The Ability of College Women Aged 17 to 25 To Perform Tasks Using Nutrition Facts Labels

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Abstract

The Nutrition Labeling Education Act has been in effect for over five years, yet little research has been conducted to determine how well Americans can use Nutrition Facts labels and evaluate nutrient content and health claims. Health educators need to know how proficient various consumer groups are at using labels in order to plan effective interventions. This study evaluated the abilities of women college students to use Nutrition Facts labels and evaluate nutrient content and health claims.

Introduction

The Nutrition Labeling and Education Act (NLEA), passed in 1990, has placed important diet and health information at consumers' fingertips (Kurtzweil, 1993; NLEA, 1990). The NLEA expanded the scope of nutrition labeling to virtually all foods, redesigned nutrition labels into the Nutrition Facts format, and explicitly defined nutrient content and health claims (Kurtzweil, 1993; Levy & Derby, 1996). An important and unique aspect of the NLEA is its emphasis on educating consumers about how they can use nutrition information on food packages to make informed, healthier food purchasing decisions in line with the Dietary Guidelines for Americans [United States Department of Agriculture (USDA), 1995] and the Food Guide Pyramid (Derby & Fein, 1995; Neuhouser, Kristal, & Patterson, 1999; Nightingale, 1993; USDA, 1992; Zarkin, Dean, Mauskopf, & Williams, 1993]. In fact, in this legislation, education is seen as key to ensuring that consumers can use the nutrition labeling on food packages to make the dietary changes needed to reduce their risk of diet-related chronic diseases (American Dietetic Association, 1990; Derby & Fein, 1995). A variety of educational programs and mass media events focusing on nutrition labeling have occurred, most of which were in the time period surrounding the August 1994 implementation date of the new labels (Derby & Fein, 1995). However, despite the facts that these educational programs were implemented and the NLEA has been in effect for over five years, little research has been conducted to determine how well Americans can use the data displayed on Nutrition Facts labels (Levy & Fein, 1998; Neuhouser, et al., 1999). Even less attention has been focused on ascertaining consumers' ability to evaluate nutrient content and health claims (The Keystone Center, 1996). Health educators need to know how proficient consumers are at using and manipulating Nutrition Facts labels as well as their ability to judge nutrient content and health claims if they are to plan and implement effective educational interventions (Levy & Fein, 1998).

While myriad environmental factors, including nutrition labeling, may affect dietary choices and contribute to the development of an individual's dietary patterns, it is widely acknowledged that the family remains the central force in establishing these patterns (American Dietetic Association, 1999). Even though family life has undergone a multitude of changes in the last few decades, 80 to 85 percent of all women still bear the primary responsibility for food purchasing and preparation (International Food Information Council, 1999). Females have largely retained the role of the family's food gatekeeper. By extension, that means females (i.e., mothers and potential future mothers) are a central force in establishing the dietary patterns of children and, thus, may be the key to the development of eating patterns that will help future generations reduce their risk of chronic diet-related diseases.

Because women bear the primary responsibility for filling their families' larders and have the potential to exert a long-term impact on family health, they are important candidates for nutrition labeling education. An increasing percentage of women are attending college and postponing child bearing until after the college years (U.S. Census Bureau, 1999; Ventura, 1989), thus an opportune time to reach a large number

of women may be while they are receiving post-secondary education.

Currently, most nutrition label educational materials target general audiences. However, the differences in label use by gender, age group, and education have led researchers to suggest that nutrition labeling education programs be tailored to focus on the needs of specific groups of consumers (Bender & Derby, 1992; Saltos, Davis, Welsh, Guthrie, & Tamaki, 1994). In order to design campus-based nutrition labeling education interventions targeted to the needs and concerns of young, college-educated women, their ability to use food label information needs to be investigated. Thus, the purpose of this study was to evaluate the ability of women college students, aged 17 to 25, to locate and manipulate information on Nutrition Facts labels and determine their ability to evaluate nutrient content and health claims.

Procedures

Participants

Undergraduate women at a northeastern university were recruited to participate in this study during 1999. The sample was limited to women between the ages of 17 and 25 who had never enrolled in a college level nutrition course. The age limitation was set because there is evidence that the label reading skills of young women differ from those who are older (Cole & Balasubramanian, 1993; Cole & Gaeth, 1990). Women who had completed a college level nutrition course were excluded from the study because these courses tend to include instruction on nutrition labeling. Thus, the nutrition labeling knowledge and skills of individuals who had enrolled in such courses likely would not be equivalent to the general college population.

Instrument

The survey instrument was a self-report, pencil-and-paper instrument that was based on instruments used in previous studies (Alfieri, 2000; Byrd-Bredbenner, 1994; Levy, Fein, & Schucker, 1996; Levy & Fein, 1998; Lewis & Yetley, 1992) and input from a panel of nutrition experts (n=6). A panel comprised of experts in nutrition and/or tests and measurement reviewed the first draft of the instrument for intended purpose, ambiguity, usefulness, and comprehensiveness. Revisions based on the expert review were made and the instrument was reviewed again by the panel of experts to establish content validity. After further refinement, the instrument was pilot-tested with 15 individuals having characteristics similar to the study's sample to determine the amount of time needed to complete the survey and assess participant comprehension of the survey's instructions and questions. The instrument was further refined using pilot test results. The final instrument (see Note 1) could be completed in 10 minutes and was administered in a relatively distraction-free room, such as a classroom or study lounge.

The instrument had three main sections. Section 1 included questions that asked the participant to estimate the number of separate trips she made to a food store each week and the total amount of time she spent food shopping weekly, report the frequency with which she read Nutrition Facts labels, rate the overall quality of her diet and health, and indicate the degree to which she thought she was informed about nutrition.

Section 2 focused on nutrition and diet attitudes. It was comprised of two Likert-type attitude scales designed to measure two *a priori* constructs titled: *I Care About My Diet* and *I Believe Nutrition Affects Health* (abbreviated *Care About Diet* and *Nutrition Affects Health*).

The items comprising each of these scales were derived from those used in previous research studies (Byrd-Bredbenner & Shannon, 1982; Byrd-Bredbenner, O'Connell, Shannon, & Eddy, 1984; Byrd-Bredbenner, Shannon, Hsu, & Holderness, 1988). The attitude statements for each construct were reviewed for clarity by experts in nutrition, education, and/or tests and measurements, revised according to their recommendations, and reviewed a second time by the experts. The revised attitude statements were then pilot-tested with individuals having characteristics the same as the study sample and further revisions were made based on pilot test results. Construct validity of the final attitude scales was established by factor analyzing the responses of study participants to examine the unidimensionality of the statements reflecting each of the two constructs. To avoid a response set, some statements were worded negatively and statements from each construct were alternated throughout the instrument. Participants were asked to indicate whether they strongly agreed, agreed, were uncertain, disagreed, or strongly disagreed with each statement. For each item, a score of 5, 4, 3, 2, or 1 was assigned to responses of strongly agree, agree, uncertain, disagree, or strongly disagree, respectively, for positively worded statements. The scoring was reversed for negatively worded statements. An overall mean scale score was computed for each scale by summing the score of the three items in the scale and

dividing by three. Thus, mean scores could range from 5 (strongly positive) to 1 (strongly negative). The Kuder-Richardson 20 reliability coefficients (Illinois State Board of Education, 1995) for the *Care About Diet* and *Nutrition Affects Health* scales were 0.47 and 0.53, respectively.

Section 3 contained four scales designed to assess the participants' ability to use and interpret nutrition labeling. The rules of cognitive test item construction (Gronlund, 1997; Linn & Gronlund, 1999) were carefully followed in the development of Section 3. A different Nutrition Facts label was used for each scale, except for Scale C, which used two labels (i.e., one for each set of four questions).

Scale A-Ability to locate quantitative information on the label (abbreviated *Scale A-Locate*) contained five items designed to determine whether participants could accurately locate and retrieve information from a Nutrition Facts label. Participants were asked questions like these: How much protein is in one serving of this food? How much vitamin A does one serving of this food provide? A score was computed by summing the number of correct answers. Scores for Scale A could range from 0 to 5, with higher scores indicating a greater ability to locate label information.

Scale B-Ability to manipulate quantitative information on the label (abbreviated *Scale B-Manipulate*) included five items that assessed the participants' ability to perform simple computations related to diet planning. Questions on this scale included: If you ate two servings of this food, how much fiber would you get? How many servings of this food would you need to eat to get all the calcium you need in a day? A score for this scale was calculated by summing the number of correct responses. Scores could range from 0 to 5, with higher scores indicating a greater ability to manipulate label information.

Scale C-Ability to judge nutrient content claim truthfulness (abbreviated *Scale C-Nutrient Content Claims*) included 8 items designed to determine the participants' ability to use the information on a Nutrition Facts label to judge the truthfulness of nutrient content claims (i.e., determine whether the claims were factually correct or incorrect) that could appear on a food package. All nutrient content claims used in this scale were written using the criteria specified in the labeling regulations (Stehlin, 1993). Half of the items on this scale used one Nutrition Facts label; the other half used a second Nutrition Facts label. For each label, two of the four nutrient content claims were factually incorrect and the other two were factually correct. Because previous research has indicated that individuals have more difficulty in ascertaining that a false claim is false than whether a true claim is true (Levy & Fein, 1998), a subscore was computed to determine the participants' ability to judge true claims as true and a second subscore was calculated to determine the participants' ability to judge false claims as false. Both subscores were computed by awarding one point for each correctly judged claim. A total score for *Scale C-Nutrient Content Claims* was determined by summing the two subscores. Both subscores could range from 0 to 4, whereas the total scale score could range from 0 to 8. For all scores generated, higher scores indicated a greater ability to judge nutrient content claim truthfulness.

Scale D-Ability to judge health claim accuracy (abbreviated *Scale D-Health Claims*) was designed to assess participants' ability to judge whether each of five health claims would be permitted on a pasta mix bearing the Nutrition Facts label they were shown. All the health claims used in this scale were drawn from those approved by the Food and Drug Administration (FDA) and permitted to appear on food packages provided that the food meets the requirements for that health claim [e.g., to make a fiber claim on grain products, the food must be low fat and, without fortification, be a good source of fiber (Geiger, 1998)]. Three of the five health claims shown on this scale would be legally permitted on the pasta mix. However, two of the health claims on this scale would not, by law, be permitted to appear on the pasta mix because the food did not meet the criteria required for those health claims. A subscore was calculated to determine the participants' ability to correctly identify permitted health claims and another subscore was computed to determine the participants' ability to identify non-permitted health claims for the pasta mix. A total score for *Scale D-Health Claims* was computed by summing the two subscores. The subscore for identifying permitted claims could range from 0 to 3 and the subscore for identifying non-permitted claims could range from 0 to 2. The total scale score could range from 0 to 5. For this scale's subscores and total score, higher scores indicated a greater ability to correctly judge whether a health claim would or would not be permitted to appear on a food item's packaging.

The Kuder-Richardson 20 reliability coefficients (Illinois State Board of Education, 1995) for the scales in Section 3 were 0.94, 0.82, 0.61, and 0.27 for Scales A, B, C, and D, respectively. The lower reliability for Scale D is reflective of the participants' lack of

knowledge regarding the concepts measured by this scale, thereby increasing the relative difficulty of the items on this scale (Linn & Gronlund, 1999). The brevity of the scale further impacts the reliability coefficient (Linn & Gronlund, 1999).

Results

The sample was comprised of 174 undergraduate females with a mean age of 20.3±1.6 standard deviation (SD) (range 17 to 25) who had never taken a college-level nutrition course. The sample was from a wide array of college majors and represented students from every college and school at the university. Nearly one-third of the participants (n=55) reported that they did half or more of the household food shopping. These women visited a food store an average of 1.7±1.1SD times per week (range 1 to 5 times) and spent an average of 72.6±53.1SD minutes (range 15 to 300 minutes) shopping for food weekly.

Most study participants (90%) indicated that they believed that they were somewhat or very informed about nutrition. The majority (58%) rated the overall quality of their diets as fair or poor, yet 73 percent rated the overall quality of their health as excellent or good.

Nearly 3 in 10 of the women surveyed (29%) reported that they always read Nutrition Facts labels, half reported reading labels sometimes, and the remainder (20%) indicated that they rarely or never read labels (i.e., they were label non-readers). The total percentage of label readers (i.e., women who always or sometimes read labels) is very similar to the rates reported by other researchers (American Dietetic Association, 1997; Kreuter, et al., 1997; Neuhouser, et al., 1999). In addition, this rate nearly met the 85 percent goal set by Healthy People 2000 objectives (U.S. Department of Health and Human Services, 1991). Although it is possible that due to social desirability bias, the participants in this study overestimated their label use, research indicates that reported label use corresponds well to actual label use (Vandenburg, 1981).

Although eighty percent of the participants said they read labels, only 29 percent said they always read labels. As noted by Kreuter, et al., (1997), this may be because individuals repeat meal patterns; consequently, they only need to read a label once. This is a likely explanation in this case because 64 percent of the participants indicated that they regularly read nutrition labels when purchasing a food for the first time.

Label reading appears to have an important impact on food purchasing decisions. That is, 82 percent of the label readers indicated that Nutrition Facts labels always or sometimes affected their purchasing decisions. In contrast, only 15 percent of the label non-readers reported that nutrition labels ever had an impact on their food purchasing selections.

Diet and health attitudes. The mean score for the attitude scale *Care About Diet* indicates the study participants were somewhat uncertain about importance of nutrition (see Table 1). However, the mean score for the attitude scale *Nutrition Affects Health* indicates that survey respondents felt certain that diet impacts health.

As can be seen in Table 1, the results of a t-test indicated that individuals who rated their diets as good or excellent scored significantly higher on both attitude scales than those who rated their diets as fair or poor. In addition, t-test results revealed that those who rated their health most favorably had higher mean scores on the *Care About Diet* scale than those who rated their health least favorably. Analysis of variance (ANOVA) and follow-up tests indicate that those who believe they are more informed about nutrition had significantly more positive diet and health attitudes than those who felt they were less informed about nutrition. A general overall positive perception about one's diet, health, and degree to which she believes she was informed about nutrition appears to be related to more positive diet and health attitudes. Although no objective measures of diet, health, or nutrition knowledge were included in this study to verify the participants' perceptions, the data may indicate that positive perceptions promote healthful attitudes, and possibly, behaviors including label reading. While actual level of nutrition knowledge has been found to be related to label use (Guthrie, Fox, Cleveland, & Welsh, 1995) and some evidence exists that label use is related to more healthful dietary intake (Guthrie, et al., 1995; Kreuter, Brennan, Scharff, & Lukawago, 1997; Neuhouser, et al., 1999), it is not possible to establish true causality due to the cross-sectional nature of this study.

Further analysis of the attitude scales revealed a positive correlation between frequency of label reading (i.e., always, sometimes, and rarely/never) and mean attitude scale scores. That is, the more often an individual reported she read labels, the more positive her diet and health attitudes tended to be. In fact, ANOVA results indicate that those who reported always reading Nutrition Facts labels had significantly higher scores on both attitude scales than those who sometimes read and those who rarely read labels. Similarly, those who sometimes read labels scored significantly higher on both attitude scales than those

Table 1: Diet and health attitudes mean scale scores.

Participants	***Care About Diet*** Mean Scale Score (range=1 to 5)	*Nutrition Affects Health* Mean Scale Score (range=1 to 5)
All (n=174)	3.7±0.7	4.4±0.5
Diet Rating		
Excellent or good (n=73)	4.0±0.7#[a]	4.5±0.4[b]
Fair or poor (n=101)	3.5±0.7[a]	4.3±0.5[b]
Health Rating		
Excellent or good (n=127)	3.8±0.7[c]	4.4±0.5
Fair or poor (n=47)	3.5±0.7[c]	4.4±0.5
Informed About Nutrition*		
Very Informed (n=22)	4.0±0.7[d]	4.7±0.4[fg]
Somewhat Informed (n=131)	3.7±0.7[e]	4.4±0.5[fh]
Not Informed (n=17)	3.1±0.6[de]	4.1±0.4[gh]
Frequency of Label Reading		
Always Read Labels (n=51)	4.2±0.6[ij]	4.6±0.4#[lm]
Sometimes Read Labels (n=89)	3.6±0.7[ik]	4.4±0.5[ln]
Rarely/Never Read Labels (n=34)	3.1+0.5[jk]	4.0+0.3[mn]

Means followed by the same superscript are significantly different. [a]p<0.0001; Scheffe F=22.7; [b]p<0.001, Scheffe F=12.21; [c]p<0.5; Scheffe F=4.14; [d]p<0.001; Scheffe F=7.93; [e]p<0.01; Scheffe F=6.68;[f]p<0.05, Scheffe F=4.31; [g]p<0.001, Scheffe F=9.13; [h]p<0.05, Scheffe F=3.73; [i]p<0.0001, Scheffe F=13.96; [j]p<0.0001, Scheffe F=30.26; [k]p<0.001, Scheffe F=7.76; [l]p<0.01, Scheffe F=4.85; [m]p<0.0001, Scheffe F=25.62; [n]p<0.0001, Scheffe F=13.25.
*Only 170 participants responded to this question.

who rarely read labels. These findings are consistent with earlier work which reported strong relationships between diet and health attitudes and frequency of nutrition label use (Neuhouser, et al., 1999). Currently, no data are available to determine whether attitudes improve before, during, or after label reading frequency rises.

Ability to use and interpret Nutrition Facts labels. As can be seen in Table 2, the mean score on *Scale A-Locate* indicated that participants could accurately locate and retrieve information from the label. The mean score of *Scale B-Manipulate* indicates that the surveyed women were able to perform computations related to diet planning. These findings parallel previous research (Levy & Fein, 1998) in that ANOVA revealed that neither the mean score for *Scale A-Locate* nor the mean score for *Scale B–Manipulate* differed significantly with the frequency with which the participant read nutrition labels. In addition, statistical results showed that performance on these two scales did not differ significantly with the degree to which a participant reported she was informed about nutrition or the amount of household food shopping she did.

The findings for *Scale A-Locate* are consistent with previously reported data (Byrd-Bredbenner, 1994). The findings for *Scale B-Manipulate* contrast with recently published studies that indicated that consumers have difficulty making accurate mathematical calculations based on food labels (Levy & Fein, 1998; Miller, Probart, & Achterberg, 1997). This contrast likely occurred because one of these studies surveyed women older (i.e., 40 to 60) than the study population (Miller, Probart, & Achterberg, 1997). Numerous studies have reported that older people tend to perform more poorly than younger people on nutrition labeling tasks (Cole & Balasubramanian, 1993; Cole & Gaeth, 1990; Levy & Fein, 1998; Moorman, 1990). The second contrasting study (Levy & Fein, 1998) was conducted before the implementation of the current Nutrition Facts label format which includes percent Daily Value (DV), and, thus, eliminates the need to perform calculations to relate the quantity of a nutrient in a food to the recommended daily intake. The DV feature likely contributed to the skillful performance of this study's participants on *Scale B-Manipulate*.

Results from *Scale A-Locate* and *Scale B-Manipulate* indicate that even though none of the participants had completed a college level nutrition course and that 79 percent reported they had never received formal instruction on food labels, they were able to skillfully locate and manipulate Nutrition Facts label data. Thus, it appears that the Nutrition Facts label format is a consumer-friendly tool that can be used for the tasks which are among the most common uses of nutrition labels (Guthrie, et al., 1995). However, skill in applying nutrition labeling information to overall household dietary planning is a complex task (Guthrie, et al., 1995) that needs to be investigated.

The mean total score for *Scale C-Nutrient Content Claims* (see Table 2) indicates that participants generally were moderately well equipped to judge the truthfulness of nutrient content claims. Participants were better able to correctly judge false nutrient content claims as false than judge true claims as true. ANOVA comparing the mean subscores and total scale score on this scale by frequency of label reading indicated that no significant differences existed among those who always, sometimes, or rarely read labels. Additionally, mean subscores as well as total scores for this scale did not differ significantly with the degree to which a participant reported she was informed about nutrition or the amount of household food shopping the participant did.

The mean total score for *Scale D-Health Claims* indicates that, overall, participants were able to accurately judge whether a health claim would be permitted on a food package less than 60 percent of the time. Participants were better at identifying permitted health claims than non-permitted health claims. That is, participants correctly identified permitted health claims 75 percent of the time. In contrast, they correctly identified non-permitted health claims only 35 percent of the time. Statistical analysis revealed that mean subscores as well as total scores for this scale did not differ significantly with the frequency with which participants read nutrition labels, degree to which a participant reported she was informed about nutrition, or the amount of household food shopping the participant did.

The total scores for both *Scale C-Nutrient Content Claims* and *Scale D-Health Claims* indicate that participants performed similarly when judging nutrient content claims and health claims. The overall ability of participants to correctly judge the accuracy of nutrient content claims is comparable to those reported by Levy and Fein (1998). However, in contrast to those findings (Levy & Fein, 1998), participants in this study judged false nutrient content claims as true only eight percent of the time and were nearly equally likely to identify true claims as true or false. Researchers have reported

Table 2: Analysis of variance of mean scores of Scales A, B, C, and D by frequency of label reading.

Scale	Total Group	Always Read Labels (n=51)	Sometimes Read Labels (n=89)	Rarely Read Labels (n=34)
Scale A- Locate (range 0-5)	4.6±1.2	4.5±1.5	4.7±1.1	4.7±0.9
Scale B- Manipulate (range 0-5)	4.1±1.2	4.1±1.1	4.3±1.1	3.9±1.3
Scale C- Nutrient content claims				
Total correctly judged true claims (range 0-4)	2.3±1.2	2.4±1.2	2.3±1.2	2.2±1.2
Total correctly judged false claims (range 0-4)	3.7±0.5	3.8±0.5	3.7±0.5	3.8±0.4
Total scale score (range 0-8)	6.0±1.2	6.1±1.1	6.0±1.2	5.9±1.2
Scale D- Health claims				
Total correctly judged permitted claims (range 0-3)	2.2±0.8	2.1±0.9	2.3±0.8	2.3±0.8
Total correctly judged non-permitted claims (range 0-2)	0.7±0.7	0.8±0.7	0.7±0.8	0.6±0.7
Total scale score (range 0-5)	2.9±0.9	2.9±1.0	2.9±0.8	2.9±1.0

that most people do not trust nutrient content claims because they feel such claims are marketing ploys (Cronin, Achterberg, & Sims, 1993; Derby & Fein, 1995; Miller, et al., 1997). This skepticism may cause individuals to be more likely to judge all but the most easily verified claims as false. For example, a nutrient content claim that a food is 'sugar-free' on a food package with a Nutrition Facts label indicating the food has zero grams of sugar is easily verified as correct. However, claims that a food with a Nutrition Facts label indicating that it contains 20 percent of the DV for calcium is 'rich in calcium' is more difficult to accurately judge without prior knowledge of the parameters set for making this claim. In fact, an examination of the individual questions on *Scale C-Nutrient Content Claims* indicates that there is considerable confusion about these parameters. That is, the vast majority accurately judged a 'rich in vitamin C' claim for a food containing 10 percent of the DV for vitamin C as being incorrect. However, the participants were split on whether a food containing 30 percent of the DV for vitamin A could truthfully make the claim that it was 'high in vitamin A'.

Although over 60 percent of the participants in this study indicated that they knew regulations existed to help ensure the accuracy of nutrient content and health claims on food packages, the findings of this study indicate that the participants' abilities to judge the accuracy of claims was limited. As was pointed out by others, high school age consumers may not judge nutrient content and health claims correctly, but they use these claims five times more frequently than Nutrition Facts labels for nutrition information (McCullum & Achterberg, 1997). Although the Nutrition Facts label provides much more information than a claim can, many of the college-age women studied here (44%), as well as other women shoppers (Miller, et al., 1997), indicate that lack of time was a major barrier to reading labels while grocery shopping. This lack of time is particularly important because survey data indicate that consumers make 80 percent of their food purchasing decisions at the supermarket (Light, Portnoy, Blair, Smith, Rodgers, Tuckermanty, Tenney, & Mathews, 1989).

Because nutrient content and health claims can be read quickly, they can help consumers rapidly locate foods that can help them achieve healthy diets while food shopping. However, nutrient content and health claims on food labels are of little value if consumers don't trust the claims and are unable to judge their truthfulness. If the frequent use of nutrient content claims reported by high school students (McCullum & Achterberg, 1997) is to continue into the college years as well as afterwards, it will be important to increase consumer confidence in the truthfulness of claims. Thus, helping consumers become aware of some of the parameters set for the use of claims can enable them to confirm the accuracy of the claims for themselves and may help increase their confidence in food labels and willingness to more fully utilize claims when making food selections.

Conclusion

The results of this study are encouraging in that most college age women report reading Nutrition Facts labels. This finding is particularly important when one considers the impact label reading may have on health. For example, researchers have reported that individuals who read labels tend to have lower fat intakes and increased intake of fruits and vegetables (Kreuter, et al., 1997; Neuhouser, et al., 1999). Although the vast majority of women in this study report that they always or sometimes read nutrition labels, one in five rarely or never reads labels. Thus, campus-based educational interventions should promote nutrition label reading to reinforce the behaviors of the majority and encourage non-readers to begin using nutrition labels.

One of the key objectives of the NLEA was to make it easier for consumers to use the quantitative information on the food label (Levy & Derby, 1996). The findings of this research indicate that, even without formal labeling education, study participants were highly successful in locating and manipulating information on Nutrition Facts labels. The relative ease with which the study participants used nutrition labels to locate and manipulate information indicates that women in college are ready to move beyond learning basic label reading skills to using labels for more complex diet planning tasks. Previously reported research indicates that college students rarely use the label for overall daily diet planning (Marietta, Welshimer, & Anderson, 1999). Thus, this audience likely would benefit from campus-based programs that teach them how to use labels to plan diets congruent with current recommendations in order to help prevent or ameliorate diet-related disease.

Unfortunately, this study's results suggest that the abilities of the participants to evaluate nutrient content and health claims are less than optimal. The deficiencies in their knowledge about nutrient content and health claims indicate that women enrolled in college could benefit from well-designed, campus-

based educational interventions that provide opportunities to gain the knowledge needed to more accurately judge nutrient content and health claims. The expansive, unregulated use of claims by food manufacturers in the mid- to late-1980s and the consumer skepticism it engendered were primary forces in bringing about the current labeling legislation (Levy & Derby, 1996). Although a primary goal of the NLEA was to restore consumer confidence in nutrient content and health claims (Levy & Derby, 1996), a recent study indicates that many college students surveyed still feel that claims are not truthful (Marietta, et al., 1999). If consumers are to confidently use the claims on food packages when they make purchasing decisions in the supermarket, interventions will need to not only focus on helping this audience gain an understanding of the regulations governing the use of claims, but also seek to boost their confidence in the truthfulness of claims (Marietta, et al., 1999). The value of providing opportunities to learn about claims-related regulations is underscored by the fact that nutrition labels are commonly used by consumers to determine whether statements made on food packages or in advertising were true (National Food Processor Association, 1992).

While the findings of this study provide an understanding of what women enrolled in college already know about nutrition labeling and areas that need development, it is important to recognize the limitations of the present study. Because the study participants were recruited and agreed to participate in this survey, we cannot rule out the possibility of social desirability bias. Also, participants in this study were limited to a cross-section of women 17 to 25 years old who were recruited from one university in the northeast. It may be that these women are not reflective of women enrolled in other universities in this region and/or in other areas of the U.S. or women in this age group who are not enrolled in college. However, the rate of label reading among the participants in this study is quite similar to that reported by others (American Dietetic Association, 1997; Kreuter, et al., 1997; Neuhouser, et al., 1999). In addition, the rate of label reading by the participants in this study is very similar to the rates reported for females, individuals less than 35 years old, residents of the northeast region of the U.S., and individuals who have at least some college education (Guthrie, et al., 1995), thereby increasing the generalizability of the findings.

Nutrition labeling education programs can help consumers to effectively use and understand nutrition labels. This investigation provides useful information for designing the content of campus-based nutrition labeling interventions. Future research should investigate the impact of nutrition labeling education programs based on this study's findings on female students' current diet and health attitudes and dietary intake as well as the long-term impact on the dietary patterns of their household members. In addition, future research should determine whether food label use predicts positive diet and health attitudes or vice versa. Because nutrition label reading may be a key precursor to improved dietary intake, the links among nutrition labeling use, purchasing decisions, and dietary intake need to be more fully explored.

The NLEA mandated extensive changes that, for the first time, gave Americans access to consistent, standardized information about the nutrient content of packaged foods and their contribution to a healthy diet. The Nutrition Facts label is recognized as an important improvement over the previous nutrition label, yet more than five years after its introduction, little is known about the ability of consumers to use it. A primary problem faced by nutrition experts when they were revising the previous nutrition label and developing the new Nutrition Facts label was the dearth of nutrition labeling studies available (Byrd-Bredbenner, 1994; Geiger, Wyse, Parent, & Hansen, 1991a; Geiger, Wyse, Parent, & Hansen, 1991b). Although the Nutrition Facts label is not likely to be revised again in the near future, on-going investigations, like the one reported here, are needed to generate a greater body of knowledge on which decisions can be based the next time a nutrition label revision does occur.

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NOTE: A copy of the instrument is available from the author.

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