



# A Cross-Sectional Study of the Relationship between Nutrition Label Use and Food Selection, Servings, and Consumption in a University Dining Setting



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## ARTICLE INFORMATION

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## ABSTRACT

**Background** Nutrition labels at the point of purchase are recommended to improve food choice, yet food choice does not always translate into food consumption. It is important to understand the relationship between label use, food selection, servings, and consumption. Previous research, which has relied on self-reported intake or inferred label use or intake based on sales data, has not adequately answered this question.

**Objective** To combine survey and meal photographic data to compare food selection, servings, and consumption between label users and nonusers.

**Design** Diners were surveyed in two cross-sectional waves during the fall 2014 semester. Food selections were recorded, and pre- and postmeal photographs were taken of diners' plate. Photographs were coded to identify the selection, servings, and consumption of MyPlate food categories.

**Participants/setting** Convenience sample of 1,069 diners (39% women, 53% freshman) in two university dining halls. Students had to be older than age 18 years and just beginning their meal to participate.

**Main outcome measures** Selection, servings, and consumption of MyPlate food categories for label users and nonusers.

**Statistical analyses performed** Differences in food selection were tested via  $\chi^2$  tests, and differences in adjusted least squares means for servings and consumption were tested via *t* tests.

**Results** A greater proportion of nutrition label users selected fruits, vegetables, and beans and fewer selected potatoes compared with nonusers. In addition, fewer label users selected fried foods and foods with added sugars (all *P* values <0.05). Label users served themselves and consumed more vegetables and fewer potatoes and refined grains compared with nonusers (all *P* values <0.05).

**Conclusions** Our results suggest label users behave differently compared with nonusers. Based on the meals observed, these differences appear more qualitative in nature (selecting different foods) than quantitative (selecting more or less food).

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**I**NTERVENTIONS, INCLUDING THE POSTING OF NUTRITION labels, are commonly recommended to improve food choices in college students and young adults, a population at risk of weight gain,<sup>1</sup> declines in physical activity and intake of fruits and vegetables, and increases in fast-food and soft drink consumption.<sup>2</sup> However, evidence on the effectiveness of such interventions is mixed. Some research has shown that introducing nutrition labels at the point of selection in university settings can positively influence food sales or selection<sup>3-7</sup> and even weight status over the course of a year.<sup>8</sup> Conversely, other research has found posting labels had little influence on food choice or dietary behavior in college students and young adults.<sup>9,10</sup> Two

studies suggested labels may actually increase calories ordered or consumed.<sup>11,12</sup>

This lack of consensus may be partially due to some methodologic differences in the literature. The majority of studies were either unable to directly assess nutrition label use,<sup>4,5,9,12</sup> and/or relied on self-reported measures of meal selections or intake.<sup>7,10</sup> This limits understanding of how nutrition label knowledge influences food choices and consumption. Although some research suggests nutrition labels influence calorie selection and consumption, the mechanism, such as selecting healthier food choices or decreasing portion sizes, is unknown. Further, very few studies observe consumption; rather, it is often inferred that the amount selected

is also the amount consumed, which may not always be the case.

The purpose of this study was to examine the relationship between label use and food selection, servings, and consumption among college students. Survey and plate photographic data were combined to determine whether eating patterns were different across nutrition label users and nonusers, and, if so, the nature of those differences (eg, differences in food quality and/or food quantity). Food selection, servings, and consumption were assessed using digital photography, a method with strong reliability compared with measuring energy intake via doubly labeled water<sup>13,14</sup>; in addition, digital photography has been validated for measuring portion sizes compared with weighing food<sup>15</sup> and visual estimation<sup>16</sup> in cafeteria settings.<sup>13,15,16</sup> Further, participants were surveyed on potentially confounding socio-demographic and behavioral variables (such as gender, body mass index [BMI], exercise frequency, and nutrition education) to better assess the possible link between label use and food selection, servings, or consumption.

## METHODS

### Study Design

Diners were surveyed at two dining halls serving more than 9,000 students with meal plans and the general public at a major university in the Midwestern United States. Dining halls served a wide variety of food, including multiple daily rotating entrées, grilled meats, international cuisine, pizza, pasta, vegetarian and vegan entrées and sides, a salad bar, dessert bar, and cereals. Both dining facilities were all-you-can-eat and employed trayless dining. Food items were self-serve, with the exception of a very few popular items like chicken wings that required preportioning as a means of supply control. Except for salad bar items, which were not labeled due to space constraints, all items had a 2×3.5-in nutrition label, including the dish title, serving size, number of calories, and grams of fat, carbohydrates, and protein (see Figure 1 for an example).

Diners were surveyed at lunch (11:00 AM to 1:30 PM) Monday through Thursday during Weeks 8 and 12 of the 16-week fall 2014 semester. Eligible diners had to be at least



**Figure 1.** Example nutrition label posted in two university dining halls during the fall 2014 semester. Each label was 2×3.5-in and included the dish title; serving size; number of calories; and grams of fat, carbohydrates, and protein.

aged 18 years and just sitting down to eat. Diners who were already eating their meal were not asked to participate because obtaining a complete picture of food selection, servings, and consumption was not possible. Research assistants stationed in dining hall sections informed diners who met the inclusion criteria of the general study objective (to learn more about students' food choices) and asked whether they would be willing to participate in the study. After diners provided verbal consent, research assistants recorded each diner's food selections, took a photograph of the diner's meal using a mobile tablet (Dell Venue 8; Dell, Inc), and gave the diner a brief survey to complete while they ate. A unique identification number was attached to each survey. This number was placed next to the diner's plate(s) in the photograph to accurately link the two. Research assistants collected the survey at the conclusion of the meal and took a final postmeal photograph (including the identification number) when possible. Occasionally, diners needed to leave before a postmeal photograph could be taken due to class schedules; in these instances, diners left the completed survey for the research team, but no postmeal photograph was taken. This study was approved by the University of Illinois Institutional Review Board under federal regulation 45 46.101 (b) CFR.<sup>17</sup>

### Survey Instrument

A 1-page survey included questions on respondents' gender, age, college classification (eg, freshman or sophomore), height and weight (used to calculate BMI), self-perceived eating habits, exercise frequency, enrollment in college-level nutrition courses, and nutrition label use. Respondents were asked how they would rate their eating habits on a 5-point scale, with response options of excellent, good, average, fair, and poor. Exercise frequency was assessed by asking: "How often do you exercise in a typical week?" with responses of zero, one to two, three to four, and five or more times per week, similar to a previous study in this population.<sup>18</sup> For nutrition courses, diners were asked: "How many nutrition courses have you taken during your college career?" with responses ranging from zero to three or more courses. The survey was first pilot-tested with 150 students in a separate dining hall (not a part of this study) earlier in the fall semester.

Although the primary question of interest for this study was nutrition label use, students were asked a suite of three questions about their awareness and use of nutrition labels within the dining halls. The first asked: "How often does this dining hall provide calorie information for food items?" with answers ranging from 1=always to 5=never. The following question was asked: "Do you agree or disagree that: I noticed calorie information on food items in the dining hall today." Nutrition label use was then assessed by asking: "Do you agree or disagree that: I used calorie information to make my food choices today." Both label awareness and use were assessed using 5-point Likert scales, where 1=strongly disagree and 5=strongly agree. The ordering of these three questions was important due to carryover effects, with respondents likely perceiving questions as related and hence answering them using the same understanding.<sup>19</sup> The phrasing of the first two questions (provision and awareness of labels) indicated an interest in the dining hall context,

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