# Student food choice and climate change: a dining hall labeling experiment at UCSB

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## 1. BACKGROUND

Dietary choice has a large effect on global greenhouse gas emissions (GHGE), but most US college students are unaware of this (Carlsson-Kanyama and Gonzalez 2009, Davis and Sonesson 2008, Eshel and Martin 2006). Increased awareness can lead to changing dietary choices, which can in turn reduce the GHGE of the agrifood system. The UCSB Residential Dining Services (RDS), which has been successfully working to reduce its negative impact on the environment, seeks further ways to reduce the GHGE of the food it serves. RDS serves over 4,000 students daily and routinely collects data on amounts of foods selected by students and ingredients purchased.

Among food choices, animal products make a highly disproportionate contribution to GHGE in their production (Stehfest et al. 2009). Non-local and highly processed foods also make a highly disproportionate contribution to GHGE post production. Therefore, dietary changes made towards eating more fruits and vegetables, substituting animal with plant proteins, and eating less processed foods, hold the greatest potential for reduction of diet related GHGE.

Although the potential to reduce GHGE by changing dietary choices has been well documented, little is known about the psychology of food choice. In the Student Food Choice Experiment our goal was to

examine the effect different information had on student food choice. We hypothesized that the information we provided would cause students to change their food choices toward lower average GHGE, and that the different ways we provided the information would have different effects.

## 2. METHODS

We tested our hypotheses in winter of 2011 by creating three treatment plans to be able to compare what information motivated dietary changes; Environmental, Personal and a Peer Pressure treatment. There are four dining commons at UCSB. In our study three had different treatments experimental and one was the control. The dining commons operate on four-week menu cycles, repeating the menu every four weeks with slight variations. This made it easy to compare the disappearance data of the control week from the first cycle with the disappearance data of the experimental week from the second cycle for all four dining commons.

Each dinning common had the same basic design for the experimental week; assigned GHGE ratings for all the menu items and information provided on posters, digiknows, and fliers. The ratings were consistent throughout the three experimental dining commons with a 1-2-3 labeling system. The GHGE ratings were broken down into three categories based on the emissions impact of the overall lifecycle of the food. Since red meat, dairy, and highly processed foods are disproportionately high in GHGE, we used these foods as indicators for the overall ranking of the entre. Category one foods had the lowest GHGE and consisted of grains, legumes, and fresh fruit and vegetables. Category two foods had a medium range of GHGE and consisted of white meat and dairy products. Category three foods had the highest GHGE and consisted of foods with high fat content, highly processed foods, and red meats. The numbers were also color coded with a traffic light theme; one being green, two being yellow, and three being red.

To emphasize the color-coding we identified green category one foods with “eat more”, the yellow category two foods with “eat moderately” and the red category three foods with “eat less”. Studies have shown traffic light color-coding is more effective than nutrition labels in helping consumers identify healthy foods (Kelly et al. 2009). The numbers were placed on the menus as the students walked in as well as near where the food was served during lunch, dinner and brunch only.

Preparation for this project required much work and collaboration with many levels of the Residential Dining operation. The forecasted menus were taken a few weeks before the experimental week and each menu item was coded with a 1,2,3. These menus were then stored electronically in excel and used throughout the experiment as the “master reference guide”?. They were referred to by the dining commons staff responsible for making sure the menu items were correctly labeled during the experimental week, as well as by the researchers in analyzing the data after the fact.

Then, the researchers had to do a walk through of each dining commons in order to visualize how the signs would be posted, figure out what size they had to be, and record how many of each particular size, number, and format had to be printed. The numbers were laminated and cut out so they could be durable enough to reuse each day and for possible future replications of the project. (do we know how many we ended up using?)

Each dining commons at UCSB is independently run by its own unique staff and each has unique rules and resources. It was essential that the research team met with the different common’s managers to find out what the needs of the staff were to make sure everything was done as efficiently as possible and to

establish a line of communication for the duration of the project. For example, DLG was the largest dining commons with daily menu items posted both on a large white board in the front and on cardholders throughout the cafeteria. The manager took on the responsibility of putting up the laminated numbers next to each item on both the white board and cards. Considering the size of the commons and that double the numbers were needed to be placed up each day, the manager took on a lot of work that definitely could not be sustained for a longer period of time.

Another commons, Carrillo, had all menu items on cards and had enough cardholders for the laminated numbers. The third treatment dining commons, Portola, needed each of the numbers to be taped on the menus. Both Carrillo and Portola decided that having the research team come and put up the numbers for the first couple lunch and dinners worked best for them. Each manager was given a spreadsheet with all items and designated number and a packet with the appropriate laminated numbers and materials to post them.

Also worth mentioning is the fact that each dining commons had multiple managers in charge of different shifts and days. It was important that all of the managers were informed of our project goals and experimental implementation procedures so that the experiment could be run as uniformly as possible across dining commons/days/meals throughout the week. Another obstacle we encountered was the availability of the student researchers to oversee the projects implementation. Of the three researchers primarily in charge of the project two were full time students and had to work around class schedules, which often conflicted with dining commons meal schedules. This sometimes left just one researcher in charge of making sure the experiment was running properly at all three of the experimental dining commons which are spread a good distance apart across the UCSB campus and Isla Vista. The lack of uniformity among the dining commons and conflicting researcher schedules presented an organizational challenge to the initial implementation of the experiment, and a few instances of miscommunication early on.

The three experimental dining commons were also provided with two posters, displayed next to the menu's at the entrance to each dining commons. The first explained that an experiment was being performed and that no foods would be changed during the week. The second explained the numbering system (Fig. 1). Each experimental dining common also had simple digital messages (Digiknow's) on the TV screens designed specifically for each treatment. In addition to the number labels on each food item, posters in the entrance to each experimental dining common, and Digiknow ads, laminated informational flyers unique to each treatment were distributed on the tables at each of the experimental dining commons. These flyers had general information informing students what kinds of foods were labeled 1-2-3, as well as more specific information in the form of "fast facts." The "fast facts" were interesting facts relating the 1-2-3 labels to each of the three treatments. These informational flyers were designed to be read by the students during meals to reinforce the information supplied to them by other media.

Although the information provided students was different in each of the three treatments, it was presented in the same way, and the food rankings were all based on the same estimate of greenhouse gas emissions. Research has shown that using descriptive (what is being done) with injunctive (what should be done) norms has the highest impact for motivating people to change their behaviors (Schultz et al. 2007). However, for our study we only used descriptive norms (except for the brief messages accompanying the rating numbers). We did not want to influence whether the students would change their dietary choices by giving them information about what they should do. Our goal was to document what information best motivated changes in dietary choices, with no other influences. The information was available in the three dining commons during lunch, dinner and brunch only.

The three treatments were as follows:

a. Environmental Treatment

   The environmental treatment was run at Carrillo Dining Commons. Its goal was to show students the varying degree of environmental effect that their food choices had. For example, one of the facts was "The production of #3 foods requires 10 times as much fossil fuel as production of foods in category #1" (Pimentel and Pimentel 2003). This demonstrated how students could substitute number three foods with number one foods to lower their dietary contribution to GHGE.

b. Personal Treatment

   The personal treatment was run at Portola Dining Commons. It's purpose was to increase the students' knowledge about how the food they ate affected their personal health and body image. For example, one of the given facts was "Category 1 foods are rich in fiber, which make you feel full with fewer calories resulting in lower calorie intake and less tendency to overeat". This was to promote the consumption of category one foods to improve health and in turn, lower GHGE associated with dietary choices

c. Peer Pressure Treatment

   The peer treatment was run at De la Guerra Dining Commons. It's purpose was to give students information about what other University of California campuses are doing to lower their consumption/purchasing of number three foods and raise their consumption/purchasing of number one foods. About 95% of the students at UCSB are in state and can relate to other UCs, which is why we chose to only use facts about what other UC campuses are doing to become more sustainable. For example, "Out of the total food purchases at UCSC about 36% are category #3 foods and 21% are category #1 foods. UCSC is trying to reduce the percentage of #3 foods purchased" (UCSC 2009). No information was given about what UCSB was doing to become more sustainable. This was to test if by only increasing knowledge about what other UCs were doing, if students would want to emulate those like them; thus changing their dietary choices to lower GHGE.

The week prior to the experiment, surveys were conducted to see where students got information about their food, how knowledgeable they thought they were, and what motivates them to change their dietary choices (environmental factors, personal reasons, or what their peers are eating). The last Sunday before the experiment concluded, the team conducted another survey to see if the students changed their dietary choices, how many times they changed, and what motivated them to change (environmental, personal, peer).


**Figure 1: Publicity material used to inform students about the experiment.**

To execute the project, coordination was needed between each of the dining commons and the research team. The Dining Common's staff needed to know when whether the research students or their staff would set up any labels, brochures, or info tables. Each meal the experiment required at least one knowledgeable person to set up or check number labels about an hour before the doors opened. This was especially important because of last minute menu changes. Information and resources were made available by dispersing treatment specific info sheets and tri-folds to tables and providing a central information table where 1-3 volunteers could answer questions or hand out surveys.

Due to the many tasks that needed to be done at the three different dining commons simultaneously, volunteers were recruited to work shifts. At least one main organizing research assistant was assigned to set up, clean up, and volunteer at the table as much as possible to prevent any labeling mistakes and provide guidance for other student volunteers. Since there were only 3 main organizing research assistants and each meal took approximately 4 and a half to 5 hours between setting up and breaking down, there were a number of gaps that could not be covered by one of the main organizers. Even though the three research assistants in charge could not always be there in person, at least one was always on call to answer to any questions that might have come up. The research team decided to purchase meal tickets for volunteers as an incentive to get as many shifts covered as possible.

One problem that occurred during the project was volunteers not having meal tickets. This happened when the organizers could not get the meal tickets to the volunteers, volunteers brought friends to help them, or volunteers came to a wrong shift. If this experiment is to be repeated it is recommend meal tickets be given to the dining commons managers in advance to avoid any confusion that may arise.

The dynamic nature of this project proved to be the greatest challenge. Managing the volunteers, double checking labeling, manning the tables, and moving between the large distances between dining commons meant that there was not always a consistent rhythm. The difference in the operating styles of the dining commons was reflected in their reactions to this. Portola, was a smaller operation, and therefore, a more relaxed atmosphere where changes and implementation were not a problem. DLG, the largest commons, had a more strict set of rules to operate efficiently and needed us to make sure our project didn't break any rules that would interfere with their work. If this project were to be carried out again, two people should be assigned to each dinging commons where they could develop a relationship with that management and staff.

The Dining managers felt that the experiment yielded positive results, eliciting good interaction and feedback from customers. They were enthusiastic about being part of this experience, and also felt they learned more about their customer's needs as a result. There were minor issues of miscommunication with the variety and number of students that were needed to staff the information tables at each meal, but having a consistent leadership team that worked together before, during and after helped solidify relationships amongst the student interns and management staff. There was an overwhelming agreement that the benefits that were gained overrode the difficulties of logistics. This was a first effort of true collaboration between faculty and staff, up close and personal in the dining environment, as well as providing good information to customers on their sustainable dining practices. It linked research and actions with a concrete tangible goal.

## 3. RESULTS AND ANALYSES

Data were collected through two means: a survey conducted before and after the experiment to evaluate the students' perceptions of the experiment and its effect on their food choices, and collection of "food disappearance" data or the change in meals served during the experiment. The two types of data reveal conflicting results.

### *3.1. Survey data*

The survey evaluated a variety of hypotheses about the experiment. The first part of the survey tested the customers' perception and awareness of the labeling system. The following three questions were asked to the students:

1. Do you read Labels when buying food?
2. Do you read nutrition information in the dining commons?
3. Do you consider yourself well informed?

The results show that the labeling system had minimal effect on whether students read labels when they buy their food (see figure 2). The number of respondents who said they occasionally read labels increased by over 6%, but the other categories showed a minimal change between 1-3%. The results of the second question about whether students read nutritional information in the dining commons did not show a consistent trend. While the number of respondents who said they always read nutritional information decreased by 0.5%, the number of respondents who said they mostly read nutritional information increased by almost 3%. In addition, the number of respondents who said they occasionally or rarely read information decreased, while the respondents who never read nutritional information

increased. Furthermore, all changes in the data were small, 3% or less. Therefore, there was not a shift in the frequency of students reading nutritional information.

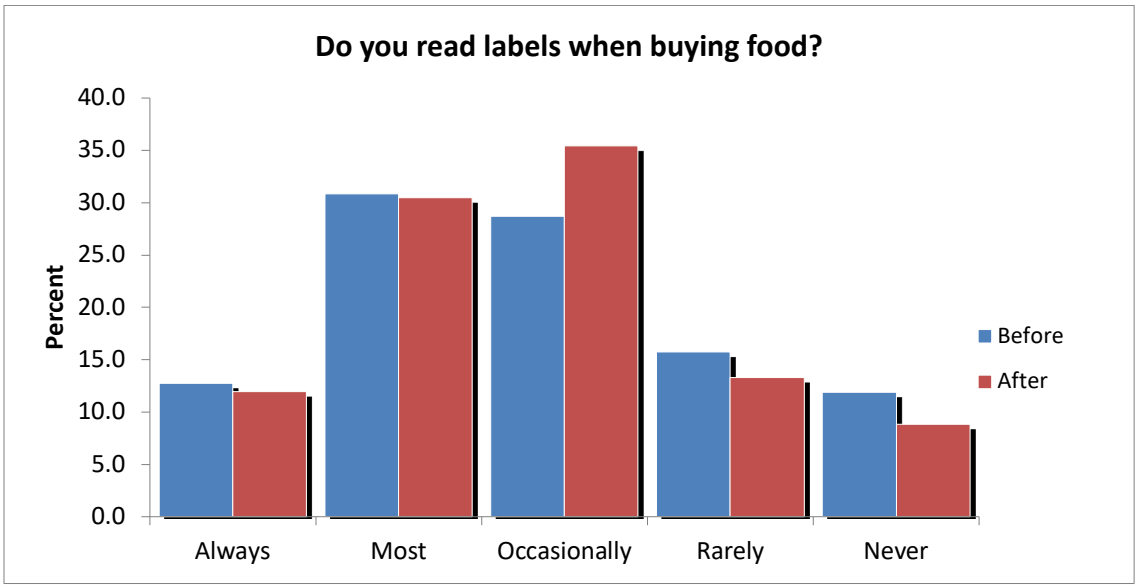


**Figure 2: Question 1 of the survey evaluating whether students read labels when buying food.**

The question that showed the greatest change concerned how informed the respondents felt. After the experiment, students felt they were substantially more informed (see figure 3). The percentage of respondents who believed they were well informed about their food grew from 44% to 59%.

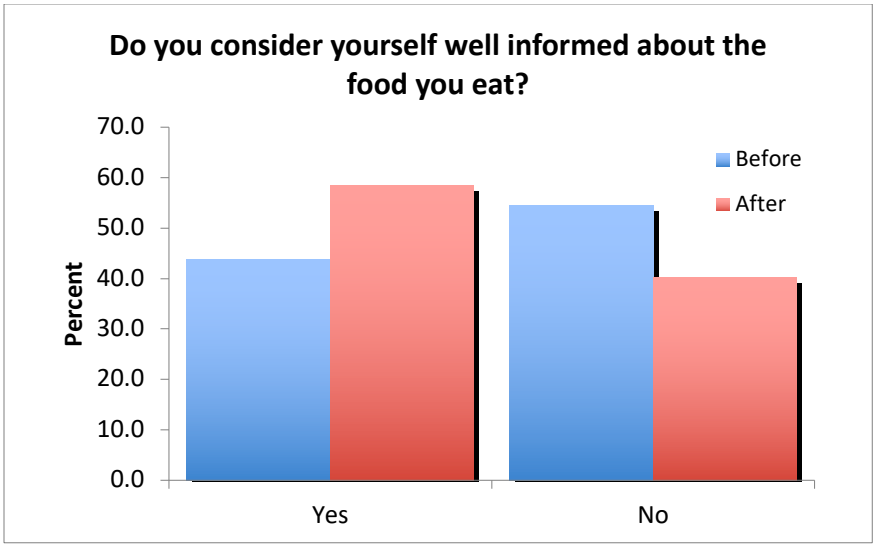


**Figure 3: A question in the survey asking students how informed they feel about their food.**

A second set of questions tried to capture the effect of the labels on the customers. Therefore, the following questions were asked of the customers:

1. Did you learn anything about food from the information presented in the dining commons during the last week?
2. Did this information affect your choice of foods in the Dining Commons during the past week?
3. If yes, about how many times did you choose a different food because of new information?

For the first question, 47% of respondents said they learned from the information used in the experiment. The percentage varied by dining commons (see figure 4). DLG had the highest number of respondents who said yes at 62%, while Portola had the lowest amount at 41%.

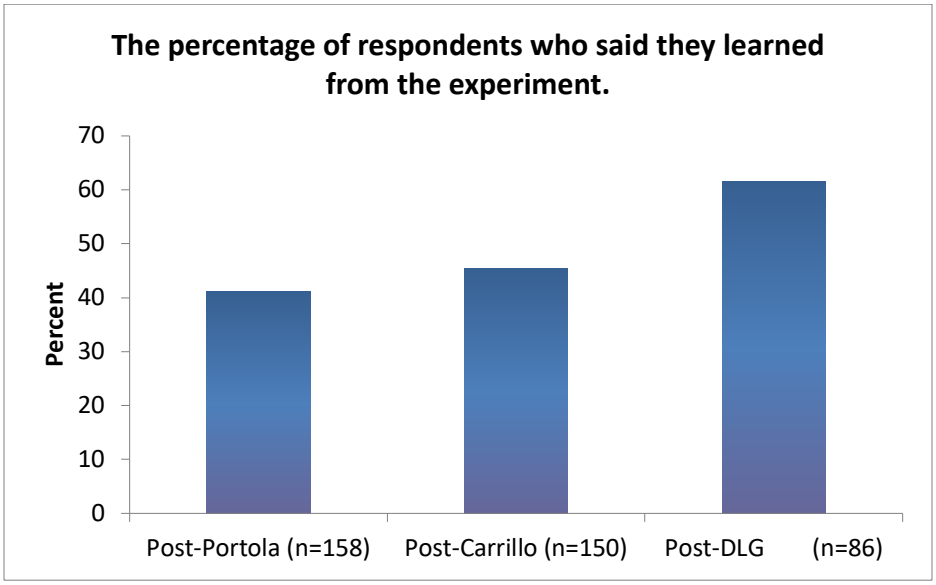


**Figure 4: A question in the survey evaluating whether the experiment taught customers about their food.**

In addition, a large number of students said that the experiment affected their decision of which foods to eat. A total of 41% of the respondents at all the dinning commons made decisions based on the experiment. There was variation in the results depending on the dining commons (see figure 5). DLG again showed the highest response to the experiment. At DLG, 48% of the respondents said that the experiment affected their food selection. Carrillo showed the lowest effect with 37% of the respondents saying the experiment altered their decisions.

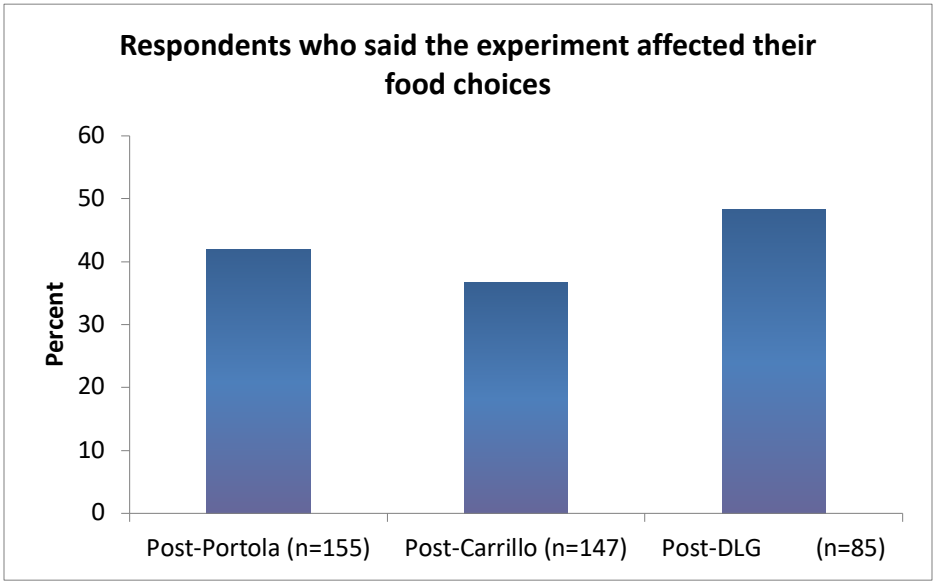


**Figure 5: A survey question evaluating whether the experiment affected customer choice.**

Students also indicated the number of items they changed based on the information in the labeling. There was a large range in the number of items modified with the lowest being 0 and the highest 20. While the majority of students said they did not change their food choices, there were a number of

students who did (see figure 6). A total of 13% of all respondents said they altered 1 to 3 items due to the experiment. In addition, 13% of respondents said they altered 4 to 6 items and 3% said they changed 7 to 9 items. There were also 6% of the respondents who said they switched 10 or more items due to the experiment. These are aggregated results from all of the dining commons. All of the dining commons had respondents who said they altered their food choices.

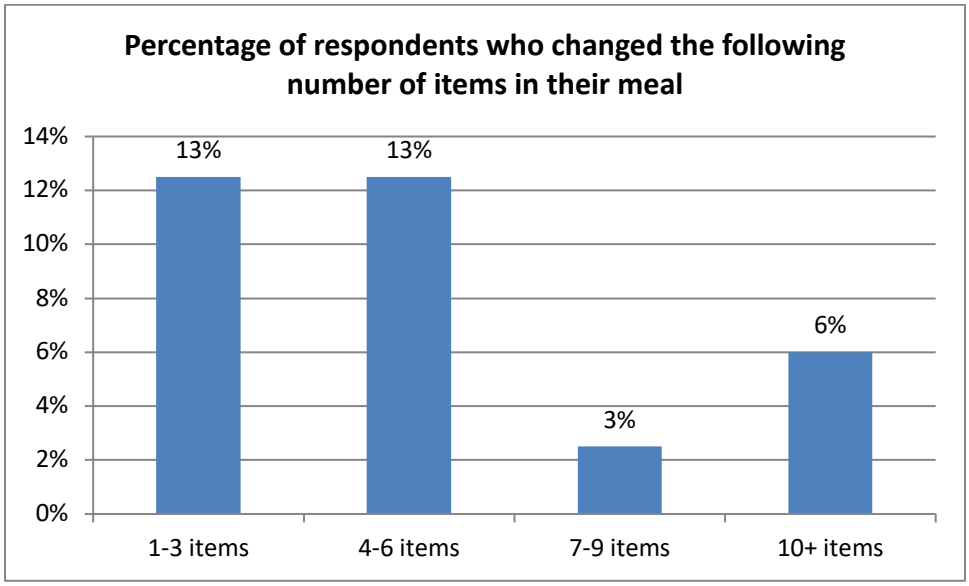


**Figure 6: Results from the survey question asking how many food items customers changed due to the experiment.**

*3.2. Food disappearance data*

The fact that RDS operates on a four-week menu cycle in each dining commons (DC) made it fairly easy to compare changes in the food disappearance data between the control week in January and the experiment week in February in which almost the same menu was served. To compare between the two weeks the data were manipulated in excel in various ways, however the units of comparison were always normalized as servings/customer (S/C). "Servings" in the following tables always refer to servings taken, and "customers" refer to the actual customer counts. The number of servings, customers, and S/C can be found in table 2. The servings per customer slightly increased in the control dining commons, while it slightly decreased for the dining commons that received experimental treatments

Table 2: Number of customers and servings

| | | Control | | Experiment | |
|---|---|---|---|---|---|
| | | Jan | Feb | Jan | Feb |
| No. of Servings | Category 1 | 4455 | 5013 | 35732 | 34602 |
| | Category 2 | 7257 | 8295 | 26183 | 28164 |
| | Category 3 | 4710 | 4470 | 33982 | 32978 |
| | Total | 16422 | 17778 | 95897 | 95744 |
| No. of Customers | | 8038 | 8595 | 40230 | 40828 |
| Servings per Customer | | 2.04 | 2.07 | 2.38 | 2.35 |

Initially, the data for the control and experiment were compared for all meals (see figure 7). There were no consistent trends between the different categories. While category 3 foods decreased for the experiment, they decreased by an even greater amount for the control, which is contrary to what was expected. For category 2 foods, the control increased by a greater extent than the experiment. As for

category 1, the servings per customer increased for the control while they decreased for the experiment. Therefore, data from the experiment do not show that the labeling had an effect on customers' decisions.

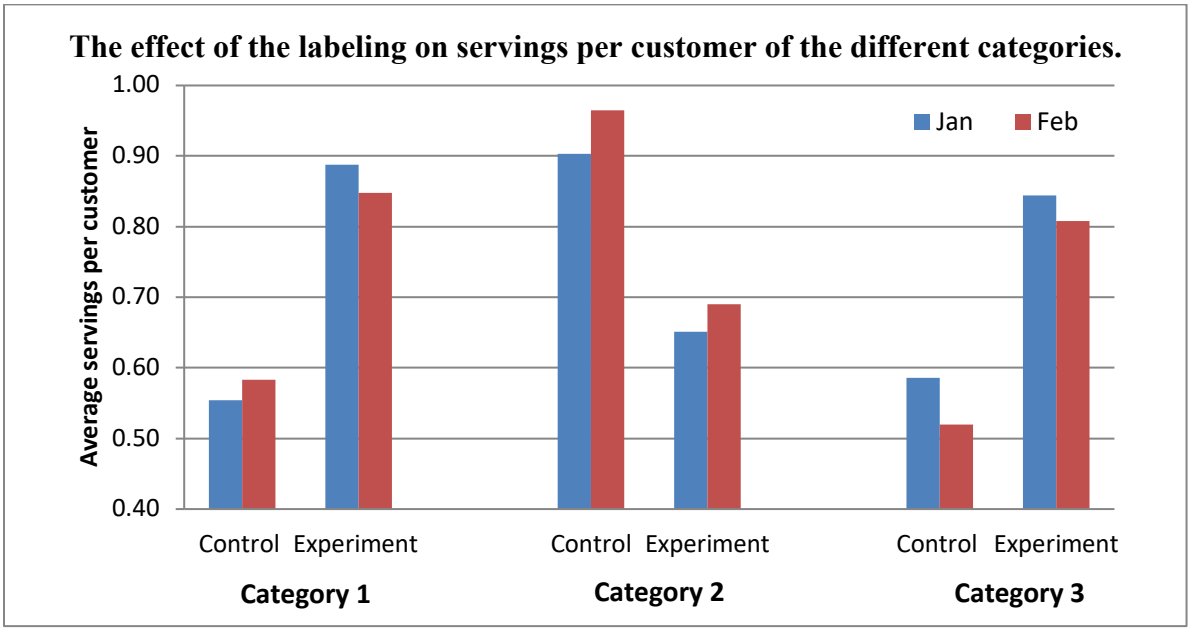


**Figure 7: The food disappearance data for the experiment showed no trends in the data.**

The data were further broken down by dining commons, by day, and by meal, and dining commons by meal to look for significant trends. When no significant trends were observed in these manipulations, it was broken down further by the specific subcategories, red meat, white meat, and vegetable entrée. In the case of these subcategories the average S/C in each of the dining commons at each meal were compared between the control and experiment weeks. Again no significant trends were identified in the results. Table 3 shows the percent change in servings per customer for each dining commons, meal, and food category. Category 3 sometimes showed decreases while other times had increases. The increases and decreases appear to be random without a significant pattern. Therefore, no overall trends were observed in the disappearance data.

Table 3: Percent change in serving per customer

| | | Percent change in servings per customer | | |
|---|---|---|---|---|
| | | Lunch | Dinner | Total |
| Control | Category 1 | 23% | -6% | 5% |
| | Category 2 | 4% | 10% | 6% |
| | Category 3 | -12% | -10% | -13% |
| Experiment (Average) | Category 1 | 0% | -10% | -5% |
| | Category 2 | 0% | 11% | 6% |
| | Category 3 | -3% | -6% | -5% |
| DLG | Category 1 | 3% | -5% | -1% |
| | Category 2 | 8% | 74% | 17% |
| | Category 3 | -8% | -21% | -14% |
| Carrillo | Category 1 | 2% | -18% | -11% |
| | Category 2 | -3% | -4% | -4% |
| | Category 3 | -3% | 9% | 2% |
| Portola | Category 1 | -10% | -11% | -4% |
| | Category 2 | 19% | -3% | 3% |
| | Category 3 | 26% | -2% | 9% |

## 4. CONCLUSION

The labeling experiment showed conflicting results. Based on the survey data, the customers of Residential Dining Services felt they learned from the experiment and were better informed about their food decisions. In addition, they believe that the experiment had an effect on their food choices. Many students said they changed their food consumption based on the information provided in the experiment. The survey results suggest that there is a correlation between information obtained and food choice.

The food disappearance data, on the other hand, does not show this effect. These results show no consistent trend that support the correlation from the survey data. There are a variety of reasons why the two data sources do not show similar results. One factor could be related to the difficulty in measuring and accounting for the food disappearance data. There are many variables and external factors that were not accounted for such as how often students ate at different dining commons. There may also be certain food items that are outliers such as tater tots that may skew the data.

Another factor could be due to a disconnect of what someone says and what they do. The respondents may believe that they altered their meals or wished that they had altered their meals throughout the week, but it may be difficult to remember exactly how many times they made a change. In addition, a change of only 1 to 3 items may be such a small component of the total number of items they ate during the week that other trends or factors may obscure these changes.

While the experiment did not show that the labeling had a clear effect on customers' food choice, information can still play a role in people's decisions. It has been shown that information can affect students' decisions in their dining commons.[I] Therefore, residential dining services may wish to continue to test and evaluate how information can best influence customers' choices. By successfully identifying strategies to encourage certain meals, it can help students make informed decisions about the meals they choose.

If this study were to be repeated, certain strategies have been identified to simplify the experiment. This might eliminate some of the confounding factors that may have caused the food disappearance data to show no significant trends. The strategies are listed below:

1. It is recommended that the labeling period be much longer, at least three weeks. One week is a short study time and there might have been more results with a prolonged flow of information or labeling at the beginning of the year.
2. It would also be good to have more involvement of dining common managers and staff before and during the experiment to increase their input into research design and the efficiency of execution. For example, the lessons learned in this experiment would be very helpful to evaluate the Green Mondays program.
3. It might help to simplify the design of the experiment by reducing the number of dining commons participating. It might be easier to use only DLG and/or Ortega because they are close together. The experiment could also exclude certain days such as weekends because the meals are different (brunch instead of breakfast and lunch). In addition, the experiment could focus on only lunch or dinner.

4. The experiment could also reduce the number of treatments. Peer pressure was difficult to assess whether it had an impact and the cards were difficult to understand, minimizing the desired effect of the information.
5. The experiment could also focus on specific meals or food items such as beef or chicken because there may have been meals that skewed the results. Identifying exactly which meals to include or exclude would be important to account for other factors that affect student choice.
6. Labeling the food items might provide a different outcome. Instead of labeling items as vegan, using a symbol like a leaf might appeal to more consumers and therefore increase consumption of desired foods.

These strategies can help improve the experiment in the future. Continuing to work on experiments such as these can help Residential Dining Services understand how to motivate behavioral change in their customers.

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