



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

**CONSUMER UNDERSTANDING AND USE OF HEALTH INFORMATION ON PRODUCT
LABELS: MARKETING IMPLICATIONS FOR FUNCTIONAL FOOD**

By

Ratapol P. Teratanavat¹

Neal H. Hooker²

Curtis P. Haugtvedt³

Derek D. Rucker⁴

*Selected Paper prepared for presentation at the American Agricultural Economics
Association Annual Meeting, Denver, Colorado, August 1-4, 2004*

*Copyright 2004 by Teratanavat, Hooker, Haugtvedt and Rucker. All rights reserved. Readers may make verbatim
copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on
all such copies.*

¹ Ph.D. Candidate. Department of Agricultural, Environmental, and Development Economics. The Ohio State
University. teratanavat.1@osu.edu

² Assistant Professor. Department of Agricultural, Environmental, and Development Economics. The Ohio State
University. hooker.27@osu.edu

³ Associate Professor. Department of Marketing and Logistics. Fisher College of Business. The Ohio State
University. haugtvedt.1@osu.edu

⁴ Ph.D. Candidate. Department of Psychology. The Ohio State University. rucker.46@osu.edu

CONSUMER UNDERSTANDING AND USE OF HEALTH INFORMATION ON PRODUCT LABELS: MARKETING IMPLICATIONS FOR FUNCTIONAL FOOD

Introduction

In recent years, the numbers of functional foods being developed and subjected to scientific evaluation have increased substantially. The main characteristic of functional foods that distinguishes them from conventional foods is the potential health benefit, which can be considered to be a credence attribute of product quality. Because this characteristic cannot be easily assessed even after consumption, an asymmetric information environment for health benefits has emerged where producers have more information than consumers. Thus the government intervenes by regulating the provision of health information on product labels in order to avoid potential market failures. The Food and Drug Administration (FDA) recently amended the way health claims on labels of conventional food and dietary supplements are managed. The new policy on qualified health claims allows claims to be made based on different levels of supporting scientific evidence. The policy goal is to encourage firms to make accurate, science-based claims about the health benefits of their products while helping consumers prevent disease and improve their health through sound dietary decisions using nutrition information. This marks a break from the previous environment where a lengthy approval process was argued to provide a road block for food firms wanting to market functional foods based on emerging evidence of diet to health links.

With increasing consumer concern and interest in diet and health relationships and self-care treatments, producers of functional food have an incentive to provide information to consumers as a quality signal for their products. The producer perspective on health and nutrition labeling is that such information will create a favorable impression leading to a greater likelihood of product purchase and ultimately increased consumption of healthful products. However, concerns are often voiced by consumer advocacy groups such as the Center for Science in the Public Interest and the Consumer Federation of America that health and nutrition claims on product labels are not truthful and mislead consumers. These groups argue that consumers may not fully understand claims and that claims may lead to consumers overlooking information from other parts of label (i.e., the Nutrition Facts panel).

Many studies in both applied economics and marketing journals have explored how consumers use health and nutrition information on food labels. It has been shown that consumers consider several pieces of information when making food purchase decisions and that health and nutrition information can play a key role in leading consumers' to change eating habits and improve their diets. However, the role of information on the front label of food packaging is still not well understood as shown by inconsistent research findings, debates between food manufacturers and consumer groups, and the lack of a unifying theoretical framework to explain how consumers use labeling information to form product judgments.

This study has two objectives. **First**, to determine how consumers use health and nutrition information on food labels to form judgments about product quality, using the Elaboration Likelihood Model (ELM) as a theoretical framework. This model suggests that health and nutrition information can influence consumer's elaboration process so consumers will be further induced to carefully evaluate product quality through other sources of information on the package. Alternatively, such information can serve as a peripheral cue, if consumers only use the claim information to evaluate product quality without further thoughtful consideration. The first section of the paper will discuss the role of health and nutrition information on the front label. **Second**, to examine whether consumers can differentiate various levels of health claims, specifically the new qualified language, approved by FDA in 2003. It is interesting to determine whether consumers understand the different levels of scientific evidence supporting such claims and whether they can distinguish between the disclaimer languages used. Understanding how consumers use health and nutrition information on product labels has implications for both public policy and food manufacturers who use health claims as tools to market their products e.g., functional foods.

Overview of Information Provision on Food Labels

To control claims on food labels FDA developed two significant regulations *Nutrition Labeling and Education Act* (NLEA) of 1990 and *FDA Modernization Act* (FDAMA) of 1997. Two primary goals of these regulations are to reduce consumer confusion regarding health and nutrition claims made by food manufacturers and to ensure that such claims are truthful and do not mislead consumers (Garretson and Burton, 2000). FDA's perspective is that health and nutritional information will educate consumers about the beneficial effects of certain substances in diets, which should lead to more informed food selections and more healthful consumption patterns (Ippolito and Mathios, 1993; Jensen and Kesavan, 1993). Mojduszka and Caswell (2000) show that government intervention to mandate and regulate nutrition information on food labels is necessary to ensure that more information is available to consumers.

Currently, there are three categories of health and nutrition information allowed on food packages, including nutrient content claims, structure/function claims, and health claims, see table 1 (FDA, 2003a). Nutrient content claims describe the level of nutrients or dietary substances in food products using terms "good source", "high", or "low" (FDA, 1994). Structure/function claims are statements about a food substance's effect on the structure or function of the body or general well being without further association with a particular disease risk reduction or mitigation role (FDA, 2002). In comparison, health claims characterize the specific relationship between nutrients or other substances in the food to diseases or health-related conditions such as fiber and certain types of cancer; soy protein and heart disease (FDA, 2003a). Among the three claim types, health claims provide the most explicit description of the benefits of the food. Traditionally, health claims have only been permitted when based

on the totality of publicly available scientific evidence using a significant scientific agreement (SSA) standard, as provided by NLEA. A claim can also be based on an authoritative statement from a scientific body of the US government or the National Academy of Sciences, following FDAMA. A recent study by Caswell, et al. (2003) suggested that the implementation of NLEA has significant impact on the use of voluntary nutrient-content claims and health claims by food manufacturers. Claims have become more standardized, following the NLEA requirement. Manufacturers used nutrient-content claims much more frequently than health claims to communicate nutrition and health benefits of products. The use of health claims has been increasing, yet products with health claims remain relatively rare.

In 2003 FDA amended the way health claims on labels of conventional food and dietary supplements are to be reviewed. The recommendation to allow qualified health claims was made in a task force report *Consumer Health Information for Better Nutrition Initiative* (FDA, 2003b). Under this new policy, manufacturers of food and dietary supplement can petition FDA to allow claims explaining relationships between food substances and disease conditions even when scientific evidence does not meet the SSA standard. The new policy aims to provide a credible and effective framework that firms can use to apply or petition for qualified health claims. With FDA's permission, qualified health claims will be ranked based on the quality and quantity of scientific evidence publicly available at the time a firm submits a petition. The rank will be based on study design, study quality, and strength of the entire body of evidence. Disclaimers are required to inform consumers about different levels of scientific support. Examples of these qualified health claims and disclaimers are shown in table 2.

Literature Review

Economists have developed models to examine the joint influence of price, rising or falling income, and diet and health information in order to understand the role of product labels on changes in food consumption patterns (see, for example, Variyam, Blaylock and Smallwood, 1996; Variyam and Golan, 2002). Many researchers have applied individual response data from surveys to assess whether consumers use health and nutrition information when making purchase decisions (Caswell and Mojduszka, 1996; Feick, Herrmann, and Warland, 1986; Ippolito and Mathios, 1993; Jensen and Kesavan, 1993; Mazis and Raymond, 1997; Wang, Fletcher, and Carley, 1995). Studies have shown that health and nutrition information on product labels allow consumers to make better decisions about consumption and that such information is valuable to consumers (Mathios, 1998; Variyam and Golan, 2002). The effect of nutrition information on individual dietary behavior may vary over time due to a heightening awareness of diet-disease relationships, improving attitudes about healthy eating, and an evolving knowledge of food compositions that lead to better food choices (Jensen, Kesavan, and Johnson, 1992; Kinnucan and Venkateswaran, 1990).

Jensen and Kesavan (1993) suggest that the effect of information on changes in consumer behavior also depends on the individual's ability to absorb and process such information. Wang, Fletcher, and Carley (1995) applied a probit model to examine the consumer utilization of food labeling using 1987-1988 Nationwide Food Consumption Survey data and showed that consumer use of information on food labels depends on several factors including socio-demographic, economic and health awareness. Feick, Herrmann, and Warland (1986) also found the use of different information sources can partly be explained by individual characteristics. Given a wide variety of relevant food attributes, consumers may choose unhealthy food trading-off taste, price, convenience, or familiarity even when they have a high degree of knowledge of health and nutrition (Bhaskaran and Hardley, 2002; Blaylock, et al., 1999). Moreover, people generally process health information differently depending on their knowledge and interests. Consumers who have high knowledge about a particular diet and disease relationship may not need full information as compared to people who do not have such knowledge. Clearly, the information provided will only matter to those consumers who are interested in the particular product category and motivated to pursue health benefits.

Many experimental studies have been conducted to examine how consumers process and use information contained on the Nutrition Facts panel in conjunction with various nutrient and health claims on the front label (Bruck, Mitchell, and Staelin, 1984; Ford, et al., 1996; Garretson and Burton, 2000; Ippolito and Mathios, 1990; Keller, et al., 1997; Kozup, Creyer, and Burton, 2003; Mitra, et al., 1999; Wansink, 2003). Evidence from these studies suggests that the provision of Nutrition Fact panel information does not moderate the effects of a health claim. Consumers are fairly sophisticated in their ability to use Nutrition Fact panel information to draw conclusions and are somewhat wary of health claims, preferring instead to trust specific nutritional information when it is available. Nevertheless, Roe, Levy, and Derby (1999) found that the presence of health and nutrient content claims on food packages induces respondents to truncate information search to the front panel. Respondents also tend to provide more positive summary judgments of products and give greater weight to the information mentioned in claims than to the information on the Nutrition Facts panel. Furthermore, they found that nutrient content claims and health claims have similar practical impacts on information processing and product evaluation. Levy, Derby, and Roe (1997) evaluated the effects of claim type and content on consumers' product evaluation and purchase intentions and reported no significant differences across claim formats. Because the policy on qualified health claims is so new, there is yet no published study examining how consumers react to the various levels and disclaimers.

Theoretical Framework: The Elaboration Likelihood Model (ELM)

The Elaboration Likelihood Model (ELM), developed by Richard Petty and John Cacioppo, has

been applied in many cognitive/social psychology and consumer research programs over the past twenty years (Lien, 2001; Petty, Cacioppo, and Heesacker, 1984; Petty, Cacioppo, and Schumann, 1983; Petty and Wegener, 1999). It specifies the major ways in which message content can affect persuasion. According to ELM, marketing communication can produce persuasion via two fundamentally different routes, a central route and a peripheral route. The difference between the two routes is the relative thinking effort spent on the issues or on processing the information provided by the message. The central route is based on a thoughtful consideration of issue-relevant argumentation, whereas the peripheral route is based on affective association or simple inferences tied to issue-relevant cues in the persuasion context.

In this study, ELM is applied to explore how health and nutrition information on the front label influences consumer judgment of product quality. This study examines whether claims induce greater (or less) elaboration regarding the product and/or whether they serve as peripheral cues. The claims may also act as an element of argument quality; however, this cannot be tested in this study because they only represent a strong or favorable message regarding product quality. In order to test the role of such claim information, two product qualities (healthy and unhealthy) are included by manipulating certain nutrient levels in the Nutrition Facts panel, which serves as argument quality in this study.

According to the ELM, if consumers follow the central route when viewing health and nutrition information, such information or message content should influence the extent or direction of issue and argument elaboration (Petty and Cacioppo, 1986). In this case, consumers should show greater differentiation of strong from weak arguments. In other words, consumers should more carefully scrutinize product quality when health and nutrition information is present on the front label. Consequently, a message presented with a strong argument (the healthy version of Nutrition Facts) should enhance positive attitudes toward the product when it is scrutinized carefully; meanwhile a message presented with a weak argument (the unhealthy version of Nutrition Facts) should result in a more negative attitude toward product when it is scrutinized carefully.

Consumers can also use health and nutrition information as a peripheral cue, which refers to a stimulus in the persuasion context that can affect attitudes without requiring processing of the message arguments. In this case, health and nutrition information will not induce people to more carefully scrutinize product quality through enhancing the elaboration process. Instead, people will only rely on information on the front label when forming product judgments without paying attention to the Nutrition Facts. They will hold more positively attitudes toward the product when exposed to health and nutrition information on the front label regardless of the nutrient levels.

Hypothesis Testing

The first hypothesis tests the role on elaboration processing of health and nutrition information on

the front label. By providing a health claim on the front label, consumers will be induced to more carefully scrutinize the information on the Nutrition Facts panel. Thus, information on the front label will increase the likelihood of elaboration, meaning that subjects should be better able to differentiate between healthy and unhealthy products. The hypothesis predicts that the mean score for attitude and buying intention will be higher if claims enhance elaboration.

H1: Participants who are exposed to health and nutrition information on the front label will look at the Nutrition Facts information more carefully. Thus, they will react more positively (higher score on attitude and/or buying intention measures) to the healthy version of Nutrition Facts and more negatively (lower score on attitude and/or buying intention measures) to the unhealthy version of Nutrition Facts compared to participants who are exposed to a label with no claim.

Regardless of the manner of elaboration, as the argument scrutiny is reduced, peripheral cues become more important determinants of persuasion. The next hypothesis explores the role of health and nutrition information on the front label on persuasion as peripheral cues. If this is true, consumers will only rely on a health claim on the front label without paying attention to information on Nutrition Facts.

H2: When health and nutrition information is present on the front label, participants will take this as a cue without further elaborative processing. As a result, they will react no differently to healthy and unhealthy versions of Nutrition Facts. The mean scores of attitude and/or buying intention measures will not be different between participants who receive the healthy version and those who receive the unhealthy version of Nutrition Facts.

The other two hypotheses test whether participants are able to distinguish different levels of qualified health claim. This study aims to provide evidence from consumer studies to FDA indicating whether qualified health claims, which by definition do not meet the Significant Scientific Agreement (SSA) standard of evidence, mislead consumers and whether consumers can distinguish between the multiple levels of qualified health claims.

H3: Participants who receive a stronger claim (e.g., level A) rate the strength of scientific support for the diet-disease relationship higher than those who receive a weaker claim (e.g., level D) on the front label.

H4: Participants who receive a stronger claim (e.g., level A) rate the expected health benefits of the product higher than those who receive a weaker claim (e.g., level D) on the front label.

Methodology

Product and Stimuli

This study used a still hypothetical functional food product a wheat cracker containing soy protein. It has been shown that soluble fiber and isoflavones, which can be found in wheat and soy products, respectively, independently help prevent the risk of several maladies including cancer and heart disease (Sirtori and Lovati, 2001). Thus, the consumption of wheat crackers containing soy should help promote good health and/or reduce the risk of having these diseases, perhaps in a synergistic manner. Meanwhile, it is assumed that other conventional foods such as existing wheat crackers in the market do not offer these same (multiplicative) benefits. Front labels and Nutrition Facts panel for this wheat cracker containing soy were created. The front label was designed to simulate typical front panels found on commercially available cracker products and the Nutrition Facts panel was designed to resemble nutrition information displays (see Appendices 1 and 2).

Study Design

A 5 (claim information on the front label a control condition and the four levels of qualified health claim) x 2 (information on Nutrition Facts) between-subjects factorial design was applied. A controlled and randomized experimental design was employed with all independent variables manipulated and controlled and subjects randomly assigned to different conditions. Each claim contained explicit relationships between nutrients and diseases i.e., isoflavones - heart disease and soluble fiber - cancers, but had different disclaimers explaining the level of scientific evidence supporting the claim. A report card was also included to inform consumers about the various claim levels, ranging from level A to D. Claims with level A have the strongest scientific evidence available, whereas claims with level D are based on very little scientific evidence to date.

Information on the Nutrition Facts panel was manipulated representing a “healthy” and an “unhealthy” version (see Appendix 2). It is noted that these nutrient levels may not be realistic; this is an attempt to vary information so that the perception of nutrient levels significantly differs between the two versions. The healthy version has low calories (77 calories), low total fat (1g), low sodium (100mg), low carbohydrate (14g), low sugar (4g), and high dietary fiber (10g). The unhealthy version has high calories (400 calories), high total fat (13g) high sodium (800mg), high carbohydrate (40g), high sugar (40g), and no dietary fiber (0g).

A pretest is conducted with a hundred and two undergraduate students. Each student was presented with one of the five different front labels of wheat crackers containing soy (a control condition and four versions of qualified health claim) and one of the two different versions of the Nutrition Facts panel (unhealthy or healthy). Participants were asked to pay attention to the stimulus materials and to

answer a series of questions about their perceptions of health and nutrition information provided on the label, health benefits, and their evaluation of product quality. Findings from this pretest confirmed that consumers learn about product benefits when health and nutrition information is present. Also, perceptions of health benefits and the level of trust and confidence in the information vary across claim levels. Finally, the argument manipulation of nutrient levels in the Nutrition Facts panel was sufficient to affect consumers' perceptions of product quality.

Participants and Procedures

Three hundred and seventy-two undergraduate students participated in the study, receiving extra credit for a Marketing class. They were told that “*they will read about and provide their opinion of food products*” when signing up for the study. Using a computer-based system, participants were randomly assigned to different versions of the stimuli, but were not directed to pay particular attention to any specific part of the package information. It is important to ensure that subjects are unaware of the study focus on the persuasion effect of the stimuli in order to avoid undue attention of the subjects' toward the stimuli (Petty and Cacioppo, 1986). The instructions were “*you will view labels and information about products. Imagine that you are seeing these products in the aisle of your local grocery store. Feel free to spend as little or as much time as you like viewing the information.*” The front label and Nutrition Facts panel of two products, yogurt and tortilla chips, were shown before participants were exposed to the label of the product of interest (crackers). The front label was shown first, followed with the Nutrition Facts panel. Once participants finished looking at the stimulus material, the information was removed and a series of questions were asked.

Measures of Dependent Variables

Several multi-item scales are used as dependent variables, including attitude toward the product, buying intention, strength of evaluation about scientific studies to support claim, confidence about claim statement, perception of product's health benefit, and information search, see table 3. Seven-point scales were used for each item where higher scores reflect higher construct values. The mean score is calculated for each measure. The correlation coefficient (r) for each measure is greater than 0.80. Measures of attitude toward the product and buying intention are used to examine how consumers use health and nutrition information on the front label, whereas measures of evaluation of strength about scientific studies, confidence level, perceived health benefits, and information search are used to determine whether consumers can distinguish between the various claim levels. A univariate analysis of variance (ANOVA) is conducted to test main and interaction effects among independent variables on a dependent variable using the GLM procedure in SAS 8.2 (Hatcher and Stepanski, 1994).

Results

As shown in table 4, results are analyzed using a two-way ANOVA, with two between-group factors. This analysis reveals a significant main effect for various claim types (C) on both attitude toward product, $F(4,362) = 4.21$; $p < 0.002$ and buying intention, $F(4,362) = 2.40$; $p < 0.049$. This suggests that different levels of claim information, including the control condition, have effects on participant's attitude and buying intention for the product. Also, there is a significant main effect for the two versions of Nutrition Facts Panel (N) for both attitude toward the product, $F(1, 362) = 24.85$; $p < 0.001$ and buying intention $F(1, 362) = 22.55$; $p < 0.001$. The mean score plots for each dependent measure is shown in figure 1. The results imply that subjects consider Nutrition Facts information before making judgments about the product. Participants react more positively to the product with a strong argument quality (healthy version) than to the product with a weak argument quality (unhealthy version).

The pair-wise comparisons, using t-tests, suggest that various qualified levels of health claim tend to have different effects on participant's attitudes and buying intention. Participants react more positively to products with qualified claim levels C, B, and A, than to no claim (control) or level D. While results may suggest that level D (the weakest level of qualified health claim) can be differentiated from other qualified levels, based on attitude and buying intention measures, there is no significant difference among levels A, B, and C.

Using information search as a dependent variable, ANOVA result reveals a significant main effect for various claim types (C), $F(4, 362) = 6.40$, $p < 0.001$. The results from pair-wise comparisons suggest that participants who receive claim information (A, B, C, or D) are more likely to pay attention to the product's nutritional information than those who receive no claim (control condition). This finding confirms the previous result suggesting that claim information on the front label, regardless of the qualified level, induces people to pay more attention to Nutrition Facts.

ANOVA results also suggest significant main effects on various claim types (C) for other dependent measures, including the evaluation of strength of scientific evidence, $F(4, 362) = 4.40$; $p < 0.002$, the confidence about claim information, $F(4, 362) = 2.38$; $p < 0.051$, and perceived health benefit, $F(4, 362) = 2.38$; $p < 0.051$. Pair-wise comparisons show a main difference between the control condition and certain qualified claim levels. There is no clear distinction, however, that participants react differently to various qualified health claims. For instance, when using the evaluation of strength of scientific studies as a dependent measure, it is shown that subjects understand differences in some claim levels; particularly, they are able to differentiate level D (the weakest claim) from other qualified levels. Level A and B receive no significantly different evaluations, whereas it is not clear if participants can differentiate level C from levels A and B. Meanwhile, the measures of consumers' confidence in claim information and their perception of health benefits do not vary across different levels of qualified health claim. The

findings do not support the idea that the disclaimer and the report card with different grading help participants to understand the different levels of scientific support for the claims.

Discussion and Conclusion

Considering first the effect of health and nutrition information on food labels, the results of this study suggest that consumers pay attention to information from all sources including the front label and Nutrition Facts panel. Even though it is shown that consumers react more positively to versions with health claims, there is no evidence to support the first hypothesis that consumers are more careful in evaluating product quality when health and nutrition information is present on the front package. Nevertheless, consumers are able to differentiate healthy products from unhealthy products, regardless of the presence of health and nutrition information on the front label. This may imply that consumers do not use health and nutrition information on the front label as a peripheral cue when forming judgments about product quality. Instead, they are likely to pay attention to information shown in the Nutrition Fact panel, which leads us to reject the second hypothesis. The result here is consistent with findings from the literature suggesting that consumers tend to rely more on information in the Nutrition Facts panel than claims (Ford et al., 1996; Garretson and Burton, 2000; Keller et al., 1997; Mitra et al., 1999).

Next, this study examines whether consumers understand and can distinguish various levels of qualified health claims. Although evidence suggests that consumers react differently to various claim levels, it is not clear whether people understand differences in the scientific support of these claims, as described in the disclaimer. Despite an increasing trend in attitude and purchase intention from the weakest claim (level D) to the strongest claim (level A), there is no statistically significant difference among claim levels when using measures of evaluation of strength of scientific studies, confidence about claim information, and perception of product's health benefit. Level A and B receive similar evaluations, using various measures, which may imply that consumers are not able to differentiate between these two levels of claims. In addition, consumers react more positively to labels with level C than to the control condition and level D. However, consumers perceive no difference in evaluation of scientific studies between levels C and D, whereas these two levels are significantly different from level A. These results lead us to reject the third and fourth hypotheses. Though the findings may suggest that consumers are not able to distinguish all four levels of qualified health claims, it is quite clear in this study that level D (the weakest claim) receives the lowest evaluation and is perceived to be different from the other qualified claim levels. Consumers do not perceive the product to be healthful when the disclaimer explicitly states that there is little evidence supporting the claim with the lowest level "D" highlighted in the report card.

Understanding why and how consumers utilize food labels is necessary when designing food labeling regulations (Lenaham, et al., 1973). From the public policy perspective, the results of this study

can help determine how consumers evaluate health and nutrition information. It is shown that consumers do not overlook information from other parts of the label specifically the Nutrition Facts panel and that the presence of health and nutrition information on the front label is not likely to mislead consumers. The key issue here that needs further investigation is how to effectively provide information on the front label to consumers. FDA's goal is to permit the use of more, better, easily understood, and up-to-date scientific information about how dietary choices can affect consumers' health on food labels. It is important to identify optimal levels of qualified health claims, perhaps only two levels instead of four levels, so that consumers can distinguish and understand differences in terms of the scientific support for the claims and product benefits. Qualitative studies such as focus groups should be conducted to find more distinct disclaimer wording which better conveys the different levels of scientific support to consumers.

Another interesting question that is not addressed in this study is whether consumers pay attention to a disclaimer or they simply rely on the report card as a cue when evaluating the product. The fact that consumers react differently to various claims may simply be a response to the different grades assigned on the report card. Thus, future research is needed to consider the role of this report card or other visual aids on consumer evaluation of product quality. Also, it is interesting to further examine how dual/synergistic health benefits play a role in consumer's product evaluation since the functional food environment has become increasingly complex where multiple food attributes deliver a range of health benefits in a single food.

The results of this study can help food manufacturers decide what level of health and nutrition information they should provide to consumers. In addition to understanding the petitioning procedures for different claims, food firms must determine which, how, and when consumers understand and use health information in order to find the most efficient marketing communication channels. From a manufacturers standpoint, it is more costly to provide (or wait for) sufficient scientific studies required by the traditional (unqualified) FDA claim approval process. If consumers who are interested in functional foods and are more likely to use product labels for information search and do not react differently to various qualified health claims, it may be better for manufacturers to simply use a lower level of qualified claim such as level B or C, instead of level A.

It should be noted that this study focuses on a certain type of functional food, wheat crackers containing soy, with certain health characteristics. Results may be limited and different from those for other functional foods with different benefits. It is interesting to apply the same theoretical model capturing the effect of health and nutritional information developed in this study to other products and subjects. Consumers' reactions to different types of claims and sources of information may also be different for other diseases which they are more or less interested in (motivation). Additional experiments should be conducted to validate these results and to evaluate sensitivity measures.

References

- Bhaskaran, Suku and Felicity Hardley (2002), "Buyer Beliefs, Attitudes, and Behavior: Foods with Therapeutic Claims," *Journal of Consumer Marketing*, 19(7), 591-606.
- Blaylock, James, David Smallwood, Kathleen Kassel, Jay Variyam, and Lorna Aldrich (1999), "Economics, Food Choices, and Nutrition," *Food Policy*, 24, 269-286.
- Brucks Merrie, Andrew A. Mitchell, and Richard Staelin (1984), "The Effect of Nutritional Information Disclosure in Advertising: An Information Processing Approach," *Journal of Public Policy & Marketing*, 3, 1-27.
- Caswell, Julie A. and Eliza M. Mojduszka (1996), "Using Informational Labeling to Influence the Market for Quality in Food Products," *American Journal of Agricultural Economics*, 78(December), 1248-1253.
- Caswell, Julie A., Yumei Ning, Fang Liu, and Eliza M. Mojduszka (2003), "The Impact of New Labeling Regulations on the Use of Voluntary Nutrient-Content and Health Claims by Food Manufacturers," *Journal of Public Policy and Marketing*, 22(2), 147-158.
- Feick, Lawrence F., Robert O. Herrmann, and Rex H. Warland (1986), "Search for Nutrition Information: A Probit Analysis of the Use of Different Information Sources," *The Journal of Consumer Affairs*, 20(2), 173-192.
- Food and Drug Administration (1994), "A Food Labeling Guide," Center for Food Safety and Applied Nutrition, <http://www.cfsan.fda.gov/~dms/flg-toc.html>.
- Food and Drug Administration (2002), "Structure/Function Claims Small Entity Compliance Guide," Center for Food Safety and Applied Nutrition, <http://www.cfsan.fda.gov/~dms/sclmguid.html>.
- Food and Drug Administration (2003a), "Claims That Can Be Made For Conventional Foods and Dietary Supplements," Office of Nutritional Products, Labeling, and Dietary Supplements. Center for Food Safety and Applied Nutrition, <http://www.cfsan.fda.gov/~dms/hclaims.html>.
- Food and Drug Administration (2003b), "Consumer Health Information for Better Nutrition Initiative. Task Force Final Report," Office of Nutritional Products, Labeling, and Dietary Supplements. Center for Food Safety and Applied Nutrition, <http://www.cfsan.fda.gov/~dms/nuttftoc.html>.
- Ford, Gary T., Manoj Hastak, Anusree Mitra, and Debra Jones Ringold (1996), "Can Consumer Interpret Nutrition Information in the Presence of Health Claim? A Laboratory Investigation," *Journal of Public Policy and Marketing*, 15(1), 16-27.
- Garretson, Judith A. and Scot Burton (2000), "Effects of Nutrition Facts Panel Values, Nutrition Claims, and Health Claims on Consumer Attitudes, Perceptions of Disease-Related Risks and Trust," *Journal of Public Policy and Marketing*, 19(2), 213-227.
- Hatcher, Larry and Edward J. Stepanski (1994), *A Step-by-Step Approach to Using the SAS System for Univariate and Multivariate Statistics*, Cary, NC: SAS Institute.
- Ippolito, Pauline M. and Alan D. Mathios (1990), "Information, Advertising, and Health Choices: A Study of the Cereal Market," *RAND Journal of Economics*, 21(3), 459-480.

- Ippolito, Pauline M. and Alan D. Mathios (1993), "New Food Labeling Regulations and the Flow of Nutrition Information to Customers," *Journal of Public Policy and Marketing*, 12(2), 188-205.
- Jensen, H.H. and T. Kesavan (1993), "Sources of Information, Consumer Attitudes on Nutrition, and Consumption of Dairy Products," *The Journal of Consumer Affairs*, 27(2), 357-376.
- Jensen, H.H., T. Kesavan, and S.R. Johnson (1992), "Measuring the Impact of Health Awareness on Food Demand," *Review of Agricultural Economics*, 14(2), 299-312.
- Keller, Scott B., Mike Landry, Jeanne Olson, Anne M. Velliquette, Scot Burton, and J. Craig Andrews (1997), "The Effects of Nutrition Package Claims, Nutrition Facts Panels, and Motivation to Process Nutrition Information on Consumer Product Evaluation," *Journal of Public Policy and Marketing*, 16(2), 256-269.
- Kinnucan, Henry W. and Meenakshi Venkateswaran (1990), "Effects of Generic Advertising on Perceptions and Behavior: The Case of Catfish," *Southern Journal of Agricultural Economics*. 22(December), 137-151.
- Kozup, John C., Elizabeth H. Creyer, and Scot Burton (2003), "Making Healthful Food Choices: The Influence of Health Claims and Nutrition Information on Consumers' Evaluations of Packaged Food Products and Restaurant Menu Items," *Journal of Marketing*, 67(April), 19-34.
- Lenahan, R.J., J.A. Thomas, D.A. Taylor, D.L. Call, and D.I. Padberg (1973), "Consumer Reaction to Nutritional Labels on Food Products," *The Journal of Consumer Affairs*, 27(Winter), 1-12.
- Levy, Alan S., Brenda M. Derby, and Brian E. Roe (1997) "Consumer Impacts of Health Claims: An Experimental Study," Division of Market Studies. Center for Food and Applied Nutrition (HFS-727), Food and Drug Administration. <http://vm.cfsan.fda.gov/~dms/hclm-rpt.html>.
- Lien, Nai-Hwa (2001), "Elaboration Likelihood Model in Consumer Research: A Review," *Proceeding of the National Science Council, Republic of China*, 11(4), 301-310.
- Mathios, Alan D. (1998), "The Importance of Nutrition Labeling and Health Claim Regulation on Product Choice: An Analysis of the Cooking Oils Market." *Agricultural and Resource Economic Review*. 27(2), 159-168.
- Mazis, Michael B. and Mary Anne Raymond (1997), "Consumer Perceptions of Health Claims in Advertisements and on Food Labels," *The Journal of Consumer Affairs*, 31(1), 10-26.
- Mitra, Anu, Manoj Hastak, Gary T. Ford, and Debra Jones Ringold (1999), "Can the Educationally Disadvantaged Interpret the FDA-Mandated Nutrition Facts Panel in the Presence of an Implied Health Claim?" *Journal of Public Policy and Marketing*, 18(1), 106-117.
- Mojduszka, Eliza M. and Julie A. Caswell (2000), "A Test of Nutritional Quality Signaling in Food Markets Prior to Implementation of Mandatory Labeling," *American Journal of Agricultural Economics*, 82(May), 298-309.
- Petty, Richard E. and John T. Cacioppo (1986), *Communication and Persuasion: Central and Peripheral Routes to Attitude Change*. New York, NY: Springer/Verlag.

- Petty, Richard E. and John T. Cacioppo, and Martin Heesacker (1984), "Central and Peripheral Routes to Persuasion: Application to Counseling," in *Social Perception in Clinical and Counseling Psychology*, ed. Richard P. McGlynn, James E. Maddux, Cal D. Stoltenberg, and John H. Harvey, Lubbock, TX: Texas Tech Press.
- Petty, Richard E. and John T. Cacioppo, and David Schumann (1983), "Central and Peripheral Routes to Advertising Effectiveness: The Moderating Role of Involvement," *Journal of Consumer Research*, 10(September), 135-146.
- Petty, Richard E. and Duane T. Wegener (1999), "The Elaboration Likelihood Model: Current Status and Controversies," in *Dual-Process Theories in Social Psychology* ed. Shelly Chaiken and Yaacov Trope, New York, NY: The Guilford Press.
- Roe, Brian, Alan S. Levy, and Brenda M. Derby (1999), "The Impact of Health Claims on Consumer Search and Product Evaluation Outcomes: Results from FDA Experimental Data," *Journal of Public Policy and Marketing*, 18(1), 89-105.
- Sirtori, Cesare R. and Maria R. Lovati (2001), "Soy Proteins and Cardiovascular Disease," *Current Atherosclerosis Report*, 3(1), 47-53.
- Variyam, Jayachandran N., James Blaylock, and David Smallwood (1996), "A Probit Latent Variable Model of Nutrition Information and Dietary Fiber Intake," *American Journal of Agricultural Economics*, 78(August), 628-639.
- Variyam, Jayachandran N. and Elise Golan (2002), "New Health Information is Reshaping Food Choices," *Food Review*, Economic Research Service, USDA, (Spring), 13-18.
- Wang, Guijing, Stanley M. Fletcher, and Dale H. Carley (1995), "Consumer Utilization of Food Labeling as a Source of Nutrition Information," *The Journal of Consumer Affairs*, 29(2), 368-380.
- Wansink, Brian (2003), "How Do Front and Back Package Labels Influence Beliefs about Health Claims?" *The Journal of Consumer Affairs*, 37(2), 305-316.

Table 1: Permitted Claims on Dietary Supplement and Conventional Food Labels

Claim Types	Description
Health Claim	Describes a relationship between a food substance and a disease or health-related condition
Structure / Function Claim	Describes the effect that a substance has on the structure or function of the body but makes no reference to a disease
Nutrient Content Claim	Describes the level of a nutrient or dietary substance in the product using terms such as "good source", "high" or "free"

Source: FDA / CFSAN- Center for Food Safety and Applied Nutrition: see <http://www.cfsan.fda.gov/label.html>

Table 2: Different Levels of Qualified Health Claims with Disclaimers

Qualified Health Claim Level	Level of Scientific Evidence	Examples of Claims with Disclaimers
A	Significant scientific agreement (SSA)	Same as unqualified or NLEA authorized health claim. No disclaimer is required for this level e.g., this product contains high level of soluble fiber and it may reduce the risk of heart disease and some cancers.
B	Good to moderate level of scientific agreement	This product contains high level of soluble fiber and it may reduce the risk of heart disease and some cancers. Although there is scientific evidence supporting the claim, FDA has determined that the evidence is not conclusive.
C	Low level of scientific agreement	This product contains high level of soluble fiber. Some scientific evidence suggests that consumption of soluble fiber may reduce the risk of heart disease and some cancers. However, FDA has determined that this evidence is limited and not conclusive.
D	Very low level of scientific agreement	This product contains high level of soluble fiber and it may reduce the risk of heart disease and some cancers. Very limited and preliminary scientific research suggests that soluble fiber may reduce the risk of heart disease and some cancers. FDA concludes that there is little scientific evidence supporting this claim.

Table 3: Descriptions of Multi-Item Measures for Dependent Variables

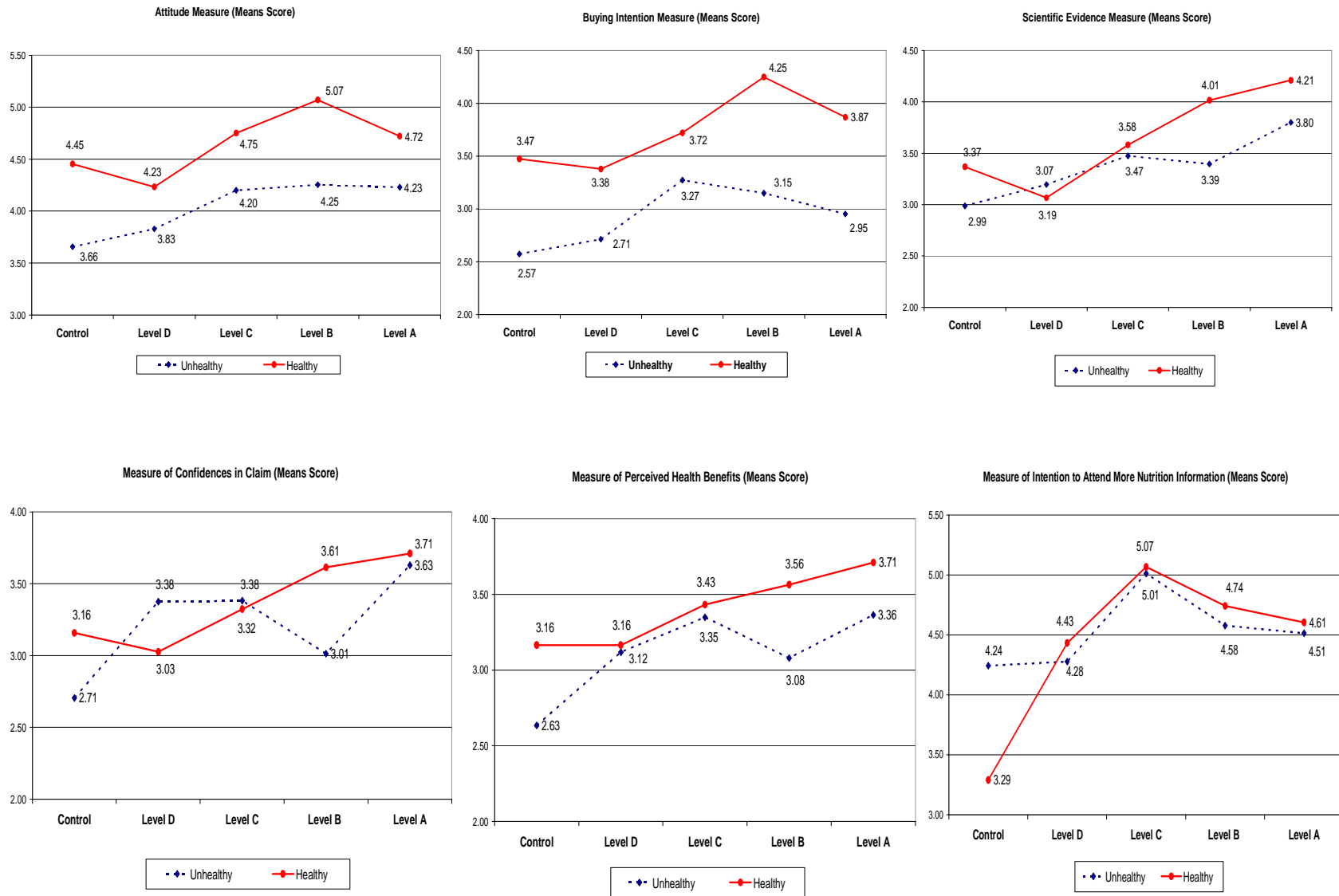
Dependent Variables	Multi-Items Measures
Attitude (r = 0.91)	<ol style="list-style-type: none"> 1. My attitude toward this WHEAT CRACKER is (1 = very bad; 7= very good) 2. My attitude toward this WHEAT CRACKER is (1=extremely unfavorable; 7=extremely favorable) 3. My attitude toward this WHEAT CRACKER is (1=extremely negative; 7=extremely positive) 4. Consuming this WHEAT CRACKER is likely to be (1=extremely unpleasant; 7=extremely pleasant) 5. Consuming this WHEAT CRACKER is likely to be (1=harmful; 7=beneficial)
Buying Intention (r = 0.94)	<ol style="list-style-type: none"> 1. If this WHEAT CRACKER were available in your local supermarket, how likely are you to purchase it? (1=very unlikely; 7=very likely) 2. How likely would you try this WHEAT CRACKER when it is available in your local supermarket? (1=very unlikely; 7=very likely) 3. How likely would you recommend this WHEAT CRACKER to other people when it is available in your local supermarket? (1=very unlikely; 7=very likely)
Scientific Evidence (r = 0.84)	<ol style="list-style-type: none"> 1. To what extent do scientists believe that consuming this WHEAT CRACKER will reduce the risk of CANCERS? (1= Very little; 7=A great deal) 2. To what extent do scientists believe that consuming this WHEAT CRACKER will reduce the risk of HEART DISEASE? (1= Very little; 7=A great deal)
Confidence in Claim (r = 0.83)	<ol style="list-style-type: none"> 1. How confident are you in scientific studies that consuming this WHEAT CRACKER will reduce the risk of CANCERS? (1= Not at all confident; 7=Very confident) 2. How confident are you in scientific studies that consuming this WHEAT CRACKER will reduce the risk of HEART DISEASE? (1= Not at all confident; 7=Very confident)
Perceived Health Benefits (r = 0.93)	<ol style="list-style-type: none"> 1. How much of a health benefit would adding this WHEAT CRACKER to your diet have on preventing you from getting CANCERS? (1=No benefit at all; 7=A large benefit) 2. How much of a health benefit would adding this WHEAT CRACKER to your diet have on preventing you from getting HEART DISEASE? (1=No benefit at all; 7=A large benefit) 3. In your view, what is the likelihood that the consumption of this WHEAT CRACKER will help reduce the risk of CANCERS? (1=unlikely to reduce risk; 7=likely to reduce risk) 4. In your view, what is the likelihood that the consumption of this WHEAT CRACKER will help reduce the risk of HEART DISEASE? (1=unlikely to reduce risk; 7=likely to reduce risk)
Intention to Search for More Information (r = 0.93)	<ol style="list-style-type: none"> 1. The information contained on this WHEAT CRACKER caused me to pay attention to the product's nutritional information (1 = strongly disagree; 7 = strongly agree) 2. The information contained on this WHEAT CRACKER caused me to think carefully about the product's nutritional information (1 = strongly disagree; 7 = strongly agree)

Note: r = correlation coefficient for multi-item measures

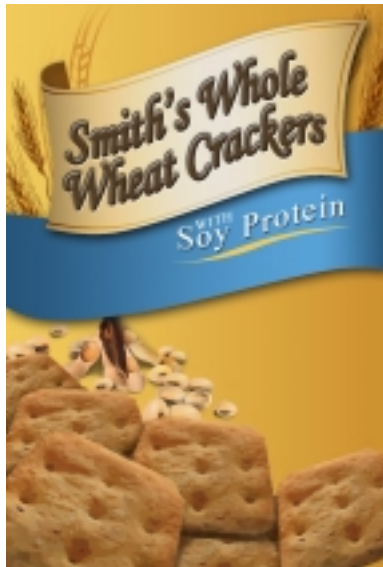
Table 4: ANOVA Results for Various Dependent Measures

Variables	Main Effect				Interaction Effect		Pair Wise Comparison (t-test) Significant level = 0.1
	Claim (C)		Nutrition Facts (N)		C x N		
	F-Value	Significant Level	F-Value	Significant Level	F-Value	Significant Level	
Attitude	4.21	0.002	24.85	0.001	0.45	0.769	Control - Level C Control - Level B Control - Level A Level D - Level C Level D - Level B Level D - Level A
Buying Intention	2.40	0.049	22.55	0.001	0.44	0.779	Control - Level C Control - Level B Level D - Level B
Scientific Evidence	4.40	0.002	3.18	0.075	0.69	0.598	Control - Level B Control - Level A Level D - Level B Level D - Level A Level C - Level A
Confidence in Claim	2.38	0.051	0.88	0.348	1.22	0.301	Control - Level C Control - Level A Level D - Level A
Perceived Health Benefit	2.38	0.051	4.32	0.04	0.49	0.743	Control - Level C Control - Level B Control - Level A Level D - Level A
Information Search	6.40	0.001	0.34	0.56	1.69	0.151	Control - Level D Control - Level C Control - Level B Control - Level A Level D - Level C Level C - Level A

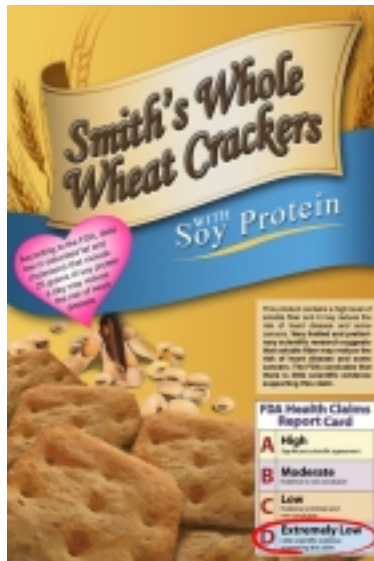
Figure 1: Mean Score Plots for Various Dependent Measures



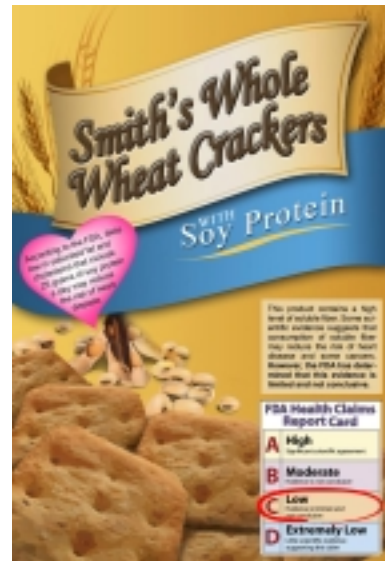
Appendix 1: Five Versions of Front Labels Used in Study



Control (No Claim)



Level D



Level C



Level B



Level A

Appendix 2: Two Versions of Nutrition Facts Panel Used in Study

Nutrition Facts			
Serving Size 13 crackers (31g)			
Servings Per Container About 7			
Amount Per Serving			
Calories 77		Calories from Fat 9	
		% Daily Value*	
Total Fat 1g			6%
Saturated Fat 0.5g			3%
Polyunsaturated Fat 0g			0%
Monounsaturated Fat 0.5g			3%
Cholesterol 0mg			0%
Sodium 100mg			4%
Potassium 135mg			4%
Total Carbohydrate 14g			5%
Dietary Fiber 10g			40%
Sugar 4g			
Protein 3g			
Vitamin A 0%		Vitamin C 0%	
Calcium 2%		Iron 6%	
*Percent daily values are based on a 2000 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
Calories per gram			
Fat 9 • Carbohydrate 4 • Protein 4			

Healthy Version

Nutrition Facts			
Serving Size 13 crackers (31g)			
Servings Per Container About 7			
Amount Per Serving			
Calories 400		Calories from Fat 117	
		% Daily Value*	
Total Fat 13 grams			65%
Saturated Fat 5 grams			25%
Polyunsaturated Fat 4g			20%
Monounsaturated Fat 4g			20%
Cholesterol 0mg			0%
Sodium 800mg			34%
Potassium 135mg			4%
Total Carbohydrate 40g			14%
Dietary Fiber 0g			0%
Sugar 40g			
Protein 3g			
Vitamin A 0%		Vitamin C 0%	
Calcium 2%		Iron 6%	
*Percent daily values are based on a 2000 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
Calories per gram			
Fat 9 • Carbohydrate 4 • Protein 4			

Unhealthy Version