Associations among Grade, Sex, and Free and Reduced Price Lunch Eligibility with Use of Nutrition Labels in Middle and High School Students

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A thesis
Submitted in partial fulfillment of the
Requirements for the degree of

Master of Public Health

University of Washington

2012

Committee:

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Program Authorized to Offer Degree:

Nutritional Sciences

University of Washington

Abstract

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Background: Nutrition labeling interventions are proposed to improve adolescent food consumption patterns. However, little is known about the use of nutrition labels by adolescents.

Objective: This study investigated the associations among students' grade level and sex, as well as the proportion of students eligible for free and reduced price lunch within a school, with use of nutrition labels in helping students decide what to eat.

Methods: This study was a secondary data analysis based on results from a cross-sectional survey consisting of questions regarding demographic information and use of nutrition labels. Use of nutrition labels in helping students decide what to eat was reported using a five point Likert scale ranging from "Strongly Agree" to "Strongly Disagree". Surveys were administered in February 2011 in three middle and three high schools in the Renton School District to 689 students who completed the surveys during class time. The survey data was recoded so that label use became a binary variable, the "Not Sure" responses were removed from the dataset, and a logistic regression analysis was used to determine the associations between sex and grade level and use of nutrition labels in helping students decide what to eat. A graphic display was created to show differences in label use between schools.

Results: There were no significant relationships between either sex or grade level and use of nutrition labels in helping students decide what to eat ($p = 1.00$ and 0.39, respectively). There was also no apparent relationship between the proportions of students eligible for free and reduced price lunch and nutrition label use in each school.

Implications: These results suggest that there may be benefits to overarching efforts to promote use of nutrition labels independent of grade level, sex, and the proportion of students eligible for free and reduced price lunch in a school.

INTRODUCTION

Adolescents in the U.S. consume too much saturated fat, salt, and sugar and not enough fruits and vegetables, calcium-containing foods, whole grains, or iron[1,2,3,4,5]. Poor dietary choices among young people is problematic because unhealthy dietary habits initiated at a young age may increase the risk of chronic diseases including heart disease, osteoporosis, obesity, and various cancers later in life[6]. Moreover, the effects of poor dietary behaviors have resulted in overt disease among children and adolescents in recent years[1,7,8]. Although many factors contribute to unhealthy dietary behaviors in young people, poor knowledge about nutrition and a lack of awareness about food consumption patterns are perhaps the easiest factors to target with nutrition interventions[9].

A growing awareness of the damage caused by poor nutrition in young people has drawn attention to the school food environment as an important factor in adolescents' eating behavior[10]. In 2011, an estimated 31.7 million and 11.7 million students ate lunch and breakfast in school, respectively[11]. Schools are therefore an appropriate venue to educate youth about healthy eating and promote positive eating behaviors[8,11,12,13].

Nutrition labels in school cafeterias may provide one method for improving adolescents' eating behaviors. The availability of nutrition information through labels has been shown to have a positive impact on eating behavior across many studies, in both adults and adolescents [5,14,15,16,17,18,19]. However, label availability alone, without education about their use, has left both adults and adolescents struggling to use labels effectively[18,20].

To be most effective, nutrition education interventions should be specifically tailored for intended audiences[9,18,21,22,23]. Therefore it is important for those designing interventions to understand the determinants of food label use[23].

Students' interest in nutrition, aptitude for understanding labels, and exposure to nutrition labels vary widely by age, sex, and other factors[19,21,23]. For example, females are generally more interested in nutrition and concerned about their weight than males and may use information on front labels/nutrition claims more often than males, while males may be more concerned with other parts of food packages besides the nutrition label such as package appearance[21,22,24]. After exploring the effects of nutrition label use on fat consumption in adolescents, Huang et al. (2004) concluded that "early nutrition education that takes into account gender-specific issues is clearly needed to help the public better understand and use nutrition labels"[25: 401].

Grade level is also an important consideration because nutrition labels must be developmentally appropriate. For example, older adolescents respond to abstract concepts and engage in critical thinking more so than younger ones[1]. Thus, nutrition label interventions designed for adolescents should specifically emphasize critical-thinking skills whereas labels for children should include more thorough instructions on how to use labels[18].

Beyond these simple demographic factors, the socioeconomic status (SES) of students is another variable of interest in the design of effective nutrition labeling interventions. Students from different socioeconomic backgrounds are likely to display different levels of understanding when it comes to nutrition and nutrition labels[19].

The extent to which grade level and sex affect students' use of nutrition labels and their subsequent impact on deciding what to eat is unknown. Furthermore, the effect of school-level factors, such as a school's aggregate socioeconomic level, on individual level factors has not been explored. Research aimed at filling this void is important because age-, sex, and SES-appropriate interventions are likely to be more successful than universal strategies for increasing understanding and use of nutrition labels[18,19,21,23,24,25].

The overall goal of this study was to assess the impact of grade level and sex on students' use of nutrition labels in deciding what to eat. Specifically, it was hypothesized that females use nutrition labels more than males and that older students use nutrition labels more than younger students. A secondary hypothesis was that students at schools with a higher SES, as assessed by the percentage of students eligible for free and reduced price lunch at each school, use nutrition labels more than those at schools with a lower SES.

This project will help to inform effective age-, sex-, and socioeconomically-appropriate interventions that focus on nutrition labeling in middle and high school settings.

METHODS

This study is a secondary data analysis based on a survey disseminated in three middle and three high schools in the Renton School District in Renton, WA in February 2011. The purpose of the survey was to assess student knowledge, attitudes, self-efficacy and behaviors related to nutrition and school lunches. Renton School District foodservice managers identified teachers from each of the six secondary schools who were interested in participating in the evaluation. Classrooms in which surveys were handed out included Culinary Studies, Family Sciences, Home Living, and Physical Education. Informational letters were provided to parents, who were given the option to refuse the participation of their child by returning a form to the classroom teacher. Participating students were required to complete an assent form at the time of the survey.

The protocols for the original study were approved by the University of Washington Human Subjects Division. The current secondary analysis did not qualify as human subjects research due to the lack of identifying information collected and was declared exempt from the need for institutional review board (IRB) approval.

The survey (see Appendix 1) consisted of one demographic question (i.e. sex), four questions about frequency of purchasing school lunch with answer choices ranging on a five point Likert scale from zero days/week to five days/week, six questions about attitude toward nutrition, self-efficacy regarding nutrition labels, knowledge about nutrition labels, and nutrition label behavior with answers ranging on a five point Likert scale from "Strongly Agree" to "Strongly Disagree", and one question asking students to estimate the number of calories that should be consumed in one day. The primary outcome of this study was related to the question that asked whether and to what degree participants used nutrition labels in deciding what to eat. This question was adapted from a point of purchase survey used by Public Health Seattle and King County. The entire survey was pre-tested with middle school students, after which revisions were made. No revisions were made to the question of nutrition label use.

The percentages of students at each of the six schools eligible for free and reduced price lunch in 2010 were also obtained, as a potential contributor to differences in use of nutrition labels between schools[26].

Before conducting the statistical analysis, the "Not Sure" responses were removed from the dataset and the remaining four responses were recoded to form a binary variable ("Strongly Agree" and "Agree" were combined to form the new category "Agree", while "Strongly Disagree" and "Disagree" were combined to form the new category "Disagree"). The "Not Sure" responses were removed because they did not match the study's objective of differentiating between those who use labels to help them decide what to eat and those who do not.

To compare responses of males to females and middle school to high school students, a logistic regression analysis was performed with STATA 11 software (StataCorp. 2009. *Stata Statistical Software: Release 11*. College Station, TX: StataCorp LP). A p-value less than .05 was considered significant. The students' school-level SES (according to which school each student attended) was explored using a graph featuring mean use of labels at each school compared to percentage of students at each school eligible for free and reduced price lunch. For this relationship, it was inappropriate to conduct a statistical test to determine the extent of the correlation due to an extremely small sample size (six—i.e. the number of schools). Therefore, it was more appropriate to plot the values and observe any possible associations between the points on the graph.

RESULTS

Demographic information is summarized in Table 1.

Table 1. Demographic characteristics of middle and high school students who completed Renton Schools Menu Labeling Evaluation survey.

Characteristic	**n**	**%**
Total number of subjects	689	
Sex		
Female	368	55
Male	299	45
Grade level		
Middle school	332	49
High school	343	51
Percentage of students eligible for free and reduced price lunch		
1 (32%)	103	15
2 (41%)	141	20.5
5 (42%)	134	19.5
6 (51%)	103	15
3 (61%)	99	14
4 (76%)	109	16

Figures 1 and 2 present counts of the various responses (Strongly Agree, Agree, etc.) to the statement: "I use nutrition labels on food to help me decide what to eat." Figure 1 compares differences between middle school and high school students, while Figure 2 compares differences between males and females. There were no significant associations between sex ($p = 1.00$) or grade level ($p = 0.39$) and students' use of labels in deciding what to eat.

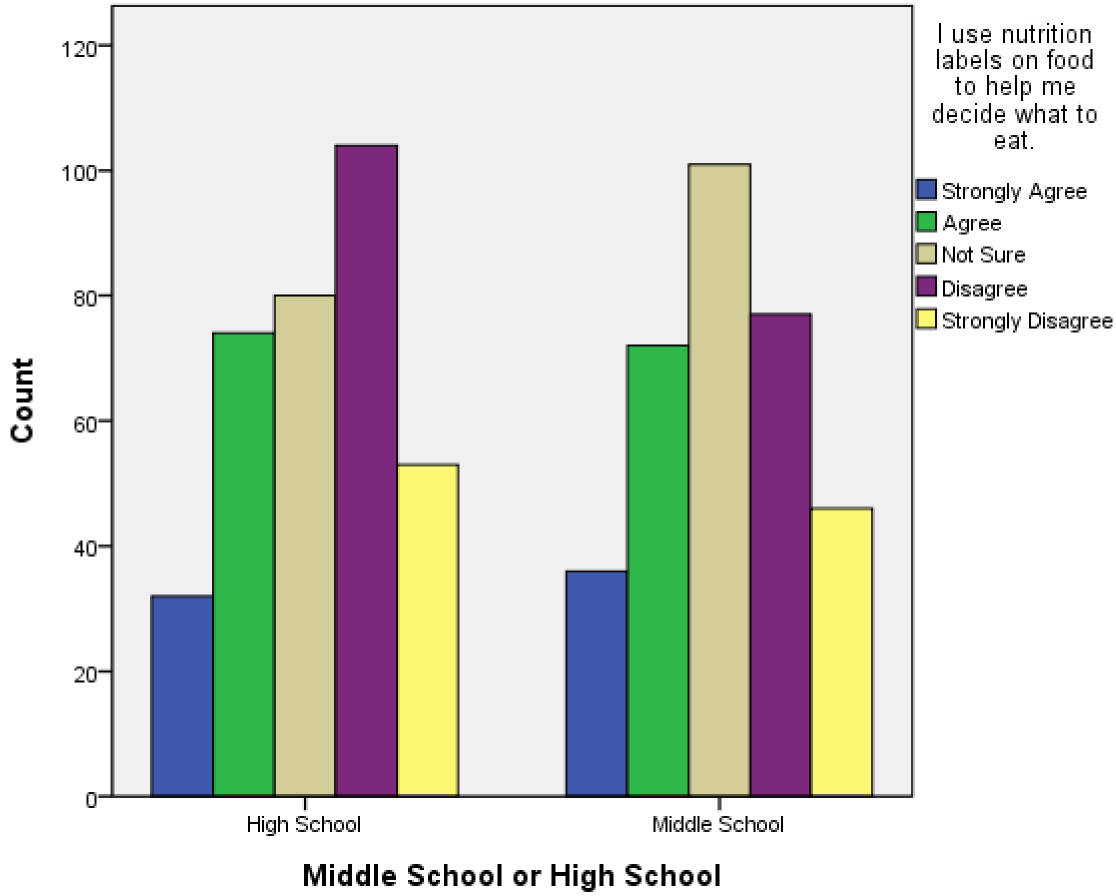

Figure 1. Response counts for use of nutrition labels by middle and high school students who completed Renton Schools Menu Labeling Evaluation survey.

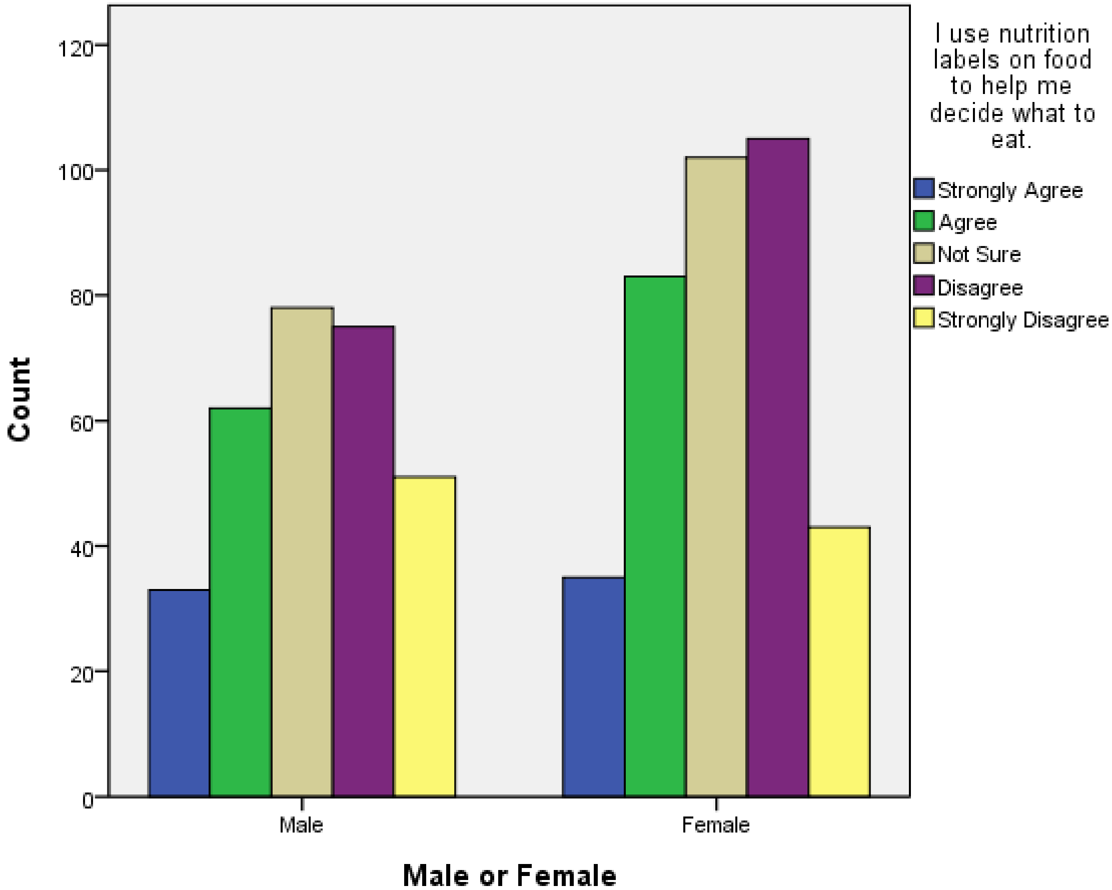

Figure 2: Response counts for use of nutrition labels by middle and high school students who completed Renton Schools Menu Labeling Evaluation survey.

The association between the proportion of students in each school who were eligible for free and reduced price lunch and each school's average use of nutrition labels is shown in Figure 3. Based on the plotted means with upper and lower bounds, there is no apparent trend between percentage of students at each school eligible for free and reduced price lunch and use of nutrition labels in helping students decide what to eat.

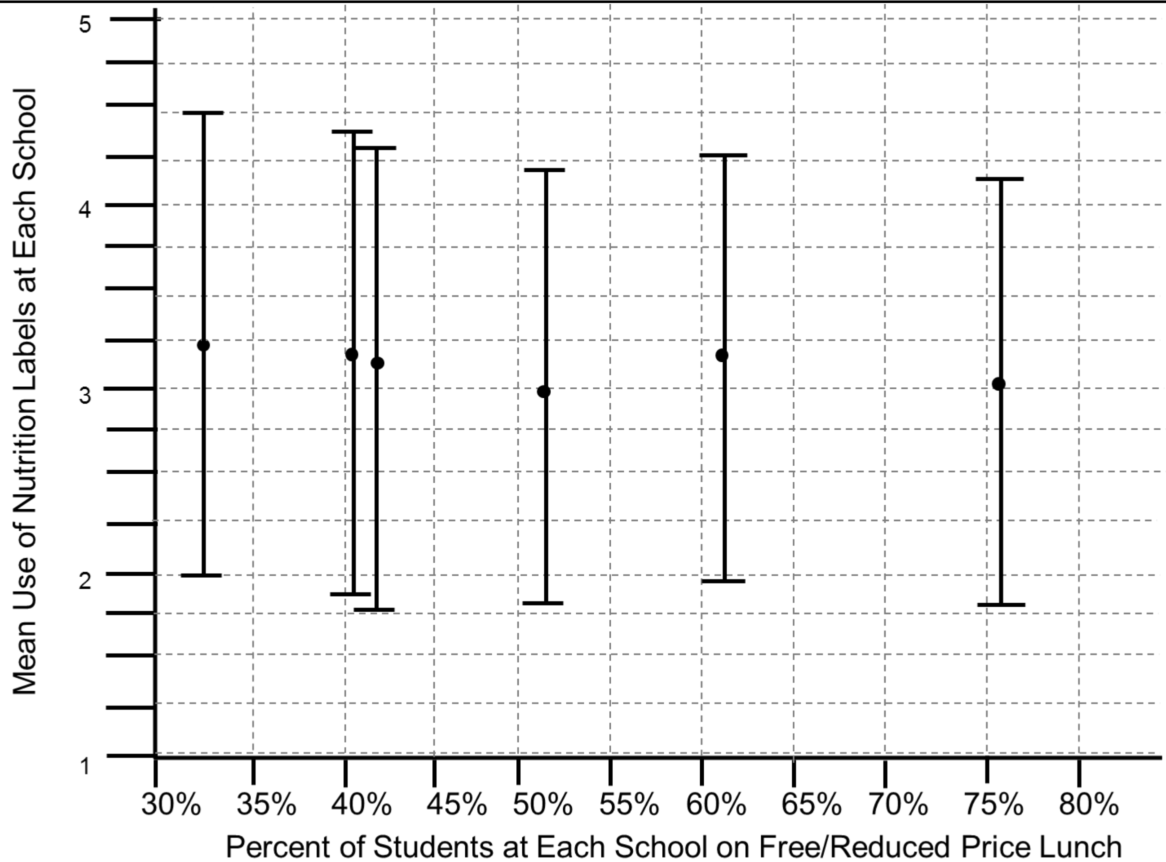

Figure 3: School-wide mean use of nutrition labels (based on Renton Schools Menu Labeling Evaluation survey) by percentage eligible for free and reduced price lunch. Error bars represent standard deviations around each mean.

DISCUSSION

This study demonstrated that use of nutrition labels in helping students decide what to eat did not differ significantly between older and younger students, or between males and females, in a sample of middle and high school students in the Renton School District. Figures 1 and 2 offer a visual representation of the lack of associations between grade levels and sexes, respectively, and students' use of labels in deciding what to eat. The four "curves" featured in these figures are all fairly similar, with high response rates in the middle ("Agree", "Not Sure", and "Disagree") and lower response rates on the edges ("Strongly Agree" and "Strongly Disagree").

When comparing use of nutrition labels between the different schools by eligibility for free and reduced price lunch, used as a proxy measure of school-level SES, there was no trend of higher label usage in schools with lower rates of free and reduced price lunch eligibility (i.e. higher SES).

The lack of significant associations among participants of different age groups and sexes with use of labels was contrary to initial hypotheses and does not corroborate prior studies, most of which have found associations between use of nutrition labels and these demographic variables[17,18,19,21,23]. After conducting a survey assessing frequency of nutrition label use in an adult population, Satia and colleagues found that nutrition label use was significantly higher among females and older participants[19]. Sharf and colleagues conducted a survey testing nutrition label comprehension and found that females paid significantly more attention to food labels than males among a group of young adults[18]. Level of education and female sex both seem to have a positive effect on use of nutrition labels, as discerned by Hess and colleagues in their 2011 review[23].

There are at least two possible explanations for why the present study results are different from those previously reported. First, most of the studies exploring associations between nutrition label use and demographic variables have been conducted in adult populations, whereas this study focused on adolescents[18,19,23]. Associations between age level and use were difficult to discern in the present population because the range of ages was rather small (6th grade-12th grade). In adult study participants, the ranges tend to be much wider[18,19,23]. Furthermore, adolescents are typically still in the process of developing their long-term health behaviors, whereas the habits of most adults (including nutrition label use) are already ingrained[9,18]. More significant associations between label use and sex could thus occur in adult males and females who are more decided in their habits than adolescent males and females who are less sure.

Second, participants in this study reported use of nutrition labels on a five point scale ranging from "Strongly Disagree" to "Strongly Agree", whereas in many past studies participants reported use on a frequency scale (e.g., number of times per week) or were tested on their comprehension of food labels(14,15,18,19,20,23,25). Thus, the survey instrument used in the present study may not have been sensitive enough to pick up associations between label use and grade level/sex. Related, many of this study's participants reported that they were unsure of their use of nutrition labels, a response that is not an option when using a frequency scale or a comprehension test. More students responded "Not Sure" or "Disagree" to the question of nutrition label use than any of the other three responses (see Figures 1 and 2). Among middle school students, about one third reported that they did not know if they used labels or not to help them decide what to eat. At such a young age, many students have not been exposed to nutrition labels or have not received proper education about how to use labels(27). This lack of understanding might have given rise to the high proportion of "Not Sure" responses.

Although the use of a five point scale is an important consideration, the differences in results between the current study and prior studies cannot be fully explained by the five point scale and the high proportion of "Not Sure" responses; the uncertainty among the student respondents did not ultimately affect the results of the study. Even after the "Not Sure" responses were removed from the dataset, there were no significant associations between use of nutrition labels and sex or grade level. However, the fact that so many students reported being unsure is an important finding in and of itself. Students need basic label reading education before they can make a decision to use them or not.

The study has several limitations. First, the generalizability of the results is compromised because students in the three middle and high schools who completed surveys may not be representative of all middle and high school students in Renton, WA or more broadly throughout the state and nation. Second, measurement error and bias may have been introduced by a lack of reliability/validity testing for the survey. Third, the use of free and reduced price lunch percentages to infer about SES at the school level does not provide information about SES at the individual level, which may or may not be a stronger predictor of label use. Finally, although using a binary division for grade level rather than the students' actual ages allowed for a more simplistic analysis, this division may have limited the detection of statistical associations between age and use of labels.

In the future, students could be recruited from numerous geographical regions throughout the United States in order to make any results concerning nutrition label use more widely generalizable. Assessment methods could be developed and used that could produce more precise assessments of label use than those produced by a five point Likert scale. In fact, focus groups and/or interviews could be utilized to assess label use and understanding in a more qualitative way. Finally, the potential association between use of nutrition labels and SES could be explored on an individual level to further explore the putative relationship between this demographic variable and nutrition label use.

IMPLICATIONS

The self-reported use of nutrition labels did not differ between older and younger students or males and females in this large sample of students. These results suggest that there may be benefits to overarching efforts to promote use of nutrition labels independent of grade level, sex, and the proportion of students eligible for free and reduced price lunch in a school.

ACKNOWLEDGEMENTS

Mary Podrabsky, MPH, RD, Anita Rocha, Brett Carter, MS, Joanna Vong, Rachael Stovall, and Donna Johnson, PhD, RD were involved in the formulation of the survey, the selection of participants, data collection, and data organization. Donna Johnson, PhD, RD and Glen Duncan, PhD played integral roles in the editing process.

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Appendix 1: Survey

Your Student ID# (please write in)_______________

Renton Schools Menu Labeling Evaluation
Student Survey Questions

A.) Please check one box. Are you female☐ or male☐ ?

B.) For lunch, ***about*** how often do you ***usually***:

	0 days/ week (X)	1 day/ week (X)	2 days/ week (X)	3 days/ week (X)	4 days/ week (X)	5 days/ week (X)
buy and eat school lunch in the cafeteria?						
buy food from vending machines on the school campus?						
bring lunch from home?						
buy food off-campus? (only ***high school*** students answer this question)						

C.) Please put an X in the column with the best answer to these questions.

	Strongly Agree (X)	Agree (X)	Not Sure (X)	Disagree (X)	Strongly Disagree (X)
Eating a healthy lunch is important to me					
I read nutrition labels					
I understand nutrition labels					
I am confident that I can use nutrition labels to choose healthy foods					
I use nutrition labels on food to help me decide what to eat					
Nutrition labels help me make healthy food choices					

D.) How many calories do you think a person your age, weight and height should eat during an entire day? (This includes breakfast, lunch, dinner and all snacks). Write in the number here → _____________

Rev3-08-11 v2