major differences in knowledge and utilization of

nutrition labels between students living on-campus and off-campus.

A Pearson correlation was computed to assess the relationship between the participants' age and the three scales. There was a negative correlation between the participants' age and the total knowledge, (r= -.203). A scatterplot summarizes the results (Figure 2). Overall, there was a moderate to weak, negative correlation between age and knowledge. As age increased, total knowledge score tended to decrease within the sample. On the other hand, there was no significant relationship between the participants' age and the utilizations of the labels (r= -.143).



*Figure 2:* A Pearson correlation showing the relationship between the participants' age and the total knowledge. There was a negative correlation between the participants' age and the total knowledge.

#### Discussion

The research hypothesis stated that the non-international college students would have different knowledge and utilization of the nutrition labels than the international college students. This hypothesis was partially accepted due to the findings of the current investigation. The findings of this investigations indicated: 1.) a significant difference in knowledge of nutrition labels between non-international and international college students.

Lack of basic nutrition knowledge about energy requirements has been documented among many individuals regardless of race, level of education, age, or being in a health related area (Headrick, Rowe, Kendall, Zitt, Bolton & Langkamp-Henken, 2013). This study's findings demonstrated that non-international students were more knowledgeable than the international students in regard to nutrition labels, yet still poor knowledge. Non-international college students' answered 32.35% correct of the knowledge questions, and international college students' answered only 24.11% correct, indicating that education on nutrition labels overall is lacking. Although the Nutrition Labeling and Education Act was signed into law in 1990, the education piece of the food labels is missing because most of the college students, including international and noninternational students, were not knowledgeable about the nutrition labels. Poor understanding of food labels can make it challenging for individuals to utilize the labels effectively; thus, to follow a healthy diet. Therefore, health care providers need to pay more attention to educate college students on nutrition and healthy eating in general and food labels specifically. This may help them reach their personal dietary goals that enable people to have healthier and higher quality of life (Worsley, 2002).

The aim of the nutrition labeling is to help consumers make healthy dietary choices (Levy & Fein, 1998). However, positive outcomes of using the nutrition labels are effective only if they are used properly. Many people do not use the labels, and those consumers who use nutrition labels use them to avoid specific food components instead of using labels to guide them to healthfully eating patterns (Bender & Derby, 1992). According to one research study, 78% of the college students read the nutrition labels when they bought packaged foods. Food labels use was significantly higher among females, older, highly educated, and obese individuals (Satia, Galanko & Neuhouser, 2005). In contrast, only 25% of the participants in this study reported using the nutrition labels frequently. Moreover, a study showed that people do not pay attention to the nutrition labels; therefore, they do not help in choosing healthy food (Van Herpen & van Trijp, 2011). The low utilization scores of nutrition labels among international and noninternational college age students suggests that many college students do not use the nutrition labels in a regular basis which may reduce the quality of their diet. Overall, there were no significant differences in utilization scores between the non-international and international students. This indicates that the lack of label use among international students may not be due to not understanding the labels because of the language differences but maybe due to lack of knowledge.

Knowledge scores were significantly higher among females than males. In addition, females scored significantly higher than males in the utilization of the food labels. This findings coincides with the findings of Misra (2007), where women had significantly greater label reading behavior scores and nutrition knowledge than did men. Moreover, when calorie information was provided on food packages, females tend to choose lower calorie foods; however, males' selection was not effected (Gerend, 2009). In addition, no significant differences were found in this study in the nutrition facts attitude between women and men suggesting that the lower utilization of nutrition labels among males may not be due to distrusting the truthfulness of the labels but the poor knowledge.

The findings of this study showed that 41.6% of the participants stated that nutrition facts label that appears on most packaged foods is useful. Moreover, 38% of the students said that nutrition information provided in the nutrition facts label is accurate. Therefore, the low utilization of nutrition labels among the participants might be due to lack of knowledge of the food labels, not because distrusting the truthfulness of the food labels. On the other hand, Misra (2007) stated that the majority of adults think that nutrition labels are useful and easy to understand, but many distrust the truthfulness and accuracy of the labels.

Previous research by Misra (2007), showed significant differences in attitude and knowledge between graduate and undergraduate students, yet not on their label reading behavior. However, findings of this present investigation, showed no statistically
significant differences in knowledge and utilization of the nutrition labels between graduate and undergraduate students. Indicating that providing similar nutrition programs to educate college students about the labels may be beneficial as age or level of college is not as big of factor as gender.

The participants were asked if they heard about the new nutrition labeling; only 13% of the students answered by yes, and 68% of those who said yes stated that they liked it better than the old one. These findings suggest that there should be more effort made by the health care providers and dietitians to inform college students with the new updates.

### Application

Nutrition knowledge is significantly associated with healthy eating patterns. Individuals with higher nutrition education are 25 times more likely to get their requirements of fruit, vegetables, and fat consumption than those with lower nutrition knowledge (Wardle, Parmenter & Waller, 2000). Often the nutrition knowledge is limited among college students including international college students (Perez-Cueto, Verbeke, Lachat & Remaut-De Winter, 2009). In addition, present investigation showed that both non-international and international college age students are not well educated about the food labels. According to a research study, most of college aged students are not aware of the high content of calories, fat, saturated fat, and sodium in foods served by restaurants (Burton, Creyer, Kees & Huggins, 2006). Lack of nutrition knowledge may reduce the effectiveness of nutrition labels use among international and non-international college students (Guthrie, Fox, Cleveland & Welsh, 1995). Therefore research findings imply the need for educating university students to increase their nutrition knowledge. Educating college students on how to use the labels could be by helping them with performing complex tasks as calculating fiber and fat content, clarifying and explaining terms and phrases present on nutrition labels (Misra, 2007).

Food labels help individuals in managing their daily dietary intake. Therefore, it is important for people to have the ability to understand and interpret the information on nutrition labels to practice eating healthy diets and help reducing diet related disease as the processed packaged foods are increasing in the markets (Norazmir, Norazlansh, Naqieyah, & Anuar, 2012). Educating young adults on how to use the labels could be through print, posters, physical courses, online courses, or other media. Universities can provide elective classes for both graduate and undergraduate students on increasing the nutrition knowledge of the students and helping them to learn and understand the labels. Also, universities or health providers could educate adults through the social media, such as Facebook, Twitter, and Instagram in simple and fun ways so that people start paying attention to nutrition labels and improve the quality of their diets as well their life.

Many universities provide free workshops to their students on different IT topics as technology is becoming more involved in human life. From a health perspective, universities could also provide free workshop sessions on educating college students about nutrition and label use for one or two hours every month per semester. These kind of education activities may help in increasing college students' awareness about health in general and eating healthier foods specifically. Also, universities could provide free online courses where the student can listen, read, or watch a short documentary about nutrition and nutrition label use and then answer some questions about what he/she watched and get a certificate as a reward.

Although the nutrition labels are seen on almost all packaged foods in grocery stores, most of the individuals do not know how to use the food labels. As a huge effort is made by the FDA to present nutrition labels in most of the food packages, there should be more effort made by the FDA to educate people about the food labels that they offer. This could be through TV advertisements', street posters, and social media. In addition, grocery stories could also provide posters all around the stores especially in the food sections to educate people about the nutrition labels by providing clear and easy to understand information about the labels to the consumers.

Finally, as the new labeling is coming up, it might be the time of action where health care providers and dietitians can make more effort on educating people about nutrition in general and nutrition labels specifically by being more creative and inspiring and using the different social media available to emphasize the importance of nutrition and using the labels in well-being and healthy lifestyle. People should be aware about the food that they are eating and should pay more attention on consuming healthier foods in balanced amounts and not just have food for pleasure but also for promoting their health.

### Limitations

This study has several limitations. Firstly, the study was limited by the use of a convenience sample. The sample population size may be a limitation as well with a qualifying 176 participants out of 350. The sample population was unequal with higher representation from non-international students versus international students.

#### Conclusion

In conclusion, this study demonstrated overall poor nutrition labels knowledge and utilization among international and non-international college age students. This lack of knowledge and utilization of the labels might be due to the lack of nutrition education and practices specific to labels use. Lack of knowledge and poor dietary intake among college students may have a negative effect on their health status, and may lead to dietrelated chronic disease in the future. College students may need creative nutrition related education strategies in order to gain a strong knowledge base and awareness of nutrition label use and its importance in having a healthy life style. These findings also suggests dietetic professionals need to come together to find unique ways to educate young adults about nutrition in general and food labels specifically in different ways. APPENDICES

**APPENDIX A** 

REQUIREMENTS FOR HEALTH CLAIMS MADE IN LABELING

# Appendix A

# Requirements For Health Claims Made In Labeling

Approved Claims	Requirements for the Food	Claim Requirements	Model Claim, Statements
Calcium and Osteoporosis and calcium, vitamin D, and osteoporosis	high in calcium for calcium and osteoporosis claim high in calcium and vitamin D for calcium, vitamin D and osteoporosis claim Dietary Supplementations must dissolve; in addition, Phosphorus should not exceed calcium	Calcium and Osteoporosis: Adequate calcium intake in daily diet may decrease the risk of osteoporosis. Calcium, vitamin D and osteoporosis: Adequate calcium and vitamin D intake in daily diet with physical activity may decrease the risk of osteoporosis.	The claim states the importance of adequate calcium consumption, or adequate calcium and vitamin D consumption, in a healthy diet, are necessary to decrease osteoporosis risk.
Dietary Fat and Cancer	Low fat Game meats and fish &: "Extra lean"	Required expressions: "Total fat" or "Fat" "Some types of cancers" or "Some cancers"	The risk of some cancers may decrease by consuming meals containing low total fat.
Sodium and Hypertension	Low sodium	Required expressions: "Sodium", "High blood pressure"	Low sodium diet may decrease the risk of hypertension.

Cholesterol and	Low cholesterol,	Required	The risk of heart
Dietary Saturated	Low fat, and Low	expressions:	disease my decrease
Fat, and risk of	saturated fat		when consuming
Heart Disease		Saturated fat and	meals low in
		cholesterol,	cholesterol and
		,	saturated fat
		"Coronary heart	
		disease" or heart	
		disease	
Vegetables, Fruits	A vegetable, fruit.	Required	The risk of heart
Grains containing	or grain product	expressions:	disease my decrease
Fiber, especially	containing fiber:	"Fiber". "Dietary	by consuming diets
Soluble Fiber, and	Low cholesterol.	fiber". "Some types	low in saturated fat
Risk of V Coronary	Low fat.	of dietary fiber".	and cholesterol, and
Heart Disease	Low saturated fat.	"Some dietary	high in fruits.
	As a minimum of	fibers", or "Some	vegetables, and
	0.6 g of soluble	fibers"	whole grain
	fiber per RACC (no	"Saturated fat" and	products which
	fortification) and	"Cholesterol"	contains fiber
	Soluble fiber	"Heart disease" or	
	amount is shown on	"Coronary heart	
	labels	disease"	
Fruits and	Fruits and	Required	Risk of cancer may
Vegetables and	vegetables low in fat	expressions:	decrease when
Cancer	and high in at least	"Fiber", "Dietary	consuming diets low
Culleer	one of the following	fiber" or "Total	in fat and high in
	nutrients:	dietary fiber".	fruit and vegetables
	Vitamin A	"Total fat" or "Fat"	which contains
	Vitamin C	"Some types of	vitamins A and C
	Fiber	cancer" or "Some	and fiber
		cancers"	
		"Foods that are low	
		in fat and may	
		$\Delta$ contain Vitamin $\Delta$	
		Vitamin C and	
		dietary fiber "	
		"Good source" of	
		Dietary fiber	
		Vitamin A or	
		Vitamin C	
		, mannin C.	1

Grain Products,	Vegetables, fruits,	Required expressions:	The risk of some
Fruits, and	and grain products	"Fiber", "Dietary	type of cancers may
Vegetables	containing fiber;	fiber", or "Total	decrease when
containing Fiber	Low fat, and	dietary fiber"	consuming foods
and Cancer	Good source of fiber	"Some types of	low in fat, and high
	(not fortified)	cancer" or "Some	in fiber from fruit,
		cancers"	vegetables, and
			grain products
Folate and Neural	Minimum of 40 mcg	Required expressions:	Adequate intake of
Tube Defects	folate per serving,	Expressions that	folate through
	"Good source" of	explains a relationship	healthy diet may
	folate.	e.g., Women who are	decrease the risk of
	Supplements or	able to became	having a baby with
	food products that	pregnant and who get	a brain or spinal
	are naturally good	adequate folate.	cord defect.
	source of folate.	"Folate", "folic acid",	
	The claim should	"folacin","folate a B	
	not be provided on	vitamin", "folic acid, a	
	food products that	B vitamin," "folacin, a	
	have more than	B vitamin," "neural	
	100% of RDI for	tube defects", "birth	
	vitamin D or	defects, spinal bifida,	
	vitamin A as retinol	or anencephaly",	
	or preformed	"birth defects of the	
	vitamin A	brain or spinal cord	
	The amount of	anencephaly or spinal	
	folate should be	bifida", "spinal bifida	
	provided on the	or anencephaly, birth	
	label	defects of the brain or	
		spinal cord"	
		Need to include the	
		safe amount of daily	
		intake, and	
		information about the	
		multifactorial nature	
		of neural tube defects.	

Dietary	Sugar free	Required expressions:	Full claim:
Noncariogenic	Also, when	"does not promote,"	Frequent between-
Carbohydrate	fermentable	"may reduce the risk	meal consumption
Sweeteners and	carbohydrate is	of," "useful [or is	of foods high in
Dental Caries	present; the food	useful] in not	sugars and starches
	must not reduce	promoting" or	promotes tooth
	plaque pH below	"expressly [or is	decay. The sugar
	5.7.	expressly] for not	alcohols in [name of
	Eligible substances	promoting" dental	food] do not
	include	caries;	promote tooth
	1) sugars, such as	"dental caries" or	decay.
	alcohols:xylitol,	"tooth decay."	Claim (on small
	sorbitol, mannitol,	"sugar alcohol" or	packages only):
	maltitol, isomalt,	"sugar alcohols" or the	Does not promote
	lactitol,	name or names of the	tooth decay.
	hydrogenated starch	sugar alcohols; or D-	
	hydrolysates,	tagatose, or sucralose	
	hydrogenated	Note: D-tagatose may	
	glucose syrups,	be recognized as	
	erythritol, or a	"tagatose"	
	combination of	If the substance in the	
	these.	subject of the claim is	
	2) The following	a noncariogenic sugar	
	sugar:D-tagatose	(i.e., D-tagatose) the	
	3) The following	claim must explain the	
	non-nutritive	substance as a sugar	
	sweetener:sucralose	that is not as the other	
		sugars, does not cause	
		the development of	
		dental caries.	
		May contain statement	
		that regular snack	
		consumption of foods	
		high in sugars and	
		starches can cause	
		tooth decay.	

Soluble Fiber from	Low saturated fat	Required expressions:	Soluble fiber from
Certain Foods and	Low cholesterol	"Heart disease" or	foods such as [name
Risk of Coronary	Low fat	"coronary heart	the soluble fiber
Heart Disease	Food must include	disease."	source, and may
	one of the below	"Saturated fat" and	include name of
	whole oat or barley	"cholesterol."	food product if
	foods:	When specifying a	possible], as part of
	1) oat bran, 2) rolled	substance claim will	a diet low in
	oats, 3) whole oat	be state as "soluble	saturated fat and
	flour, 4) whole grain	fiber"	cholesterol, may
	barley or dry milled	Claim specifying the	reduce the risk of
	barley, and the	daily intake of the	heart disease. A
	whole oat or barley	soluble fiber source	serving of [name the
	foods must contain	necessary to decrease	food product]
	at least 0.75 g of	the risk of heart	supplies grams of
	soluble fiber per	disease	the soluble fiber
	RACC of the food	Claim specifying the	from [name of
	product; or	quantity of soluble	soluble fiber source]
	Oatrim that contains	fiber in per serving of	necessary per day to
	at least 0.75 g of	the product.	have this effect.
	beta-glucan soluble	_	
	per RACC of the		
	food product; or		
	Psyllium husk that		
	contains at least 1.7		
	g of soluble fiber		
	per RACC of food		
	product.		

Soy Protein and	At least 6.25 g soy	Required expressions:	(1) 25 grams of soy
Risk of Coronary	protein per RACC	"Heart disease" or	protein a day, as
Heart Disease	Low saturated fat,	"coronary heart	part of a low in
	Low cholesterol,	disease"	saturated fat and
	and	"Soy protein"	cholesterol, may
	Low fat	"Saturated fat" and	reduce the risk of
		"cholesterol"	heart disease. A
			serving of [name the
			food] supplies
			grams of soy
			protein.
			(2) Diets low in
			saturated fat and
			cholesterol that
			include 25 grams of
			soy protein a day
			may reduce the risk
			of heart disease.
			One serving of
			[name the food]
			provides grams
			of sov protein.
Plant Sterol/stanol	Minimum of 0.65 g	Required expressions:	(1) Foods
esters and Risk of	plant sterol esters	"May" or "might"	containing at least
Coronary Heart	per RACC of	decrease the risk of	0.65 gram per of
Disease	spreads and salad	Coronary Heart	vegetable oil sterol
	dressings, or	Disease	esters, eaten twice a
	Minimum of 1.7 g	"Heart disease" or	day with meals for a
	plant stanol esters	"coronary heart	daily total intake of
	per RACC of	disease	least 1.3 grams, as
	spreads, salad	"Plant sterol esters" or	part of a diet low in
	dressings, snack	"plant stanol esters";	saturated fat and
	bars, and dietary	excluding "vegetable	cholesterol, may
	supplements.	oil" may substitute the	reduce the risk of
	Low saturated fat.	term "plant" if	heart disease. A
	Low choleterol	vegetable oil is the	serving of [name the
		only source of the	food] supplies
		sterol/stanol ester	grams of
		Claim specifies plant	vegetable oil sterol
		stero/stanol esters are	esters.
		part of a diet low in	(2) Diets low in
		saturated fat and	saturated fat and

	cholesterol.	cholesterol that
	Claim does not cause	include two servings
	any degree of risk for	of foods that
	CHD decrease.	provide a daily total
	Claim is specifying	of at least 3.4 grams
	the daily intake of	of plant stanol esters
	plant sterol or stanol	in two meals may
	esters needed to	reduce the risk of
	decrease thr risk of	heart disease. A
	CHD.	serving of [name the
	Claim is specifying	food] supplies
	the plant sterol or	grams of plant
	stanol esters which	stanol esters.
	should be consumed	
	with two different	
	meals per day.	

RACC = Reference Amounts Customarily Consumed.

Note. Adapted from U.S. Food and Drug Administration, 2009

**APPENDIX B** 

**DEFINITIONS OF NUTRIENT CONTENT CLAIM** 

# Appendix B

## Definitions of Nutrient Content Claim

Nutrient Content Claims ("Free " "Low " "Reduced/Less")			
Free	Low	Reduced/Less	Notes
Alternative expression for "Free": "Zero", "No", "Without", "Trivial Source of", "Negligible Source of", "Dietarily Insignificant Source of" For meals and main dishes the definitions for "Free" are the listed values per labeled portion	Alternative expression for "Low": "Little", ("Few" for Calories), "Contains a Small Amount of", "Low Source of"	Alternative expression for "Reduced/Less": "Lower" ("Fewer" for Calories) may use the word "Modified" in statement of identity For meals and main dishes the definitions are alike as for individual foods on a each 100 g basis	For "Free", "Very Low", or "Low", need to state if food meets a definition with no benefit of particular processing, modification, formulation or reformulation; e.g., "broccoli, a fat-free food" or "celery, a low calorie food"

Note. Adapted from U.S. Food and Drug Administration, 2009

### **APPENDIX C**

### EXAMPLES AND DEFINITIONS OF NUTRIENT CONTENT CLAIMS

# Appendix C

## Examples and Definitions of Nutrient Content Claims

Nutrient	Free	Low	Reduced/Less
Calories	Food must contain less than 5 calories per RACC and per serving	Food must contain 40 calories or less per RACC. Main dishes and meals must contain 120 calories or less per 100 g	Minimum 25% fewer in calories per RACC than an appropriate reference food. For main dishes and meals, at least 25% less calories every 100g
Total Fat	Food must contain less than 0.5 g of fat per RACC and per serving For main dishes and meals, less than 0.5 g per serving	Food must contain 3g or less fat per RACC main dishes and meals contain 3 g or less fat each 100 g and not greater than 30% of calories from fat	Minimum 25% less fat each RACC than an appropriate reference food For main dishes and meals, at least 25% less fat each 100g
Saturated Fat	Food must contain less than 0.5 g saturated fat and less than 0.5 g trans fatty acids per RACC and per serving For main dishes and meals, less than 0.5 g saturated fat and less than 0.5 g trans fatty acids per serving	Food must contain 1 g or less of saturated fat per RACC and 15% or less of calories came from saturated fat For main dishes and meals 1 g or less each 100 g and less than 10% of calories from saturated fat	Minimum 25% less saturated fat per RACC than an appropriate reference food For main dishes and meals at least 25% less saturated fat each 100g

Cholesterol	Food must contain less than 2 mg per RACC and per serving For main dishes and meals less than 2 mg per serving	Food must contain 20 mg or less per RACC For main dishes and meals 20 mg or less each 100 g	minimum 25% less cholesterol per RACC than an appropriate reference food For main dishes and meals at least 25% less cholesterol each 100g
Sodium	Food must contain less than 5 mg per RACC and per serving For main dishes and meals less than 5 mg per serving	Food must contain 140 mg or less per RACC For main dishes and meals 140 mg or less each 100g "Very Low Sodium": food must have 35 mg or less sodium per For main dishes and meals 35mg or less each 100g	Minimum 25% less sodium per RACC than an appropriate reference food For main dishes and meals at least 25% less sodium each 100g
Sugar	Food must contain less than 0.5 g sugars per RACC and per serving For main dishes and meals less than 0.5 g per serving)	Not detriment	Minimum 25% less sugars per RACC than an appropriate reference food For main dishes and meals at least 25% less sugar each 100g This claim is not for vitamins and minerals supplements

RACC = Reference Amounts Customarily Consumed.

Note. Adapted from U.S. Food and Drug Administration, 2009

APPENDIX D

STUDY QUESTIONNAIRE

### Appendix D

### Study Questionnaire

**Directions**: Select the correct answer please

1. Which of the following has the most calories per gram?

- A. Fat
- B. Protein
- C. Carbohydrate

2. Which one of the following items listed on the "Nutrition Facts" panel is recommended to eat less of?

- A. Carbohydrates D. I don't know
- B. Trans Fat
- C. Protein

3. A food is described on the label as being "reduced calorie". The reduced calorie food contains what percentage of calories less than the original food?

A.	5%	D. 35%
B.	15%	E. 50%
C.	25%	F. I don't know

4. Which of the following nutrient's recommended amount may vary with calorie intake?

A.	Fat	D. Iron
B.	Vitamin C	E. Vitamin A
C.	Calcium	F. I don't know

5. A food is considered a good source of a nutrient when it contains at least what percentage of the nutrient of the daily value?

A.	5%	D. 20%
B.	10%	E. 25%
C.	15%	F. I don't know

6. If a can of soup provides 5 servings and has 100 calories per serving. How many calories are in the entire can?

A.	100	D. 800
B.	200	E. 400
C.	500	F. I don't know

7. A nutrition label states that the serving size is a certain amount – such as  $\frac{1}{2}$  cup or 15 crackers. Which of the following statements best describes this amount?

A. The amount that most nutrition experts recommend that most people should eat.

B. The amount most people usually eat.

C. The amount of food that the manufacturer decides to put on the label.

D. The amount that will make the number of servings in the container come out to be a whole number.

E. I don't know

8. The % Daily Value is based on which of the following caloric requirements?

A.	1000 Calories	D. 2500 Calories
B.	1500 Calories	E. 3000 Calories
C.	2000 Calories	F. I don't know

9. When % Daily Value of a nutrient is 5% or less...

- A. The food contains 5% by volume of that nutrient.
- B. The food contains 5% by weight of that nutrient
- C. 5% of the calories for that day are contributed by that nutrient.
- D. The food is a low source of that nutrient.
- E. I don't know

10. In the ingredient list on food labels, ingredients are listed in which order by weight?

- A. Descending order. D. By most important to least important nutrients
- B. Ascending order. E. I don't know
- C. Random order.

**Directions:** Using the food labels provided, answer the following questions to the best of your ability

Nutr	ition	Fac	ts	
Serving Size 1 cup (85g) (3 oz.)				
Servings per c	ontainer	2.5		
Amount per se	rving			
Calories 45	Calories	from Fat	0	
		% Dai	ily Value*	
Total Fat Og			0%	
Saturated Fa	t Og		0%	
Cholesterol On	na		0%	
Sodium 55 m	1		2%	
Total Carbohydrate 10g 3%				
Dietary Fibe	r 3a		12%	
Sugars 5g				
Protein 1g				
Vitamin A 360% • V	/itamin C 8%	• Calcium 2	% • Iron 0%	
*Percent Daily Values are based on a 2,000 calorie diet. Your daily value may be higher or lower depending on your calorie needs.				
	Calories:	2,000	2,500	
Total Fat Sat. Fat Cholesterol Sodium Total Carbohydrate Dietary Fiber	Less than Less than Less than Less than Less than Less than	65g 20g 300mg 2,400mg 300mg 25g	80g 25g 300mg 2,400mg 375mg 30g	
Calories per gram: F	at 9 • Carboh	ydrate 4 • Pro	tein 4	

11. Using the Label above, how many grams of total fat should be eaten in a 2000 calorie diet?

- A. Less than 20
- B. Less than 65
- C. Less than 80
- D. Less than 300 E. Less than 2400
- F. I don't know



12. When comparing the two food labels above, which food product has the most grams of fat per serving?

A. Label 1

B. Label 2

C. I don't know

13. When comparing the two food labels above, which food product has the most grams of fiber per serving?

A. Label 1B. Label 2C. I don't know

Directions: please answer with T (true) or F (false)

14. Reading the food labels help consumers to identify amount of salt and sodium in the packaged foods ( \_\_\_)

15. Reading the food labels doesn't help consumers to determine the amount and kind of fat in the packaged foods (\_\_)

16. Reading the food labels doesn't help consumers to choose foods with dietary fibers (\_\_\_)

17. Reading the food labels help consumers to determine the sugar content of the packaged foods (\_\_\_\_)

Directions: Circle one answer that you most agree with

18. Would you purchase a food item with a health claim statement on the front label rather than the same or similar item with no health claim statement on the label? **Never Rarely Occasionally Often Always** 

19. When you eat a food, do you use the information on the "Nutrition Facts" label to help you fit that food into your daily diet?

Never Rarely Occasionally Often Always

20. Do you look at nutritional facts labels on foods when you buy food packages?

Never Rarely Occasionally Often Always

21. Considering your answer for #20, please provide the reason why you do or do not look at nutritional facts labels on foods.

**Directions**: Answer "yes" or "no" to the following question.

Do you look for the following items when reading either the front label or the "Nutrition Facts" label on food packages?

	Never	Rarely	Occasionally	Often	Always
22. Serving Size					
23. Ingredients list					
24. Protein					
25. Vitamin A					
26. Vitamin C					
27. Calcium					
28. Iron					
29. Health Claims					
such as "may reduce	;				
the risk of hypertens	ion"				
30. Nutritional Claims					
such as "Low Sodiu	m"				
31. Calories					
32. Calories from Fat					
33. Total Fat					
34. Saturated Fat					
35. Trans Fat					
36. Cholesterol					
37. Sodium					
38. Potassium					
39. Total Carbohydrate					
40. Dietary Fiber					
41. Sugar					

your answers. Pick	the one that is	most closely co	prresponds with	your opinion.
Strongly agree 5	Agree 4	Neutral 3	Disagree 2	Strongly disagree 1
42. The "Nutrition	Facts" label th	at appears on m	ost food packag	ges is a useful tool for
5	4	3	2	1
43. Nutrient inform	nation provided	l in the "Nutritic	on Facts" label	is accurate.
5	4	3	2	1
44.Nutritional clair food packages are	ns such as "lov truthful.	w fiber" and "no	fat," that appea	ar on the front of the
5	4	3	2	1
45. Health claims v a claim is "Diets hi factors"	which appear o gh in fiber ma	n the front of fo y reduce the risk	od packages are c of heart diseas	e truthful. An example of se. "A disease with many
5	4	3	2	1
46. The "Nutrition	Facts" label is	easy to understa	and	
5	4	3	2	1
Directions: Please	provide some	basic demograp	hic information	l.
47. What is your ag	ge?			
48. What is your g	ender?	Mal	e Fem	ale
49. Have you ever	read, heard, or Yes	been taught info S No	ormation about	how to use food labels?:
46. Please indicate	your nationali	ty:		
Non-international	Inter	mational		
(please provide ho	me country)			

**Directions**: Please use the scale below to respond to the following questions by circling your answers. Pick the one that is most closely corresponds with your opinion.

50. Does your home country mandate Nutrition Labels on packaged foods Yes No					
51. Do you use the Nutrition Labels in your home country Yes No					
52. Are you? A graduate or under gradu	ate Student				
53. What is your class rank?					
<ul><li>A. Freshman</li><li>B. Sophomore</li><li>C. Junior</li></ul>	D. Senior E. Graduate Stu	ıdent			
54. Where do you currently live?					
A. Residence Hall/Dormitory       E. Off-campus house or apartment         B. Fraternity or Sorority residence       F. Other         C. On-campus apartments       55. Please indicate your height:					
56. Please indicate your weight:					
57. Are you currently on a Campus Dining Meal Plan?: Yes No					
58. If "Yes", please specify the number of meals per semester included in your plan					
59. What percent of your meals do you eat at the following locations?					
Home% Restaurant% Fast Food Campus Dining%	% Premade Gro	cery Stores Fo	od%		
60. Do you smoke? Yes No Occasi	onally Former	Smoker (1-2 y	vears)		
61. How many times per week do you exerc	ise?				
62. Did you hear about the new Nutrition La	bel format?	Yes	No		
63. Did you like it better than the old one? Why?		Yes	No		

**APPENDIX E** 

**IRB APPROVAL** 

Appendix E

**IRB** Approval



IRB Level I, category 2 approval for Protocol application #14-216 - please retain this email for your records

**RAGS Research Compliance** <researchcompliance@kent.edu> To KAREN, me

RE: Protocol #14-216 - entitled "How does knowledge and utilization of Nutrition Labels differ among international and non-international college students at Kent State University"

The Kent State University Institutional Review Board has reviewed and approved your Application for Approval to Use Human Research Participants as Level I/Exempt from Annual review research. Your research project involves minimal risk to human subjects and meets the criteria for the following category of exemption under federal regulations:

Exemption 2: Educational Tests, Surveys, Interviews, and Public Behavior Observations This application was approved on April 8, 2014.

\*\*\*Submission of annual review reports is not required for Level 1/Exempt projects. If any modifications are made in research design, methodology, or procedures that increase the risks to subjects or includes activities that do not fall within the approved exemption category, those modifications must be submitted to and approved by the IRB before implementation.

Please contact an IRB discipline specific reviewer or the Office of Research Compliance to discuss the changes and whether a new application must be submitted.

http://www.kent.edu/research/researchsafetyandcompliance/irb/index.cfm

Kent State University has a Federal Wide Assurance on file with the Office for Human Research Protections (OHRP); FWA Number 00001853.

If you have any questions or concerns, please contact us at

Researchcomplaince@kent.edu or by phone at 330-672-2704 or 330.672.8058. Respectfully,

Kent State University Office of Research Compliance

224 Cartwright Hall | fax 330.672.2658

Kevin McCreary | Research Compliance Coordinator | 330.672.8058 |

<u>kmccrea1@kent.edu</u>

Paulette Washko | Manager, Research Compliance |330.672.2704| Pwashko@kent.edu

### **APPENDIX F**

### **CONSENT FORM**

### Appendix F

#### Consent Form



#### **Nutrition Labels**

Welcome to "The Nutrition Labels," a web-based experiment that examines some of the finer points Nutrition Labeling. Before taking part in this study, please read the consent form below and click on the "I Agree" button at the bottom of the page if you understand the statements and freely consent to participate in the study.

#### **Consent Form**

This study involves a web-based experiment designed to understand the difference in knowledge and utilization of nutrition labels among international versus non-international college students. The study is being conducted by Dr. Gordon and Ala Alsadda of Kent State University, and it has been approved by the Kent State University Institutional Review Board. No deception is involved, and the study involves no more than minimal risk to participants (i.e., the level of risk encountered in daily life).

Participation in the study typically takes 15 minutes and is strictly anonymous. Participants begin by answering a series of questions about nutrition knowledge. After that they will answer some questions regarding the utilization of nutrition labels.

All responses are treated as confidential, and in no case will responses from individual participants be identified. Rather, all data will be pooled and published in aggregate form only. Participants should be aware, however, that the experiment is not being run from a "secure" https server of the kind typically used to handle credit card transactions, so there is a small possibility that responses could be viewed by unauthorized third parties (e.g., computer hackers).

Many individuals find participation in this study enjoyable, and no adverse reactions have been reported thus far. Participation is voluntary, refusal to take part in the study involves no penalty or loss of benefits to which participants are otherwise entitled, and participants may withdraw from the study at any time without penalty or loss of benefits to which they are otherwise entitled. If participants have further questions about this study or their rights, or if they wish to lodge a complaint or concern, they may contact the principal investigator, Ala Alsaddah, at (330) 622-2250 or Dr. Gordon at (330) 672-2248; or the Kent State University Institutional Review Board, at (330) 672-2704.

If you are 18 years of age or older, understand the statements above, and freely consent to participate in the study, click on the "I Agree" button to begin the experiment.

I Agree I Do Not Agree

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