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## Consumption & Attitudes about Whole Grain Foods of UNL Students Who Dine in a Campus Cafeteria

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## 1 Introduction

Diet is thought to contribute to seven of the top ten causes of death in the United States (Adams & Standridge, 2006). In fact, for those persons with positive lifestyle factors which include dietary practices, up to ten additional years of life expectancy are suggested (Adams & Standridge, 2006). The importance of diet is recognized by the U.S. federal government, and since 1980 the U.S. Department of Agriculture (USDA) and the U.S. Department of Health and Human Services (HHS) have collaborated to publish the Dietary Guidelines for Americans every five years. The Dietary Guidelines for Americans 2005, the most recent publication, placed an increased emphasis on consuming whole grains. One of the “Key Recommendations” specifically states:

Consume 3 or more ounce-equivalents of whole-grain products per day, with the rest of the recommended grains coming from enriched or whole-grain products (US Depts. of Agriculture and Health and Human Services, 2005).

The American Heart Association (AHA) and the Healthy People 2010 Objectives for the Nation echo the increased emphasis on whole grains (American Heart Association, 2007; Food & Drug Administration & National Institutes of Health, 2000).

A whole grain is made up of three parts. The bran, forming the outer protective layer of the seed, encases the endosperm, the major portion of the seed. The germ is the smallest but most nutritionally concentrated inner part of the seed.

The emphasis on whole grain consumption stems from research indicating health benefits. While individual components of whole grains have been thoroughly studied in controlled clinical trials, epidemiological studies have found the benefits of consuming processed whole grains to be even greater. The large bowel is impacted positively, and there is a risk reduction for type 2 diabetes mellitus, cardiovascular disease, and certain cancers. Even weight regulation, in preliminary studies, appeared to be aided by consumption of whole grains (Slavin, 2004; Adams & Standridge, 2006). Whole grains have been correlated to reduced risk for all-cause mortality in several epidemiological studies. The major components thought to be related to these health benefits included dietary fiber (soluble and insoluble), starch, fat, antioxidant nutrients, minerals, vitamins, lignans, and phenolic compounds. These protective components were, for the most part, found in the germ and bran. In refined grain products, these two portions of the grain were drastically reduced (Slavin, 2004; Adams & Standridge, 2006).

While many Americans report consuming whole grains between 1990 and 2000, only a small fraction consumed more than one serving per day (Albertson &

Tobelmann, 1995; Cleveland, Moshfegh, Albertson, & Goldman, 2000). More recent research in 2002 showed little, if any, improvement with whole grain consumption levels remaining stable at about one serving per day (Kanto, Variyam, Allshouse, Putnam, & Lin, 2002).

Ignorance of health benefits, inability to identify, lack of preparation knowledge, cost, availability of products in stores, and unacceptable taste and texture were the most common barriers to whole grain consumption cited (Slavin, 2004; Adams & Engstrom, 2002; Lang & Jebb, 2003). Yet in a nationwide survey, 90% of the respondents believed whole grain breads and cereals were healthier than “regular” products, and 55% reported they were “much healthier” (American Dietetic Association [ADA], 2000). Inability to identify could be attributed to unclear packaging and labeling. In one study, 90% of military food service specialists, whose roles included management and procurement, believed they were serving whole-grain bread, yet in reality only 22 % were (Warber, Haddad, Hodgkin, & Lee, 1996).

For whole grain product identification, the package label offered information to consider. A product with a whole grain health claim ensures consumers that the product did in fact contain significant portions of whole grains (>50% whole grain ingredients)(Slavin, 2004). Additionally, a label of *whole wheat bread* requires that it is made from 100% whole wheat flour (ADA, 2004). Any statement using the word *whole* followed by the name of a grain indicates a good source of whole grains (i.e. 100% whole wheat or whole grain [name of grain]). However, statements such as *crackers made with whole grain* are indicators that the product is most likely not a significant source of whole grains. Additionally, when the first ingredient listed contains the word *whole*, it is likely that the product is primarily whole grain (Whole Grains Council, n.d.). Common terms misunderstood to mean whole grain included *seven-grain*, *multigrain*, *100% wheat*, and *bran* (Whole Grains Bureau, n.d.).

The inadequate current whole grain consumption levels can be addressed through intervention techniques. The Stages of Change Model, also known as the Transtheoretical Model, has been used effectively to address dietary behavior changes (Bauer & Sokolik, 2002). Three assumptions form the foundation of this model: 1) behavior change involves a series of different steps/stages, 2) there are common stages of change (Precontemplation, Contemplation, Preparation, Action, & Maintenance) associated with behavior change in general, and 3) intervention tailored to the stage a person is in, increases effectiveness of that intervention. Persons can begin at any stage of readiness and have relapses back into prior stages before moving forward toward maintenance again (Bauer & Sokolik,

2002). Because the Transtheoretical Model has distinct stages which can be tracked, it is possible to measure changes.

Despite many potential health benefits, whole grains are consumed at levels far below recommendations. In response to this, a survey was administered to a sample of University of Nebraska – Lincoln (UNL) students eating in a campus dining center to determine if these students were also under-consumers.

## **2 Methods**

### ***2.1 Objective***

The objective of this research was to determine campus dining center students' status regarding whole grains with the possibility of establishing tailored intervention recommendations.

### ***2.2 Survey tool***

To gauge and quantify the consumption levels of whole grains and the attitudes toward whole grains in a University of Nebraska – Lincoln (UNL) student population, a survey was administered. The survey contained questions concerning demographics; stages of change in relation to attitudes toward both eating healthy and eating whole grains; levels of whole grain consumption; preferences and acceptability of different whole grain products; and knowledge level about recognizing and choosing whole grain products. Two survey questions were based on determining the actual stage a person was in according to the Stage of Change Model (Transtheoretical Model). Specific components of these two questions can be seen in Table 1.

Once designed, the survey was validated by University of Nebraska–Lincoln, Department of Nutrition and Health Sciences faculty members and registered dietitians and received approval from the University of Nebraska – Lincoln's Institutional Review Board. After pilot testing with current UNL students, recommended changes were incorporated in the final survey.

### ***2.3 Study population***

The survey was administered to students dining in the Selleck Dining Hall. Selleck is located in the center of UNL's City Campus and serves over 40% of the students eating in dining halls. The central campus location and extended hours contribute to Selleck's popularity and made it the most reasonably representative population to sample.

| <b>Stage of Change question 1</b> (Options listed on survey)   | <b>Corresponding Stage of Change</b> |
|--|--------------------------------------|
| <i>I do not care about eating healthy</i>                      | Precontemplation                     |
| <i>I want to begin eating health in the next 6 month</i>       | Contemplation                        |
| <i>I want to begin eating healthy in the next month</i>        | Preparation                          |
| <i>I have been eating healthy for less than 6 months</i>       | Action                               |
| <i>I have been eating healthy for more than 6 months</i>       | Maintenance                          |
| <b>Stage of Change question 2</b>                              |                                      |
| <i>I do not care about eating whole grains</i>                 | Precontemplation                     |
| <i>I want to begin eating whole grains in the next 6 month</i> | Contemplation                        |
| <i>I want to begin eating whole grains in the next month</i>   | Preparation                          |
| <i>I have been eating whole grains for less than 6 months</i>  | Action                               |
| <i>I have been eating whole grains for more than 6 months</i>  | Maintenance                          |

**Table 1:** Stages of Change determination

## ***2.4 Data collection***

The survey was administered over a 3-day span at Selleck Dining Center in November, 2006. To encourage a representative sampling, different times of the day, mid-morning to evening, were used. A table, staffed by the principal investigator and occasionally a research assistant, was located outside the dining center's entrance/exit. The table had a visible basket of whole grain snack foods to attract attention while the investigator verbally recruited students walking past. The visible snacks proved effective in piquing interest in students. All participants were ultimately self-selected. Once the survey was anonymously completed and returned to the investigator, a whole grain snack and educational brochure were offered. A total of 205 surveys were completed and usable in the final analysis.

## ***2.5 Statistical analysis***

The Statistical Package for the Social Sciences (SPSS) (version 13.0, SPSS Inc, Chicago, IL, 2004) was used for data entry and statistical analysis. Frequencies, standard deviations, means, ranges, and modes were determined for the compiled data. Crosstabulations were completed to determine relationships evaluated using Pearson Chi-Square. Significance was established at  $P < 0.05$ .

### 3 Results & Discussion

#### 3.1 Participant demographics

The demographics of the participants are shown in Figures 1–4. Of those reporting gender, 112 respondents were female and 84 were male. There was a fairly representative sampling of college year, age, and major.

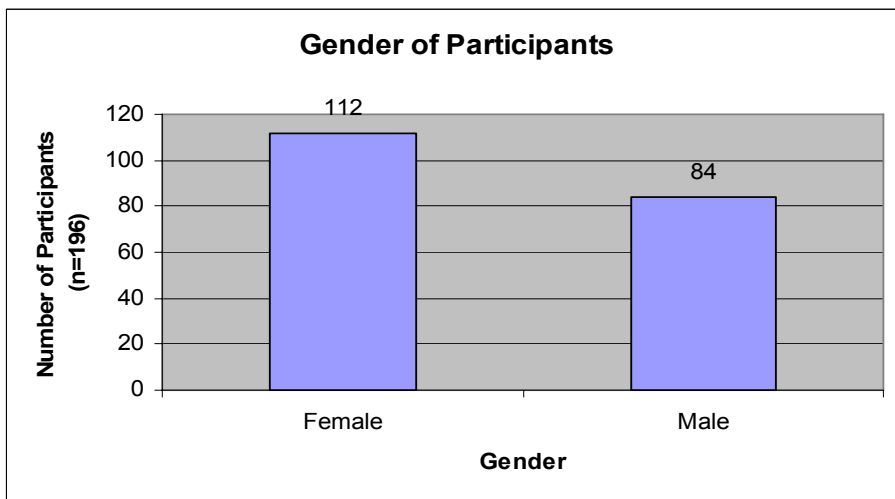


Figure 1: Demographics of participants – gender.

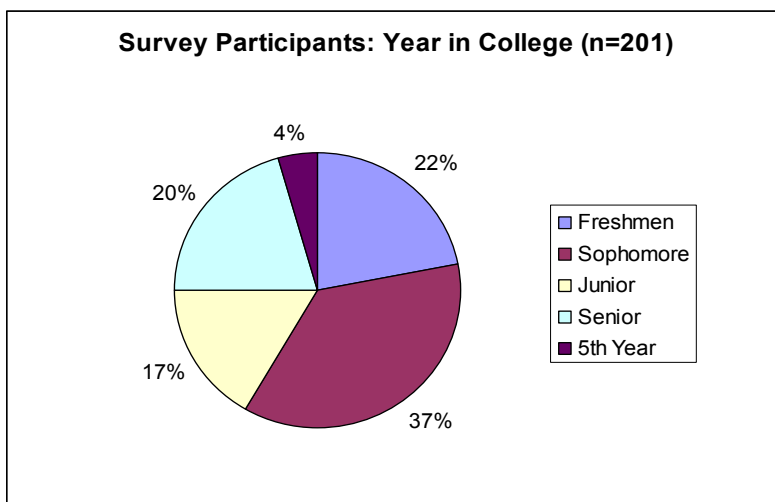
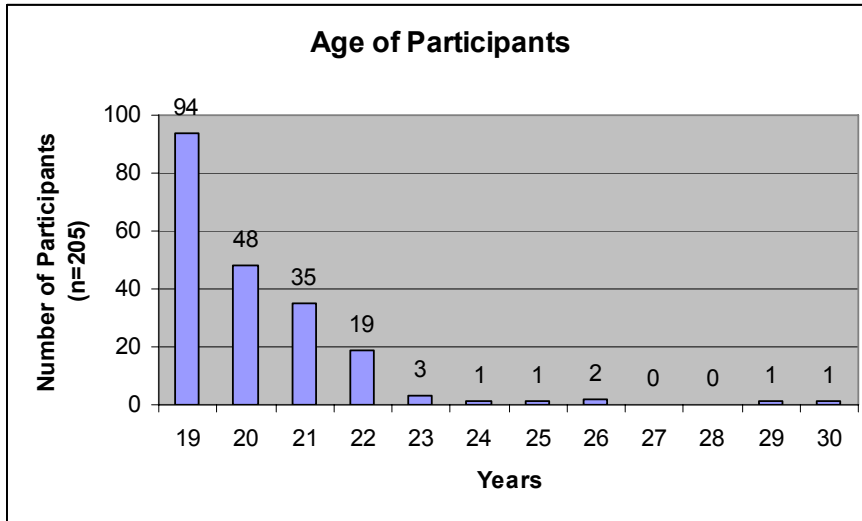
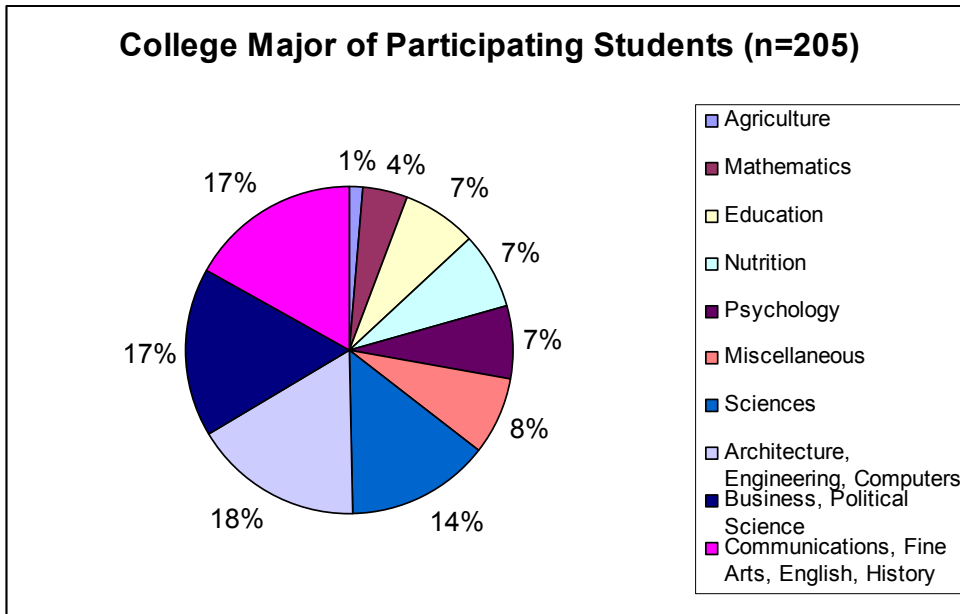


Figure 2: Demographics of participants – year.



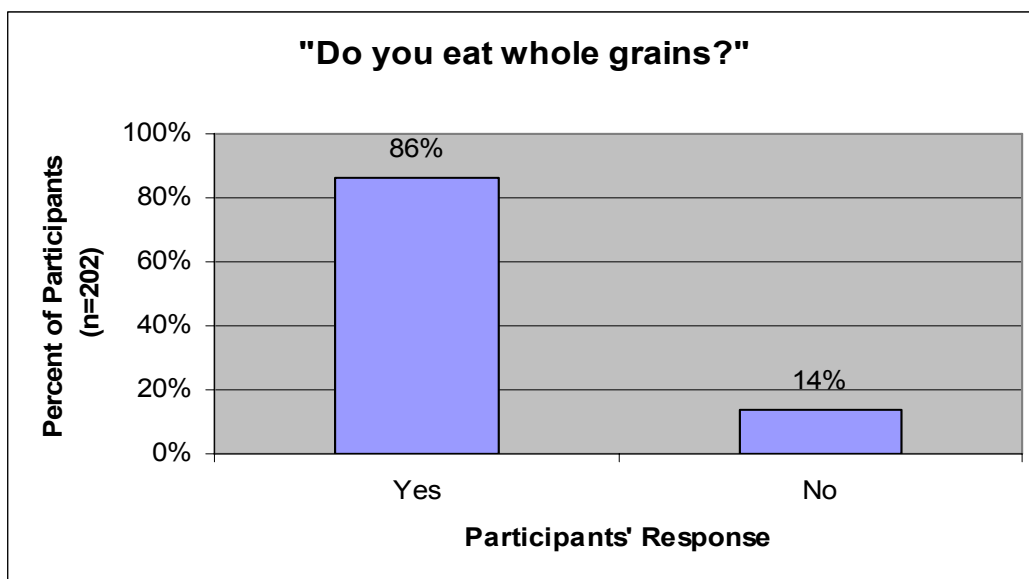
**Figure 3:** Demographics of participants – age.



**Figure 4:** Demographics of participants - college major

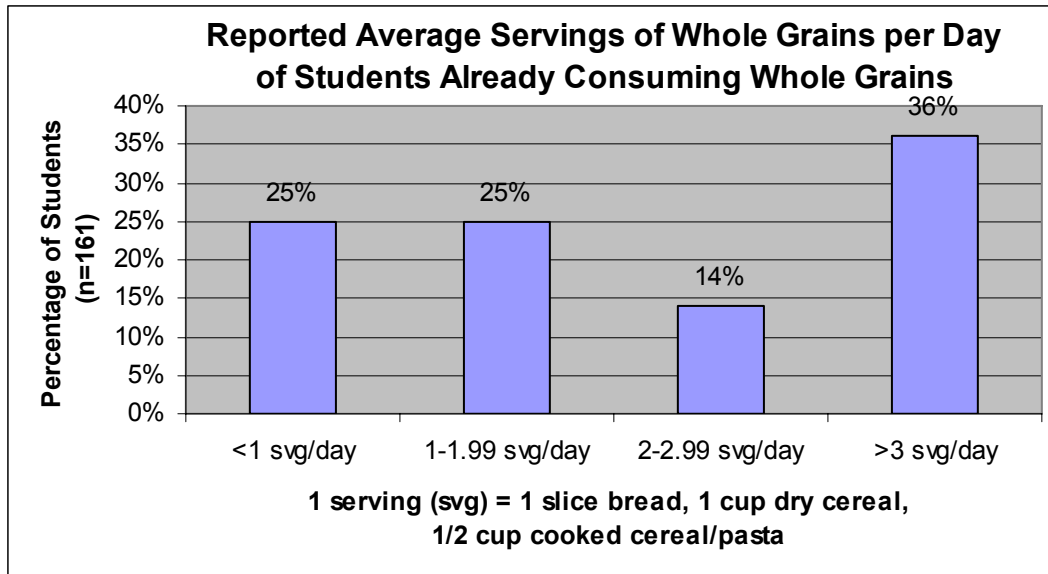
### 3.2 Consumption of whole grains

Consumption of whole grains was also reported. Most, 86%, of those responding ( $n = 202$ ), reported eating whole grains (Figure 5). A total of 64% of those participants who reported they did eat whole grains did not consume an average of at least 3 servings of whole grains per day (Figure 6). In a sample of Americans older than 19 years, only 23% consumed any whole grain foods during an observed period (Albertson & Tobelmann, 1995). Most of those persons consuming whole grains ate less than 1 serving per day with only 0.8% of the sample consuming the recommended 3 servings per day. In a USDA survey of food intakes from 1994–6, only 29% were non-consumers, but the average consumption was less than 1 serving per day (Cleveland, Moshfeqh, Albertson & Goldman, 2000).



**Figure 5:** Number of participants who reported consuming or not consuming whole grains.





**Figure 6:** Whole grain consumption levels of those who reported consuming whole grains

### ***3.3 Readiness toward healthy eating and whole grains***

The Transtheoretical Model (Stages of Change Model) served as the basis for two of the survey questions to document the current readiness or motivational stage of students to consume whole grains in their diets. Since the entire range of stages encompassed at least some students (Figure 7), a comprehensive approach aimed at the entire spectrum of motivational stages appears to be appropriate.

A comparison of the progression through the various stages of the Transtheoretical Model (in relation to attitude toward healthy eating and attitude toward eating whole grains) indicated a moderate, positive relationship of  $r = .47$  ( $P < 0.0001$ ). As participants reported healthier attitudes toward eating in general, they were more likely to report a similar attitude toward eating whole grains.

### Readiness toward Eating Whole Grains: A Transtheoretical Model Categorization

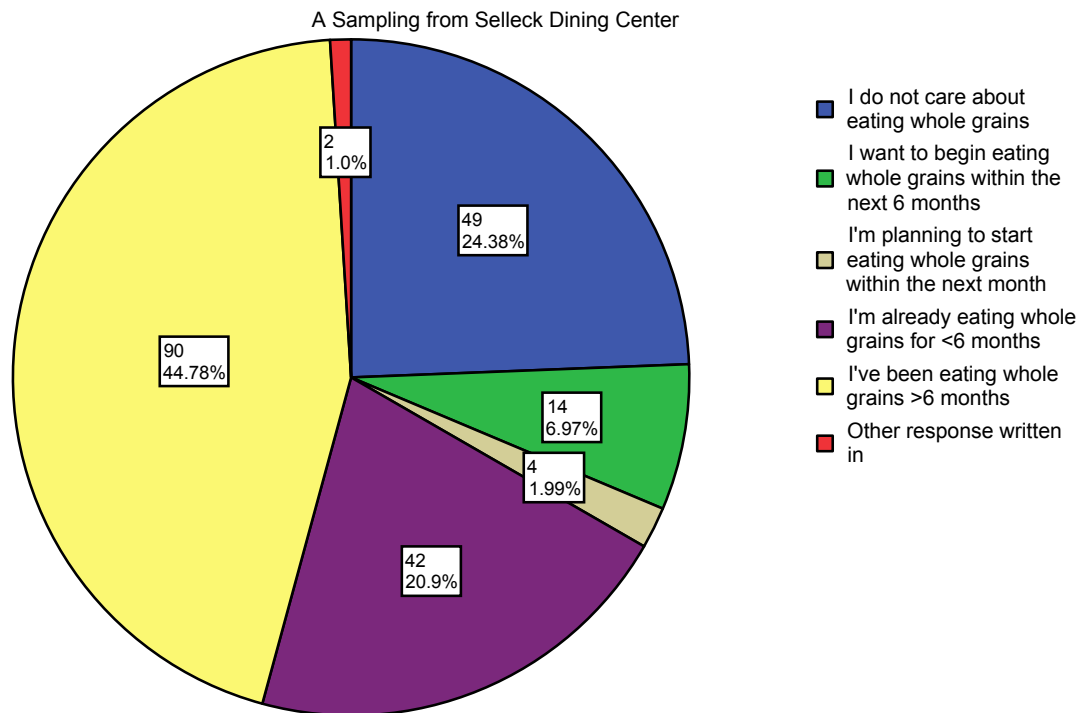


Figure 7: Transtheoretical Model Categorization

#### 3.4 Barriers and motivating factors

Respondents were given the opportunity to indicate (in as many ways as applied) why they did or did not eat whole grain products. *Health beliefs* (77%,  $n = 133$ ) and *flavor/taste* (69%,  $n = 119$ ) were the most common reported reasons for consuming whole grain products. Of those reporting they did not eat whole grain products, 45% ( $n = 14$ ) indicated this was because they dislike the taste or texture, and 35% ( $n = 11$ ) indicated they do not eat whole grain products because they do not know what products are whole grain. Americans on average have reported this similar enjoyment of whole grains for health benefits (ADA, 2000). The two barriers reported by UNL students as well as a lack of preparation knowledge for whole grains and higher costs of whole grain products were common barriers for American consumers at large (Adams & Engstrom, 2002; Lang & Jebb, 2003). Tables 2 and 3 present a comprehensive view of reported motivating factors and barriers, respectively, for the UNL student respondents.

| <b>Reasons for Consuming Whole Grain Products</b><br>(multiple answers accepted) | <b>Percentage of Participants (n=173)</b> |
|--|---|
| Health benefits  | 77%                                       |
| Flavor/taste   | 69%                                       |
| Texture  | 23%                                       |
| Only option available  | 5%  |
| Other  | 5%  |

**Table 2:** Whole Grain Consumption Motivating Factors

| <b>Reasons for Not Consuming Whole Grain Products</b><br>(multiple answers accepted) | <b>Percentage of Participants (n=31)</b> |
|--|--|
| Taste, texture   | 45%                                      |
| Unable to identify   | 35%                                      |
| Products not available   | 13%                                      |
| Unaware of any benefits  | 7%                                       |
| Other  | 6%                                       |

**Table 3:** Whole Grain Consumption Barriers

### ***3.5 Understanding and knowledge of whole grain products***

To determine the ability to recognize a whole grain product, participants were asked to mark as many of the provided terms (*100% wheat, bran, multi-grain, seven-grain, cracked wheat, 100% whole wheat, stone-ground*) that, if seen on a product's package, would make them think the product was whole grain. While *100% whole wheat* was the most popular (81% of respondents) and the only term that is an identifiable marker for whole grain products, the other terms were chosen with great frequency. These misconceptions are similar to those of the average American consumer (Whole Grain Bureau, n.d.)

Crosstabulations were used to further investigate these misconceptions. Reported whole grain product consumption level (<1 svg/day, 1–1.99 svgs/day, 2–2.99 svgs/day, >3 svgs/day) was compared to the terms the respondent believed meant a product was whole grain. No significant relationships were found between reported consumption level of whole grains and whether or not the words *100% wheat, bran, multi-grain, seven-grain, cracked wheat, 100% whole wheat,*

or *stone ground* made the participant think the product was whole grain. Considering the percentages of participants who did think these words indicated whole grain, there is reason to question the validity of the reported whole grain consumption levels. The likelihood is high that the reported numbers, at all consumption levels, are greater than reality. Overestimation may have been due either to unintentional ignorance in properly identifying whole grains or to intentionally reporting inflated figures, possibly because participants believed they *should* be eating whole grains.

A second question also investigated the participants' knowledge about selecting whole grains by asking them to mark the methods they used to judge if a product was whole grain or not. Respondents were allowed to select as many choices as applied. Altogether, 82% of participants indicated that they looked to see if the package said *100% whole grain*, and 42% looked at the *ingredients listed on the Nutrition Facts Panel*. These are both valid ways to determine if a product is whole grain. Two other methods, both invalid, were used. Almost one-fourth, 23%, of respondents used *color (tan to brown)* to determine if a product was whole grain, while 14% of respondents looked to see if the package said *wheat*. Crosstabulations were again used to further explore how the popularity of these answers related to the participants' consumption levels of whole grains.

|                |        | Judge a product as whole grain if package says "100% Whole Grain" |          | Total |
|----------------|--------|---|----------|-------|
|                |        | no  | yes      |       |
| Daily servings | <1     | 6   | 35 (85%) | 41    |
| of Whole       | 1-1.99 | 1   | 38 (97%) | 39    |
| Grains         | 2-2.99 | 2   | 20 (90%) | 22    |
|                | >3     | 15  | 43 (74%) | 58    |

**Table 4:** Judging products using "100% Whole Grain"

There was a significant difference ( $P = 0.013$ ) between reported level of whole grain consumption and whether or not the participant judged a product to be whole grain by the words *100% whole grain*. Participants who reported whole grain intake levels between 1 and 2 servings per day were more likely than participants at other consumption levels to have accurately used the words *100% whole grain* to judge a product as whole grain. This indicates these participants

were more likely to be correct in their reports of daily whole grain consumption. Participants reporting levels at the far ends of the spectrum (<1 svg/day or >3 svg/day) reported using this technique less frequently and were much more likely to have overestimated their whole grain consumption levels.

|                                |        | Judge a product as whole grain by ingredients listed on Nutrition Facts panel |          | Total |
|--------------------------------|--------|---|----------|-------|
|                                |        | no  | yes      |       |
| Daily servings of Whole Grains | <1     | 28  | 13 (32%) | 41    |
|                                | 1–1.99 | 25  | 14 (36%) | 39    |
|                                | 2–2.99 | 15  | 7 (32%)  | 22    |
|                                | >3     | 23  | 35 (60%) | 58    |

**Table 5:** Judging Whole Grains by ingredients listed on Nutrition Facts panel

There was a significant difference ( $P = 0.001$ ) between the reported level of whole grain consumption among participants and whether or not the Nutrition Facts Panel was used to judge if a product was whole grain. As consumption levels increased, so did the likelihood of using the Nutrition Facts Panel, although overall, it was not commonly used (only 43% overall). This low prevalence of utilizing the Nutrition Facts Panel as a tool to determine the whole grain content of a product, once again indicated that overall consumption levels were likely overestimated.

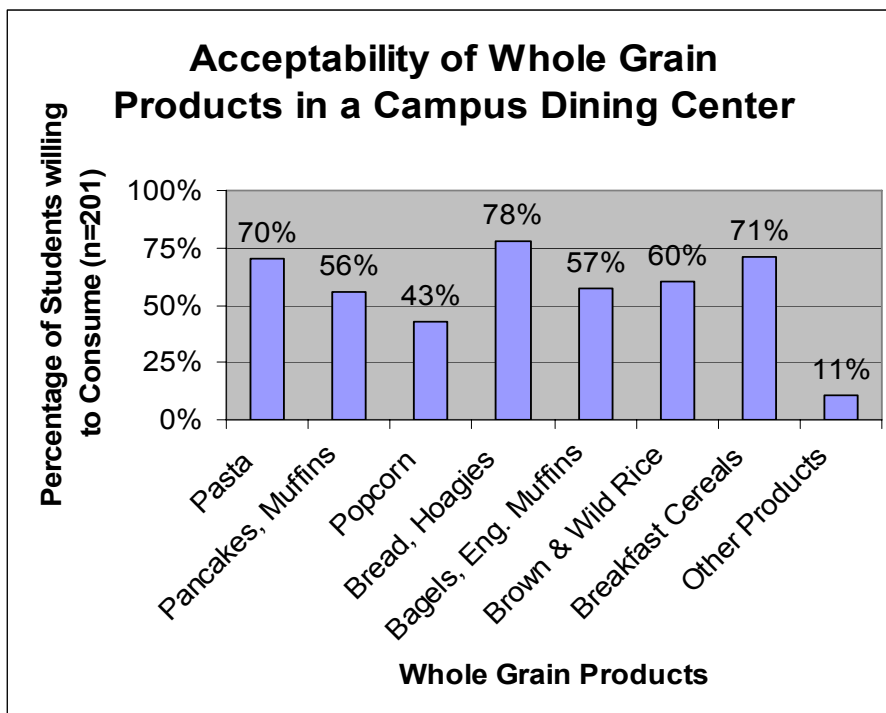
An absence of significant differences between levels of whole grain consumption and using the word *wheat* as well as using *color (brown to tan)* to be a marker of whole grains, indicates similar usage of these criteria at all consumption levels. These invalid methods of judging products to be whole grain were common enough (14% and 23%, respectively) to yet again question the validity of all reported consumption levels. It is encouraging however, that in general these students were already or attempting to eat whole grains but not in recommended amounts.

### ***3.6 Preferences and acceptability of products***

Participants were given the chance to select products which, in a whole grain version, would be acceptable to them if offered in a university dining center. Results

can be seen in Figure 8. Most products were acceptable to over half of the respondents including: bread/hoagies, breakfast cereals, pasta, brown & wild rice, bagels & English muffins, and pancakes & muffins.

Currently, the whole grain options in UNL dining centers are primarily breakfast cereals, oatmeal (available only at breakfast), brown rice, and whole wheat sliced sandwich bread. To encourage increasing whole grain consumption and maintaining intake levels, more whole grain options are vital. Having more than one sandwich bread option that is whole grain would allow a variety that is not currently present. Whole grain buns and hoagies would be possibilities. Purchasers may also consider whole white wheat products. Whole white wheat offers the same nutritional benefits as traditional “red” wheat, yet is albino and has a milder flavor making it more appealing to people accustomed to refined flour (Whole Grains Council, n.d.). When introducing new products, special signage could aid in encouraging students to try these options. Comment cards, amount of product taken, as well as plate waste should be monitored to find the most acceptable whole grain products.



**Figure 8:** Acceptability of products to survey participants

Education of foodservice employees as to what constitutes a whole grain is essential to ensure that the individuals ordering products do not fall to the same misconceptions that students do when supposedly choosing whole grain products.

### ***3.7 Intervention Recommendations***

The *Dietary Guidelines for Americans, 2005* (US Depts of Agriculture and Health and Human Services, 2005) recommendations for whole grains as well as research touting the health benefits of whole grains make it appropriate to recommend intervention, via UNL dining centers, to increase whole grain consumption among students. Additionally, research has suggested that for prompt change in consumer behavior, such as increasing whole grain consumption, four features are required: motivation; clear and relevant messages; understandable, actionable changes; and continual reminders (Adams & Engstrom, 2002).

With nearly 25% of student respondents reporting themselves to *not care about eating whole grains*, they can be considered in the Precontemplation Stage of Change (Bauer & Sokolik, 2002; Boyle & Holben, 2006). Providing personalized information at this level to raise awareness and boosting self-efficacy to create motivation are key strategies before advancement in the stages can be expected (Bauer & Sokolik, 2002; Boyle & Holben, 2006). Information could possibly be in the form of table tents which focus on explaining health benefits of whole grains as well as ease of incorporating whole grains into a diet, especially by listing whole grain options in the dining centers. This education can serve a dual purpose by eliminating the barrier of not knowing what products are whole grain which was reported by 35% of the population surveyed. Eliminating barriers is especially important for students in the Contemplation Stage who are “*considering beginning to eat whole grains within the next six months*” (Bauer & Sokolik, 2002; Boyle & Holben, 2006).

To encourage students in the Preparation Stage (those wanting to start eating whole grains within the next month) reasonable yet specific goals such as incremental increases in the number of servings of whole grains consumed should be suggested rather than immediately aiming for the ultimate goal of 3 servings. These goals are both actionable and, with additional information, could be easily understood. Students in the Action and Maintenance stages (those who have been eating whole grains for less than six months and those who have been eating them more than six months, respectively) can be supported by identifying whole grain options with special labels, such as a green light (indicating a healthy choice that one should “go” for). These labels would serve as continual, daily reminders of goals *while* choosing food, as opposed to table tents which are read after food

choices have been made (Bauer & Sokolik, 2002; Boyle & Holben, 2006). In fact, posting nutrition information right next to a product was found to be *probably* or *definitely* used by 90% of shoppers in an informal Shopping for Health survey (Prevention, 1999).

#### 4 Conclusion

Adequate consumption of whole grains is desirable as substantial evidence indicates health benefits. Campus dining centers have the opportunity to be pivotal in the movement to increase whole grain consumption among their users. Appropriate intervention by dining centers includes education on whole grain benefits, placement of identifiable markers for whole grains, and offering a wider selection of whole grain products.

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