Analysis of Dietary Patterns over Freshman Year of College

Senior Project
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**Introduction**

This analysis is an investigation of changes in Cal Poly students’ eating habits over freshman year. The motivation behind this was an interest in college students’ lifestyles; college is the first time most students live on their own and it can be an important maturation period. College is stressful, exciting, liberating, and terrifying all at the same time. This distinctive life experience, along with my desire to handle big and messy data, led me to this research question.

The response variable to be analyzed is food consumption and the explanatory variables are: sex, race, quarter, food group, stress, exercise, BMI, sleep quality and quantity. These variables were chosen based on interest in how they could relate to the change in dietary patterns over the first year of college.
Data
Cal Poly’s Stride Program started the FLASH study in order to investigate college health. It is composed of an online survey and a physical assessment. Student responses are collected every fall and spring quarter, beginning in a students’ freshman year and continuing throughout their college career. The goal is not only to examine aspects of students’ health but to also see whether and how these change over time. My analysis uses the survey data only.

The survey component is composed of over 100 questions, broken into six sections:

1. Sociodemographic Information:
2. Health Perceptions & Lifestyle
3. Physical Activity and Exercise Habits
4. Stress
5. Dietary Habits and Dining Patterns
6. Sun Exposure and Sunblock Use

For my analysis I have used the survey data from fall 2009 and spring 2010. The survey used in fall 2009 is in Appendix B.

All data management and analysis was done using SAS® software. The fall 2009 and spring 2010 datasets were merged using PROC SQL, and only students who took the survey in both quarters were kept. Removing those who were missing an entry for sex gave a total sample size of 740 observational units. Table I describes the demographics of the data set.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Levels</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Male</td>
<td>40.14%</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>59.86%</td>
</tr>
<tr>
<td></td>
<td>n=740</td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td>White/Asian</td>
<td>82.51%</td>
</tr>
<tr>
<td></td>
<td>Hispanic</td>
<td>14.89%</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>2.60%</td>
</tr>
<tr>
<td></td>
<td>n=732</td>
<td></td>
</tr>
</tbody>
</table>

Table I: Descriptive statistics of demographic variables for complete dataset
Response Variable – Food Frequency Variables
The dietary habits section of the survey contains over 20 questions detailing consumption frequency of specific foods. Below is an example of one of these questions.

Ex. Please think about what you usually ate or drank during the past month, that is, the past 30 days, including meals and snacks. Mark one X in each row to report how many times per month, week, or day you ate each food

Cold cereals:

<table>
<thead>
<tr>
<th>NEVER</th>
<th>1-3 times last month</th>
<th>1-2 times per week</th>
<th>3-4 times per week</th>
<th>5-6 times per week</th>
<th>1 time per day</th>
<th>2 times per day</th>
<th>3 times per day</th>
<th>4+ times per day</th>
</tr>
</thead>
</table>

The consumptions were converted into consumption per month. For example, the category “1-2 times per week” was converted to 1.5*4 due to the midpoint of the 1-2 range and generally 4 weeks in a month. These food consumptions were then grouped into seven categories: grains, vegetables, fruits, dairy, proteins, oils, and empty calories based on government health guidelines [6]. A food item could be placed in multiple categories based on the nutritional guidelines, i.e. peanut butter is grouped with both proteins and oils. However it should be noted that the food groups are created so that variables in the “empty calories” group cannot be in any other nutritional group. The groupings of the foods are on the following page. Food consumptions were averaged within each of these groups, so the consumption variable being analyzed is average food consumption per month.
Grains

*Cereals, deli sandwiches, white bread/English muffins/bagels, wheat bread/English muffins/bagels, and pasta.*

Vegetables

*Deli sandwiches, other potatoes, cooked or canned beans, lettuce or green leafy salad, and other vegetables.*

Fruits

*Fruits and 100% fruit juice.*

Dairy

*Milk*

Protein

*Deli sandwiches, cooked or canned beans, fish and seafood, red meat, chicken, peanut butter, and nuts/ seeds.*

Oils

*Peanut butter, and mayonnaise or salad dressing.*

Empty Calories

*Bacon or sausage, hot dogs or other processed meat such as lunch meats, hamburgers, pizza, French fries, jelly/jam/preserves, chips, cake/muffins/pies/brownies/cookies/sweet pastries, frozen desserts, fruit-flavored drinks, regular soft drinks, and energy drinks.*

Food Variables Excluded From Categories

*The food/drink variables that were not put in to any category are: coffee/specialty coffee beverages, diet soft drinks, and water. There were no dietary guidelines regarding these beverages.*
Figure I shows the mean consumption for each food category by quarter. Food group will play an important role as an explanatory variable because it allows the ability to look at consumption based on the type of food.

*Figure I: Mean consumption of food groups by quarter.*
Explanatory Variables of Interest
Along with sex, the variables listed below are those of interest in exploring an association with changes in dietary patterns.

**Race**
Due to the small percentage of non-white students at Cal Poly, race was collapsed into three categories: White/Asian, Hispanic, and other.

**Stress Score**
Stress score was created using the 14 questions from the stress section of the survey. These questions originated from Sheldon Cohen’s “Perceived Stress Scale” article (1983) that attempts to evaluate a person’s perceived level of stress. A sample question is listed below.

*Ex. In the last 30 days, how often have you felt that you were unable to control the important things in your life?*

<table>
<thead>
<tr>
<th>Never</th>
<th>Almost Never</th>
<th>Sometimes</th>
<th>Fairly Often</th>
<th>Very Often</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Each question was rated 0 to 4, then the 14 ratings were summed together to create the stress score variable with possible range 0 to 56. This was done so that a higher score indicates higher perceived level of stress.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Fall 2009 Mean (SD)</th>
<th>Spring 2010 Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stress Score</td>
<td>21.5 (7.9) n=650</td>
<td>21.5 (8.4) n=590</td>
</tr>
</tbody>
</table>

*Table II: Descriptive statistics for stress score.*

Cohen’s article states that the normal stress score for ages 18-29 is 14.2 [3]. The data in Table II suggest that Cal Poly students seem quite stressed, however it should be noted that the article is from 1983 so “normal” stress level could have changed.

**Perceived Body Mass Index (BMI)**
Age, height, and weight were used to create perceived BMI for each person. According to the Center of Disease Control and Prevention, normal BMI is between 18.5 to 24.9 kg/m² [2].

<table>
<thead>
<tr>
<th>Variable</th>
<th>Units</th>
<th>Fall 2009 Mean (SD)</th>
<th>Spring 2010 Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived BMI</td>
<td>kg/m²</td>
<td>22.2 (3.1) n=723</td>
<td>22.6 (4.3) n=705</td>
</tr>
</tbody>
</table>

*Table III: Descriptive statistics for Perceived BMI*
International Physical Activity Questionnaire (IPAQ) Score

IPAQ is a categorical variable used to describe exercise. Exercise amount and level were recorded using questions like the following:

*Ex. Think about all the moderate activities you did in the LAST 7 DAYS. Moderate physical activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those activities that you did for at least 10 minutes at a time.*

During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

___ days per week  OR  □ NO moderate physical activity (skip next)

How much time did you usually spend doing moderate physical activities on one of those days?

___ hours per day ___ minutes per day  OR  □ Don’t know / not sure

Using guidelines for IPAQ scoring [4], three categories were created:

**High**: 1+ hour per day of at least moderate-intensity activity or half an hour of vigorous-intensity activity

**Moderate**: Half an hour of at least moderate-intensity activity on most days

**Low**: Not meeting any of the criteria for either of the previous categories

<table>
<thead>
<tr>
<th>Variable</th>
<th>Levels</th>
<th>Fall 2009</th>
<th>Spring 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPAQ</td>
<td>Low</td>
<td>29.86%</td>
<td>28.51%</td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td>54.19%</td>
<td>50.68%</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>15.95%</td>
<td>20.81%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>n=740</td>
<td>n=740</td>
</tr>
</tbody>
</table>

*Table IV: Descriptive statistics for IPAQ*
**Sleep Variables**

Sleep quality and sleep quantity were answered on a Likert scale of very bad, bad, average, good, and very good. The questions are listed below.

*How would you rate your overall sleep QUALITY?*

<table>
<thead>
<tr>
<th></th>
<th>Fall 2009</th>
<th>Spring 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sleep Quantity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bad</td>
<td>28.87%</td>
<td>25.35%</td>
</tr>
<tr>
<td>Average</td>
<td>40.19</td>
<td>43.20</td>
</tr>
<tr>
<td>Good</td>
<td>30.94</td>
<td>31.44</td>
</tr>
<tr>
<td>n=724</td>
<td>n=706</td>
<td></td>
</tr>
<tr>
<td><strong>Sleep Quality</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bad</td>
<td>11.43%</td>
<td>11.35%</td>
</tr>
<tr>
<td>Average</td>
<td>40.91</td>
<td>44.40</td>
</tr>
<tr>
<td>Good</td>
<td>47.66</td>
<td>44.24</td>
</tr>
<tr>
<td>n=726</td>
<td>n=696</td>
<td></td>
</tr>
</tbody>
</table>

Table V: Descriptive statistics for sleep variables by quarter
**Statistical Analysis**

To recap, I am interested in whether and how dietary patterns change over freshman year, particularly in relation to sex, race, quarter, food group, stress, exercise, BMI, sleep quality and quantity. There are many different ways to approach this, and this section will detail the methods investigated.

**Hotelling’s Paired $T^2$ Test**

The first step in the analysis was to compare fall 2009 consumption to spring 2010 consumption. A multivariate approach analyzing the vector of differences among the seven food consumption groups was preferred over a univariate paired t-test for each separate food group. This was done because consumptions of the food groups can be correlated with each other, as shown in Figure II and Table VI.

![Scatterplot Matrix](image)

*Figure II: Correlation matrix of food groups*
Hotelling’s Paired $T^2$ Test yielded an overall p-value <0.0001, providing evidence that the true mean food consumptions are jointly significantly different for fall 2009 and spring 2010.

**MANOVA**

Following the evidence that the true mean food consumptions jointly significantly differ across the two quarters, the next step is to model these differences. Throughout each method discussed, the first step will be to only consider sex, food group, and quarter as explanatory variables.

To understand the fundamentals behind Multivariate Analysis of Variance (MANOVA), the hypothesis (H) and error (E) matrices were derived for a very simple situation of comparing two food consumptions (grains and vegetables) for males vs. females. Since this was a simple situation for the purpose of understanding the mechanics of MANOVA, quarter was not included. The importance of the H and E matrices is the use of the eigenvalues of $E^{-1}H$ in the calculation of test statistics. Details of these derivations are in Appendix D.

<table>
<thead>
<tr>
<th></th>
<th>F09_Grains</th>
<th>F09_Vegetables</th>
<th>F09_Fruits</th>
<th>F09_Dairy</th>
<th>F09_Protein</th>
<th>F09_Oils</th>
<th>F09_EmptyCals</th>
</tr>
</thead>
<tbody>
<tr>
<td>F09_Grains</td>
<td>1.0000</td>
<td>0.4112</td>
<td>0.2787</td>
<td>0.2950</td>
<td>0.3913</td>
<td>0.2315</td>
<td>0.3115</td>
</tr>
<tr>
<td>F09_Vegetables</td>
<td>0.4112</td>
<td>1.0000</td>
<td>0.4764</td>
<td>0.0887</td>
<td>0.4687</td>
<td>0.2080</td>
<td>0.1030</td>
</tr>
<tr>
<td>F09_Fruits</td>
<td>0.2787</td>
<td>0.4764</td>
<td>1.0000</td>
<td>0.0966</td>
<td>0.2832</td>
<td>0.1899</td>
<td>0.0503</td>
</tr>
<tr>
<td>F09_Dairy</td>
<td>0.2950</td>
<td>0.0887</td>
<td>0.0966</td>
<td>1.0000</td>
<td>0.1571</td>
<td>0.0650</td>
<td>0.0786</td>
</tr>
<tr>
<td>F09_Protein</td>
<td>0.3913</td>
<td>0.4687</td>
<td>0.2832</td>
<td>0.1571</td>
<td>1.0000</td>
<td>0.5618</td>
<td>0.3707</td>
</tr>
<tr>
<td>F09_Oils</td>
<td>0.2315</td>
<td>0.2080</td>
<td>0.1899</td>
<td>0.0650</td>
<td>0.5618</td>
<td>1.0000</td>
<td>0.2410</td>
</tr>
<tr>
<td>F09_EmptyCals</td>
<td>0.3115</td>
<td>0.1030</td>
<td>0.0503</td>
<td>0.0786</td>
<td>0.3707</td>
<td>0.2410</td>
<td>1.0000</td>
</tr>
</tbody>
</table>

Table VI: Correlations between the food groups
**Multivariate Regression**

With the understanding of the mechanics of MANOVA, analysis moved towards the main goal of modeling changes in dietary patterns. An important decision was made at this step: this analysis is **longitudinal**, so analyzing differences between the two quarters will not suffice. FLASH is an ongoing study and one of the main goals of this project was to leave the analysis in a place where it could be continued with new data from the following quarter(s).

In an attempt to recognize the longitudinal nature the data were stacked, creating two observations per person—one per quarter. This allowed the use of quarter as an explanatory variable. PROC GLM using the MANOVA statement with “intercept=h” was used to model the food consumptions. However when comparing the model of all seven food groups to the same model for one of the food groups, the results were the same. This means that the other food consumptions are not being taken into account, so this is not being correctly analyzed.

**Multivariate Repeated Measures**

Since the analysis of the stacked data did not produce the desired results, the data were further transformed. The food consumptions were transposed to create a consumption variable and a food group variable. The quarter variable remained as is. An example of the data is given in Table VII. The response variable is consumption and the main interest was how the explanatory variables of interest interact with food and quarter since that would explain how the variable was related to changes in consumption over time for each food group. Any person with a missing food consumption was removed. This resulted in a new sample size of 509 that was used in the remaining analyses.

<table>
<thead>
<tr>
<th>ID</th>
<th>Sex</th>
<th>Food Group</th>
<th>Quarter</th>
<th>Consumption</th>
<th>Stress Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Female</td>
<td>Grains</td>
<td>Fall 2009</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>1</td>
<td>Female</td>
<td>Vegetables</td>
<td>Fall 2009</td>
<td>23</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Female</td>
<td>Grains</td>
<td>Spring 2010</td>
<td>18</td>
<td>21</td>
</tr>
<tr>
<td>1</td>
<td>Female</td>
<td>Vegetables</td>
<td>Spring 2010</td>
<td>20</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Male</td>
<td>Grains</td>
<td>Fall 2009</td>
<td>26</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table VII: Example data for n=509 data*
The approach was to treat food and quarter as repeated measures within a person and use an unstructured covariance matrix. This seemed to be the appropriate method of analysis while modeling food, quarter, and sex, however adding covariates (such as stress score) resulted in miscalculation of error degrees of freedom. Using a multivariate repeated measures model, stress was the first covariate to be added, and its error degrees of freedom did not make sense. The way the data were collected meant that stress was measured in each quarter, but the error degrees of freedom for stress under this model were too large and suggested that it was being analyzed as though it was measured separately with each food consumption. This is incorrect, so the correct degrees of freedom needed to be devised in order to find the correct method.

**Subset of Data**

A subset of 100 people was extracted from the data in order to easily compute the correct degrees of freedom, as well as to reduce computing time while trying different methods. The ANOVA table below represents the goal degrees of freedom with error terms bolded.

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>1</td>
</tr>
<tr>
<td>ID(Sex)</td>
<td>98</td>
</tr>
<tr>
<td>Quarter</td>
<td>1</td>
</tr>
<tr>
<td>Quarter * Sex</td>
<td>1</td>
</tr>
<tr>
<td>Quarter*ID(Sex)</td>
<td>94</td>
</tr>
<tr>
<td>Food</td>
<td>6</td>
</tr>
<tr>
<td>Sex * Food</td>
<td>6</td>
</tr>
<tr>
<td>Food * ID(Sex)</td>
<td>588</td>
</tr>
<tr>
<td>Quarter * Food</td>
<td>6</td>
</tr>
<tr>
<td>Quarter * Sex * Food</td>
<td>6</td>
</tr>
<tr>
<td>Error</td>
<td>564</td>
</tr>
<tr>
<td>Total</td>
<td>1399</td>
</tr>
</tbody>
</table>

*Table VIII: Target ANOVA table for 100 person subset*

ID(Sex) DF = (100 individuals – 1) – 1 df for sex = 98
Food*ID(Sex) DF = (7 foods – 1)(100 ind.) – 6 df for food – 6 df for sex*food = 588
Similarly for the other terms.
**Strip Plot**
The first approach to obtain the degrees of freedom in SAS® presented in Table VIII was a strip plot analysis. This treats a person as the whole plot unit, quarter as the row, food type as the column, and food by quarter as the cell. This was considered due to the lack of randomization of food and quarter. However, the error degrees of freedom still did not match what was expected.

**Split Plot with Repeated Measures**
When applied to the 100 person dataset with an unstructured covariance structure, the split plot with repeated measures method gave the desired degrees of freedom. This suggested it was doing the correct analysis. Unfortunately, when applied to the full dataset the model would not converge and would give an infinite likelihood error. Through research, I found that this is an ongoing and common problem with using the REPEATED statement in PROC MIXED with large datasets that has yet to be solved.
**Split-split Plot**

Due to the issues stated, a split-split plot analysis was the final model decided upon. Due to limited time and computing resources, further investigation had to be put on hold. The most recent results from this analysis will be presented and interpreted.

Under the split-split plot design the whole plot unit is a person, the split plot unit is food*ID, and the split-split plot unit is food*quarter*ID. Figure III is a visual representation of the experimental units in this analysis.

![Figure III: Split-split plot design experimental units](image)

The means model for this design is:

\[ y_{ijkl} = \mu_{ikl} + \delta_{ij} + \gamma_{ijk} + \epsilon_{ijkl} \]

Where

- \( y_{ijkl} = \text{consumption for sex } i, \text{ food } k, \text{ quarter } l, \text{ and person } j \)
- \( \mu_{ikl} = \text{mean consumption for sex } i, \text{ food } k, \text{ and quarter } l \)

The assumptions behind this design are:

- **Whole plot error** \( \delta_{ij} \sim \text{i.i.d. } N(0, \sigma_{\delta}^2) \)
- **Split plot error** \( \gamma_{ijk} \sim \text{i.i.d. } N(0, \sigma_{\gamma}^2) \)
- **Split - split error** \( \epsilon_{ijkl} \sim \text{i.i.d. } N(0, \sigma_{\epsilon}^2) \)

This means that by analyzing the data using a split-split plot design we assume that food and quarter were both randomized. This is not true. As stated before, issues have risen in trying to model this data and this is still a work in progress. The results from this design will be presented, but it is important to keep this violation of assumptions in mind.
Results

ANOVA Table
Using the split-split plot design, the ANOVA table for the dataset of 509 observations is shown in Table IX. Contrary to Table VIII, this is the ANOVA table for the full data set used in the analysis.

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>1</td>
</tr>
<tr>
<td>ID(Sex)</td>
<td>507</td>
</tr>
<tr>
<td>Food</td>
<td>1</td>
</tr>
<tr>
<td>Sex * Food</td>
<td>1</td>
</tr>
<tr>
<td>Food * ID(Sex)</td>
<td>3042</td>
</tr>
<tr>
<td>Quarter</td>
<td>6</td>
</tr>
<tr>
<td>Quarter * Sex</td>
<td>6</td>
</tr>
<tr>
<td>Quarter * Food</td>
<td>6</td>
</tr>
<tr>
<td>Quarter * Sex * Food</td>
<td>6</td>
</tr>
<tr>
<td>Error</td>
<td>3549</td>
</tr>
<tr>
<td>Total</td>
<td>7125</td>
</tr>
</tbody>
</table>

*Table IX: ANOVA table for split-split plot design

DF for ID(Sex) = (509 individuals – 1) – 1 df for sex = 507
Total DF = (7 food groups)(2 quarters)(509 individuals) \rightarrow 7126 – 1 = 7125
Similarly for the other terms.

When examining the addition of future covariates, race would come in at the ID(Sex) level, as expected. However, stress would come in at the last level and therefore be tested with the residual error. Stress was measured each quarter and should therefore be tested with Quarter*ID(Sex). Again, this analysis incorrectly uses Food*Quarter*ID(Sex) as the stress error term.
Effect Tests
The analysis yielded the following results.

<table>
<thead>
<tr>
<th>Effect</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>0.1365</td>
</tr>
<tr>
<td>Food</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Sex*Food</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Quarter</td>
<td>0.0934</td>
</tr>
<tr>
<td>Sex*Quarter</td>
<td>0.7220</td>
</tr>
<tr>
<td>Food*Quarter</td>
<td>0.4924</td>
</tr>
<tr>
<td>Sex<em>Food</em>Quarter</td>
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</tr>
<tr>
<td>Stress</td>
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<tr>
<td>Stress*Food</td>
<td>0.0307</td>
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</table>

*Table X: Results of split-split plot analysis

We see from Table X that sex*food*quarter is significant. Also, stress*food is significant. Therefore, I will interpret what the significance of the interaction terms sex*food*quarter and stress*food imply. The detailed output from this analysis is in Appendix A.
The three way interaction of food, sex, and quarter is illustrated in Figure IV.

Since interest is in how consumption changed over time, quarter is along the x-axis with mean consumption along the y-axis. Dashed lines are female and solid lines are male. Additionally, each food group has its own color. A flat line suggests no significant change in consumption between the quarters. The dashed red line with a negative slope from fall 2009 to spring 2010 suggests that females tended to eat less dairy in spring than in fall.

The comparisons of fall to spring are presented in Table XI and support this conjecture.

<table>
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<th>Females</th>
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<td>Grains</td>
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<td>Fruits</td>
<td>0.3267</td>
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<tr>
<td>Dairy</td>
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<tr>
<td>Protein</td>
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</tr>
<tr>
<td>Oils</td>
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<tr>
<td>Empty Calories</td>
<td>0.4135</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Males</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grains</td>
<td>0.5377</td>
</tr>
<tr>
<td>Vegetables</td>
<td>0.7132</td>
</tr>
<tr>
<td>Fruits</td>
<td>0.1969</td>
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<tr>
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<td>Protein</td>
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<tr>
<td>Oils</td>
<td>0.3353</td>
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<tr>
<td>Empty Calories</td>
<td>0.4167</td>
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</tbody>
</table>

*Figure IV: Plot of consumption vs. quarter by sex and food group

*Table XI: Pairwise comparisons of fall 2009 to spring 2010 within each sex and food group
Table XII represents the comparisons of males to females within each quarter and food group.

<table>
<thead>
<tr>
<th></th>
<th>Fall 2009</th>
<th>P-value</th>
<th>Spring 2010</th>
<th>P-value</th>
</tr>
</thead>
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<td>0.0443</td>
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</table>

*Table XII: Pairwise comparisons of males to females within each quarter and food group

There is evidence that dairy consumption is significantly different for males compared to females in fall 2009. There is also evidence that dairy and fruit consumption significantly differ for males compared to females in spring 2010.

**Food*Stress**
The interaction stress and food is seen in Figure V.

![Figure V: Plot of stress by food](image)

Here, stress is plotted against mean consumption and each line represents a food group. Since quarter and sex were not significant, these variables were held constant at males in spring 2010. This plot suggests that food consumption tends to decrease as stress increases, with an exception of empty calories.
Conclusions
With these results, there is evidence that how consumption changed from fall 2009 to spring 2010 differs between males and females, and among food groups. There is also evidence that stress relates to changes in consumption over time.

Please note that there is work left to do with this analysis and should therefore be interpreted with caution. In addition, this is a voluntary response study that did not utilize random sampling. This is a limitation with the FLASH study that hinders the ability to generalize to all Cal Poly students.

Future Directions
As a work in progress, there is still much to be done. The appropriate method of analysis needs to be chosen and successfully run using more powerful computing resources, then the additional explanatory variables of interest stated earlier can be included. Once this is accomplished the analysis can continue with the data from subsequent quarters.
## Appendix

### (A) Split-split Plot Output

```sas
proc mixed data=flash.narrow_cleaned_2 lognote;
   class id sex food quarter;
   model consumption = sex|food|quarter
                        stressscore
                        stressscore*food
                        / ddfm=kr solution;
   random id(sex) food*id(sex);
   lsmeans sex*food*quarter / adj=tukey;
run;
```

NOTE: With DDFM=SATTERTHWAITE or DDFM=KENWADROGER, unadjusted p-values in tests are based on the degrees of freedom specific to that comparison. P-values that are adjusted for multiplicity, however, are by default based on the denominator degrees of freedom for the Type 3 test of the fixed effect. If you specify the ADJDFE=ROW option in the LSMEANS statement, the adjusted p-values take into account the row-wise degrees of freedom.

NOTE: Levelizing effects.

NOTE: Processing subject and group effects.

NOTE: Setting up data.

NOTE: Loading data.

NOTE: Computing likelihood in iteration 0.

NOTE: Computing likelihood in iteration 1.

NOTE: Computing likelihood in iteration 1.

NOTE: Computing likelihood in iteration 1.

NOTE: Computing likelihood in iteration 1.

NOTE: Computing likelihood in iteration 1.

NOTE: Computing convergence criteria met.

NOTE: Computing likelihood in iteration 2.

NOTE: Computing Cholesky root of cross-products matrix.

NOTE: Solving mixed model equations.

NOTE: Computing Satterthwaite approximation for parameter 1.

NOTE: Computing Satterthwaite approximation for parameter 2.

NOTE: Computing Satterthwaite approximation for parameter 3.

NOTE: Computing H matrix.

NOTE: Computing Type 3 sums of squares.

NOTE: PROCEDURE MIXED used (Total process time):
   real time         2:17:05.25
   cpu time          2:16:47.77

### Dimensions

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### Number of Observations

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Convergence criteria met.

## Covariance Parameter Estimates

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## Fit Statistics

-2 Res Log Likelihood: 53771.2
AIC (smaller is better): 53777.2
AICC (smaller is better): 53777.2
BIC (smaller is better): 53789.9

## Solution for Fixed Effects

| Effect     | FORMER VARIABLE | Sex | Quarter | Estimate | Error | DF  | t Value | Pr > |t| |
|------------|-----------------|-----|---------|----------|-------|-----|---------|-------|---|
| Intercept  |                 |     |         | 10.5644  | 1.2330| 6463| 8.57    | <.0001|
| Sex        |                 | Female |       | 1.8749  | 1.0777| 4891| 1.74    | 0.0820|
| Sex        |                 | Male   |         | 0        | .     | .   | .       | .     |
| Food       | Dairy           |       |         | 17.0762 | 1.6798| 5828| 10.17   | <.0001|
| Food       | EmptyCals       |       |         | -5.2662 | 1.6798| 5828| -3.14   | 0.0017|
| Food       | Fruits          |       |         | 10.2876 | 1.6798| 5828| 6.12    | <.0001|
| Food       | Grains          |       |         | 1.8334  | 1.6798| 5828| 1.09    | 0.2751|
| Food       | Oils            |       |         | -2.7377 | 1.6798| 5828| -1.63   | 0.1032|
| Food       | Protein         |       |         | -2.7243 | 1.6798| 5828| -1.62   | 0.1049|
Solution for Fixed Effects

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</table>
### Solution for Fixed Effects

| Effect             | Variable | Sex  | Quarter       | Estimate | Error  | DF  | t Value | Pr > |t| |
|--------------------|----------|------|---------------|----------|--------|-----|---------|------|---|
| Sex*Food*Quarter   | Protein  | Female | Fall 2009    | 0.1533   | 1.3792 | 3546| 0.11    | 0.9115 |
| Sex*Food*Quarter   | Protein  | Female | Spring 2010  | 0        | .      | .   | .       | .    |  |
| Sex*Food*Quarter   | Vegetables | Female | Fall 2009    | 0        | .      | .   | .       | .    |  |
| Sex*Food*Quarter   | Vegetables | Female | Spring 2010  | 0        | .      | .   | .       | .    |  |
| Sex*Food*Quarter   | Dairy    | Male   | Fall 2009    | 0        | .      | .   | .       | .    |  |
| Sex*Food*Quarter   | Dairy    | Male   | Spring 2010  | 0        | .      | .   | .       | .    |  |
| Sex*Food*Quarter   | EmptyCals | Male   | Fall 2009    | 0        | .      | .   | .       | .    |  |
| Sex*Food*Quarter   | EmptyCals | Male   | Spring 2010  | 0        | .      | .   | .       | .    |  |
| Sex*Food*Quarter   | Fruits   | Male   | Fall 2009    | 0        | .      | .   | .       | .    |  |
| Sex*Food*Quarter   | Fruits   | Male   | Spring 2010  | 0        | .      | .   | .       | .    |  |
| Sex*Food*Quarter   | Grains   | Male   | Fall 2009    | 0        | .      | .   | .       | .    |  |
| Sex*Food*Quarter   | Oils     | Male   | Fall 2009    | 0        | .      | .   | .       | .    |  |
| Sex*Food*Quarter   | Protein  | Male   | Fall 2009    | 0        | .      | .   | .       | .    |  |
| StressScore        |          |        |               | -0.05197 | 0.04565 | 7088| -1.14   | 0.2549 |
| StressScore*Food   | Dairy    |        |               | -0.06799 | 0.06292 | 6435| -1.08   | 0.2799 |
| StressScore*Food   | EmptyCals |       |               | 0.08446  | 0.06292 | 6435| 1.34    | 0.1796 |
| StressScore*Food   | Fruits   |        |               | -0.1206  | 0.06292 | 6435| -1.92   | 0.0553 |
| StressScore*Food   | Grains   |        |               | 0.02918  | 0.06292 | 6435| 0.46    | 0.6429 |
| StressScore*Food   | Oils     |        |               | 0.001919 | 0.06292 | 6435| 0.03    | 0.9757 |
| StressScore*Food   | Protein  |        |               | 0.02658  | 0.06292 | 6435| 0.42    | 0.6728 |

### Type 3 Tests of Fixed Effects

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</table>

Least Squares Means
## Part 1: Sociodemographic Information

Please tell us about yourself

1. **Sex**
   - (1) Male
   - (2) Female

2. **Birth date (month/day)**
   - __/__/__

3. **Birth year**
   - 19__

4. **Do you consider yourself to be Hispanic or Latino?**
   - (0) NO
   - (1) YES
   - *Hispanic or Latino.* A person of Mexican, Puerto Rican, Cuban, South or Central American, or other Spanish culture or origin, regardless of race. The term “Spanish origin,” can be used in addition to “Hispanic or Latino.”

5. **What race do you consider yourself to be?**
   - (1) American Indian or Alaska Native: A person having origins in any of the original peoples of North, Central, or South America, and who maintains tribal affiliation or community attachment.
   - (2) Asian: A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent, including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam.
   - (3) Black or African American: A person having origins in any of the black racial groups of Africa.
   - (4) Native Hawaiian or Other Pacific Islander: A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.
   - (5) White: A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.

6. **What is the zip code of your most recent home address (in your hometown)?**
   - __________

7. **Where do you currently live (while at Cal Poly)?**
   - (1) Cal Poly residence hall
     - Specify: __________________________
   - (2) Cerro Vista apt.
   - (3) Parent’s home
   - (4) Fraternity/sorority house
   - (5) Poly Canyon
   - (6) Stenner Glen
   - (7) Other off-campus home

8. **Which category best describes your mother’s (or other female primary guardian’s) education?**
   - (1) Not a high school graduate
   - (2) High school graduate
   - (3) Some college, junior college, technical or associates degree
   - (4) College graduate
   - (5) Completed graduate school
   - (6) N/A or Do not know

9. **Which category best describes your father’s (or other male primary guardian’s) education?**
   - (1) Not a high school graduate
   - (2) High school graduate
   - (3) Some college, junior college, technical or associates degree
   - (4) College graduate
   - (5) Completed graduate school
   - (6) N/A or Do not know

10. **Which category best describes your mother’s (or other female primary guardian’s) income?**
    - (1) No income
    - (2) Less than $10,000/year
    - (3) $10,000-$24,999/year
    - (4) $25,000-$49,999/year
    - (5) $50,000-$74,999/year
    - (6) $75,000-$100,000/year
    - (7) More than $100,000/year
    - (8) N/A or Do not know

11. **Which category best describes your father’s (or other male primary guardian’s) income?**
    - (1) No income
    - (2) Less than $10,000/year
    - (3) $10,000-$24,999/year
    - (4) $25,000-$49,999/year
    - (5) $50,000-$74,999/year
    - (6) $75,000-$100,000/year
    - (7) More than $100,000/year
    - (8) N/A or Do not know

12. **How are you funding your college education?**
    - (1) Grants (all types)
    - (2) Scholarships (all types)
    - (3) Loans (all types)
    - (4) Self-funded
    - (5) Family-funded
    - (6) Other

## Part 2: Health Perceptions & Lifestyle

Please answer or estimate to the best of your ability

13. **How would you describe your overall health?**
    - (1) Very bad
    - (2) Bad
    - (3) Good
    - (4) Very Good
    - (5) Excellent

14. **What is your current weight?**
    - __________ pounds
15. What is your current height? Please estimate if you are not sure. ______ feet ______ inches

16. How would you describe your own weight?
   (1) Very underweight  (2) Slightly underweight  (3) About the right weight  (4) Slightly overweight  (5) Very overweight

17. Are you trying to do any of the following about your weight?
   (1) I am not trying to do anything about my weight  (2) Stay the same weight  (3) Lose weight  (4) Gain weight

18. On how many of the last 30 DAYS, on many days did you use: (select how many days - maximum 30, OR select one box)

19. Cigarettes
   (99) Have never used  (88) Have used, but not in the last 30 days  ______ of the last 30 days

20. Other smoking tobacco such as pipes, cigars, or hookahs
   (99) Have never used  (88) Have used, but not in the last 30 days  ______ of the last 30 days

21. Smokeless tobacco such as chewing tobacco
   (99) Have never used  (88) Have used, but not in the last 30 days  ______ of the last 30 days

22. Marijuana
   (99) Have never used  (88) Have used, but not in the last 30 days  ______ of the last 30 days

23. Alcohol
   (99) Have never used  (88) Have used, but not in the last 30 days  ______ of the last 30 days

24. Within the last 30 DAYS, approximately how many times did you drink FIVE OR MORE alcoholic drinks in one sitting?
   ______ times  (99) N/A (did not drink)

25. The last time you "partied"/socialized when alcohol was present, approximately how many alcoholic drinks did you have?
   ______ drinks  (88) So many that I cannot remember  (99) N/A (did not drink)

26. Are you sexually active? (Any type of sex)
   (1) No (skip to #24)  (2) Yes (go on to #23)

27. How often do you practice safe sex? (For any type of sex)
   (9) N/A (no sex)  (1) Never  (2) Rarely  (3) Sometimes  (4) Fairly often  (5) Very often  (6) Always

28. On campus, do you feel there is a place where you can seek advice and help on issues related to sex and contraception?
   (0) No  (1) Yes

29. Consider your sleeping patterns during the LAST 30 DAYS, and respond to the questions below based on this period.

30. How often did you have difficulty falling asleep? (In bed with intention to sleep but unable to do so for 30 min. or more)
   (1) Never  (2) Almost never  (3) Sometimes  (4) Fairly often  (5) Very often

31. How often did you have difficulty staying asleep? (Waking up frequently during the night or waking up too early and being unable to go back to sleep)
   (1) Never  (2) Almost never  (3) Sometimes  (4) Fairly often  (5) Very often

32. How would you rate your overall sleep QUALITY?
   (1) Very bad  (2) Bad  (3) Average/normal  (4) Good  (5) Excellent

33. How would you rate your overall sleep QUANTITY?
   (1) Very bad  (2) Bad  (3) Average/normal  (4) Good  (5) Excellent

34. How many hours of sleep did you get on average? (Indicate for both weeknights and weekends)
   a) WEEKNIGHTS (Sunday night to Thursday night) ______ hours

35. Did you usually take a nap during the day on WEEKDAYS?
   (2) No  (3) Yes- ______ minutes per nap

36. Did you usually take a nap during the day on WEEKENDS?
   (2) No  (3) Yes- ______ minutes per nap

37. In general, do you consider yourself an early-bird or a night-owl?
   (1) Early bird  (2) Night owl

38. Consider your tech-habits during the LAST 30 DAYS, and respond to the questions below based on this period.

39. ON WEEKDAYS...

40. How many hours of TV, movies, or other DVDs/videos did you watch?
   ______ hours per day  or  (99) I did not watch any...
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>37. How many hours did you spend gaming, playing video/computer games?</td>
<td>On the internet, Nintendo, Game Boy, Play Station, X-Box, etc</td>
</tr>
<tr>
<td></td>
<td>___ hours per day or ___ I did not play any</td>
</tr>
<tr>
<td>38. How many hours did you spend on the internet-surfing the web,</td>
<td>Facebook, shopping on the web, etc for non-academic purposes?</td>
</tr>
<tr>
<td></td>
<td>___ hours per day or ___ I did not go online</td>
</tr>
<tr>
<td>ON WEEKENDS...</td>
<td></td>
</tr>
<tr>
<td>39. How many hours of TV, movies, or other DVDs/videos did you watch?</td>
<td>___ hours per day or ___ I did not watch any</td>
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<tr>
<td>40. How many hours did spend gaming- playing video/computer games?</td>
<td>(On the internet, Nintendo, Game Boy, Play Station, X-Box, etc)</td>
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<td>___ hours per day or ___ I did not play any</td>
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<td>41. How many hours did you spend on the internet-surfing the web,</td>
<td>Facebook, shopping on the web, etc for non-academic purposes?</td>
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<tr>
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<td>___ hours per day or ___ I did not go online</td>
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<td>CONSIDERING BOTH WEEKDAYS AND WEEKENDS TOGETHER...</td>
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<tr>
<td>42. Approximately how many text messages did you send per day?</td>
<td>___ texts per day or ___ I did not send any</td>
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### PART 3: PHYSICAL ACTIVITY AND EXERCISE HABITS

Think about all the vigorous activities you did in the LAST 7 DAYS.
Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think only about those activities that you did for at least 16 minutes at a time.

43. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics or fast bicycling? ___ days per week or ___ NO vigorous physical activity (skip to #42)

44. How much time did you usually spend doing vigorous physical activities on one of those days? ___ hours per day ___ minutes per day or ___ Don't know / not sure

Think about all the moderate activities you did in the LAST 7 DAYS.
Moderate physical activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those activities that you did for at least 10 minutes at a time.

45. During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking. ___ days per week or ___ NO moderate physical activity (skip to #44)

46. How much time did you usually spend doing moderate physical activities on one of those days? ___ hours per day ___ minutes per day or ___ Don't know / not sure

Think about all the time you spent walking in the LAST 7 DAYS.
This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.

47. During the last 7 days, on how many days did you walk for at least 10 minutes at a time? ___ days per week or ___ NO walking (skip to #48)

48. How much time did you usually spend walking on one of those days? ___ hours per day ___ minutes per day or ___ Don't know / not sure

This next question is about the time you spent sitting on weekdays during the LAST 7 DAYS.
Include time spent at work, at home, while doing course work, and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television. Include study and class time. Do not include sleep time.

49. During the last 7 days, on how much time did you spend sitting on a weekday? ___ hours per day ___ minutes per day or ___ Don't know / not sure
PART 4: STRESS

The following questions ask you about your feelings and thoughts during the LAST 30 DAYS. In each case, you will be asked to indicate how often you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question.

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<tr>
<th>Question</th>
<th>Never (1)</th>
<th>Almost never (2)</th>
<th>Sometimes (3)</th>
<th>Fairly often (4)</th>
<th>Very often (5)</th>
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<tr>
<td>53. In the last 30 days, how often have you been upset because of something that happened unexpectedly?</td>
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<tr>
<td>54. In the last 30 days, how often have you felt that you were unable to control the important things in your life?</td>
<td></td>
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<tr>
<td>55. In the last 30 days, how often have you felt nervous and “stressed”?</td>
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<tr>
<td>56. In the last 30 days, how often have you dealt successfully with irritating life hassles?</td>
<td></td>
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<tr>
<td>57. In the last 30 days, how often have you felt that you were effectively coping with important chances that were occurring in your life?</td>
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<tr>
<td>58. In the last 30 days, how often have you felt confident about your ability to handle your personal problems?</td>
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<tr>
<td>59. In the last 30 days, how often have you found that things were going your way?</td>
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<tr>
<td>60. In the last 30 days, how often have you found that you could not cope with all the things that you had to do?</td>
<td></td>
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</tr>
<tr>
<td>61. In the last 30 days, how often have you been able to control irritations in your life?</td>
<td></td>
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<td></td>
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<tr>
<td>62. In the last 30 days, how often have you felt that you were on top of things</td>
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<tr>
<td>63. In the last 30 days, how often have you been angered because of things that happened that were outside of your control?</td>
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<tr>
<td>64. In the last 30 days, how often have you found yourself thinking about things that happened that were outside your control?</td>
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<tr>
<td>65. In the last 30 days, how often have you been able to control the way you spend your time?</td>
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</tr>
<tr>
<td>66. In the last 30 days, how often have you felt difficulties were piling up so high that you could not overcome them?</td>
<td></td>
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PART 5: DIETARY HABITS AND DINING PATTERNS

Consider what and how you are doing during the LAST 30 DAYS, and respond to the questions below based on this period.

<table>
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<th>Question</th>
<th>Times per week</th>
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<tbody>
<tr>
<td>67. During a typical week, how many times did you eat at an on-campus dining hall?</td>
<td></td>
</tr>
<tr>
<td>68. During a typical week, how many times did you eat at an on-campus restaurant? (Cash/credit location, such as at The Avenue, BackStage pizza, Baja Surf, 19 Metro Station, and others)</td>
<td></td>
</tr>
<tr>
<td>69. During a typical week, how many times did you eat at an off-campus restaurant?</td>
<td></td>
</tr>
<tr>
<td>70. Do you consider yourself a vegetarian?</td>
<td></td>
</tr>
<tr>
<td>71. What type of vegetarian are you?</td>
<td></td>
</tr>
<tr>
<td>72. What type of MILK do you normally drink (including lactose-free varieties)? If you do not drink milk, select N/A</td>
<td></td>
</tr>
</tbody>
</table>
### More on food and drinks...

For the next questions, please think about what you usually ate or drank during the **past month**, that is, the past 30 days, including meals and snacks. **Mark one X in each row** to report how many times per month, week, or day you ate each food.

<table>
<thead>
<tr>
<th>Item</th>
<th>Never</th>
<th>1-3 times last month</th>
<th>1-2 times per week</th>
<th>3-4 times per week</th>
<th>5-6 times per week</th>
<th>1 time per day</th>
<th>2 times per day</th>
<th>3 times per day</th>
<th>4+ times per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold cereals</td>
<td>0(0)</td>
<td>1(1)</td>
<td>2(2)</td>
<td>3(3)</td>
<td>4(4)</td>
<td>5(5)</td>
<td>6(6)</td>
<td>7(7)</td>
<td>8(8)</td>
</tr>
<tr>
<td>Milk, alone or on cereal</td>
<td>0(0)</td>
<td>1(1)</td>
<td>2(2)</td>
<td>3(3)</td>
<td>4(4)</td>
<td>5(5)</td>
<td>6(6)</td>
<td>7(7)</td>
<td>8(8)</td>
</tr>
<tr>
<td>Bacon or sausage, not light, low-fat, or turkey</td>
<td>0(0)</td>
<td>1(1)</td>
<td>2(2)</td>
<td>3(3)</td>
<td>4(4)</td>
<td>5(5)</td>
<td>6(6)</td>
<td>7(7)</td>
<td>8(8)</td>
</tr>
<tr>
<td>Hot dogs (beef or pork) or other processed meat such as cold cuts/lunch meats</td>
<td>0(0)</td>
<td>1(1)</td>
<td>2(2)</td>
<td>3(3)</td>
<td>4(4)</td>
<td>5(5)</td>
<td>6(6)</td>
<td>7(7)</td>
<td>8(8)</td>
</tr>
<tr>
<td>Hamburgers, fast food or homemade</td>
<td>0(0)</td>
<td>1(1)</td>
<td>2(2)</td>
<td>3(3)</td>
<td>4(4)</td>
<td>5(5)</td>
<td>6(6)</td>
<td>7(7)</td>
<td>8(8)</td>
</tr>
<tr>
<td>Pizza, all types</td>
<td>0(0)</td>
<td>1(1)</td>
<td>2(2)</td>
<td>3(3)</td>
<td>4(4)</td>
<td>5(5)</td>
<td>6(6)</td>
<td>7(7)</td>
<td>8(8)</td>
</tr>
<tr>
<td>Deli sandwich, homemade or deli</td>
<td>0(0)</td>
<td>1(1)</td>
<td>2(2)</td>
<td>3(3)</td>
<td>4(4)</td>
<td>5(5)</td>
<td>6(6)</td>
<td>7(7)</td>
<td>8(8)</td>
</tr>
<tr>
<td>French fries, home fries, hash browns</td>
<td>0(0)</td>
<td>1(1)</td>
<td>2(2)</td>
<td>3(3)</td>
<td>4(4)</td>
<td>5(5)</td>
<td>6(6)</td>
<td>7(7)</td>
<td>8(8)</td>
</tr>
<tr>
<td>Other potatoes, baked, boiled, mashed, or in potato salad</td>
<td>0(0)</td>
<td>1(1)</td>
<td>2(2)</td>
<td>3(3)</td>
<td>4(4)</td>
<td>5(5)</td>
<td>6(6)</td>
<td>7(7)</td>
<td>8(8)</td>
</tr>
<tr>
<td>Cooked or canned beans (baked, refrigerated, soy, lentils, black, garbanzo)</td>
<td>0(0)</td>
<td>1(1)</td>
<td>2(2)</td>
<td>3(3)</td>
<td>4(4)</td>
<td>5(5)</td>
<td>6(6)</td>
<td>7(7)</td>
<td>8(8)</td>
</tr>
<tr>
<td>Fish and seafood (all types)</td>
<td>0(0)</td>
<td>1(1)</td>
<td>2(2)</td>
<td>3(3)</td>
<td>4(4)</td>
<td>5(5)</td>
<td>6(6)</td>
<td>7(7)</td>
<td>8(8)</td>
</tr>
<tr>
<td>Red meat- beef, pork, veal, lamb</td>
<td>0(0)</td>
<td>1(1)</td>
<td>2(2)</td>
<td>3(3)</td>
<td>4(4)</td>
<td>5(5)</td>
<td>6(6)</td>
<td>7(7)</td>
<td>8(8)</td>
</tr>
<tr>
<td>Chicken</td>
<td>0(0)</td>
<td>1(1)</td>
<td>2(2)</td>
<td>3(3)</td>
<td>4(4)</td>
<td>5(5)</td>
<td>6(6)</td>
<td>7(7)</td>
<td>8(8)</td>
</tr>
<tr>
<td>Peanut butter</td>
<td>0(0)</td>
<td>1(1)</td>
<td>2(2)</td>
<td>3(3)</td>
<td>4(4)</td>
<td>5(5)</td>
<td>6(6)</td>
<td>7(7)</td>
<td>8(8)</td>
</tr>
<tr>
<td>Jelly, jam, preserves</td>
<td>0(0)</td>
<td>1(1)</td>
<td>2(2)</td>
<td>3(3)</td>
<td>4(4)</td>
<td>5(5)</td>
<td>6(6)</td>
<td>7(7)</td>
<td>8(8)</td>
</tr>
<tr>
<td>Mayonnaise, salad dressing, not low-fat or light varieties (alone, on salads, or sandwiches)</td>
<td>0(0)</td>
<td>1(1)</td>
<td>2(2)</td>
<td>3(3)</td>
<td>4(4)</td>
<td>5(5)</td>
<td>6(6)</td>
<td>7(7)</td>
<td>8(8)</td>
</tr>
<tr>
<td>Fruit- alone or with other food such as cereal or yogurt (fresh, frozen, canned)</td>
<td>0(0)</td>
<td>1(1)</td>
<td>2(2)</td>
<td>3(3)</td>
<td>4(4)</td>
<td>5(5)</td>
<td>6(6)</td>
<td>7(7)</td>
<td>8(8)</td>
</tr>
<tr>
<td>Lettuce or green leafy salad, including spinach and Cesar</td>
<td>0(0)</td>
<td>1(1)</td>
<td>2(2)</td>
<td>3(3)</td>
<td>4(4)</td>
<td>5(5)</td>
<td>6(6)</td>
<td>7(7)</td>
<td>8(8)</td>
</tr>
<tr>
<td>Other vegetables- tomatoes, carrots, onions, peppers, broccoli, zucchini, peas, beans (fresh, cooked, canned, frozen)</td>
<td>0(0)</td>
<td>1(1)</td>
<td>2(2)</td>
<td>3(3)</td>
<td>4(4)</td>
<td>5(5)</td>
<td>6(6)</td>
<td>7(7)</td>
<td>8(8)</td>
</tr>
<tr>
<td>Bread,English muffins, bagels- all white types</td>
<td>0(0)</td>
<td>1(1)</td>
<td>2(2)</td>
<td>3(3)</td>
<td>4(4)</td>
<td>5(5)</td>
<td>6(6)</td>
<td>7(7)</td>
<td>8(8)</td>
</tr>
<tr>
<td>Bread, English muffins, bagels- all whole wheat or whole grain types</td>
<td>0(0)</td>
<td>1(1)</td>
<td>2(2)</td>
<td>3(3)</td>
<td>4(4)</td>
<td>5(5)</td>
<td>6(6)</td>
<td>7(7)</td>
<td>8(8)</td>
</tr>
<tr>
<td>Pasta- any kind including mac &amp; cheese, spaghetti, lasagna, pasta salad, rice noodles</td>
<td>0(0)</td>
<td>1(1)</td>
<td>2(2)</td>
<td>3(3)</td>
<td>4(4)</td>
<td>5(5)</td>
<td>6(6)</td>
<td>7(7)</td>
<td>8(8)</td>
</tr>
<tr>
<td>99.</td>
<td>Nuts &amp; seeds—walnuts, peanuts, pistachios, flax (not peanut butter)</td>
<td>(0)</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
<td>(7)</td>
</tr>
<tr>
<td>100.</td>
<td>Chips—potato, tortilla, corn (not baked or low-fat varieties)</td>
<td>(0)</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
<td>(7)</td>
</tr>
<tr>
<td>101.</td>
<td>Cake, muffin, pie, brownie, cookies, sweet pastries (not low-fat or sugar-free varieties)</td>
<td>(0)</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
<td>(7)</td>
</tr>
</tbody>
</table>

| 102. | Frozen desserts: ice-cream, frozen yogurt, Popsicles, etc (not sugar-free varieties) | (0) | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 103. | 100% fruit juice—orange, apple, grape (not juice cocktails or juice blends and mixes) | (0) | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 104. | Fruit-flavored drinks—Gatorade, Snapple, lemonade, fruit cocktail blends, Kool-Aid | (0) | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 105. | Soft drinks: Coke, Pepsi, Sprite, Dr Pepper, others (not including diet, light) | (0) | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 106. | Soft drinks: Coke, Pepsi, Sprite, Dr Pepper, others (diet, light varieties) | (0) | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 107. | Coffee or specialty coffee beverages (càfe drinks, such as Starbucks) | (0) | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 109. | Plain water | (0) | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |

### Vitamins, minerals, dietary supplements, and medications

**110.** During the last 30 DAYS, have you taken any vitamins, minerals, herbal products, or other dietary supplements (including weight-loss or weight-gain formulas)?

- [ ] NO (skip to #109)
- [ ] YES (continue to #108 and select all that apply)

**A. Vitamins**  
- (1) Multi-vitamin  
- (2) Beta carotene  
- (3) Folic acid  
- (4) B vitamin  
- (5) Vitamin C  
- (6) Vitamin D  
- (7) Others:

**B. Minerals**  
- (1) Multi-mineral  
- (2) Calcium  
- (3) Iron  
- (4) Magnesium  
- (5) Potassium  
- (6) Others:

**C. Herbs or botanicals**  
- (1) Echinacea  
- (2) Ginkgo  
- (3) Ginseng  
- (4) St. John’s wort  
- (5) Guarana  
- (6) Others:

**D. Other formulas or supplements**  
- (1) Creatine  
- (2) Ephedrine  
- (3) DHEA  
- (4) Whey or other protein  
- (5) Amino acids  
- (6) Omega-3  
- (7) Fiber  
- (8) Weight-loss formula  
- (9) Weight-gain formula  
- (10) Other:

**112.** Are you on any prescribed medication that you take regularly, such as for blood pressure or blood sugar?

- [ ] NO (1) YES

### PART 6: SUN EXPOSURE & SUNBLOCK USE

**113.** In your opinion, is your typical sun exposure low or high?

- (1) Low
- (2) High

**114.** In the last 30 days, how much time did you typically spend outdoors on **weekdays** during daylight hours?

- (1) Less than 30 min
- (2) 30-59 min
- (3) 60-90 min
- (4) More than 90 min

**115.** In the last 30 days, how much time did you typically spend outdoors on **weekends** during daylight hours?

- (1) Less than 30 min
- (2) 30-59 min
- (3) 60-90 min
- (4) More than 90 min

**116.** In the last 30 days, think about the clothes that you typically wore and indicate which parts of your body were usually exposed to the sun when you were outside (mark all that apply):  
- (1) Face  
- (2) Neck  
- (3) Shoulders  
- (4) Back  
- (5) Upper arms  
- (6) Lower arms  
- (7) Hands  
- (8) Stomach  
- (9) Upper thighs  
- (10) Lower legs  
- (11) Feet

**117.** When do you wear sunscreen (other than in cosmetics)?

- (1) Rarely or never  
- (2) Whenever I go outdoors for extended periods  
- (3) Whenever I go outdoors  
- (4) Always

**118.** Do you ever use tanning beds or sun lamps?

- (6) No, never  
- (7) Almost never  
- [ ] Yes, times in the last month

**119.** Where did you hear about the FLASH study?

- [ ] Dorm flyer  
- [ ] Facebook  
- [ ] Email invitation  
- [ ] Word of mouth  
- [ ] Resident advisor  
- [ ] FLASH commercial  
- [ ] Other

---

32
(C) Code

```sas
libname flash 'F:\FLASH\SAS Datasets';
libname formats 'F:\FLASH\SAS formats';
libname flash 'C:\Users\chels\Documents\Cal Poly\FLASH\SAS Datasets';
libname formats 'C:\Users\chels\Documents\Cal Poly\FLASH\SAS formats';
options obs=MAX fmtsearch=(formats.formats) nofmterr;
/*log;clear;out;clear;wpgm;sub;log;top;*/

/*proc print data=flash.fall2009sv; run;*/
/*proc print data=flash.spring2010sv; run;*/

/*Merge Fall 2009 and Spring 2010 data sets*/
words sql;
create table flash.NEWDATA as
select *
from flash.fall2009sv, flash.spring2010sv
where F_2009_SV_ID = S_2010_SV_ID
);
quit;

/*proc print data=flash.NEWDATA; run;*/

/*Rename variables*/
/*Variables labeled with 'switch' are stress variables that will be switched so severity of stress answers all match*/
data flash.rename
(rename=
/*Fall 2009*/
F_2009_SV_ID=ID
F_2009_SV_1=Sex
F_2009_SV_BM=BirthMonth
F_2009_SV_BD=BirthDay
F_2009_SV_BY=BirthYear
F_2009_SV_5=Hispanic
F_2009_SV_6_1=AmericanIndian
F_2009_SV_6_2=Asian
F_2009_SV_6_3=Black
F_2009_SV_6_4=Hawaiian
F_2009_SV_6_5=White
F_2009_SV_7_F09_Zip
F_2009_SV_7_W=F09_Zip_W
F_2009_SV_8=F09_MotherEd
F_2009_SV_9=F09_FatherEd
F_2009_SV_10=F09_MotherIncome
F_2009_SV_11=F09_FatherIncome
F_2009_SV_12=F09_CPRes
F_2009_SV_13_1=F09_Grant
F_2009_SV_13_2=F09_Scholarship
F_2009_SV_13_3=F09_Loan
F_2009_SV_13_4=F09_SelfFunded
F_2009_SV_13_5=F09_FamilyFunded
F_2009_SV_13_W=F09_OtherFunded_W
F_2009_SV_14=F09_Health
F_2009_SV_15_FT=F09_HeightFt
F_2009_SV_15_IN=F09_HeightIn
```

/*log;clear;out;clear;wpgm;sub;log;top;*/
```
F_2009_SV_65=F09_AbleControlIrritations /*switch*/
F_2009_SV_66=F09_OnTopOfThings /*switch*/
F_2009_SV_67=F09_AngeredOutControlProblems
F_2009_SV_68=F09_ThinkingAboutOutControl
F_2009_SV_69=F09_AbleControlTimeSpent /*switch*/
F_2009_SV_70=F09_NotOvercomeDifficulties
F_2009_SV_71=F09_OnCampusDining
F_2009_SV_72=F09_OnCampusRestaurant
F_2009_SV_73=F09_OffCampusRestaurant
F_2009_SV_74=F09_AltDiet
F_2009_SV_75=F09_TypeMilk
F_2009_SV_76_1=F09_SoyMilk
F_2009_SV_76_2=F09_RiceMilk
F_2009_SV_76_3=F09_AlmondMilk
F_2009_SV_76_4=F09_OtherMilk
F_2009_SV_76_5=F09_DontDrinkMilk
F_2009_SV_77=F09_SoftDrinks
F_2009_SV_78=F09_CoffeeAdd
F_2009_SV_79=F09_SpecCoffee
F_2009_SV_80=F09_ColdCereal
F_2009_SV_81=F09_Milk
F_2009_SV_82=F09_BaconSausage
F_2009_SV_83=F09_HotDogs
F_2009_SV_84=F09_Hamburgers
F_2009_SV_85=F09_Pizza
F_2009_SV_86=F09_Sandwich
F_2009_SV_87=F09_FrenchFries
F_2009_SV_88=F09_Potatoes
F_2009_SV_89=F09_Beans
F_2009_SV_90=F09_Fish
F_2009_SV_91=F09_RedMeat
F_2009_SV_92=F09_Chicken
F_2009_SV_93=F09_PeanutButter
F_2009_SV_94=F09_Jelly
F_2009_SV_95=F09_Mayo
F_2009_SV_96=F09_Fruit
F_2009_SV_97=F09_Lettuce
F_2009_SV_98=F09_Veggies
F_2009_SV_99=F09_WhiteBread
F_2009_SV_100=F09_WheatBread
F_2009_SV_101=F09_Pasta
F_2009_SV_102=F09_Nuts
F_2009_SV_103=F09_Chips
F_2009_SV_104=F09_Cake
F_2009_SV_105=F09_FrozenDessert
F_2009_SV_106=F09_FruitJuice
F_2009_SV_107=F09_FruitDrink
F_2009_SV_108=F09_SoftDrink
F_2009_SV_109=F09_DietSoftDrink
F_2009_SV_110=F09_Coffee
F_2009_SV_111=F09_EnergyDrinks
F_2009_SV_112=F09_Water
F_2009_SV_113=F09_DietSupplements
F_2009_SV_114_1=F09_NoSupplement
F_2009_SV_114_2=F09_MultiVitamin
F_2009_SV_114_3=F09_BetaCarotene
F_2009_SV_114_4=F09_FolicAcid
/*Spring 2010*/
S_2010_SV_8=S10_MotherEd
S_2010_SV_9=S10_FatherEd
S_2010_SV_10=S10_MotherIncome
S_2010_SV_11=S10_FatherIncome
S_2010_SV_12=S10_CPRes
S_2010_SV_13_1=S10_Grant
S_2010_SV_13_2=S10_Scholarship
S_2010_SV_13_3=S10_Loan
S_2010_SV_13_4=S10_SelfFunded
S_2010_SV_13_5=S10_FamilyFunded
S_2010_SV_13_W=S10_OtherFunded_W
S_2010_SV_14=S10_Health
S_2010_SV_15_FT=S10_HeightFt
S_2010_SV_15_IN=S10_HeightIn
S_2010_SV_16=S10_Weight
S_2010_SV_17=S10_WeightDescr
S_2010_SV_18=S10_WeightChange
S_2010_SV_19=S10_Cig
S_2010_SV_20=S10_OtherSmokingTobacco
S_2010_SV_21=S10_SmokelessTobacco
S_2010_SV_22=S10_Marijuana
S_2010_SV_23=S10_Alcohol
S_2010_SV_24=S10_Over5DrinksAtOnce
S_2010_SV_25=S10_NumDrinks
S_2010_SV_26=S10_SexActive
S_2010_SV_27=S10_SafeSex
S_2010_SV_28=S10_HormonalContraceptive
S_2010_SV_29=S10_Pregnant
S_2010_SV_30=S10_SexContrIssues
S_2010_SV_30_W=S10_SexContrIssues_W
S_2010_SV_31=S10_DiffFallAsleep
S_2010_SV_32=S10_DiffStayAsleep
S_2010_SV_33=S10_SleepQual
S_2010_SV_34=S10_SleepQuant
S_2010_SV_35=S10_HrsSleepWeeknight
S_2010_SV_36=S10_HrsSleepWeekend
S_2010_SV_37=S10_NapWeekday
S_2010_SV_38=S10_NapWeekend
S_2010_SV_39=S10_EarlyBirdNightOwl
S_2010_SV_40=S10_HrsTvWeekday
S_2010_SV_41=S10_HrsVideoGamesWeekday
S_2010_SV_42=S10_HrsInternetWeekday
S_2010_SV_43=S10_HrsTvWeekend
S_2010_SV_44=S10_HrsVideoGamesWeekend
S_2010_SV_45=S10_HrsInternetWeekend
S_2010_SV_46=S10_TextPerDay
S_2010_SV_47=S10_VigPhysActDays
S_2010_SV_48_HR=S10_VigPhysActHrs
S_2010_SV_48_MIN=S10_VigPhysActMins
S_2010_SV_49=S10_ModPhysActDays
S_2010_SV_50_HR=S10_ModPhysActHrs
S_2010_SV_50_MIN=S10_ModPhysActMins
S_2010_SV_51=S10_WalkDays
S_2010_SV_52_HR=S10_WalkHrs
S_2010_SV_52_MIN=S10_WalkMins
S_2010_SV_53_HR=S10_SitHrs
S_2010_SV_53_MIN=S10_SitMins
S_2010_SV_54=S10_CPAthletics
S_2010_SV_55=S10_HSAthletics
S_2010_SV_56=S10_StrengthTraining
S_2010_SV_57=S10_UpsetSomethingUnexpected
S_2010_SV_58=S10_UnableControlImportantThings
S_2010_SV_59=S10_FeltNervous
S_2010_SV_60=S10_DealtSuccessWithLifeHassles /*switch*/
S_2010_SV_61=S10_EffectivelyCoping /*switch*/
S_2010_SV_62=S10_ConfidentHandleProblems /*switch*/
S_2010_SV_63=S10_ThingsGoingYourWay /*switch*/
S_2010_SV_64=S10_CouldNotCope
S_2010_SV_65=S10_AbleControlIrritations /*switch*/
S_2010_SV_66=S10_OnTopOfThings /*switch*/
S_2010_SV_67=S10_AngeredOutControlProblems
S_2010_SV_68=S10_ThinkingAboutOutControl
S_2010_SV_69=S10_AbleControlTimeSpent /*switch*/
S_2010_SV_70=S10_NotOvercomeDifficulties
S_2010_SV_71=S10_OnCampusDining
S_2010_SV_72=S10_OnCampusRestaurant
S_2010_SV_73=S10_OffCampusRestaurant
S_2010_SV_74=S10_AltDiet
S_2010_SV_75=S10_TypeMilk
S_2010_SV_76_1=S10_SoyMilk
S_2010_SV_76_2=S10_RiceMilk
S_2010_SV_76_3=S10_AlmondMilk
S_2010_SV_76_4=S10_OtherMilk
S_2010_SV_76_5=S10_DontDrinkMilk
S_2010_SV_77=S10_SoftDrinks
S_2010_SV_78=S10_CoffeeAdd
S_2010_SV_79=S10_SpecCoffee
S_2010_SV_80=S10_ColdCereal
S_2010_SV_81=S10_Milk
S_2010_SV_82=S10_BaconSausage
S_2010_SV_83=S10_HotDogs
S_2010_SV_84=S10_Hamburgers
S_2010_SV_85=S10_Pizza
S_2010_SV_86=S10_Sandwich
S_2010_SV_87=S10_FrenchFries
S_2010_SV_88=S10_Potatoes
S_2010_SV_89=S10_Beans
S_2010_SV_90=S10_Fish
S_2010_SV_91=S10_RedMeat
S_2010_SV_92=S10_Chicken
S_2010_SV_93=S10_PeanutButter
S_2010_SV_94=S10_Jelly
S_2010_SV_95=S10_Mayo
S_2010_SV_96=S10_Fruit
S_2010_SV_97=S10_Lettuce
S_2010_SV_98=S10_Veggies
S_2010_SV_99=S10_WhiteBread
S_2010_SV_100=S10_WheatBread
S_2010_SV_101=S10_Pasta
S_2010_SV_102=S10_Nuts
S_2010_SV_103=S10_Chips
S_2010_SV_104=S10_Cake
S_2010_SV_105=S10_FrozenDessert
S_2010_SV_106=S10_FruitJuice
S_2010_SV_107=S10_FruitDrink
S_2010_SV_108=S10_SoftDrink
S_2010_SV_109=S10_DietSoftDrink
S_2010_SV_110=S10_Coffee
S_2010_SV_111=S10_EnergyDrinks
S_2010_SV_112=S10_Water
S_2010_SV_113=S10_DietSupplements
S_2010_SV_114_1=S10_NoSupplement
S_2010_SV_114_2=S10_MultiVitamin
S_2010_SV_114_3=S10_BetaCarotene
S_2010_SV_114_4=S10_FolicAcid
S_2010_SV_114_5=S10_BVitamins
S_2010_SV_114_6=S10_VitaminC
S_2010_SV_114_7=S10_VitaminD
S_2010_SV_114_W_1=S10_Supplement_W1
S_2010_SV_114_W_2=S10_Supplement_W2
S_2010_SV_114_W_3=S10_Supplement_W3
S_2010_SV_115_1=S10_NoMinerals
S_2010_SV_115_2=S10_MultiMineral
S_2010_SV_115_3=S10_Calcium
S_2010_SV_115_4=S10_Iron
S_2010_SV_115_5=S10_Magnesium
S_2010_SV_115_6=S10_Potassium
S_2010_SV_115_W_1=S10_Mineral_W1
S_2010_SV_115_W_2=S10_Mineral_W2
S_2010_SV_115_W_3=S10_Mineral_W3
S_2010_SV_116_1=S10_NoHerb
S_2010_SV_116_2=S10_Echinacea
S_2010_SV_116_3=S10_Ginko
S_2010_SV_116_4=S10_Ginseng
S_2010_SV_116_5=S10_StJohnsWort
S_2010_SV_116_6=S10_Guarana
S_2010_SV_116_W_1=S10_Herb_W1
S_2010_SV_116_W_2=S10_Herb_W2
S_2010_SV_116_W_3=S10_Herb_W3
S_2010_SV_117_1=S10_NoOtherSupp
S_2010_SV_117_2=S10_Creatine
S_2010_SV_117_3=S10_Ephedrine
S_2010_SV_117_4=S10_DHEA
S_2010_SV_117_5=S10_Whey
S_2010_SV_117_6=S10_AminoAcids
S_2010_SV_117_7=S10_Omega3
S_2010_SV_117_8=S10_Fiber
S_2010_SV_117_9=S10_WeightLoss
S_2010_SV_117_10=S10_WeightGain
S_2010_SV_117_W_1=S10_OtherSupp_W1
S_2010_SV_117_W_2=S10_OtherSupp_W2
S_2010_SV_118=S10_PrescriptionMeds
S_2010_SV_118_W=S10_PrescriptionMeds_W
S_2010_SV_119=S10_SunExposure
S_2010_SV_120=S10_TimeOutdoorsWeekday
S_2010_SV_121=S10_TimeOutdoorsWeekend
S_2010_SV_122_1=S10_SunExFace
S_2010_SV_122_2=S10_SunExNeck
S_2010_SV_122_3=S10_SunExShoulders
S_2010_SV_122_4=S10_SunExBack
S_2010_SV_122_5=S10_SunExUpperArms
S_2010_SV_122_6=S10_SunExLowerArms
S_2010_SV_122_7=S10_SunExHands
S_2010_SV_122_8=S10_SunExStomach
S_2010_SV_122_9=S10_SunExUpperThighs
S_2010_SV_122_10=S10_SunExLowerLegs
S_2010_SV_122_11=S10_SunExFeet
S_2010_SV_123=S10_Sunscreen
S_2010_SV_124=S10_TanningBed
S_2010_SV_125=S10_TanningBedDays
S_2010_SV_125_W=S10_TanningBedDays_W
S_2010_SV_126_1=S10_FlashDormFlyer
S_2010_SV_126_2=S10_FlashFacebook
S_2010_SV_126_3=S10_FlashEmail
S_2010_SV_126_4=S10_FlashWordOfMouth
S_2010_SV_126_5=S10_FlashRA
S_2010_SV_126_6=S10_FlashCommercial
S_2010_SV_126_W=S10_Flash_W
/*drop repeated (gender, ID, race, and birthday)*/
drop=S_2010_SV_ID S_2010_SV_1 S_2010_SV_BM S_2010_SV_BD S_2010_SV_BY
S_2010_SV_6_: S_2010_SV_5); set flash.NEWDATA; run;

/*Create formats*/
proc format lib=formats;
value RaceNum
1='White/Asian'
2='Hispanic'
3='Other';
value EatingPref
0='Vegetarian'
1='Non-Vegetarian';
value gender
1='Male'
2='Female';
value parenteducation
1='Not a HS Graduate'
2='HS Graduate'
3='Some college'
4='College graduate'
5='Completed Graduate School';
value parentincome
1='No income'
2='Less than $10,000'
3='$10,000 to $24,999'
4='$25,000 to $49,999'
5='$50,000 to $74,999'
6='$75,000 to $100,000'
7='More than $100,000';
value cpresidence
1='Yosemite'
2='Sierra Madre'
3='Santa Lucia/North Mountain'
4='Trinity'
5='Tenaya'
6='Fremont'
7='Muir'
8='Sequoia'
9='Cerro Vista Apts'
10='Parent's Home'
11='Poly Canyon'
12='Stenner Glenn'
13='Fraternity/Sorority'
14='Other off campus housing';

value overallhealth
1='Very Bad'
2='Bad'
3='Good'
4='Very Good'
5='Excellent';

value weightdescription
1='Very Underweight'
2='Slightly Underweight'
3='About the right weight'
4='Slightly Overweight'
5='Very Overweight';

value weightchange
1='I am not trying to do anything'
2='Stay the same weight'
3='Lose weight'
4='Gain weight';

value druguse
0='Have never used'
99='Have used but not in the last 30 days';

value fivedrinks
0='Did not drink'
99='I drank but never more than 5 drinks';

value numberdrinks
0='Did not drink'
99='I drank but never more than 5 drinks';

value yesno
0='No'
1='Yes'
2='Don't Know';

value safesex
0='No sex'
1='Never'
2='Rarely'
3='Sometimes'
4='Fairly Often'
5='Very Often'
6='Always';

value neververyoften
1='Never'
2='Almost Never'
3='Sometimes'
value verybadexcellent
  1='Very Bad'
  2='Bad'
  3='Average'
  4='Good'
  5='Excellent';
value sleephr
  13='13 or more hours';
value nap
  0='No';
value earlybirdnightowl
  1='Early Bird'
  2='Night Owl';
value entertainment
  99='I did not watch any'
  77='Less than 1 hour'
  13='13 hours or more';
value text
  0='I did not send any';
value neveroften
  0='Never'
  1='Almost never'
  2='Sometimes'
  3='Fairly Often'
  4='Often';
value diet
  0='Non-vegetarian'
  1='Vegan'
  2='Lacto-vegetarian'
  3='Pesca-vegetarian'
  4='Lacto-ovo-vegetarian'
  5='Pollo-vegetarian'
  6='Semi/Flexi vegetarian';
value milk
  1='Whole'
  2='2%'
  3='1%'
  4='non-fat/skim'
  9="N/A (Don't drink)";
value soda
  1='Regular'
  2='Diet, light, zero calorie'
  9="N/A (Don't drink)";
value coffee
  1='Black'
  2='Sugar, no cream'
  3='Cream only'
  4='Sugar and cream'
  5='Artificial sweetener, no cream'
  6='Artificial sweetener and cream'
  9="N/A (Don't drink)";
value eat
  0='Never'
  1='1-3 times last month'
  2='1-2 times a week'
3='3-4 times a week'
4='5-6 times a week'
5='1 time per day'
6='2 times per day'
7='3 times per day'
8='4+ times per day';
value sunexposure
  1='Low'
  2='High';
value timespent
  1='Less than 30 minutes'
  2='30-59 minutes'
  3='60-90 minutes'
  4='more than 90 minutes';
value sunscreen
  1='Rarely'
  2='Whenever I go outdoors for extended periods'
  3='Whenever I go outdoors'
  4='Always';
value tanningbed
  99='No never'
  0='Almost never'
  1='Yes';
value drinking
  1='Did not drink'
  2='Moderate (0-5 drinks)'
  3='Heavy (Over 5 drinks)';
value sleepcat
  1='Bad'
  2='Average'
  3='Good';
value ipaq
  1='Low'
  2='Moderate'
  3='High';
value quarter
  1='Fall 2009'
  2='Spring 2010';
value ipaqchange
  1='Worse'
  2='Same'
  3='Improve';
run;

/*Create 3 race categories – Hispanic, White/Asian, Other;*/
data flash.ss_3races; set flash.rename;
race_count = Hispanic + AmericanIndian + Asian + Black + Hawaiian + White;

/*If Hispanic=1, race=Hispanic (regardless of other race identifiers);*/
if Hispanic = 1 then RaceNum=2;
else if Hispanic = 0 then do;
  *Leave RaceNum empty for the 7 obs with all 0's;*
  if Hispanic = 0 and
      AmericanIndian = 0 and
      Asian = 0 and
      Black = 0 and
      Hawaiian = 0 and
White = 0 then RaceNum = .;
else if race_count >=3 then RaceNum = 3;
else if race_count = 2 then do;
    if White= 1 and Asian = 1 then RaceNum = 1;
    else RaceNum = 3;
end;
else if White = 1 or Asian = 1 then RaceNum = 1;
/*All others go to Other*/
else RaceNum = 3;
end;

drop race_count;
run;

*Create stress score and eating preference -- vegetarian and non-vegetarian;
data flash.ss_stressscore_eatingpref; set flash.ss_3races;

*If participant is any form of vegetarian, eatingpref=0. otherwise eatingpref=1;
if F09_AltDiet>=1 then F09_EatingPref=0;
else F09_EatingPref=1;

if S10_AltDiet>=1 then S10_EatingPref=0;
else S10_EatingPref=1;

/* Fall 2009 */
/* Array containing reversed scoring stress questions. (numbers 60, 61, 62, 63, 65, 66, and 69) */
array F09_scorereverse (7)
    F09_DealtSuccessWithLifeHassles
    F09_EffectivelyCoping
    F09_ConfidentHandleProblems
    F09_ThingsGoingYourWay
    F09_AbleControlIrritations
    F09_OnTopOfThings
    F09_AbleControlTimeSpent;

/* Array containing new variables for the new reversed scores */
array F09_reversed (7)
    F09_DSWLH
    F09_EC
    F09_CAAHP
    F09_TGYW
    F09_ACI
    F09_OTOT
    F09_ACTS;

do i = 1 to 7; /* converts the given score to a new score based on wording of the question */
    if F09_scorereverse (i) = 4 then F09_reversed (i) = 0;
    else if F09_scorereverse (i) = 3 then F09_reversed (i) = 1;
    else if F09_scorereverse (i) = 2 then F09_reversed (i) = 2;
    else if F09_scorereverse (i) = 1 then F09_reversed (i) = 3;
    else if F09_scorereverse (i) = 0 then F09_reversed (i) = 4;
end;

F09_StressScore =
F09_UpsetSomethingUnexpected +
F09_UnableControlImportantThings +
F09_FeltNervous +
F09_CouldNotCope +
F09_AngeredOutControlProblems +
F09_ThinkingAboutOutControl +
F09_NotOvercomeDifficulties +
F09_DSWLH +
F09_EC +
F09_CAAHP +
F09_TGYW +
F09_ACI +
F09_OTOT +
F09_ACTS;

/* Spring 2010*/
/* Array containing reversed scoring stress questions. (numbers 60, 61, 62,
63, 65, 66, and 69) */
array S10_scorereverse (7)
S10_DealtSuccessWithLifeHassles
S10_EffectivelyCoping
S10_ConfidentHandleProblems
S10_ThingsGoingYourWay
S10_AbleControlIrritations
S10_OnTopOfThings
S10_AbleControlTimeSpent;

/* Array containing new variables for the new reversed scores */
array S10_reversed (7)
S10_DSWLH
S10_EC
S10_CAAHP
S10_TGYW
S10_ACI
S10_OTOT
S10_ACTS;

do i = 1 to 7; /* converts the given score to a new score based on wording of
the question */
if S10_scorereverse (i) = 4 then S10_reversed (i) = 0;
else if S10_scorereverse (i) = 3 then S10_reversed (i) = 1;
else if S10_scorereverse (i) = 2 then S10_reversed (i) = 2;
else if S10_scorereverse (i) = 1 then S10_reversed (i) = 3;
else if S10_scorereverse (i) = 0 then S10_reversed (i) = 4;
end;

S10_StressScore =
S10_UpsetSomethingUnexpected +
S10_UnableControlImportantThings +
S10_FeltNervous +
S10_CouldNotCope +
S10_AngeredOutControlProblems +
S10_ThinkingAboutOutControl +
S10_NotOvercomeDifficulties +
S10_DSWLH +
S10_EC +
S10_CAAHP +
S10_TGYW + S10_ACI + S10_OTOT + S10_ACTS;

drop F09_DSWLH F09_EC F09_CAAHP F09_TGYW F09_ACI F09_OTOT F09_ACTS;
S10_DSWLH S10_EC S10_CAAHP S10_TGYW S10_ACI S10_OTOT S10_ACTS;
run;

/*Group food vars based on gov health guidelines*/
data flash.foodgroups;
  set flash.ss_stressscore_eatingpref;
/* FALL 2009 */
  ARRAY F09_Grains_old (5) F09_ColdCereal F09_Sandwich F09_WhiteBread F09_WheatBread F09_Pasta;
  ARRAY F09_Vegetables_old (5) F09_Sandwich F09_Potatoes F09_Beans F09_Lettuce F09_Veggies;
  ARRAY F09_Fruits_old (2) F09_Fruit F09_FruitJuice;
  ARRAY F09_Dairy_old (1) F09_Milk;
  ARRAY F09_Protein_old (7) F09_Sandwich F09_Beans F09_Fish F09_RedMeat F09_Chicken F09_PeanutButter F09_Nuts;
  ARRAY F09_Oils_old (2) F09_PeanutButter F09_Mayo;
  ARRAY F09_EmptyCals_old (12) F09_BaconSausage F09_HotDogs F09_Hamburgers F09_Pizza F09_FrenchFries F09_Jelly F09_Chips F09_Cake F09_FruitDrink F09_SoftDrink F09_EnergyDrinks;

/*Arrays for groupings after frequency conversions*/
  ARRAY F09_Grains_new (5);
  ARRAY F09_Vegetables_new (5);
  ARRAY F09_Fruits_new (2);
  ARRAY F09_Dairy_new (1);
  ARRAY F09_Protein_new (7);
  ARRAY F09_Oils_new (2);
  ARRAY F09_EmptyCals_new (12);

/*array of adjusted food frequencies FALL 09*/
do i = 1 to 5;
  if F09_Grains_old (i) = 0 then F09_Grains_new (i) = 0;
  else if F09_Grains_old (i) = 1 then F09_Grains_new (i) = 2;
  else if F09_Grains_old (i) = 2 then F09_Grains_new (i) = 1.5*4;
  else if F09_Grains_old (i) = 3 then F09_Grains_new (i) = 3.5*4;
  else if F09_Grains_old (i) = 4 then F09_Grains_new (i) = 5.5*4;
  else if F09_Grains_old (i) = 5 then F09_Grains_new (i) = 1*30;
  else if F09_Grains_old (i) = 6 then F09_Grains_new (i) = 2*30;
  else if F09_Grains_old (i) = 7 then F09_Grains_new (i) = 3*30;
  else if F09_Grains_old (i) = 8 then F09_Grains_new (i) = 4*30;
end;

do i = 1 to 5;
  if F09_Vegetables_old (i) = 0 then F09_Vegetables_new (i) = 0;
  else if F09_Vegetables_old (i) = 1 then F09_Vegetables_new (i) = 2;
  else if F09_Vegetables_old (i) = 2 then F09_Vegetables_new (i) = 1.5*4;
  else if F09_Vegetables_old (i) = 3 then F09_Vegetables_new (i) = 3.5*4;
  else if F09_Vegetables_old (i) = 4 then F09_Vegetables_new (i) = 5.5*4;
  else if F09_Vegetables_old (i) = 5 then F09_Vegetables_new (i) = 1*30;
  else if F09_Vegetables_old (i) = 6 then F09_Vegetables_new (i) = 2*30;
  else if F09_Vegetables_old (i) = 7 then F09_Vegetables_new (i) = 3*30;
else if F09_Vegetables_old (i) = 8 then F09_Vegetables_new (i) = 4*30; end;

do i = 1 to 2;
if F09_Fruits_old (i) = 0 then F09_Fruits_new (i) = 0;
else if F09_Fruits_old (i) = 1 then F09_Fruits_new (i) = 2;
else if F09_Fruits_old (i) = 2 then F09_Fruits_new (i) = 1.5*4;
else if F09_Fruits_old (i) = 3 then F09_Fruits_new (i) = 3.5*4;
else if F09_Fruits_old (i) = 4 then F09_Fruits_new (i) = 5.5*4;
else if F09_Fruits_old (i) = 5 then F09_Fruits_new (i) = 1*30;
else if F09_Fruits_old (i) = 6 then F09_Fruits_new (i) = 2*30;
else if F09_Fruits_old (i) = 7 then F09_Fruits_new (i) = 3*30;
else if F09_Fruits_old (i) = 8 then F09_Fruits_new (i) = 4*30; end;

i = 1;
if F09_Dairy_old (i) = 0 then F09_Dairy_new (i) = 0;
else if F09_Dairy_old (i) = 1 then F09_Dairy_new (i) = 2;
else if F09_Dairy_old (i) = 2 then F09_Dairy_new (i) = 1.5*4;
else if F09_Dairy_old (i) = 3 then F09_Dairy_new (i) = 3.5*4;
else if F09_Dairy_old (i) = 4 then F09_Dairy_new (i) = 5.5*4;
else if F09_Dairy_old (i) = 5 then F09_Dairy_new (i) = 1*30;
else if F09_Dairy_old (i) = 6 then F09_Dairy_new (i) = 2*30;
else if F09_Dairy_old (i) = 7 then F09_Dairy_new (i) = 3*30;
else if F09_Dairy_old (i) = 8 then F09_Dairy_new (i) = 4*30;

do i = 1 to 2;
if F09_Protein_old (i) = 0 then F09_Protein_new (i) = 0;
else if F09_Protein_old (i) = 1 then F09_Protein_new (i) = 2;
else if F09_Protein_old (i) = 2 then F09_Protein_new (i) = 1.5*4;
else if F09_Protein_old (i) = 3 then F09_Protein_new (i) = 3.5*4;
else if F09_Protein_old (i) = 4 then F09_Protein_new (i) = 5.5*4;
else if F09_Protein_old (i) = 5 then F09_Protein_new (i) = 1*30;
else if F09_Protein_old (i) = 6 then F09_Protein_new (i) = 2*30;
else if F09_Protein_old (i) = 7 then F09_Protein_new (i) = 3*30;
else if F09_Protein_old (i) = 8 then F09_Protein_new (i) = 4*30; end;

do i = 1 to 2;
if F09_Oils_old (i) = 0 then F09_Oils_new (i) = 0;
else if F09_Oils_old (i) = 1 then F09_Oils_new (i) = 2;
else if F09_Oils_old (i) = 2 then F09_Oils_new (i) = 1.5*4;
else if F09_Oils_old (i) = 3 then F09_Oils_new (i) = 3.5*4;
else if F09_Oils_old (i) = 4 then F09_Oils_new (i) = 5.5*4;
else if F09_Oils_old (i) = 5 then F09_Oils_new (i) = 1*30;
else if F09_Oils_old (i) = 6 then F09_Oils_new (i) = 2*30;
else if F09_Oils_old (i) = 7 then F09_Oils_new (i) = 3*30;
else if F09_Oils_old (i) = 8 then F09_Oils_new (i) = 4*30; end;

do i = 1 to 12;
if F09_EmptyCals_old (i) = 0 then F09_EmptyCals_new (i) = 0;
else if F09_EmptyCals_old (i) = 1 then F09_EmptyCals_new (i) = 2;
else if F09_EmptyCals_old (i) = 2 then F09_EmptyCals_new (i) = 1.5*4;
else if F09_EmptyCals_old (i) = 3 then F09_EmptyCals_new (i) = 3.5*4;
else if F09_EmptyCals_old (i) = 4 then F09_EmptyCals_new (i) = 5.5*4;
else if F09_EmptyCals_old (i) = 5 then F09_EmptyCals_new (i) = 1*30;
else if F09_EmptyCals_old (i) = 6 then F09_EmptyCals_new (i) = 2*30;
else if F09_EmptyCals_old (i) = 7 then F09_EmptyCals_new (i) = 3*30;
else if F09_EmptyCals_old (i) = 8 then F09_EmptyCals_new (i) = 4*30;
end;

*calculate average frequency for each food under category;
F09_Grains = (sum(of F09_Grains_new:))/5;
F09_Vegetables = (sum(of F09_Vegetables_new:))/5;
F09_Fruits = (sum(of F09_Fruits_new:))/2;
F09_Dairy = (sum(of F09_Dairy_new:))/1;
F09_Protein = (sum(of F09_Protein_new:))/7;
F09_Oils = (sum(of F09_Oils_new:))/2;
F09_EmptyCals = (sum(of F09_EmptyCals_new:))/12;

drop F09_Grains_new: F09_Vegetables_new: F09_Fruits_new: F09_Dairy_new:
F09_Protein_new: F09_Oils_new: F09_EmptyCals_new;

/* SPRING 2010 */
ARRAY S10_Grains_old (5) S10_ColdCereal S10_Sandwich S10_WhiteBread
S10_WheatBread S10_Pasta;
ARRAY S10_Vegetables_old (5) S10_Sandwich S10_Potatoes S10_Beans S10_Lettuce
S10_Veggies;
ARRAY S10_Fruits_old (2) S10_Fruit S10_FruitJuice;
ARRAY S10_Dairy_old (1) S10_Milk;
ARRAY S10_Protein_old (7) S10_Sandwich S10_Beans S10_Fish S10_RedMeat
S10_Chicken S10_PeanutButter S10_Nuts;
ARRAY S10_Oils_old (2) S10_PeanutButter S10_Mayo;
ARRAY S10_EmptyCals_old (12) S10_BaconSausage S10_HotDogs S10_Hamburgers
S10_Pizza S10_FrenchFries S10_Jelly S10_Chips S10_Cake S10_FrozenDessert
S10_FruitDrink S10_SoftDrink S10_EnergyDrinks;

/*Arrays for groupings after frequency conversions*/
ARRAY S10_Grains_new (5);
ARRAY S10_Vegetables_new (5);
ARRAY S10_Fruits_new (2);
ARRAY S10_Dairy_new (1);
ARRAY S10_Protein_new (7);
ARRAY S10_Oils_new (2);
ARRAY S10_EmptyCals_new (12);

*array of adjusted food frequencies SPRING 10;
do i = 1 to 5;
if S10_Grains_old (i) = 0 then S10_Grains_new (i) = 0;
else if S10_Grains_old (i) = 1 then S10_Grains_new (i) = 2;
else if S10_Grains_old (i) = 2 then S10_Grains_new (i) = 1.5*4;
else if S10_Grains_old (i) = 3 then S10_Grains_new (i) = 3.5*4;
else if S10_Grains_old (i) = 4 then S10_Grains_new (i) = 5.5*4;
else if S10_Grains_old (i) = 5 then S10_Grains_new (i) = 1*30;
else if S10_Grains_old (i) = 6 then S10_Grains_new (i) = 2*30;
else if S10_Grains_old (i) = 7 then S10_Grains_new (i) = 3*30;
else if S10_Grains_old (i) = 8 then S10_Grains_new (i) = 4*30;
end;

do i = 1 to 5;
if S10_Vegetables_old (i) = 0 then S10_Vegetables_new (i) = 0;
else if S10_Vegetables_old (i) = 1 then S10_Vegetables_new (i) = 2;
else if S10_Vegetables_old (i) = 2 then S10_Vegetables_new (i) = 1.5*4;
else if S10_Vegetables_old (i) = 3 then S10_Vegetables_new (i) = 3.5*4;
else if S10_Vegetables_old (i) = 4 then S10_Vegetables_new (i) = 5.5*4;
else if S10_Vegetables_old (i) = 5 then S10_Vegetables_new (i) = 1*30;
else if S10_Vegetables_old (i) = 6 then S10_Vegetables_new (i) = 2*30;
else if S10_Vegetables_old (i) = 8 then S10_Vegetables_new (i) = 4*30;
end;

do i = 1 to 2;
if S10_Fruits_old (i) = 0 then S10_Fruits_new (i) = 0;
else if S10_Fruits_old (i) = 1 then S10_Fruits_new (i) = 2;
else if S10_Fruits_old (i) = 2 then S10_Fruits_new (i) = 1.5*4;
else if S10_Fruits_old (i) = 3 then S10_Fruits_new (i) = 3.5*4;
else if S10_Fruits_old (i) = 4 then S10_Fruits_new (i) = 5.5*4;
else if S10_Fruits_old (i) = 5 then S10_Fruits_new (i) = 1*30;
else if S10_Fruits_old (i) = 6 then S10_Fruits_new (i) = 2*30;
else if S10_Fruits_old (i) = 7 then S10_Fruits_new (i) = 3*30;
else if S10_Fruits_old (i) = 8 then S10_Fruits_new (i) = 4*30;
end;
i = 1;
if S10_Dairy_old (i) = 0 then S10_Dairy_new (i) = 0;
else if S10_Dairy_old (i) = 1 then S10_Dairy_new (i) = 2;
else if S10_Dairy_old (i) = 2 then S10_Dairy_new (i) = 1.5*4;
else if S10_Dairy_old (i) = 3 then S10_Dairy_new (i) = 3.5*4;
else if S10_Dairy_old (i) = 4 then S10_Dairy_new (i) = 5.5*4;
else if S10_Dairy_old (i) = 5 then S10_Dairy_new (i) = 1*30;
else if S10_Dairy_old (i) = 6 then S10_Dairy_new (i) = 2*30;
else if S10_Dairy_old (i) = 7 then S10_Dairy_new (i) = 3*30;
else if S10_Dairy_old (i) = 8 then S10_Dairy_new (i) = 4*30;
end;
do i = 1 to 7;
if S10_Protein_old (i) = 0 then S10_Protein_new (i) = 0;
else if S10_Protein_old (i) = 1 then S10_Protein_new (i) = 2;
else if S10_Protein_old (i) = 2 then S10_Protein_new (i) = 1.5*4;
else if S10_Protein_old (i) = 3 then S10_Protein_new (i) = 3.5*4;
else if S10_Protein_old (i) = 4 then S10_Protein_new (i) = 5.5*4;
else if S10_Protein_old (i) = 5 then S10_Protein_new (i) = 1*30;
else if S10_Protein_old (i) = 6 then S10_Protein_new (i) = 2*30;
else if S10_Protein_old (i) = 7 then S10_Protein_new (i) = 3*30;
else if S10_Protein_old (i) = 8 then S10_Protein_new (i) = 4*30;
end;
do i = 1 to 2;
if S10_Oils_old (i) = 0 then S10_Oils_new (i) = 0;
else if S10_Oils_old (i) = 1 then S10_Oils_new (i) = 2;
else if S10_Oils_old (i) = 2 then S10_Oils_new (i) = 1.5*4;
else if S10_Oils_old (i) = 3 then S10_Oils_new (i) = 3.5*4;
else if S10_Oils_old (i) = 4 then S10_Oils_new (i) = 5.5*4;
else if S10_Oils_old (i) = 5 then S10_Oils_new (i) = 1*30;
else if S10_Oils_old (i) = 6 then S10_Oils_new (i) = 2*30;
else if S10_Oils_old (i) = 7 then S10_Oils_new (i) = 3*30;
else if S10_Oils_old (i) = 8 then S10_Oils_new (i) = 4*30;
end;
do i = 1 to 12;
if S10_EmptyCals_old (i) = 0 then S10_EmptyCals_new (i) = 0;
else if S10_EmptyCals_old (i) = 1 then S10_EmptyCals_new (i) = 2;
else if S10_EmptyCals_old (i) = 2 then S10_EmptyCals_new (i) = 1.5*4;
else if S10_EmptyCals_old (i) = 3 then S10_EmptyCals_new (i) = 3.5*4;
else if S10_EmptyCals_old (i) = 4 then S10_EmptyCals_new (i) = 5.5*4;
else if S10_EmptyCals_old (i) = 5 then S10_EmptyCals_new (i) = 1*30;
else if S10_EmptyCals_old (i) = 6 then S10_EmptyCals_new (i) = 2*30;
else if S10_EmptyCals_old (i) = 7 then S10_EmptyCals_new (i) = 3*30;
else if S10_EmptyCals_old (i) = 8 then S10_EmptyCals_new (i) = 4*30;
end;

*calculate average frequency for each food under category;
S10_Grains = (sum(of S10_Grains_new:))/5;
S10_Vegetables = (sum(of S10_Vegetables_new:))/5;
S10_Fruits = (sum(of S10_Fruits_new:))/2;
S10_Dairy = (sum(of S10_Dairy_new:))/1;
S10_Protein = (sum(of S10_Protein_new:))/7;
S10_Oils = (sum(of S10_Oils_new:))/2;
S10_EmptyCals = (sum(of S10_EmptyCals_new:))/12;
drop S10_Grains_new: S10_Vegetables_new: S10_Fruits_new: S10_Dairy_new:
S10_Protein_new: S10_Oils_new: S10_EmptyCals_new:;
run;

/*proc print data=flash.foodgroups;*/
/*var F09_Grains F09_Vegetables F09_Fruits F09_Dairy F09_Protein F09_Oils
F09_EmptyCals*/
/*  S10_Grains S10_Vegetables S10_Fruits S10_Dairy S10_Protein S10_Oils
S10_EmptyCals;*/
/*run;*/

/*categorize number of drinks into 3: none, moderate, heavy*/
data flash.drinks;set flash.foodgroups;
if S10_NumDrinks = 77 then S10_NumDrinks = 7; /*fix data entry error*/
if F09_NumDrinks = 0 then F09_DrinkCat = 1;
else if F09_NumDrinks <= 5 & F09_NumDrinks > 0 then F09_DrinkCat = 2;
else if F09_NumDrinks > 5 then F09_DrinkCat = 3;
if S10_NumDrinks = 0 then S10_DrinkCat = 1;
else if S10_NumDrinks <= 5 & S10_NumDrinks > 0 then S10_DrinkCat = 2;
else if S10_NumDrinks > 5 then S10_DrinkCat = 3;
run;

/*Deletes obs with missing sex variable*/
data flash.missingsex;set flash.drinks;
if Sex = . then delete;
run;

/*Calculates age, BMI, converts kg and cm for height and weight */
data flash.bmi;set flash.missingsex;
/*Error -- weight as 15, unclear what should be so set to missing*/
if id=7134 then F09_weight = .;
/*Error -- Sep.31 birthday*/
if Birthday=31 & BirthMonth=9 then Birthday=30;
/* calculate age */
if BirthDay=. & BirthMonth=. & BirthYear=. then do
bdate = mdy(BirthMonth,BirthDay,BirthYear);
F09_agewithdec=(F_2009_SV_Date - bdate)/365.25;
F09_age = int(F09_agewithdec);
end;

if F09_HeightIn=. & F09_HeightFt=. & F09_Weight=. then do
/* Height: Inches to CM */
F09_Height = F09_HeightIn + (F09_HeightFt*12);
F09_HeightCM = F09_Height*2.54;
F09_HeightMeters = F09_HeightCM/100;

/* Weight: Pounds to kg */
F09_WeightKg = F09_Weight*0.45359237;

/* Calculate BMI */
F09_PerceivedBMI = F09_WeightKg/(F09_HeightMeters*F09_HeightMeters);
end;

/* Spring 2010 */
/* calculate age */
if BirthDay=. & BirthMonth=. & BirthYear=. then do
    bdate = mdy(BirthMonth,BirthDay,BirthYear);
    S10_agewithdec=(S_2010_SV_Date - bdate)/365.25;
    S10_age = int(S10_agewithdec);
end;

if S10_HeightIn=. & S10_HeightFt=. & S10_Weight=. then do
/* Height: Inches to CM */
S10_Height = S10_HeightIn + (S10_HeightFt*12);
S10_HeightCM = S10_Height*2.54;
S10_HeightMeters = S10_HeightCM/100;

/* Weight: Pounds to kg */
S10_WeightKg = S10_Weight*0.45359237;

/* Calculate BMI */
S10_PerceivedBMI = S10_WeightKg/(S10_HeightMeters*S10_HeightMeters);
end;

drop bdate F09_agewithdec S10_agewithdec;
run;

data flash.ipaq; set flash.bmi;
/*F09_IPAQ=put(F09_IPAQ,1.); *make sure numeric;/*
/*S10_IPAQ=put(S10_IPAQ,1.);*/
/*Create IPAQ groupings based on article from FLASH binder*/
F09_IPAQ = 1;
if F09_VigPhysActDays in (5,6,7) & (F09_VigPhysActHrs>=0.5 | F09_ModPhysActHrs>=1) then F09_IPAQ = 3;
else if F09_VigPhysActHrs>=0.5 | F09_ModPhysActHrs>=0.5 then F09_IPAQ = 2;

S10_IPAQ = 1;
if S10_VigPhysActDays in (5,6,7) & (S10_VigPhysActHrs>=0.5 | S10_ModPhysActHrs>=1) then S10_IPAQ = 3;
else if S10_VigPhysActHrs>=0.5 | S10_ModPhysActHrs>=0.5 then S10_IPAQ = 2;
/*Categorize change in IPAQ*/
length IPAQchange 8;
if F09_IPAQ ^= . & S10_IPAQ ^= . then do;
    IPAQchange = 2;
    if F09_IPAQ < S10_IPAQ then IPAQchange = 3;
else if F09_IPAQ > S10_IPAQ then IPAQchange = 1;
end;
run;

data flash.diffs; set flash.ipaq;
GrainDiff = F09_Grains - S10_Grains;
VegDiff = F09_Vegetables - S10_Vegetables;
FruitDiff = F09_Fruits - S10_Fruits;
DairyDiff = F09_Dairy - S10_Dairy;
ProteinDiff = F09_Protein - S10_Protein;
OilDiff = F09_oils - S10_oils;
EmptycalDiff = F09_EmptyCals - S10_EmptyCals;
BMIDiff = F09_PerceivedBMI - S10_PerceivedBMI;
StressDiff = F09_StressScore - S10_StressScore;
run;

data flash.sleep; set flash.diffs;
if F09_SleepQuant in (1,2) then F09_SleepQuantCat=1;
else if F09_SleepQuant = 3 then F09_SleepQuantCat=2;
else if F09_SleepQuant in (4,5) then F09_SleepQuantCat=3;
*if F09_SleepQual in (1,2) then F09_SleepQualCat=1;
if F09_SleepQual = 1 then F09_SleepQualCat=1;
else if F09_SleepQual = 2 then F09_SleepQualCat=1;
else if F09_SleepQual = 3 then F09_SleepQualCat=2;
else if F09_SleepQual = 4 then F09_SleepQualCat=3;
else if F09_SleepQual = 5 then F09_SleepQualCat=3;
*else if F09_SleepQual in (4,5) then F09_SleepQualCat=3;
if S10_SleepQuant in (1,2) then S10_SleepQuantCat=1;
else if S10_SleepQuant = 3 then S10_SleepQuantCat=2;
else if S10_SleepQuant in (4,5) then S10_SleepQuantCat=3;
*if S10_SleepQual in (1,2) then S10_SleepQualCat=1;
if S10_SleepQual = 1 then S10_SleepQualCat=1;
else if S10_SleepQual = 2 then S10_SleepQualCat=1;
else if S10_SleepQual = 3 then S10_SleepQualCat=2;
else if S10_SleepQual = 4 then S10_SleepQualCat=3;
else if S10_SleepQual = 5 then S10_SleepQualCat=3;
*else if S10_SleepQual in (4,5) then S10_SleepQualCat=3;
run;

data flash.finaldataset; set flash.sleep;
/* Adds labels and formats */
LABEL
    Sex = "Sex"
    RaceNum = "Race"
    F09_Age = "Age - Fall 2009"
    S10_Age = "Age - Spring 2010"
    F09_Height = "Height(in) - Fall 2009"
S10_Height = "Height(in) - Spring 2010"
F09_MotherEd = "Mother's Education - Fall 2009"
S10_MotherEd = "Mother's Education - Spring 2010"
F09_FatherEd = "Father's Education - Fall 2009"
S10_FatherEd = "Father's Education - Spring 2010"
F09_MotherIncome = "Mother's Income - Fall 2009"
S10_MotherIncome = "Mother's Income - Spring 2010"
F09_FatherIncome = "Father's Income - Fall 2009"
S10_FatherIncome = "Father's Income - Spring 2010"
F09_CPRes = "Cal Poly Residence - Fall 2009"
S10_CPRes = "Cal Poly Residence - Spring 2010"
F09_Health = "Overall Health - Fall 2009"
S10_Health = "Overall Health - Spring 2010"
F09_PerceivedBMI = "Perceived Body Mass Index - Fall 2009"
S10_PerceivedBMI = "Perceived Body Mass Index - Spring 2010"
F09_Alcohol = "Alcohol Use in Past 30 Days - Fall 2009"
S10_Alcohol = "Alcohol Use in Past 30 Days - Spring 2010"
F09_Over5DrinksAtOnce = "Binge Drinking in Past 30 Days - Fall 2009"
S10_Over5DrinksAtOnce = "Binge Drinking in Past 30 Days - Spring 2010"
F09_HrsSleepWeeknight = "Average Hours of Sleep: Weeknights - Fall 2009"
S10_HrsSleepWeeknight = "Average Hours of Sleep: Weeknights - Spring 2010"
F09_HrsSleepWeekend = "Average Hours of Sleep: Weekends - Fall 2009"
S10_HrsSleepWeekend = "Average Hours of Sleep: Weekends - Spring 2010"
F09_SleepQual = "Sleep Quality - Fall 2009"
S10_SleepQual = "Sleep Quality - Spring 2010"
F09_SleepQuant = "Sleep Quantity - Fall 2009"
S10_SleepQuant = "Sleep Quantity - Spring 2010"
F09_VigPhysActDays = "Days per Week of Vigorous Physical Activity - Fall 2009"
S10_VigPhysActDays = "Days per Week of Vigorous Physical Activity - Spring 2010"
F09_StressScore = "Stress Score (7 - 70) - Fall 2009"
S10_StressScore = "Stress Score (7 - 70) - Spring 2010"
F09_EatingPref = "Eating Preference: Vegetarian or Non-Vegetarian - Fall 2009"
S10_EatingPref = "Eating Preference: Vegetarian or Non-Vegetarian - Spring 2010"
F09_Grains = "Grain Consumption - Fall 2009"
S10_Grains = "Grain Consumption - Spring 2010"
F09_Vegetables = "Vegetable Consumption - Fall 2009"
S10_Vegetables = "Vegetable Consumption - Spring 2010"
F09_Fruits = "Fruit Consumption - Fall 2009"
S10_Fruits = "Fruit Consumption - Spring 2010"
F09_Dairy = "Dairy Consumption - Fall 2009"
S10_Dairy = "Dairy Consumption - Spring 2010"
F09_Protein = "Protein Consumption - Fall 2009"
S10_Protein = "Protein Consumption - Spring 2010"
F09_Oils = "Oil Consumption - Fall 2009"
S10_Oils = "Oil Consumption - Spring 2010"
F09_EmptyCals = "Empty Calorie Consumption - Fall 2009"
S10_EmptyCals = "Empty Calorie Consumption - Spring 2010"
F09_DrinkCat = "Drinking Habits (per night of drinking) - Fall 2009"
S10_DrinkCat = "Drinking Habits (per night of drinking) - Spring 2010"
F09_SleepQuantCat = "Sleep Quantity Category - Fall 2009"
S10_SleepQuantCat = "Sleep Quantity Category - Spring 2010"
F09_SleepQualCat = "Sleep Quality Category - Fall 2009"
S10_SleepQualCat = "Sleep Quality Category - Spring 2010"
F09_IPAQ = "IPAQ - Fall 2009"
S10_IPAQ = "IPAQ - Spring 2010"
IPAQchange = "Change in IPAQ Score"

format
Sex  gender.
RaceNum  racenum.
F09_MotherEd  F09_FatherEd  parenteducation.
F09_MotherIncome  F09_FatherIncome  parentincome.
F09_CPRes  cpresidence.
F09_Health  S10_Health  overallhealth.
F09_WeightDescr  S10_WeightDescr  weightdescription.
F09_WeightChange  S10_WeightChange  weightchange.
F09_Cig  F09_OtherSmokingTobacco  F09_Marijuana  F09_Alcohol  S10_Cig
S10_OtherSmokingTobacco  S10_Marijuana  S10_Alcohol  druguse.
F09_Over5DrinksAtOnce  S10_Over5DrinksAtOnce  fiveDrinks.
F09_NumDrinks  S10_NumDrinks  numberDrinks.
F09_SafeSex  S10_SafeSex  safeSex.
F09_DiffFallAsleep  F09_DiffStayAsleep  S10_DiffFallAsleep  S10_DiffStayAsleep
neververyoften.
F09_SleepQual  F09_SleepQuant  S10_SleepQual  S10_SleepQuant
verybadexcellent.
F09_HrsSleepWeeknight  F09_HrsSleepWeekend  S10_HrsSleepWeeknight
S10_HrsSleepWeekend  sleephr.
F09_EarlyBirdNightOwl  S10_EarlyBirdNightOwl  earlybirdnightOwl.
F09_HrsTvWeekday  F09_HrsVideoGamesWeekday  F09_HrsInternetWeekday
F09_HrsTvWeekend  F09_HrsVideoGamesWeekend  F09_HrsInternetWeekend
S10_HrsTvWeekday  S10_HrsVideoGamesWeekday  S10_HrsInternetWeekday
S10_HrsTvWeekend  S10_HrsVideoGamesWeekend  S10_HrsInternetWeekend
entertainment.
F09_TextPerDay  S10_TextPerDay  text.
F09_AltDiet  S10_AltDiet  diet.
F09_TypeMilk  S10_TypeMilk  milk.
F09_SoftDrinks  S10_SoftDrinks  soda.
F09_CoffeeAdd  S10_CoffeeAdd  coffee.
F09_ColdCereal  F09_Milk  F09_BaconSausage  F09_HotDogs  F09_Hamburgers
F09_Pizza  F09_Sandwich  F09_FrenchFries  F09_Potatoes  F09_Beans  F09_Fish
F09_RedMeat  F09_Chicken  F09_PeanutButter  F09_Jelly  F09_Mayo
F09_Fruit
F09_Lettuce  F09_Veggies  F09_WhiteBread  F09_WheatBread  F09_Pasta
F09_Nuts
F09_Chips  F09_Cake  F09_FrozenDessert  F09_FruitJuice  F09_FruitDrink
F09_SoftDrink  F09_DietSoftDrink  F09_Coffee  F09_EnergyDrinks  F09_Water
S10_ColdCereal  S10_Milk  S10_BaconSausage  S10_HotDogs  S10_Hamburgers
S10_Pizza  S10_Sandwich  S10_FrenchFries  S10_Potatoes  S10_Beans  S10_Fish
S10_RedMeat  S10_Chicken  S10_PeanutButter  S10_Jelly  S10_Mayo
S10_Fruit
S10_Lettuce  S10_Veggies  S10_WhiteBread  S10_WheatBread  S10_Pasta
S10_Nuts
S10_Chips  S10_Cake  S10_FrozenDessert  S10_FruitJuice  S10_FruitDrink
S10_SoftDrink  S10_DietSoftDrink  S10_Coffee  S10_EnergyDrinks  S10_Water
eat.
F09_SunExposure  S10_SunExposure  sunexposure.
F09_TimeOutdoorsWeekday  F09_TimeOutdoorsWeekend
S10_TimeOutdoorsWeekday  S10_TimeOutdoorsWeekend  timespent.
F09_Sunscreen S10_Sunscreen sunscreen.
F09_TanningBed S10_TanningBed tanningbed.
F09_NapWeekday F09_NapWeekend S10_NapWeekday S10_NapWeekend nap.
Hispanic American Indian Asian Black Hawaiian White F09_Grant
F09_Scholarship
F09_Loan F09_SelfFunded F09_FamilyFunded S10_SexActive S10_SexActive
F09_HormonalContraceptive S10_HormonalContraceptive F09_Pregnant
F09_SexContrIssues S10_SexContrIssues F09_CP Athletic S10_CP Athletic
F09_HS Athletic S10_HS Athletic
F09_RiceMilk
F09_AlmondMilk F09_OtherMilk F09_Don tDrinkMilk S10_SoyMilk
F09_RiceMilk S10_AlmondMilk S10_OtherMilk S10_Don tDrinkMilk
F09_SpecCoffee S10_SpecCoffee F09_DietSupplements S10_DietSupplements
F09_NoSupplement F09_MultiVitamin F09_BetaCarotene F09_FolicAcid
F09_BVitamins F09_VitaminC F09_VitaminD F09_NoMinerals F09_MultiMineral
F09_Calcium F09_Iron F09_Magnesium F09_Potassium F09_NoHerb
F09_Echinacea
F09_Ginko F09_Ginseng F09_StJohnsWort F09_Guarana F09_NoOtherSupp
F09_Creatine F09_Ephedrine F09_DHEA F09_Whey F09_AminoAcids
F09_Omega3
F09_Fiber F09_WeightLoss F09_WeightGain F09_PrescriptionMeds
S10_NoSupplement S10_MultiVitamin S10_BetaCarotene S10_FolicAcid
S10_BVitamins S10_VitaminC S10_VitaminD S10_NoMinerals S10_MultiMineral
S10_Calcium S10_Iron S10_Magnesium S10_Potassium S10_NoHerb
S10_Echinacea
S10_Ginko S10_Ginseng S10_StJohnsWort S10_Guarana S10_NoOtherSupp
S10_Creatine S10_Ephedrine S10_DHEA S10_Whey S10_AminoAcids S10_Omega3
S10_Fiber S10_WeightLoss S10_WeightGain S10_PrescriptionMeds
F09_SunExFace F09_SunExNeck F09_SunExShoulders F09_SunExBack
F09_SunExUpperArms F09_SunExLowerArms F09_SunExHands F09_SunExStomach
F09_SunExUpperThighs F09_SunExLowerLegs F09_SunExFeet S10_SunExFace
S10_SunExNeck S10_SunExShoulders S10_SunExBack S10_SunExUpperArms
S10_SunExLowerArms S10_SunExHands S10_SunExStomach S10_SunExUpperThighs
S10_SunExLowerLegs S10_SunExFeet F09_FlashDormFlyer F09_FlashFacebook
F09_FlashEmail F09_FlashWordOfMouth F09_FlashRA F09_FlashCommercial
S10_FlashDormFlyer S10_FlashFacebook S10_FlashEmail
S10_FlashWordOfMouth
S10_FlashRA S10_FlashCommercial yes no.
F09_DrinkCat S10_DrinkCat drinking.
F09_SleepQuantCat S10_SleepQuantCat F09_SleepQualCat S10_SleepQualCat
sleepcat.
F09_IPAQ S10_IPAQ ipaq. IPAQ change ipaqchange.;
run;

proc print data=flash.finaldataset label; run;

/*Subsets by sex*/
data flash.males; set flash.finaldataset; if sex=1; run;
data flash.females; set flash.finaldataset; if sex=2; run;

/****REARRANGE DATA*****/
/* split data by quarter */
data flash.Fall09
(rename=(
F09_StressScore = StressScore
F09_PerceivedBMI = PerceivedBMI

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F09_SleepQuantCat = SleepQuantCat
F09_SleepQualCat = SleepQualCat
F09_IPAQ = IPAQ
F09_Grains = Grains
F09_Vegetables = Vegetables
F09_Fruits = Fruits
F09_Dairy = Dairy
F09_Protein = Protein
F09_Oils = Oils
F09_EmptyCals = EmptyCals

set flash.finaldataset;
keep ID Sex RaceNum Quarter F09_StressScore F09_PerceivedBMI
   F09_SleepQuantCat F09_SleepQualCat F09_IPAQ
   F09_Grains F09_Vegetables F09_Fruits F09_Dairy F09_Protein F09_Oils
   F09_EmptyCals IPAQchange;
/* - F09::*/
Quarter = 1; format Quarter quarter.;
run;

data flash.Spring10
   (rename=(
      S10_StressScore = StressScore
      S10_PerceivedBMI = PerceivedBMI
      S10_SleepQuantCat = SleepQuantCat
      S10_SleepQualCat = SleepQualCat
      S10_IPAQ = IPAQ
      S10_Grains = Grains
      S10_Vegetables = Vegetables
      S10_Fruits = Fruits
      S10_Dairy = Dairy
      S10_Protein = Protein
      S10_Oils = Oils
      S10_EmptyCals = EmptyCals
   ));
set flash.finaldataset;
keep ID Sex RaceNum Quarter S10_StressScore S10_PerceivedBMI
   S10_SleepQuantCat S10_SleepQualCat S10_IPAQ
   S10_Grains S10_Vegetables S10_Fruits S10_Dairy S10_Protein S10_Oils
   S10_EmptyCals IPAQchange;
/* - S10::*/
Quarter = 2; format Quarter quarter.;
run;

proc sort data=flash.Fall09; by ID; run;
proc sort data=flash.Spring10; by ID; run;

data flash.stacked;
   merge flash.Fall09
      flash.Spring10;
      by ID Quarter;
Label
   Grains = "Grains"
   Vegetables = "Vegetables"
   Fruits = "Fruits"
   Dairy = "Dairy"
   Protein = "Protein"
Oils = "Oils"
EmptyCals = "EmptyCals"
run;
proc sort data=flash.stacked out=flash.stacked_sorted;
by Quarter;
run;

/*TRANPOSE*/
data flash.food (keep=ID Quarter Grains Vegetables Fruits Dairy Protein Oils EmptyCals);
set flash.stacked; run;
data flash.notfood (keep=ID Quarter Sex RaceNum PerceivedBMI StressScore SleepQuantCat SleepQualCat IPAQ);
set flash.stacked; run;
proc transpose data=flash.food out=flash.transpose prefix=consumption;
by ID Quarter;
var Grains Vegetables Fruits Dairy Protein Oils EmptyCals;
run;
proc sort data=flash.transpose; by ID; run;
proc sort data=flash.notfood; by ID; run;
data flash.narrow (rename=(consumption1=Consumption _NAME_=Food));
merge flash.notfood flash.transpose;
by ID Quarter;
run;
proc sort data=flash.narrow; by ID Quarter; run;

/* MACRO */
dm 'log; clear; output; clear; ';
options symbolgen mlogic mprint;

/*Categorical Vars*/
DATA flash.FREQvars;
RETAIN
    /*Sociodemographic Information*/
    Sex RaceNum F09_MotherEd S10_MotherEd F09_FatherEd S10_FatherEd F09_CPRes S10_CPRes F09_MotherIncome S10_MotherIncome F09_FatherIncome S10_FatherIncome
    /*Health Perceptions and Lifestyle*/
    F09_Health S10_Health F09_PeceivedBMI S10_PeceivedBMI F09_Alcohol S10_Alcohol F09_Over5DrinksAtOnce S10_Over5DrinksAtOnce F09_HrsSleepWeeKnight S10_HrsSleepWeeKnight F09_HrsSleepWeekend S10_HrsSleepWeekend F09_SleepQual S10_SleepQual F09_SleepQuant S10_SleepQuant
    /*Physical Activity and Exercise Habits*/
    F09_VigPhysActDays S10_VigPhysActDays
    /*Stress*/
    F09_StressScore S10_StressScore
    /*Dietary Habits and Dining Patterns*/
DATA flash.QUAnvars;
  SET flash.finaldataset;
  KEEP */
  F09_PerceivedBMI S10_PerceivedBMI F09_HrsSleepWeeknight F09_HrsSleepWeeknight S10_HrsSleepWeeknight*/
  /*
  F09_VigPhysActDays S10_VigPhysActDays F09_StressScore S10_StressScore*/
  Sex RaceNum F09_Grains S10_Grains F09_Vegetables S10_Vegetables
  F09_Fruits S10_Fruits
  F09_Dairy S10_Dairy F09_Protein S10_Protein F09_Oils S10_Oils
  F09_EmptyCals S10_EmptyCals
  ;
RUN;

ods graphics on;

%Macro CreateFreq;
  proc contents data = flash.FREQvars /*creates dataset varList with variable names and their formats*/
    out = varList1 (keep=name format varnum) noprint;
  run;
  proc sort data=VarList1;
    by varnum;
  run;
  %global nObs; /*counts the number of variables and assigns to nObs. ??*/
  data _null_; 
    set varList1 nobs=nobs;
    call symput('nObs',strip(put(nObs,5.)));
    stop;
  run;
  %put < &nObs. >;
  *************************************************************;
  * Build a looper dataset and then execute                   *
  *************************************************************;
  ods noproctitle;
  ods pdf file="F:\FLASH\Output\DescriptiveStats(FREQ).pdf" FONTSCALE=100 NOTOC STARTPAGE=NO;
  %do i=1 %to &nObs. ;
    %global nexVarToGraph nexVarToTitle nextFmtToUse;
    data _null_; 
      set varList1;
      if _n_ = &i. ;
      call symput('nexVarToGraph',strip(name));
      call symput('nextFmtToUse',strip(format));
      call symput('nexVarToTitle',strip(translate(name,' ','_')));
    run;
    %global nLevels;
    proc sql noprint;
      select count(distinct(&nexVarToGraph)) into:nLevels
      from flash.FREQvars;
    quit;
  %end;
  /*****************************************************************************/
  /*The following PROC FREQs and PROC SGPLOTs can be commented out as desired*/
  /*****************************************************************************/
  /* Proc Freq of Overall */
  *Title &nexVarToTitle;
  proc freq data=flash.FREQvars;
    TABLE &nexVarToGraph;
  run;
  /* Graph of OVERALL */
  pattern color=orange v=solid;
proc SGPLOT data=flash.FREQvars;
  VBAR &nexVarToGraph;
run;

/* Proc Freq By Sex */
Title &nexVarToTitle;
proc freq data=flash.FREQvars;
  TABLE &nexVarToGraph*Sex;
run;
/* Graph BY SEX */
pattern color=orange v=solid;
proc SGPLOT data=flash.FREQvars;
  VBAR &nexVarToGraph / GROUP = Sex;
run;

/* Proc Freq BY RACE */
Title &nexVarToTitle;
proc freq data=flash.FREQvars;
  table &nexVarToGraph * racenum;
run;
/* Graph BY RACE */
pattern color=orange v=solid;
proc SGPLOT data=flash.FREQvars;
  VBAR &nexVarToGraph / GROUP=racenum;
run;
quit;

%end;
ods pdf close;
%Mend CreateFreq;

%CreateFreq;

%Macro CreateMeans;

proc contents data = flash.QUANvars /*creates dataset varList with variable names and their formats*/
  out = varList2 (keep=name format varnum) noprint;
run;
proc sort data=VarList2;
  by varnum;
run;

%global nObs; /*counts the number of variables and assigns to nObs. ??*/
data _null_; /*build a looper dataset and then execute*/
  set varList2 nobs=nobs;
  call symput('nObs',strip(put(nObs,5.)));/* Build a looper dataset and then execute */
  stop;
run;
%put < &nObs. >;

******************************************************************************
* Build a looper dataset and then execute                                       *;
%do i=1 %to &nObs.;
  %global nexVarToGraph nexVarToTitle nextFmtToUse;
data _null_;  
  set varList2;
  if _n_ = &i.;
  call symput('nexVarToGraph',strip(name));
  call symput('nextFmtToUse',strip(format));
  call symput('nexVarToTitle',strip(translate(name,' ','_')));
run;

%global nLevels;
proc sql noprint;
  select count(distinct(&nexVarToGraph.)) into:nLevels
  from flash.QUANvars;
quit;

****
/*The following PROC MEANs and PROC SGLOTs can be commented out as desired*/
****

%put Next variable to plot is &nexVarToGraph. a with title of &nexVarToTitle. with a form at of &nextFmtToUse.;

/* Proc Means of Overall */
proc means data=flash.QUANvars mean median std min max nmiss;
  VAR &nexVarToGraph;
run;
PROC MEANS data=flash.QUANvars mean median std min max nmiss;
  VAR &nexVarToGraph;
  CLASS Sex;
Run;
PROC MEANS data=flash.QUANvars mean median std min max nmiss;
    VAR &nexVarToGraph;
    CLASS RaceNum;
Run;
PROC SGPLOT data=flash.QUANvars;
HISTOGRAM &nexVarToGraph;
RUN;
%end;
ods pdf close;
%Mend CreateMeans;

%CreateMeans;
ods graphics off;
/* Data Analysis */
/* DESCRIPTIVE STATS */
ods rtf file='F:\FLASH\Output\Descriptive_2.rtf';
ods rtf file='C:\Users\chels\Documents\FLASH\Output\Descriptive_2.rtf';
proc freq data=flash.stacked_sorted;
by Quarter;
table Sex RaceNum SleepQuantCat SleepQualCat IPAQ;
run;
proc means data=flash.stacked_sorted;
by quarter;
var PerceivedBMI StressScore;
run;
proc means data=flash.stacked_sorted;
by quarter;
var grains vegetables fruits dairy protein oils emptycals;
run;
ods rtf close;

/* UNIVARIATE PAIRED T-TESTS */
ods rtf file='F:\FLASH\Output\PairedT_1.rtf';
ods rtf file='C:\Users\chels\Documents\FLASH\Output\PairedT_1.rtf';
proc ttest data=flash.finaldataset;
paired F09_Oils*S10_Oils;run;
proc ttest data=flash.finaldataset;
paired F09_StressScore*S10_StressScore;
run;
/*proc ttest data=flash.finaldataset;
paired F09_PerceivedBMI*S10_PerceivedBMI;
run;*/
ods rtf close;

/* TEST OF SYMMETRY */
ods rtf file='F:\FLASH\Output\Symmetry_1.rtf';
ods rtf file='C:\Users\chels\Documents\FLASH\Output\Symmetry_1.rtf';
proc freq data=flash.finaldataset;
tables F09_SleepQualCat * S10_SleepQualCat / Agree;
run;
proc freq data=flash.finaldataset;
tables F09_SleepQuantCat * S10_SleepQuantCat / Agree;
run;
proc freq data=flash.finaldataset;
   tables F09_IPAQ * IPAQ / Agree;
run;
ods rtf close;

/* MULTIVARIATE */
/* PAIRED HOTELLING */
ods rtf file='F:\FLASH\Output\MultiVar_1.rtf';
ods rtf file='C:\Users\chels\Documents\FLASH\Output\MultiVar_1.rtf';

/*comparing all 3 methods*/
proc iml;
  start hotel;
    mu0={0, 0, 0, 0, 0, 0, 0};
    one=j(nrow(x),1,1);
    ident=i(nrow(x));
    ybar=x`*one/nrow(x);
    s=x`*(ident-one*one`/nrow(x))*x/(nrow(x)-1.0);
    print mu0 ybar;
    print s;
    t2=nrow(x)*(ybar-mu0)`*inv(s)*(ybar-mu0);
    f=(nrow(x)-ncol(x))*t2/ncol(x)/(nrow(x)-1);
    df1=ncol(x);
    df2=nrow(x)-ncol(x);
    pvalue=1-probf(f,df1,df2);
    print t2 f df1 df2 pvalue;
  finish;
  use hotelling;
  read all var{graindiff vegdiff fruitdiff dairydiff proteindiff oildiff emptycaldiff} into x;
run hotel;
quit;

/* PROC REG and GLM PROGRAMS TO COMPUTE THE ONE-SAMPLE HOTELLING'S T-SQUARED STATISTIC.*/
This example is a the multivariate paired difference test, which is the multivariate analog of the paired t test. */
proc reg data=flash.finaldataset;
   model graindiff vegdiff fruitdiff dairydiff proteindiff oildiff emptycaldiff = ; /* The intercept is the only term in this model */
   mtest intercept; /* Performs the multivariate test on the mean vector */
run;quit;
proc glm data=flash.finaldataset;
   model graindiff vegdiff fruitdiff dairydiff proteindiff oildiff emptycaldiff = ; /* The intercept is the only term in this model */
   manova h=intercept;
run;quit;
ods rtf close;

/* MANOVA & MULTIVARIATE REGRESSION */
proc glm data=flash.stacked;
   class Sex Quarter;
/* to compare to only grains */
proc glm data=flash.stacked;
  class Sex Quarter;
  model Grains = Sex|Quarter;
  manova h=intercept;
run;quit;

/* MULTIVARIATE REPEATED MEASURES */
proc mixed data=flash.narrow;
  class Food ID Sex Quarter;
  model Consumption = Food|Quarter|Sex StressScore;
  repeated Food Quarter / type=un@un subject=ID;
run;

/*100 person dataset for testing*/
/*only want people with all 7 foods for both quarters*/
data flash._100; set flash.narrow(keep=ID Sex Food Quarter Consumption SleepQuantCat StressScore RaceNum PerceivedBMI);
  if food='' & quarter=. & sex=. & consumption=. & SleepQuantCat=. & StressScore=. & RaceNum=. & PerceivedBMI=.;
retain temp;
retain i 1;
if id=temp then count=0;
count+1;
temp=id;
drop temp i;
run;
proc sort data=flash._100;
by ID descending count;
run;
data flash._100_2; set flash._100;
by ID descending count;
retain good i;
if first.ID & count=14 then good=1;
else if first.ID & count=14 then good=0;
if good=1;
i+1;
if i<=1400;
drop count i good;
run;
proc print data=flash._100_2; run;

data flash.narrow_cleaned; set flash.narrow(keep=ID Sex Food Quarter Consumption SleepQuantCat StressScore RaceNum PerceivedBMI IPAQ);
  if food='' & quarter=. & sex=. & consumption=. & SleepQuantCat=. & StressScore=. & RaceNum=. & PerceivedBMI=. & IPAQ=.;
retain temp;
retain i 1;
if id=temp then count=0;
COUNT+1;
TEMP=ID;
DROP TEMP I;
RUN;
PROC SORT DATA=FLASH.NARROW_CLEANED;
BY ID DESCENDING COUNT;
RUN;
DATA FLASH.NARROW_CLEANED_2; SET FLASH.NARROW_CLEANED;
BY ID DESCENDING COUNT;
RETAIN GOOD;
IF FIRST.ID & COUNT=14 THEN GOOD=1;
ELSE IF FIRST.ID & COUNT^=14 THEN GOOD=0;
IF GOOD=1;
DROP COUNT GOOD;
RUN;
PROC PRINT;RUN;

/* STRIP PLOT */
PROC MIXED DATA=FLASH._100_2 METHOD=TYPE3 LOGNOTE MAXITER=10;
   CLASS ID SEX QUARTER FOOD;
   MODEL Consumption = SEX|QUARTER|FOOD STRESSSCORE|FOOD|QUARTER|SEX;
   RANDOM ID(SEX) FOOD*ID(SEX) STRESSSCORE*QUARTER*ID(SEX);
RUN;

/* SPLIT W/ REPEATED MEASURES */
PROC MIXED DATA=FLASH.NARROW METHOD=MIVQUE0 LOGNOTE;
   CLASS ID SEX FOOD QUARTER;
   MODEL consumption = sex food quarter;
   RANDOM id(sex) food*id(sex);
   REPEATED food / TYPE=UN SUBJECT=QUARTER*ID(SEX);
RUN;

/* SPLIT-SPLIT */
PROC MIXED DATA=FLASH.NARROW_CLEANED_2 LOGNOTE NOCLPRINT;
   CLASS ID SEX FOOD QUARTER;
   MODEL consumption = sex|food|quarter
                      STRESSSCORE
                      STRESSSCORE*FOOD
                      / DDFM=KR;
   RANDOM id(sex) food*id(sex);
   LSMEANS sex*food*quarter;
RUN;
(D) MANOVA Work

\[ H_0: \mu_M = \mu_F \]

\[
\begin{bmatrix}
\mu_{M1} \\
\vdots \\
\mu_{Mk}
\end{bmatrix} =
\begin{bmatrix}
\mu_{F1} \\
\vdots \\
\mu_{Fk}
\end{bmatrix}
\]

\[ H = n \left( \bar{y}_M - \bar{y}_F \right) \left( \bar{y}_M - \bar{y}_F \right)' \]

\[ = n \left[ \left( \bar{y}_{M1} - \bar{y}_F \right) \left( \bar{y}_{F1} - \bar{y}_F \right)' + \left( \bar{y}_{M2} - \bar{y}_F \right) \left( \bar{y}_{F2} - \bar{y}_F \right)' + \cdots + \left( \bar{y}_{Mk} - \bar{y}_F \right) \left( \bar{y}_{Fk} - \bar{y}_F \right)' \right] \]

\[ = n \left[ \left( \bar{y}_{M1} - \bar{y}_F \right)^2 + \left( \bar{y}_{M2} - \bar{y}_F \right)^2 + \cdots + \left( \bar{y}_{Mk} - \bar{y}_F \right)^2 \right] + \left( \bar{y}_{M1} - \bar{y}_F \right) \left( \bar{y}_{M2} - \bar{y}_F \right) + \cdots + \left( \bar{y}_{Mk} - \bar{y}_F \right) \left( \bar{y}_{Mk} - \bar{y}_F \right) \]

\[ = n \left[ \left( \bar{y}_{M1} - \bar{y}_F \right)^2 + \left( \bar{y}_{M2} - \bar{y}_F \right)^2 + \cdots + \left( \bar{y}_{Mk} - \bar{y}_F \right)^2 \right] + \left( \bar{y}_{M1} - \bar{y}_F \right) \left( \bar{y}_{M2} - \bar{y}_F \right) + \cdots + \left( \bar{y}_{Mk} - \bar{y}_F \right) \left( \bar{y}_{Mk} - \bar{y}_F \right) \]
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