

ASSESSING THE NEW NUTRITION FACTS PANEL DESIGN

BY

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Abstract

Background: Nutrition literacy is an important component of overall health. The Nutrition Literacy Instrument (NLit) is a validated tool for measuring nutrition literacy. One element of nutrition literacy is the ability to read nutrition fact panels (NFP). Consequently, 6 numeracy questions in the NLit test users on their ability to correctly read NFPs. The FDA has announced a new NFP design that will be required by 2018 for large manufacturers, while smaller companies will have an additional year to comply. Easier usability is one of the goals of the new NFP design. It was hypothesized that NLit scores on numeracy questions over the current NFP design would be significantly correlated with NLit scores on numeracy questions over the new NFP design. It was also hypothesized that NLit scores on numeracy questions on both the current and new NFP design would be significantly different. Finally, in response to emerging trends in food labeling, participant preferences for information included on food labels was collected in order to see what kind of information consumers look for on food labels.

Methods: Surveys were administered during January, February, and March 2017 to attendees at financial literacy classes administered by a local ministry. A total of 50 participant surveys were collected, and 48 surveys were used. Surveys collected demographic information, financial literacy information, and nutrition literacy information. Nutrition literacy information was collected by asking participants 6 NLit numeracy questions over the current NFP and asking the same 6 NLit numeracy questions over the new NFP. Participants were also asked which label they preferred and why, how often they looked at nutrition labels while grocery shopping, and to indicate other kinds of information that they considered important for inclusion on food labels.

Results: NLit numeracy question scores between the current NFP and the new NFP were significantly correlated ($r=0.842$, $p<0.0001$), indicating consistency. Cronbach's alpha for the current NFP NLit numeracy scores and new NFP NLit numeracy scores was 0.733 and 0.815, respectively, indicating reliability of the instrument. Mean NLit numeracy question scores for the current NFP and the new NFP were 53.5% and 55.5%, respectively, and were not significantly different ($p=0.437$). Out of the 12 different options that were provided to participants to indicate what information they considered to be most important for inclusion on food labels, "serving size" and "sodium" received the most selections (26 each).

Conclusions: Significantly correlated scores between NLit numeracy questions on the current NFP and on the new NFP and acceptable Cronbach's alpha statistics (<0.7) are important in ensuring the continued validity and usability of the NLit as an instrument to measure nutrition literacy in the future, once the new food label design is mandatory in 2018. Similar scores between NLit numeracy questions on the current and new NFPs suggest that the new design may not be easier to read than the current design. Further research is warranted to continue assessing whether the new NFP design is effective in increasing usability. Finally, feedback on the kind of information consumers are interested in seeing on food labels, such as serving size and sodium content, is important for health professionals to know to better target education efforts.

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The Food Label & Numeracy section of the Nutrition Literacy Assessment Instrument (NLit) © 2016, University of Kansas, is used with permission

Table of Contents

Chapter 1 – Introduction	1
Summary of the most recent literature	1
Reasons for future investigation.....	2
Statement of purpose	3
Research questions	3
Chapter 2 – Review of Literature.....	5
Relationship between nutrition literacy and nutrition label comprehension	5
Reasons warranting changes in the nutrition facts panel design	6
Changes in the nutrition facts panel design.....	8
Evidence supporting the new nutrition facts panel design.....	10
Evidence contradicting the new nutrition facts panel design.....	11
Emerging trends in nutrition labeling.....	13
Conclusion.....	14
Chapter 3 – Methods.....	15
Overview	15
Setting.....	15
Sample.....	16
Data collection methods	16
Description of tools or instruments	16
Methods of analyzing data	18
Chapter 4 – Results	19
Sample characteristics	19
NLit Reliability	20
Survey Scores	20
Participant preferences regarding nutrition facts panel design.....	24
Participant preferences regarding information included on food labels.....	26
Chapter 5 – Discussion	28
Major findings	28
Validity and Reliability of NLit Referencing New NFP	28
Survey scores and sample characteristics.....	29
Study limitations.....	30
Conclusion.....	32
References Cited	34
Appendix.....	36

Chapter 1 – Introduction

Summary of the most recent literature

Although packaged foods have been around for decades, laws requiring food and nutrition labels are relatively new. In 1990, Congress passed the Nutrition Labeling and Education Act, which required that nutrition labels be included on all packaged food products. The law included requirements regarding food standards and nutrition labeling (1). In 2014, the FDA proposed the first changes to the nutrition facts panel (NFP) format in over 20 years; on May 20, 2016, those proposed changes were approved and the new NFP design released (2). Companies are required to be compliant with the new panel design by July 26, 2018; companies with less than \$10 million in annual food sales will have an additional year to comply.

Key updates in the new NFP design that will be investigated in this proposed research study include highlighting of the words “calories” and “serving size” in an attempt to make it easier for consumers to locate this information. The serving size listed on the packages has also been updated to reflect portions typically consumed in one sitting, a component of labeling also required by the Nutrition Labeling and Education Act. Labels on packaged foods that contain between 1 and 2 servings per package (such as a 20z bottle of soda) will be required to list the entire package as one serving, since most individuals will consume the entire package in one sitting. Other changes to the food label include a new listing of “added sugars” under the “total carbohydrates” category. This addition is prompted by evidence indicating the difficulty of meeting nutritional needs while staying within calorie limits if sugar intake is >10% of total calories (2)

Many of the changes in the new label design have been added in order to make it easier for consumers to interpret the label. Research testing the new label design has found that in many

cases, the new label design does increase consumer understanding of the information. Hydock et al. (3) examined if participants ate different amounts of food depending on which nutrition facts panel design they viewed. In this study, participants were provided M&Ms and then asked to view either a food label with current serving sizes, similar to the current NFP, or new food label displaying larger portion sizes, similar to the new NFP. Results indicated that subjects who viewed the food label with a larger serving size ate less candy ($M=39.4$, $SD=32.6$) than subjects who viewed the food label displaying the current serving size ($M=51.7$, $SD=38.5$; $t(148) = 2.1$, $p < 0.05$), suggesting that the changes in serving size listing on the new label is effective in reducing portion sizes.

An important concept to consider when examining NFPs is nutrition literacy. Nutrition literacy is defined as “the degree to which people have the capacity to obtain, process, and understand basic nutrition information” (4). One element of nutrition literacy is the ability to use and apply information acquired from the NFP, a skill measured using the Newest Vital Sign (NVS) or the Nutrition Literacy Instrument (NLit). The NLit has been confirmed as a valid and reliable tool to measure nutrition literacy (Gibbs manuscript under review) and measures health literacy across several domains. For instance, when looking at parental nutrition literacy using the NLit and its relationship with child diet quality, nutrition and health food group domains exhibit substantial reliability at 0.841 and 0.851, respectively; food label and numeracy domains exhibit moderate reliability at 0.776; household food measurement and consumer skill domains exhibit fair reliability at 0.47 and 0.549, respectively (5).

Reasons for future investigation

The NLit tool is currently validated for use with the present NFP. Because the new label design will be required by 2018, testing for consistency between the NLit with the present label

and with the proposed label will be important in ensuring the validity of the NLit tool when the new label is required in 2018. In addition, because the label design is new, more testing is needed to determine if the new label design does increase consumer understanding of the nutrition information presented on the label.

Statement of purpose

The purpose of this study is three-fold. The first objective is to determine whether there is correlation between subjects' scores on the NLit numeracy questions testing over NFP comprehension. Correlation will be assessed between participants' scores when asked questions on the present NFP and their scores when asked the same questions on the new NFP. The goal of determining this correlation will be to identify whether the validated questions achieve comparable scores when referencing the new NFP design as the present NFP design. T-tests will also be used to identify differences between scores using the different NFP designs. Cronbach's alpha will be used to assess whether there is internal consistency of the NLit instrument when asking the same numeracy questions on the new NFP design. The second objective is to measure if the new NFP design improves its usability. This will be measured by comparing NLit questions specifically testing over serving size identification and calorie content. The third objective is to collect data regarding participants' preference between the two NFPs, as well as their preference regarding emerging food trends such as GMO labeling and gluten-free labeling.

Research questions

1. Do subjects achieve similar scores on the NLit numeracy section when tested on the new NFP compared to their score when tested on the present NFP?
2. Do the validated question achieve internal consistency when referencing the new NFP?
3. Is the new NFP better understood by subjects than the present NFP?

4. What kind of information do consumers consider most important for inclusion on food labels?

Chapter 2 – Review of Literature

Individual health is a complex result of many intersecting factors such as lifestyle and genetics. One important factor contributing to an individual's health is one's health literacy and nutrition literacy level. "Literacy" and "health literacy" are different but related concepts. "Literacy" is defined as "the ability to read and write" (6). Health literacy specifically applies literacy to a health context and includes many skills related to navigating health care. Health literacy can be defined as "the degree to which an individual has the capacity to obtain, communicate, process, and understand basic health information and services to make appropriate health decisions" (7). In a 2003 national survey, only 12% of the participants had proficient health literacy (8), and low health literacy has been associated with poorer health outcomes (9). Nutrition literacy is defined similarly, with the replacement of the word "health" with "nutrition" (4).

Relationship between nutrition literacy and nutrition label comprehension

Nutrition literacy is a relatively new concept, and few statistics regarding nutrition literacy levels are available. One study conducted by Zoellner et al., however, examined the nutrition literacy status of adults in Mississippi using the Newest Vital Sign (NVS) tool (4). The results of this study indicated that 24% of participants were highly likely to have limited nutrition literacy, 28% were possibly limited in nutrition literacy, and 48% reported having adequate nutrition literacy. One important element of nutrition literacy is the ability to use and apply information obtained from the NFP. This skill of applying information is measured using the NVS or Nutrition Literacy Assessment Instrument (NLit). The NLit has been confirmed as a valid and reliable tool to measure nutrition literacy (Gibbs manuscript under review) and measures health literacy across several domains. Of note, nutrition and health food group domains exhibit substantial reliability at

0.841 and 0.851, respectively. The food label and numeracy domain exhibit substantial reliability at 0.776 (5).

Several studies have provided data supporting a correlation between literacy level, health literacy level, and the ability to understand nutrition labels. A literature review by Miller and Cassady indicated that individuals with prior knowledge of nutrition used nutrition labels more and were more likely to correctly comprehend nutrition labels (10). On the other hand, a study conducted by Rothman et al. measured participants' literacy and numeracy skills and then tested their ability to comprehend nutrition labels (11). This study noted that poor nutrition label comprehension was related to lower levels of literacy and lower numeracy skills. Since properly reading nutrition labels is a component of nutrition literacy, and nutrition literacy is related to overall health, adjustments to the NFP design to make it easier to understand is a reasonable proposition in an effort to make better choices.

Reasons warranting changes in the nutrition facts panel design

Correctly understanding serving size information may play a large role in overall health. Chronic diseases such as heart disease, cancer, and obesity are some of the most common, costly, and preventable health problems (12). Obesity, defined as having a body mass index (BMI) greater than or equal to 30 kg/m² (12), particularly poses a serious health threat as it is a risk factor for many other chronic diseases (13). Unfortunately, obesity rates have been rising. National Health and Nutrition Examination Survey (NHANES) data suggests an increase in obesity prevalence among adults age 20 and older from 23% in the 1980s to 34% in 2005 – 2006. From 2009 – 2010, 78 million people (one out of three American adults) were identified as obese (12). One probable cause for this rise in obesity is increasing portion sizes over the past decades (14).

Inconsistency between serving size terminology is one reason warranting changes to the serving size component of the nutrition label. “Serving size” and “portion size,” although often used interchangeably, are different concepts (15). Per the National Institute of Health (NIH), a portion is “the amount of food that you choose to eat for a meal or snack,” while a serving is defined as “a measured amount of food or drink, such as one slice of bread or one cup (eight ounces) of milk. ” (16). An individual’s chosen portion size may be larger or smaller than the serving size listed on the NFP. By law, the serving sizes listed on the NFP must reflect how much food individuals typically consume, not the amount that they should consume (17). Serving sizes that are listed on NFPs are determined by actual intake data and do not reflect the amount of food that one “should” eat (18).

Portion sizes (amounts of food that people voluntarily choose to eat) have increased. Adding to the confusion is the fact that serving sizes listed on packages have also increased. Young et al. compared the commercially available portion sizes of common foods such as white bread, fries, and soda with the USDA and the Food and Drug Administration (FDA) recommended serving sizes. Except for white bread, all of the commercially available portion sizes exceeded the recommended serving sizes. In addition, when the current commercially available portion sizes were compared with portion sizes from the 1970s, 1980s, and 1990s, it was clear that portion sizes have grown larger overtime (14).

In addition to increasing portion sizes, consumer misinterpretation of serving size information is also a problem. A recent study by Zhang et al. found the number of consumers who use serving size information has increased; however, the majority (51 – 55%) of those consumers misinterpreted serving size information (18). Zhang et al. examined the following data sets: The FDA Health and Diet Survey (HDS) from 1994, 1995, and 2008, the National

Health and Nutrition Examination Survey (NHANES) from 2005 – 2006 and 2007 – 2008, and the 2011 FDA Nutrition Facts Label Experimental Study (NFLES). The HDS, which examined how serving size was determined as well as the frequency it was used, indicated an increase in serving size information usage from 1994 – 2008, which is an encouraging trend. NHANES and NFLES tested participants on what serving size information meant. Data from NHANES and NFLES indicated that the majority of participants were incorrectly interpreting serving size information as the amount of food that one “should” eat, which is another reason warranting changing the nutrition fact panel so that serving size information is more easily comprehended.

Changes in the nutrition facts panel design

A change in the NFP design, including how serving size information is presented, is appropriate. On May 20, 2016, the FDA announced a new nutrition label design (19). Large manufacturers have until July 26, 2018 to comply with the new nutrition label guidelines. Smaller manufacturers will have an additional year to implement the new labels (19).

There are several changes to the NFP. One change in the label design includes how serving size information is presented. The proposed nutrition label will look similar to the current label, although “calories,” “servings per container,” and “serving size” will be typed in larger font to make these pieces of information easier to locate (19). The number of calories and the number of serving sizes per package will also be bolded. In addition, the amounts listed as a “serving size” will be updated to reflect the amount of food typically consumed in one portion; presently, the amount listed on the current food labels as a “serving size” is the recommended serving size. If a package contains between one and two servings, the entire package will be listed as a serving; if a package contains more than two servings, two columns will be provided

on the label, one displaying nutrition information for one serving and one with information for the entire package (19).

Nutrition Facts			
Serving Size 2/3 cup (55g)			
Servings Per Container About 8			
Amount Per Serving			
Calories	230	Calories from Fat 72	
% Daily Value*			
Total Fat	8g		12%
Saturated Fat	1g		5%
Trans Fat	0g		
Cholesterol	0mg		0%
Sodium	160mg		7%
Total Carbohydrate	37g		12%
Dietary Fiber	4g		16%
Sugars	1g		
Protein	3g		
Vitamin A			10%
Vitamin C			8%
Calcium			20%
Iron			45%
* 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	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Nutrition Facts	
8 servings per container	
Serving size	2/3 cup (55g)
Amount per serving	
Calories	230
% Daily Value*	
Total Fat	8g 10%
Saturated Fat	1g 5%
Trans Fat	0g
Cholesterol	0mg 0%
Sodium	160mg 7%
Total Carbohydrate	37g 13%
Dietary Fiber	4g 14%
Total Sugars	12g
Includes 10g Added Sugars	20%
Protein	3g
Vitamin D	2mcg 10%
Calcium	260mg 20%
Iron	8mg 45%
Potassium	235mg 6%
* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.	

Figure 1. Current NFP (left) vs. new NFP (right)(17)

One of the primary theories behind updating the serving size information on the label to a typical portion size is that this change will make it easier for consumers to more accurately calculate the nutrients in the food they are eating. For example, currently a serving of ice cream is typically ½ cup (20); on average, ½ cup of ice cream contains 150 calories. Most consumers, however, eat more than ½ cup in one portion. A consumer may eat 1 cup of ice cream, glance at the label, and mistakenly calculate that he or she has eaten 150 calories when he or she has actually consumed 300 calories (20). In theory, the changes to serving size information will help prevent these types of miscalculations and allow consumers to have a more accurate idea of what

they are eating. Research is needed, however, to understand if the changes have the intended impact.

Evidence supporting the new nutrition facts panel design

Several studies have produced results indicating that the new nutrition label design will enhance accurate interpretation of serving size information. Hydock et al. (3) tested if viewing the new nutrition fact panel affected the amount of food consumed. Participants were provided M&Ms as a "thank you" for participating in the research and were asked to examine the nutrition facts. Groups were randomly assigned to view either the current or new nutrition fact labels. Independent sample *t* tests revealed that participants who viewed the new nutrition fact label ate less candy than participants who viewed the current nutrition fact label. These results suggest that the new nutrition fact label might help decrease portion sizes.

Some studies, while not directly testing the effectiveness of the proposed food labels, examined the performance of food labels formatted similarly to the proposed food labels. One 2012 study (21) measured the effectiveness of single-larger-portion-size and dual-column labeling. The particular focus of this study was to examine the effect of the changes to the NFP for foods listed as having one or two servings, but can be consumed in one sitting. For example, if a 15oz can of soup contains between one and two servings, the proposed nutrition fact label will list "one serving" on the label since most consumers will eat the entire can in one sitting (21).

Subjects were randomly assigned into one of 10 label formats further classified into the following three groups: listing two servings per container in a single column, listing two servings per container with a dual column, and listing a single serving per container (21). Participants were asked to complete several tasks after viewing their respective nutrition label; tasks included

determining the number of calories and nutrients per serving and per container as well as comparing products and determining which one contained fewer calories per serving. Single serving per container or dual column formatting performed better than labels with a single serving, single-column format. Because the new nutrition label design features single serving per container and dual-column formatting, this study indicates that the new nutrition label design may be effective in enhancing consumer interpretation of nutrition information on labels (21).

Other studies lend support to the dual-column and per-container serving size labeling featured on the new NFP. Antonuck et al. (22) examined if and how dual-column labeling affected the amount of food consumed. Participants were all given 50 M&Ms as a snack and then randomly assigned into two groups. One group viewed nutrition information via a single-column label and the other group viewed a dual-column label. Participants viewed a short film and ate the M&Ms as they watched. Participants were then administered a short questionnaire, with one of the questions assessing dieting behavior (on a diet vs. not on a diet). Among non-dieters, dual-column labeling reduced the amount of M&Ms consumed compared to single-column labeling.

Evidence contradicting the new nutrition facts panel design

As seen in the research, the proposed changes to the nutrition fact labels have been successful in regulating portion sizes and increasing the interpretation of nutrition information. While successful, however, the proposed changes are not perfect. Some research indicates that the proposed changes may actually lead to confusion rather than clarification regarding serving size information. Dallas et al. (20) completed a study designed to examine if consumers incorrectly interpreted the serving size information presented on the new food label as the recommended serving size or correctly interpreted it as the amount of food typically consumed in one sitting. This study (20) was conducted online and involved participants being randomly

assigned to view either the current nutrition label or the proposed nutrition label. After viewing their respective label, participants were asked to identify what they thought the serving size information referred to. Participants could select “The amount that people can consume in one sitting as part of a healthy, well-balanced diet,” “The amount that people typically consume in one sitting,” “The amount that people should consume in one sitting as part of a healthy, well-balanced diet,” or “other,”(20) .

Regardless of what label they were exposed to, the majority of participants (82.4% of those exposed to the current label and 78.0% of those exposed to the proposed label) selected that the serving size information referred to the amount that one can or should eat in one sitting. As discussed, however, the serving size information on the proposed nutrition label is being updated to reflect the amount of food that is typically consumed in one sitting, not the amount that one can or should eat in one sitting. Dallas et al. (20) conducted three additional studies examining whether this misinterpretation of serving size information impacted the amount of food that consumers purchased and served to themselves and others. Results from these studies indicate that the changes in serving size information could potentially backfire and result in consumers choosing to eat more instead of less, while believing that they are following healthy serving size recommendations.

Additional data also offers mixed results regarding the effectiveness of the new NFP’s update in serving size information. Spanos et al. (23) examined the effect of providing objective serving-size information on the amount of food consumed. Participants were asked to sign up for a taste-test study. They were randomly assigned to one of four of the following groups that were served pizza: small portion of pizza, no label; large portion of pizza, no label; large portion of pizza with a label reading "contains two servings,"; and large portion of pizza with a label

reading "contains four servings." The group served a small portion of pizza without a label consumed the least amount of pizza; the group served a large portion of pizza with the "contains two servings label" consumed the most. Additionally, participants ate 27% more when served a large, unlabeled portion of pizza compared to when they were served a small, unlabeled portion of pizza. Intake was also lower in the group served the large portion labeled "contains four servings" compared to intake in the group served the large portion of pizza labeled "contains two servings."

Spanos et al. found that consumers choose to eat more when they are served more food (23). It also appears that if a food is labeled as containing multiple servings, consumers tend to eat less. Spanos et al. (23) indicated that providing objective serving-size information does impact the amount of food consumed. Consumers, however, also ate more food when the label indicated fewer servings. Since the serving size information on the new NFPs will reflect what is typically eaten in one sitting, and typical portion sizes are increasing, the new nutrition fact panels will list fewer servings per container. This could lead consumers to eat more, not less, after viewing the new labels.

Emerging trends in nutrition labeling

Although not directly related to the NFP, it is important for dietitians and other health professionals to be aware of what information the public is interested in seeing on food labels. New policies, such as the recent law mandating that companies label whether their food contains GMOs or not (24) reflect a growing consumer interest in knowing more about what is in the packaged food products they are eating. Other new labels that will be added to some packaged foods include the "Good Housekeeping Nutritionist Approved" emblem, the "50%+ Whole Grain" stamp, and a "Certified Transitional" seal, for producers who are in the process of

transitioning to making organic products but are not 100% organic yet (25). Knowing what consumers want to know can help companies prioritize the information they print on labels, but it can also help nutrition and health professionals know what to prioritize in public health education efforts.

Conclusion

The design changes to the NFP appear promising in many regards, including their potential to enhance consumer understanding of nutrition facts information. Some research, however, indicates that the changes in the NFP design will actually cause more misinterpretation of information, specifically regarding serving size. While there is evidence to support that the changes reflected in the new NFP design are effective in enhancing interpretation of nutrition information, more research is needed to verify these results. Additionally, tools used to measure nutrition literacy (i.e. NLit) must be updated to incorporate the new nutrition fact panel design and these updates should be validated for reliability.

Chapter 3 – Methods

Overview

The primary purpose of this thesis project was to assess the correlation between subjects' answers for NLit nutrition label numeracy questions on the present nutrition label with their answers for NLit nutrition label numeracy questions on the new nutrition label. The secondary purpose of this thesis project was to observe if participants score better on questions that test on the new NFP design compared to their scores on questions that test on the present NFP design. The final purpose of this study was to simply gather information on participants' preference between the two food labels as well as what they consider to be important information to see labeled on food products (such as gluten-free and non-GMO containing).

Setting

Participants were recruited from attendees at Metropolitan Lutheran Ministries (MLM) weekly class sessions. Metropolitan Lutheran Ministries is an organization serving Kansas City-area counties in Kansas and Missouri. MLM seeks to connect needy families with various resources such as food, housing, health care, and employment services (26). The organization offers classes to teach individuals financial literacy-related skills such as how to read a lease, how to search for a job, and how to manage personal finances. Some of these classes are held on Wednesday morning and afternoon sessions. Occasionally, MLM will host financial management classes on weekends.

Researchers at the University of Kansas Medical Center had been hired by MLM to administer surveys testing financial literacy before and after classes to assess the effectiveness of the classes. The NFP assessment survey was added to the study protocol and appended to the survey packet. Surveys were primarily administered at Wednesday morning class sessions during

the months of January, February, and March and at one Saturday afternoon financial management class in February.

Sample

Participants were individuals who attended the Wednesday morning class sessions and the Saturday morning financial management class. Participants were 18 years or older. The goal sample size was 50 participants. This was decided upon using a rule of thumb estimate for questionnaire design requiring 10 participants per item. With 6 items, in this case the required sample size is 60 participants. Alternatively, a power calculation based upon a correlation effect of 0.400 or higher: with $\alpha = 0.05$, $\beta = 0.200$, $r = 0.400$, yields a sample requirement of 47 participants (27). There were 84 total individuals who were eligible to complete the survey, and all 50 surveys were administered and completed (60% response rate).

Data collection methods

Researchers from KUMC sat at a table in the main room of the center where the classes were held on Wednesday mornings. When individuals arrived at the center to attend class, they were asked if they wanted to take the survey. After agreeing to take the survey, participants were handed the survey packet and given brief instructions regarding the content of the survey and were also informed that they would receive a \$5 Aldi gift card as compensation after completing the survey. After completing the survey, participants handed them back to the researchers, who double checked each survey to make sure every question had an answer marked and then gave participants their gift card.

Description of tools or instruments

Five documents were included in the survey packets. The first document was a letter of introduction to the participant explaining the purpose, benefits, and risks of completing the

surveys. The second document was a 9-question demographics questionnaire. Health literacy was screened for in this document via the validated Single Item Literacy Screener (SILS), which asks the question “How often do you need to have someone help you when you read instructions, pamphlets, or other written material from your doctor or pharmacy?” Responses of “sometimes,” “often,” and “always” were considered positive and indicative of some difficulty with reading printed health-related materials. (28) The third document was a 5-question financial literacy survey. The fourth document was the 20 question NFP survey specifically created for this research project. See Appendix for samples of Version 1 and Version 2 of the survey.

The NFP survey included pictures of NFPs in both the current and updated designs. The label utilizing the new design was generated using OnlineLabels.com (29). For each label, the 6 NLit numeracy questions were asked. These questions tested ability to locate information on the NFPs and compute simple calculations based on information presented in the NFP. Two versions of the NFP survey were created, version 1 and version 2. Version 1 tested questions on a picture of the current NFP design first and asked questions regarding the updated design second. Version 2 presented the updated design first, and the current design second. These two versions were created to control for subject recognition that the same numeracy questions were asked for each label. In each version, the questions were also reverse-ordered for the second NFP (updated design in version 1, current design in version 2) as another effort to control for bias. On survey version 1, two additional questions regarding the added sugars component of the updated NFP design were added. A total of 50 surveys were administered, but two were not used for data analysis due to incomplete answers. Therefore, 48 surveys were used for data analysis – 18 of version 1 and 30 of version 2.

Methods of analyzing data

Two scores were calculated from each survey – the number of correct questions from the current NFP (out of 6 total), and the number of correct questions from the new NFP (out of 6 total). SPSS (Version 22, ©IBM, 2013) was used to perform all data analyses. A paired t-test was performed to determine if there was a significant difference between mean scores on questions from the current NFP and questions from the new NFP. Mean scores per question were also analyzed using pairwise t-tests to determine if participants performed significantly better or worse on specific questions. Cronbach's alpha was performed on the set of scores from the current NFP and on the set of scores from the new NFP to confirm internal consistency and reliability of each set of questions, with the acceptable range for Cronbach's alpha values being 0.70 – 0.95 (30). Responses from the open-ended questions were simply tallied into a total number.

Chapter 4 – Results

The four primary research questions for this thesis were the following: 1) Are scores using the validated NLit questions using current and new NFP formats correlated? 2) Do the validated questions demonstrate internal consistency and reliability when participants use the new NFP? 3) Is the new NFP better understood by subjects than the current NFP? 4) What kind of information do consumers consider most important for inclusion on food labels? Data results and analysis for each question are presented below. Characteristics of the sample are presented in Table 1.

Sample characteristics**Table 1.** Participant characteristics ($n = 48$)

Characteristic	Frequency	% of n
Age (years)		
18 – 29	13	27.1
30 – 39	22	45.8
40 – 49	11	22.9
50 – 59	1	2.1
60+	1	2.1
Total	48	100
Gender		
Female	42	87.5
Male	6	12.5
Race		
White	10	20.8
Black	30	64.6
Hispanic/Latino	4	8.3
Native American	2	4.2
Asian	1	2.1
Education		
Some high school	12	25.0
High school diploma/GED	11	22.9
Some college	21	43.8
Associate degree	3	6.3
Bachelor's degree or higher	1	2.1
Monthly income \$0 - \$2380; $\mu = \$869.08$; $\text{std}(X) = \$718.103$		

Participant health literacy screening results are presented in Table 2. Health literacy was screened for via the SILS, which asks “How often do you need to have someone help you when

you read instructions, pamphlets, or other written material from your doctor or pharmacy?”

Responses of “sometimes,” “often,” and “always” were considered a positive indicator of some difficulty reading printed health-related material. Out of 48 participants, 12 responded with a positive score (25%) and suggesting low health literacy.

Table 2. Participant health literacy ($n=48$)

Answer choice	Frequency	% of n
Never	29	60.4
Rarely	7	14.6
Sometimes	8	16.7
Often	2	4.2
Always	2	4.2

NLit Reliability

As shown in Table 3, Cronbach’s alpha for the current nutrition facts panel (NFPC) and new nutrition facts panel (NFPN) was significant for both sets of questions (0.733 and 0.815, respectively).

Table 3. Cronbach’s alpha for NFPC and NFPN

	Cronbach’s alpha	N of items
NFPC	0.733	6
NFPN	0.815	6

Survey Scores

The mean score for NLit questions on the current NFP (ScoreNFPC) was 3.21/6 (53.5%). The mean score for NLit questions on the new NFP (Score NFPN) was 3.33/6 (55.5%). The mean scores were significantly correlated ($r=0.8042$, $p<0.0001$). Paired samples t-test between ScoreNFPC and ScoreNFPN was not significant ($p=0.437$).

Pearson correlations and paired t-tests were also performed as post-hoc analysis on each set of answers for each specific question and are shown in Table 4 (Correlation) and Table 5 (Differences). All of the pairs were positively and significantly correlated. All of the 6 pairs of

questions were not significantly different. Of note, however, the question “If you are advised to eat 45 grams of carbohydrate per meal, and eat 1 serving of macaroni and cheese, how many grams of total carbohydrate should you eat from another food at the same meal?” approached significance, demonstrating a trend ($p=0.057$) for better performance on this question when viewing the NFPN ($\mu=.69$) than NFPC ($\mu=.56$).

Table 4. Paired sample correlations ($n=48$)

Question	Significance of r (p)	Correlation (r)
How many calories will you eat if you eat the whole container?	<0.0001	0.708
If you are limiting your total fat intake to 65 grams per day, and you eat one (1) cup of macaroni and cheese, what is the highest amount of total fat you can eat from other food sources?	<0.0001	0.499
How many grams of total carbohydrate would you eat in 2 cups of macaroni and cheese?	0.004	0.408
If you eat ½ cup of this macaroni and cheese, how many grams of total fat would you eat?	<0.0001	0.649
If you are advised to eat 45 grams of carbohydrate per meal, and eat 1 serving of macaroni	<0.0001	0.583

and cheese, how many grams of total carbohydrate should you eat from another food at the same meal?		
If your doctor has advised you to limit your total fat intake to 60 grams per day, what percentage of your day's intake have you eaten in one serving of this macaroni and cheese?	<0.0001	.621

Table 5. Paired samples test ($n=48$)

Question	<i>n</i> correct	Mean difference	Std. Deviation	Significance (<i>p</i>)
How many calories will you eat if you eat the whole container? NFPC and NFPN	NFPC 25	-0.021	0.385	0.710
	NFPN 26			
If you are limiting your total fat intake to 65 grams per day, and you eat one (1) cup of macaroni and cheese, what is the highest amount of total fat you can eat from other food sources? NFPC and NFPN	NFPC 23 NFPN 23	0.000	0.505	1.00

How many grams of total carbohydrate would you eat in 2 cups of macaroni and cheese? NFPC and NFPN	NFPC 36 NFPN 32	0.083	0.498	0.252
If you eat ½ cup of this macaroni and cheese, how many grams of total fat would you eat? NFPC and NFPN	NFPC 33 NFPN 36	-0.063	0.381	0.261
If you are advised to eat 45 grams of carbohydrate per meal, and eat 1 serving of macaroni and cheese, how many grams of total carbohydrate should you eat from another food at the same meal? NFPC and NFPN	NFPC 27 NFPN 33	-0.0125	0.444	0.057
If your doctor has advised you to limit your total fat intake to 60 grams per day, what percentage of your day's intake have you eaten in one serving of this macaroni	NFPC 10 NFPN 10	0.000	0.357	1.000

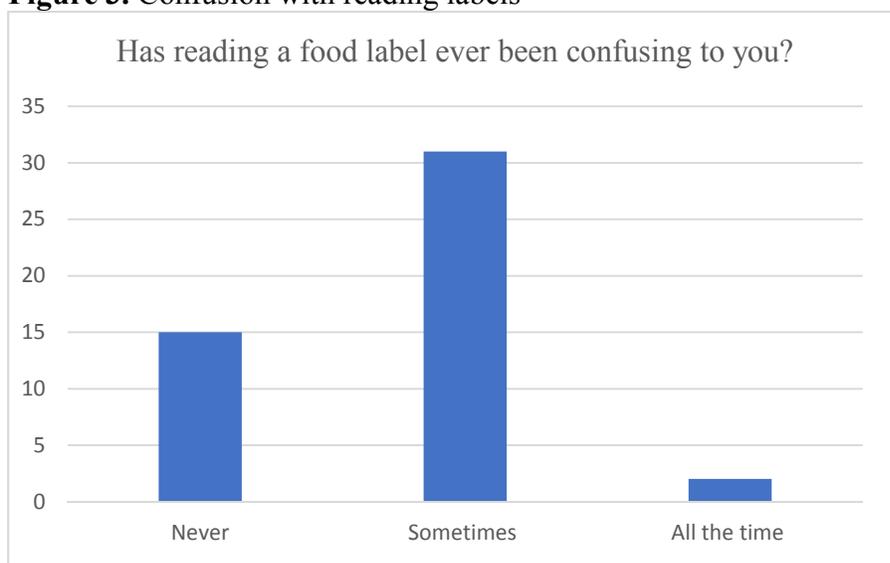
and cheese? NFPC and NFPN				
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Participant preferences regarding nutrition facts panel design

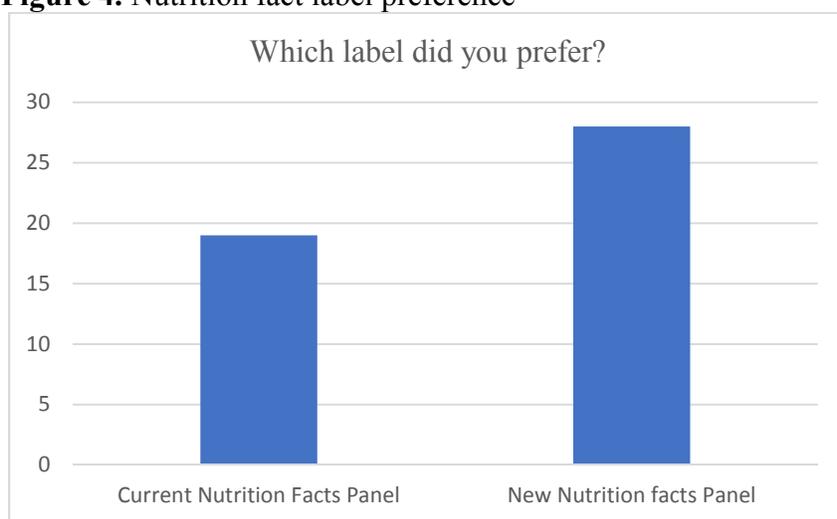
Half-way through the survey, participants were asked to indicate how often they read food labels as well as if reading food labels had ever been confusing to them. At the conclusion of the survey, participants were asked to indicate which label they preferred. Participants were also asked why they preferred one label over the other and were given answer choices. Finally, participants were asked which label was easiest for them to gather information from. These data are presented in Figures 2-6.

Figure 2. Frequency of label reading

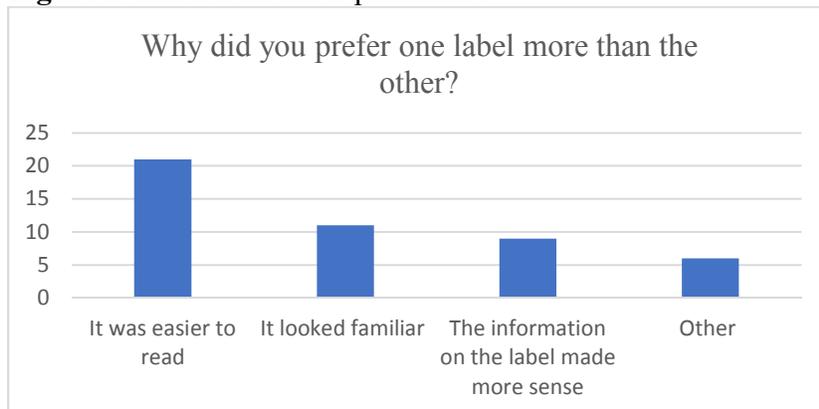


Figure 3. Confusion with reading labels

Never = 15
Sometimes = 31
All the time = 2

Figure 4. Nutrition fact label preference

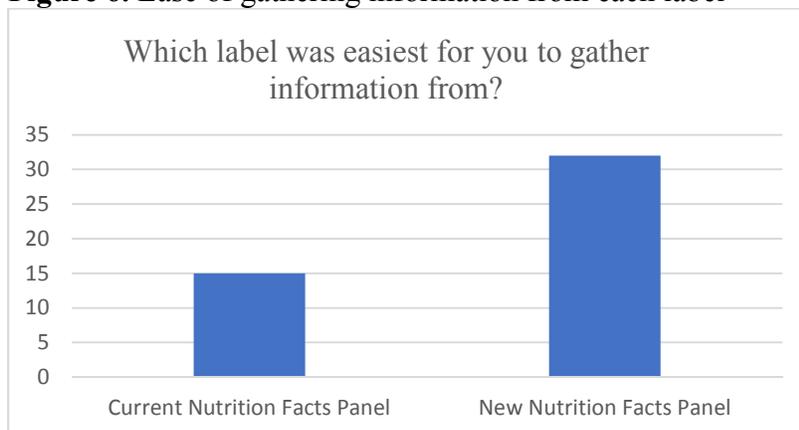
19 participants preferred
the current NFP
28 participants preferred
the new NFP
1 participant indicated
no preference

Figure 5. Reason for label preference

It was easier to read = 21
 It looked familiar = 11
 The information on the label made more sense = 9
 Other = 6

“Other” reasons were the following: “less fat (total),” “didn’t mind either,” “has vitamins A and C,” “calories are easier legible,” “can’t tell the difference,” and “I only had one label”

1 participant did not answer

Figure 6. Ease of gathering information from each label

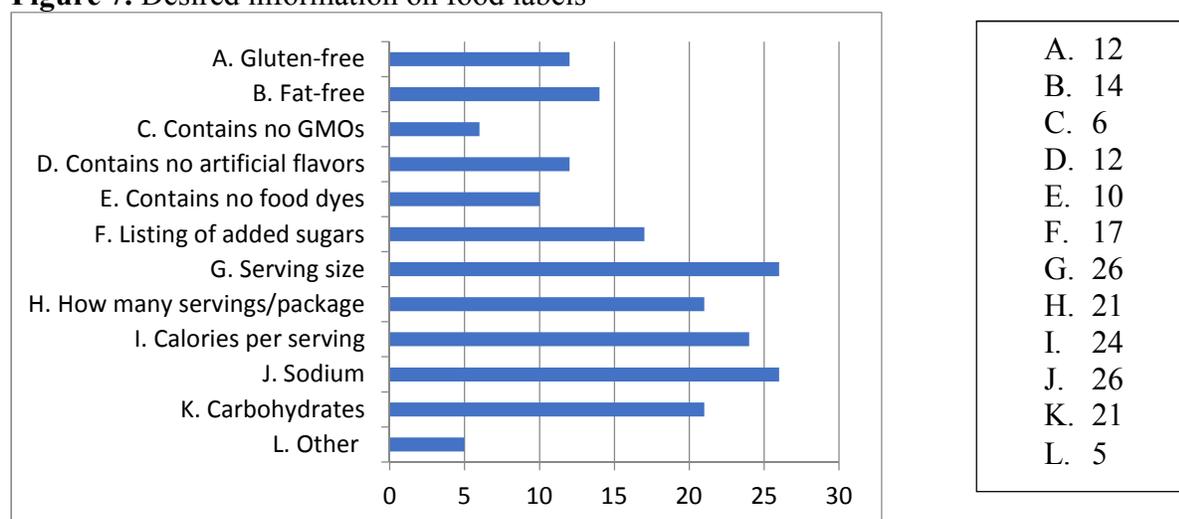
Current NFP = 15
 New NFP = 32
 No preference = 1

Participant preferences regarding information included on food labels

Half-way through the survey, participants were asked to indicate what kind of information they desired to see on food labels; 12 answer options were included, and participants were allowed to check as many options as they wanted. Options G and J, “serving size” and “sodium,” respectively, were the most popular choices and were checked by 54% of participants

each and each was selected 26 times. Option L was “other,” and participants were asked to specify what other information they would like to see on labels if they selected this option. “Other” was picked five times, and answers written by participants were “price,” “sometimes never,” “none,” “I don’t buy packaged foods, I prefer fresh produce,” and “protein.”

Figure 7. Desired information on food labels



Chapter 5 – Discussion

Major findings

Nutrition literacy is a component of an individual's health, and the ability to accurately read NFPs is an important aspect of nutrition literacy. It is equally important to ensure the continued validity and reliability of instruments that measure nutrition literacy, such as the NLit. This study found that simply replacing the present NFP with the new NFP in the numeracy section of the NLit does not affect the validity or reliability of the tool, which is important because using the current NFP version when the new NFP becomes standard would theoretically decrease the face reliability of the tool. The results of this study also indicate that, although the new NFP was designed with the intent of making nutrition information easier to read and understand, NLit numeracy scores on questions on the current NFP and the new NFP were significantly correlated and not significantly different, even when considering individual item responses. Finally, a wide range of answers regarding what kinds of information participants consider important on food labels was reported. Serving size, sodium content, calories per serving, and carbohydrate content were the answer choices that got selected most often (26, 26, 24, and 21 times, respectively).

Validity and Reliability of NLit Referencing New NFP

Scores on NLit numeracy questions on the current NFP and the new NFP were significantly correlated ($r=0.842$; $p<0.0001$). Additionally, Cronbach's alpha for each set of numeracy questions was 0.733 and 0.815, respectively. Therefore, the numeracy questions from the NLit will still be a reliable instrument for assessing nutrition literacy even after replacement of the current NFP with the new NFP.

Survey scores and sample characteristics

It was hypothesized that participants would score better on NLit questions asked on the new NFP than on questions asked on the current NFP. Although the mean total score was slightly higher on questions asked on the new NFP when compared to scores from the same questions asked on the current NFP (53.5% and 55.5%, respectively), this difference was not significantly different ($p=0.437$). Because the scores were significantly correlated, as previously discussed, it makes sense that there is not a significant difference between scores.

There are several possible explanations for why the scores were not significantly different. One of the main reasons is the sample that completed the surveys. Research indicates that educated and wealthy individuals are typically the population who looks at food labels. Responses from Gallup's annual Consumption Habits survey in 2013 indicated that education and economic status both correlated with how often individuals looked at nutrition labels (31). In this survey, 81% of college graduates claimed they paid a "great deal" or "fair amount" of attention to nutrition labels found on food packages, with 67% of individuals with some college and only 58% of those with a high school diploma or less reporting that they paid attention to nutrition labels on food packages. In terms of income, 62% of individuals who made less than \$30,000 a year reported that they paid attention to nutrition labels, while 75% of participants who made \$75,000 or more a year claimed that they read nutrition labels.

The demographics of the population surveyed for this study indicate that 91.7% of participants either had "some high school," "high school diploma/GED," or "some college" for education status. The mean monthly income reported was \$896.08, although income reports widely ranged between \$0/month and \$2380/month. Therefore, one reason why survey scores were relatively low for both the current NFP and the new NFP (53.5% and 55.5%, respectively)

may have been because this sample does not typically look at NFPs and was not familiar with either format. Additionally, in response to the question “How often do you read food labels while grocery shopping?” 75% of this sample reported that they “sometimes,” “rarely,” or “never” read food labels. As Cha et al. point out, food labels are only effective in helping individuals make healthier food choices if they actually read and understand them (32).

Study limitations

There were several limitations to this study. There were a few logistical errors that occurred when preparing the surveys. Originally, there were two additional questions addressing the added sugar component of the new NFP that were supposed to have been asked. Version 1 of the survey (see appendix) includes these questions. However, when preparing Version 2 of the survey, the two labels were switched in their order of appearance in the survey, but the questions were not. This resulted in the questions over added sugars not being included on the part of the survey that tested on the new NFP. Consequently, the questions regarding added sugar were thrown out and not analyzed. Additionally, there was an error made in copying the surveys which resulted in more Version 2 surveys being copied and administered than Version 1 surveys. A total of 18 participants received Version 1 and 30 participants received Version 2.

Another limitation of this study is the fact that some of the data collected were self-reported. For instance, when screening for general health literacy, 29 individuals (60.4% of the sample) reported that they “never... need to have someone help you when you read instructions, pamphlets, or other written material from your doctor or pharmacy,” and 14.6% of participants reported “rarely” needing help with reading health-related materials. Only 12 out of 48 participants (25%) indicated that they “sometimes,” “often,” or “always” need help reading health-related materials. Per the SILS threshold, this means only 25% of the sample indicated

limited health literacy (28). Previous research (32), however, has found that individuals with low health literacy are less likely to use food labels. Cha et al. assessed the relationships between health literacy, food label use, and dietary quality in young adults (ages 18 – 29). NVS was used to measure health literacy, and responses to the question “how often do you use the food label when making a food selection?” with 5 answer choices ranging from “never” to “always” was used to measure food label use behavior. Results indicated a trend that, after adjusting for self-efficacy, the low health literacy group was less likely to use food labels ($p=0.071$).

Previously discussed results from this thesis project, however, indicate that the majority (75%) of participants, when screened for health literacy via the SILS, did not screen as having low health literacy; 75% of them also reported low food label use. Based on previous research (32), it would be expected that individuals reporting higher health literacy levels would also report more frequent usage of food labels. Two theoretical perspectives currently are used to explain inaccuracy of self-reported data (33). The cognitive perspective proposes that individuals incorrectly report information because they do not accurately understand the question being asked. The situational perspective proposes that the context in which the questions are asked influences the accuracy of the reported data. One construct used to explain the situational perspective is social desirability, which is defined as the “desire to provide others with a favorable impression of oneself,”(33). In this study, it is possible that some participants overestimated their health literacy out of a desire to not appear incompetent with managing their health. In addition, since the SILS is a validated screener for health literacy, subject responses to that single question are not fully representative of one’s health literacy. The SILS also assumes that the subject responding to the question regularly sees a doctor or uses a pharmacist, which may or may not be true for this study population. The context in which the surveys were

administered – individuals were waiting to attend class, and some may have felt rushed or unable to fully focus – could have also contributed to inaccurate responses to the survey questions.

Conclusion

The new NFP design was created with the goal of making nutrition information easier for the general public to read and understand. The results of this study, although they must be analyzed within the context of the specific sample surveyed, do not support that goal. It must also be noted that the ability to correctly read nutrition labels is not enough in and of itself to increase health outcomes. Previous research (20) indicates that even if individuals are able to correctly read nutrition labels, they often do not accurately understand how to interpret what the information on the label means. Additionally, as Cha et al. explained (32), the US NFP requires the use of basic math skills for proper interpretation; the new NFP design, although designed to limit the math skills needed, still requires that consumers have some knowledge of numbers and their meaning. The European Union, on the other hand, uses “Choices” logos and the traffic light system for indicating which foods are healthier options. This system requires that consumers only be able to recognize specific logos and understand the meaning of colors in order to select healthier food options (32). The newly announced Good Housekeeping “Nutritionist Approved” seal is a step towards making it easier to select healthy choices without needing numeracy skills. One limitation with such seals, however, is that products must pay to have the seal; all packaged foods are required by law to have the NFP.

Further research on larger and more diverse samples is merited to continue assessing the effectiveness of the new NFP design. Additionally, attention must be given to ensure that consumers are not only able to read what the label says, but are also able to correctly understand what the information means and then use that information to make healthier food choices. Public

education regarding nutrition is clearly an effort mandating a multi-disciplinary approach. Dietitians, physicians, teachers, policy makers, and ultimately the consumer are all important players in increasing the public's nutrition knowledge and decreasing health problems. The new NFP, although not perfect, may be a step in the right direction towards increasing nutrition literacy.

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Appendix
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This Nutrition Facts Panel at right is taken from the back of a container of macaroni and cheese.

Label A

Nutrition Facts	
Serving Size 1 cup (228g)	
Servings Per Container about 2	
Amount Per Serving	
Calories 250	Calories from Fat 110
% Daily Value*	
Total Fat 12g	18%
Saturated Fat 3g	15%
Trans Fat 3g	
Cholesterol 30mg	10%
Sodium 470mg	20%
Total Carbohydrate 31g	10%
Dietary Fiber 0g	0%
Sugars 5g	
Proteins 5g	
Vitamin A	4%
Vitamin C	2%
Calcium	20%
Iron	4%
*Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs:	
	Calories: 2,000 2,500
Total Fat	Less than 65g 80g
Saturated Fat	Less than 20g 25g
Cholesterol	Less than 300mg 300mg
Sodium	Less than 2,400mg 2,400mg
Total Carbohydrate	300g 375g
Dietary Fiber	25g 30g

For educational purposes only. This label does not meet the labeling requirements described in 21 CFR 101.9.

- How many calories will you eat if you eat the **whole container**?
 - 250 calories
 - 500 calories
 - 700 calories
 - 750 calories

- If you are limiting your total fat intake to 65 grams **per day**, and you eat one (1) cup of macaroni and cheese, what is the highest amount of total fat you can eat from other food sources?
 - 33 grams
 - 47 grams
 - 53 grams
 - 57 grams

- How many grams of total carbohydrate would you eat in 2 cups of macaroni and cheese?
 - 31 grams
 - 45 grams
 - 62 grams
 - 75 grams

Label A

4. If you eat 1/2 cup of this macaroni and cheese, how many grams of total fat would you eat?

- A. 2 grams
- B. 4 grams
- C. 6 grams
- D. 8 grams

Nutrition Facts	
Serving Size 1 cup (228g)	
Servings Per Container about 2	
Amount Per Serving	
Calories 250	Calories from Fat 110
% Daily Value*	
Total Fat 12g	18%
Saturated Fat 3g	15%
Trans Fat 3g	
Cholesterol 30mg	10%
Sodium 470mg	20%
Total Carbohydrate 31g	10%
Dietary Fiber 0g	0%
Sugars 5g	
Proteins 5g	
Vitamin A	4%
Vitamin C	2%
Calcium	20%
Iron	4%
*Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs:	
	Calories: 2,000 2,500
Total Fat	Less than 65g 80g
Saturated Fat	Less than 20g 25g
Cholesterol	Less than 300mg 300mg
Sodium	Less than 2,400mg 2,400mg
Total Carbohydrate	300g 375g
Dietary Fiber	25g 30g

For educational purposes only. This label does not meet the labeling requirements described in 21 CFR 101.9.

5. If you are advised to eat 45 grams of carbohydrate **per meal**, and eat 1 serving of macaroni and cheese, how many grams of total carbohydrate should you eat from another food at the same meal?

- A. 9 grams
- B. 10 grams
- C. 14 grams
- D. 20 grams

6. If your doctor has advised you to limit your total fat intake to 60 grams **per day**, what percentage of your day's intake have you eaten in one serving of this macaroni and cheese?

- A. 10%
- B. 15%
- C. 18%
- D. 20%

7. What information do you look for on a food package? (check all that apply)

- A. Gluten-free
- B. Fat-free
- C. Contains no GMOs
- D. Contains no artificial flavors
- E. Contains no food dyes
- F. Listing of added sugars
- G. Serving size
- H. How many servings are in a package
- I. Calories per serving
- J. Sodium
- K. Carbohydrates
- L. Other (please specify) _____

8. How often do you read food labels while grocery shopping?

- A. Always
- B. Sometimes
- C. Rarely
- D. Never

9. Has reading a food label ever been confusing for you?

- A. Never
- B. Sometimes
- C. All the time

Label B

This Nutrition Facts Panel at right is taken from the back of a container of macaroni and cheese.

10. . If you are advised to eat no more than 50 grams of added sugar per day, and you eat 1 serving of macaroni and cheese, what is the highest amount of added sugar you can consume from other food sources?

- A. 0 grams
- B. 19 grams
- C. 45 grams
- D. 50 gram

11. How many grams of added sugar are in one serving of this macaroni and cheese?

- A. 0 grams
- B. 5 grams
- C. 31 grams
- D. 250 grams

12. If your doctor has advised you to limit your total fat intake to 60 grams **per day**, what percentage of your day's intake have you eaten in one serving of this macaroni and cheese?

- A. 10%
- B. 15%
- C. 18%
- D. 20%

13. If you are advised to eat 45 grams of carbohydrate **per meal**, and eat 1 serving of macaroni and cheese, how many grams of total carbohydrate should you eat from another food at the same meal?

- A. 9 grams
- B. 10 grams
- C. 14 grams
- D. 20 grams

Nutrition Facts	
2 servings per container	
Serving size	1 cup
Amount Per Serving	
Calories	250
% Daily Value*	
Total Fat 12g	15%
Saturated Fat 3g	15%
Trans Fat 3g	
Cholesterol 30mg	10%
Sodium 470mg	20%
Total Carbohydrate 31g	11%
Dietary Fiber 0g	0%
Total Sugars 5g	
Includes 0g Added Sugars	0%
Protein 5g	10%
Vitamin D 0mcg	0%
Calcium 260mg	20%
Iron 0.72mg	4%
Potassium 0mg	0%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

This Nutrition Facts Panel at right is taken from the back of a container of macaroni and cheese.

Label B

Nutrition Facts	
2 servings per container	
Serving size	1 cup
Amount Per Serving	
Calories	250
	<small>% Daily Value*</small>
Total Fat 12g	15%
Saturated Fat 3g	15%
Trans Fat 3g	
Cholesterol 30mg	10%
Sodium 470mg	20%
Total Carbohydrate 31g	11%
Dietary Fiber 0g	0%
Total Sugars 5g	
Includes 0g Added Sugars	0%
Protein 5g	10%
Vitamin D 0mcg	0%
Calcium 260mg	20%
Iron 0.72mg	4%
Potassium 0mg	0%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

14. If you eat 1/2 cup of this macaroni and cheese, how many grams of total fat would you eat?
- 2 grams
 - 4 grams
 - 6 grams
 - 8 grams
15. How many grams of total carbohydrate would you eat in 2 cups of macaroni and cheese?
- 31 grams
 - 45grams
 - 62 grams
 - 75 grams
16. If you are limiting your total fat intake to 65 grams **per day**, and you eat one (1) cup of macaroni and cheese, what is the highest amount of total fat you can eat from other food sources?
- 33 grams
 - 47 grams
 - 53 grams
 - 57 grams
17. How many calories will you eat if you eat the **whole container**?
- 250 calories
 - 500 calories
 - 700 calories
 - 750 calories

Follow-Up Questions:

18. Which label did you prefer?
- A. Label A
 - B. Label B
19. Why did you prefer one label more than the other?
- A. It was easier to read
 - B. It looked familiar
 - C. The information on the label made sense
 - D. Other (please specify) _____
20. Which label was easiest for you to gather information from?
- A. Label A
 - B. Label B

This Nutrition Facts Panel at right is taken from the back of a container of macaroni and cheese.

Label A

Nutrition Facts	
2 servings per container	
Serving size	1 cup
Amount Per Serving	
Calories	250
<small>% Daily Value*</small>	
Total Fat 12g	15%
Saturated Fat 3g	15%
Trans Fat 3g	
Cholesterol 30mg	10%
Sodium 470mg	20%
Total Carbohydrate 31g	11%
Dietary Fiber 0g	0%
Total Sugars 5g	
Includes 0g Added Sugars	0%
Protein 5g	10%
Vitamin D 0mcg	0%
Calcium 260mg	20%
Iron 0.72mg	4%
Potassium 0mg	0%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

- How many calories will you eat if you eat the **whole container**?
 - 250 calories
 - 500 calories
 - 700 calories
 - 750 calories

- If you are limiting your total fat intake to 65 grams **per day**, and you eat one (1) cup of macaroni and cheese, what is the highest amount of total fat you can eat from other food sources?
 - 33 grams
 - 47 grams
 - 53 grams
 - 57 grams

- How many grams of total carbohydrate would you eat in 2 cups of macaroni and cheese?
 - 31 grams
 - 45 grams
 - 62 grams
 - 75 grams

Label A

4. If you eat 1/2 cup of this macaroni and cheese, how many grams of total fat would you eat?

- A. 2 grams
- B. 4 grams
- C. 6 grams
- D. 8 grams

Nutrition Facts	
2 servings per container	
Serving size	1 cup
Amount Per Serving	
Calories	250
	<small>% Daily Value*</small>
Total Fat 12g	15%
Saturated Fat 3g	15%
Trans Fat 3g	
Cholesterol 30mg	10%
Sodium 470mg	20%
Total Carbohydrate 31g	11%
Dietary Fiber 0g	0%
Total Sugars 5g	
Includes 0g Added Sugars	0%
Protein 5g	10%
Vitamin D 0mcg	0%
Calcium 260mg	20%
Iron 0.72mg	4%
Potassium 0mg	0%
<small>*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.</small>	

5. If you are advised to eat 45 grams of carbohydrate **per meal**, and eat 1 serving of macaroni and cheese, how many grams of total carbohydrate should you eat from another food at the same meal?

- A. 9 grams
- B. 10 grams
- C. 14 grams
- D. 20 grams

6. If your doctor has advised you to limit your total fat intake to 60 grams **per day**, what percentage of your day's intake have you eaten in one serving of this macaroni and cheese?

- A. 10%
- B. 15%
- C. 18%
- D. 20%

7. What information do you look for on a food package? (check all that apply)

- A. Gluten-free
- B. Fat-free
- C. Contains no GMOs
- D. Contains no artificial flavors
- E. Contains no food dyes
- F. Listing of added sugars
- G. Serving size
- H. How many servings are in a package
- I. Calories per serving
- J. Sodium
- K. Carbohydrates
- L. Other (please specify) _____

8. How often do you read food labels while grocery shopping?

- A. Always
- B. Sometimes
- C. Rarely
- D. Never

9. Has reading a food label ever been confusing for you?

- A. Never
- B. Sometimes
- C. All the time

Label B

This Nutrition Facts Panel at right is taken from the back of a container of macaroni and cheese.

10. . If you are advised to eat no more than 50 grams of added sugar per day, and you eat 1 serving of macaroni and cheese, what is the highest amount of added sugar you can consume from other food sources?

- A. 0 grams
- B. 19 grams
- C. 45 grams
- D. 50 gram

11. How many grams of added sugar are in one serving of this macaroni and cheese?

- A. 0 grams
- B. 5 grams
- C. 31 grams
- D. 250 grams

12. If your doctor has advised you to limit your total fat intake to 60 grams **per day**, what percentage of your day's intake have you eaten in one serving of this macaroni and cheese?

- A. 10%
- B. 15%
- C. 18%
- D. 20%

13. If you are advised to eat 45 grams of carbohydrate **per meal**, and eat 1 serving of macaroni and cheese, how many grams of total carbohydrate should you eat from another food at the same meal?

- A. 9 grams
- B. 10 grams
- C. 14 grams
- D. 20 grams

Nutrition Facts	
Serving Size 1 cup (228g)	
Servings Per Container about 2	
Amount Per Serving	
Calories 250	Calories from Fat 110
% Daily Value*	
Total Fat 12g	18%
Saturated Fat 3g	15%
Trans Fat 3g	
Cholesterol 30mg	10%
Sodium 470mg	20%
Total Carbohydrate 31g	10%
Dietary Fiber 0g	0%
Sugars 5g	
Proteins 5g	
Vitamin A	4%
Vitamin C	2%
Calcium	20%
Iron	4%

* Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs:

	Calories: 2,000	2,500
Total Fat	Less than 65g	80g
Saturated Fat	Less than 20g	25g
Cholesterol	Less than 300mg	300mg
Sodium	Less than 2,400mg	2,400mg
Total Carbohydrate	300g	375g
Dietary Fiber	25g	30g

For educational purposes only. This label does not meet the labeling requirements described in 21 CFR 101.9.

This Nutrition Facts Panel at right is taken from the back of a container of macaroni and cheese.

14. If you eat 1/2 cup of this macaroni and cheese, how many grams of total fat would you eat?
- 2 grams
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15. How many grams of total carbohydrate would you eat in 2 cups of macaroni and cheese?
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 - 57 grams
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 - 500 calories
 - 700 calories
 - 750 calories

Label B

Nutrition Facts		
Serving Size 1 cup (228g)		
Servings Per Container about 2		
Amount Per Serving		
Calories 250	Calories from Fat 110	
% Daily Value*		
Total Fat 12g	18%	
Saturated Fat 3g	15%	
Trans Fat 3g		
Cholesterol 30mg	10%	
Sodium 470mg	20%	
Total Carbohydrate 31g	10%	
Dietary Fiber 0g	0%	
Sugars 5g		
Proteins 5g		
Vitamin A	4%	
Vitamin C	2%	
Calcium	20%	
Iron	4%	
* Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs:		
	Calories: 2,000	2,500
Total Fat	Less than 65g	80g
Saturated Fat	Less than 20g	25g
Cholesterol	Less than 300mg	300mg
Sodium	Less than 2,400mg	2,400mg
Total Carbohydrate	300g	375g
Dietary Fiber	25g	30g

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