U.S. Consumer’s Intake of Food At Home and Food Away from Home as A Complex Economic System

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Background Information and Justification

- Americans spend 9.7% of their disposable income on food each year, and food expenditures are the third largest expenditure in the U.S. economy.
- In 2009 Food Away From Home expenditures surpassed Food At Home for the first time.
- As of 2018, less than 50% of food expenditures were used to purchase FAH.
- Rise of FAFH expenditures
  - Industrialization of the 19th century
  - Urbanization and creation of automobiles
- Literature suggests that factors such as income, time constraints, relative price of food and non-food items, and household demographic composition are important factors in determining the U.S. consumer’s food expenditures.
Important Definitions

● Food at Home- FAH
  ○ All food purchased from supermarkets, retailers, smaller grocery stores, or supercenters
  ○ It can include prepared or semi-prepared items that are consumed off-premise or at home

● Food Away From Home- FAFH
  ○ Food obtained from restaurants, school lunches, and an ‘other’ category.
  ○ Restaurants encompass both full service and fast-food establishments.
  ○ The other category holds expenditures such as vending machines, someone else, etcetera
Consumer Expenditure Patterns

Constant-dollar food expenditures, 1987-2017 (1988 = 100)

Objectives

- Discover factors that influence consumers' consumption of FAH and FAFH
  - Identify factors that influence consumer expenditure
  - Determine correlations between expenditures and other factors
  - Find causality structures determining FAH and FAFH intake/consumption patterns using cutting-edge machine learning algorithms (Directed Acyclic Graphs)
Data

- United States Department of Agriculture- Economic Research Service
  - FoodAPS National Household Food Acquisition and Purchase Survey
- Week-long survey of households from April 2012 and January 2013.
- Instructed to record all FAH and FAFH expenditures
  - Other factors were collected such as income, program participation, food security, health status, and distance to local supermarkets
- This study focuses on 10 variables- FAH, FAFH, Age, Sex, Race, Ethnicity, Employment, Education, Marital Status, and BMI.
  - The original data contains many more variables, and further research can begin to include these for a more inclusive view.
  - We excluded everyone under 21 due to missing BMI, Education, Marital Status, and Employment.
Variables

Sex

- Female: 4936
- Male: 4216

Ethnicity

- Hispanic: 7130
- Non-Hispanic: 2022

Race

- White: 69%
- Black: 14%
- American Indian: 9%
- Asian: 5%
- Other: 2%
- Multiple Race: 1%

- Hispanic: 9%
- Non-Hispanic: 71%
- White: 69%
- Black: 14%
- American Indian: 9%
- Asian: 5%
- Other: 2%
- Multiple Race: 1%
Variables

Employment

- Employed: 49%
- Unemployed: 51%

Education

- None: 14%
- <10th Grade: 29%
- H.S. Diploma: 13%
- Some college: 6%
- HS, No Diploma: 14%
- Bachelor's: 32%

Marital Status

- Married: 46%
- Widowed: 6%
- Divorced: 14%
- Separated: 4%
- Never Married: 30%
## Summary Statistics

<table>
<thead>
<tr>
<th></th>
<th>FAH ($/person/week)</th>
<th>FAFH ($/person/week)</th>
<th>Age (in years)</th>
<th>BMI (kg/m²)</th>
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Methodology

- Causality structures are identified through Greedy Equivalence Search (GES) machine-learning algorithm.
- GES is operationalized through TETRAD statistical package.
  - Searches causal models with artificial intelligence and Directed Acyclic Graphs.
- GES finds the optimal causal structures through a search of equivalence classes (Chickering, 2000) in order to minimize a Bayesian Information Criteria.
- We imposed knowledge to that FAH and FAFH are weakly-exogenous and other variables to be exogenous.
Results - Directed Acyclic Graph (DAG) of Consumer Expenditure
Conclusions and Next Steps

● Conclusions
  ○ Age and ethnicity are exogenous
  ○ Food away from home expenditure is determined by the individual education status, body mass index, and employment status.
  ○ Food at home expenditure is determined by the individual education status, employment status, marital status, gender and race.
  ○ Also, there is a contemporaneous causality relationship between food at home and food away from home expenditures.

● Future Research
  ○ Expand the model to include more explanatory variables
  ○ Break the model up into smaller groups to discover patterns within subgroups (age, participation in food assistance programs, etc.) to help policymakers create effective policy
Thank you!
Questions or Comments?
CHARACTERIZING WHERE CONSUMERS PURCHASE FRESH FRUITS: AN ATTITTUDINAL FACTOR STUDY

JULIANO M. R. MARQUES
PURDUE UNIVERSITY/UFLA
ARIANA P TORRES
PURDUE UNIVERSITY
BRIDGET K. BEHE
MICHIGAN STATE UNIVERSITY
PETRUS LANGENHOVEN
PURDUE UNIVERSITY
LUIZ HENRIQUE DE BARROS VILAS BOAS
PURDUE UNIVERSITY/UFLA
Investigate attitudinal factors and market attributes guiding consumers to purchase fresh fruit at their selected markets.
Fresh fruits consumption has increased in the U.S.
  • Higher sales and production

Yet, consumers are less predictable
  • Proliferation of labels
  • Abundance of information on product preferences
Literature review

Fresh fruits
- consumer preferences and willingness to pay for fruits
- health benefits of fresh fruits

Marketplace
- Specific market characteristics
- Factors influencing buying produce at a marketplace

Limited studies examining how attitudes drive choice of marketplace among fresh fruit buyers
What guides fresh fruits buyers to choose their marketplace?

- How attitudes influence this decision?
- What market characteristics influence this decision?
**Marketplaces**

- **Chain Stores**
  - Walmart
  - Meijer

- **Club Stores**
  - Costco
  - Sam's Club

- **DTC**
  - Farmers markets, at the farm, CSA

- **Independent Stores**
  - Independent or ethnic stores
DATA AND METHODS
**DATA**
- Online questionnaire distributed in Fall 2018
- Valid Responses = 1,658

**Attitudinal scales**
- General Health Interest \((\text{GHI})\)
- Craving Sweet Food \((\text{CSF})\)
- Food Pleasure \((\text{FP})\)
- Variety Seeking in Foods \((\text{VSF})\)

Adapted from:
- Roininen et al. (2001)
- Van Trijp and Steenkamp (1991)

**METHODS**
1º Analysis of variance (ANOVA)
2º Multinomial logistic regression

**Test**
Principal Component Analysis on GHI, FP, CSF, and VSF

**Test**
\[ y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \ldots + \beta_p x_p + \epsilon \]
RESULTS
FACTORS DRIVING THE LIKELIHOOD TO CHOOSE CLUB STORES OR WAREHOUSE

CLUB STORE

- **CSF**: 0.90
- **VSF**: -0.82
- **Selection**: -5.16
- **Purchase Responsible**: -1.96
- **Rural Area**: -2.41
- **Miles Traveled**: 0.07
- **Fresh Fruits Monthly Spend**: 0.01
- **Organic Fruits**: 4.65
- **Asian**: 4.71
- **West**: 3.34
- **Hispanic**: 2.58
- **Income**: 0.00
FACTORS DRIVING THE LIKELIHOOD TO CHOOSE INDEPENDENT GROCERY STORES

INDEPENDENT STORE

- **market price:** -8.22
- **convenience:** -12.85
- **purchase responsible:** -4.93
- **number of child:** -3.14
- **south:** -12.43
- **asian:** 8.74
- **female:** 6.20

Graphic subtitle
- **Demographic**
- **Purchase**
- **Market**
- **Attitudinal**
FACTORS DRIVING THE LIKELIHOOD TO CHOOSE DTC MARKETS

- Market availability: -3.00
- Market price: -4.86
- Selection: -4.89
- Diversity: -5.29
- Market distance: -8.28
- Household size: -0.91
- Midwest: -3.28
- West: -4.06

- CSF: 0.93
- Localfruits: 18.73
- Only place: 7.33
- Friendliness of atmosphere: 7.21
- Asian: 4.45
- Single: 2.30

Graphic subtitle:
- Demographic
- Purchase
- Market
- Attitudinal
From a robust U.S. sample, our findings provide useful information for academics, marketplaces managers and policy makers.

- Support on strategic and direct messages to fresh fruits customers:
  - Chain stores should highlight fresh fruits price
  - Club stores may downplay fresh fruits variety
  - Independent stores may focus on taste of fruits to attract female shoppers
  - DTC markets should emphasize sweetness messages about local food and focus on small households

- Support smaller retail vendors to have a better access to their customers.
Thanks for your attention!

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Visiting Student at Purdue University
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FRUIT AND VEGETABLE CONSUMPTION AMONG A SELECTED GROUP OF COLLEGE STUDENTS

Patricia E. McLean-Meyinsse
Southern University and A&M College
INTRODUCTION

• The *Dietary Guidelines for Americans* were first introduced in 1980 to help Americans to make healthier food choices.

• These *Guidelines* contain recommendations aimed at fostering healthier eating habits so as to mitigate rising overweight and obesity rates, incidences of chronic diseases, and healthcare costs, among others.
INTRODUCTION

• In essence, the recommendations encourage Americans to eat a wide variety of fruits, vegetables, protein foods, grains, and fat-free or low fat dairy and to curtail their daily intake of sugars, saturated fats, trans fats, sodium, and alcohol.
INTRODUCTION

• With respect to fruits and vegetables, the Guidelines indicate that to maintain good health, adults should eat at least $1\frac{1}{2} - 2$ cups of fruits and 2-3 cups of vegetables daily.

• However, many Americans, including college students, do not meet the recommended daily guidelines for these or for any other food groups.
PROBLEM STATEMENT

• College students are notorious for their unhealthy eating habits and a lack of physical activity, which put them at increased risks for chronic diseases in adulthood.

• Thus, it is imperative for researchers to continue to study students’ eating habits and to help them to make healthier food choices when deficiencies are uncovered.
PROBLEM STATEMENT

• Our study is based on that premise.
• It examines college students’ daily consumption of fruits and vegetables and factors associated with consumption.
OBJECTIVES

The study’s objectives are as follows.

• To describe daily consumption of fruits and vegetables by a randomly selected group of students.

• To determine whether selected sociodemographic characteristics: academic classifications (CLASS), household size (HSIZE), income levels (INCOME), area of residence (LIVE), martial status (MARITAL), employment status (WORK), race (RACE), and gender (GENDER) affect consumption levels.
METHODS & PROCEDURES

• The study’s data were compiled from a random sample of 132 college students in Spring 2020.

• The questions were designed to ascertain nutritional knowledge, fruit and vegetable consumption, and sociodemographic characteristics.
METHODOLOGY & PROCEDURES

Questions on Fruit and Vegetable Consumption:

• In general, how many cups of fresh or processed fruit do you eat per day? **FRUIT**
  – A. None
  – B. 1 ½ to 2 Cups
  – C. Greater than 2 Cups

• In general, how many cups of fresh or processed vegetables do you eat per day? **VEGETABLE**
  – A. None
  – B. 2 to 3 Cups
  – C. Greater than 3 Cups
• How are you classified?
• Where do you live?
• How many people live at your permanent address?
• Which of the following best describes you?
• Which category do you think best describes your family’s total annual household income?
• Are you working while attending school?
• Gender
Empirical Analyzes

• Descriptive Statistics are used to address the first objective.

• The chi-square tests for independence are used to analyze Objective 2.

• The data were analyzed with Excel and SPSS.
RESULTS AND DISCUSSION

• DESCRIPTIVE STATISTICS:

• Academic Classification
  – Freshman 11%
  – Sophomores 47%
  – Juniors 19%
  – Seniors 4%
  – Graduate Students 19%
RESULTS AND DISCUSSION

• Median Household Size 3

• Median Income $35,000-$49,999

• Live
  – On Campus 39%

• Marital Status
  – Single 86%
RESULTS AND DISCUSSION

• Employment Status
  – Work 66%

• Race
  – African Americans 89%

• Gender
  – Female 77%
RESULTS AND DISCUSSION

• DAILY CONSUMPTION PATTERNS:

• FRUITS
  – 1½ - 2 Cups  54%
  – Greater than 2 Cups  7%
  – None  39%

• VEGETABLES
  – 2 - 3 Cups  48%
  – Greater than 3 Cups  6%
  – None  46%
### Table 1: Factors Associated with Daily Fruit Consumption

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<tr>
<th>Variables</th>
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<th>1½ -2 Cups</th>
<th>&lt;2 Cups</th>
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### Table 1: Factors Associated with Daily Fruit Consumption

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Note: (**) implies statistical significance at the 5% level of probability.
### Table 2: Factors Associated with Daily Vegetable Consumption

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### Table 2: Factors Associated with Daily Vegetable Consumption

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<td>35.6</td>
<td>13.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>43.7</td>
<td>54.0</td>
<td>2.3</td>
<td>8.433*</td>
<td>0.015</td>
</tr>
<tr>
<td><strong>RACE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African Americans</td>
<td>45.8</td>
<td>48.3</td>
<td>5.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>50.0</td>
<td>42.9</td>
<td>7.1</td>
<td>0.157</td>
<td>0.925</td>
</tr>
<tr>
<td><strong>GENDER</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>48.0</td>
<td>46.1</td>
<td>5.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>40.0</td>
<td>53.3</td>
<td>6.7</td>
<td>0.603</td>
<td>0.740</td>
</tr>
</tbody>
</table>

Note: (**) implies statistical significance at the 5% level of probability.
CONCLUDING REMARKS

Students who consumed between 1½-2 cups of fresh fruits per day were more likely to be

• juniors,
• married or divorced,
• to live in households with income levels above $50,000,
• or to have jobs.
CONCLUDING REMARKS

• 46% of respondents did not eat vegetables regularly;

• 48% reported eating between 2-3 cups daily; and 6% reported eating more than three cups daily.

• Students who worked were more likely to eat 2-3 cups of fresh vegetables daily.
CONCLUDING REMARKS

• A majority of the participants appeared to have met the minimum daily recommendations for fruits but not for vegetables.
• Given the state’s high obesity rate among young adults, students should be encouraged to include more vegetables in their diets.
SPECIAL THANKS TO

• The United States Department of Agriculture, National Institute of Food and Agriculture (Evans-Allen Project # 1020359) and the Southern University Agricultural Research and Extension Center for funding the research project

The National Institute of Food and Agriculture
Predicting obesity among American adults using FoodAPS data: A Discriminant Analysis Approach

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Dept. of Agric. Food & Resource Economics
Rutgers University, New Jersey

Paper presented at the 2020 FDRS Virtual Conference, October 13, 2020
Introduction

• Obesity has long been a pressing issue in the United States; however, only in that past 20 years has it become an epidemic (Ogden 2010).

• The CDC has recognized that obesity is a health epidemic, and the American Medical Association (AMA) has officially recognized obesity as a chronic disease (AMA 2013).

• Clearly there have been changes in food consumption behavior of American consumers, and not necessarily in a good way.

• When we look at the changes in American diets, we see that there has been an increase in calories consumed, but no real increase in activity levels (Bentley 2017).

• Consumers went from eating 2,016 calories on average in 1970 to 2,390 average calories per day in 2014 (Bentley 2017).
Introduction (contd.)

• Eating large amounts of processed or fast food, eating out more often, and consuming larger portions are all associated with weight gain and in turn obesity (NHS 2019).

• Americans’ obesity problem may be related to their food consumption behavior, particularly consumption of food away from home (FAFH).

• Americans now consume more FAFH than FAH. In 2017, American consumers spent $900 billion on FAFH consumption compared to $750 billion on food-at-home (FAH).

• Fast food (QSR) fat content specifically has changed very little over the decades (down to 39 from 41 percent) showing that this may be a large contributor to the negative overall health status of American consumers (USDA, ERS 2014) and the share of calories that fats and oils occupies in our diets has gone up over the years, seemingly due to high consumption of these foods.
Graph 1. FAFH and FAH Expenditures

Food Away from Home Expenditures Surpassed Food at Home Expenditures in 2010

Source: Okrent et al. 2018, ERS
Graph 2. Caloric Share of Various Outlet Sources in the American Adults Diet (1977-2014)

Source: Guthrie, Lin and Smith 2018, ERS
<table>
<thead>
<tr>
<th>Top 30 Fast-Food Restaurants</th>
<th>Top 30 Casual-Dining Restaurants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arby's</td>
<td>Applebee’s Neighborhood Grill &amp; Bar</td>
</tr>
<tr>
<td>McDonald’s</td>
<td>Macaroni Grill</td>
</tr>
<tr>
<td>Boston Market</td>
<td>Bennigan’s Grill &amp; Tavern</td>
</tr>
<tr>
<td>Panda Express</td>
<td>Olive Garden</td>
</tr>
<tr>
<td>Burger King</td>
<td>Bob Evans</td>
</tr>
<tr>
<td>Panera Bread</td>
<td>Outback Steakhouse</td>
</tr>
<tr>
<td>Carl’s Jr.</td>
<td>Buffalo Wild Wings Grill &amp; Bar</td>
</tr>
<tr>
<td>Papa John's Pizza</td>
<td>P.F. Chang’s China Bistro</td>
</tr>
<tr>
<td>Checkers Drive-In/Rally's</td>
<td>California Pizza Kitchen</td>
</tr>
<tr>
<td>Pizza Hut</td>
<td>Perkins Restaurant &amp; Bakery</td>
</tr>
<tr>
<td>Chick-fil-A</td>
<td>Carrabba’s Italian Grill</td>
</tr>
<tr>
<td>Popeyes</td>
<td>Red Lobster</td>
</tr>
<tr>
<td>Chipotle</td>
<td>Chili’s Bar &amp; Grill</td>
</tr>
<tr>
<td>Quiznos Subs</td>
<td>Red Robin Gourmet Burgers</td>
</tr>
<tr>
<td>Church’s Chicken</td>
<td>Cracker Barrel Old Country Store</td>
</tr>
<tr>
<td>Sonic Drive-In</td>
<td>Ruby Tuesday</td>
</tr>
<tr>
<td>Dairy Queen</td>
<td>Denny’s</td>
</tr>
<tr>
<td>Starbucks</td>
<td>Ryan’s Grill Buffet Bakery</td>
</tr>
<tr>
<td>Domino's Pizza</td>
<td>Friendly’s</td>
</tr>
<tr>
<td>Steak ‘n Shake</td>
<td>Sbarro</td>
</tr>
<tr>
<td>Dunkin’ Donuts</td>
<td>Golden Corral Buffet &amp; Grill</td>
</tr>
<tr>
<td>Subway</td>
<td>T.G.I. Friday’s</td>
</tr>
<tr>
<td>Hardee’s</td>
<td>HomeTown Buffet/Old Country Buffet</td>
</tr>
<tr>
<td>Taco Bell</td>
<td>Texas Roadhouse</td>
</tr>
<tr>
<td>Jack in the Box</td>
<td>Hooters</td>
</tr>
<tr>
<td>Wendy’s</td>
<td>The Cheesecake Factory</td>
</tr>
<tr>
<td>KFC</td>
<td>IHOP</td>
</tr>
<tr>
<td>Whataburger</td>
<td>Tim Hortons</td>
</tr>
<tr>
<td>Little Caesars Pizza</td>
<td>LongHorn Steakhouse</td>
</tr>
<tr>
<td></td>
<td>Waffle House</td>
</tr>
</tbody>
</table>

Objectives

- As discussed earlier, what American consumers eat and where they eat have implications on their health. Our general objective, thus, is to examine the relationship between FAFH behavior and obesity among American adults.

- The specific objectives of this research are as follows:
  - to examine American adults' FAFH outlet choices (chain vs non chain), and
  - to analyze if consumers who frequent chain restaurants more often are more likely to be obese.
Analytical Framework

• To examine American adults’ food and outlet choices (specific objective 1), we use simple frequency analysis.
  – This gives us an idea of the current levels of behavior across America and between various groups separated by individual characteristics.

• to analyze if consumers who frequent chain restaurants more often are more likely to be obese (specific objective 2), we use Discriminant Analysis.
  – We carry out several association tests to examine if there is any association between consumers’ chain restaurant use (from low to very high) to their demographic characteristics, such as age, income, education, race, etc.
  – We use a DA model to predict which type of consumers among those who frequent chain restaurants are likely to become obese as opposed to not obese.
Discriminant Analysis model

- DA allows us to use known group memberships to create “discriminant functions”, which in turn are used to estimate predictions and identifies which variables/predictors are most significant (Cramer 2003).
- We will use DA to predict an individual consumer’s likelihood of being placed in the normal or overweight category, and normal or obese category. Discriminant function analysis was used previously by researchers to predict obesity from fitness scores (Hart 2019).
- As the focus is on individuals, discriminant analysis will provide more actionable information than a logit model even though the theory and functional form may be similar.
- Our D.A model is shown below:

\[ Z = \text{Logit } Y (\text{BMI}) = \beta_0 + \beta_1 \text{INCOME} + \beta_2 \text{AGE} + \beta_3 \text{EDUCATION} + \beta_4 \text{CHAINVISIT} + \epsilon, \]
Data

- We are using the USDA's National Household Food Acquisition and Purchase Survey (FoodAPS) data on an individual level. FoodAPS tracked all food acquisitions made by consumers during a consecutive 7-day period during between April 2012 and January 2013.

- We use the CHAIN variable from the FoodAPS FAFH EVENT dataset to examine chain outlet consumption and the implications on health.

- We focus on the primary respondent (i.e. the person who ate the acquired food). This will allow us to examine the link between food consumed and an individual’s health implications.

- The sample size used in this report = 3,117 individuals who are primary respondents and who consumed the purchased food from one of the top 30 chain restaurants. Of those 3,117 respondents who acquired and ate FAFH, 1,017 did NOT acquire food from chain restaurants. Therefore, the effective N for our analysis is N=2,100.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Variable values</th>
<th>Mode</th>
<th>Max</th>
<th>Min</th>
</tr>
</thead>
</table>
| OBESITY    | follows CDC definition of obesity: BMI of 30 or above                      | 1 = BMI under 18.5 (underweight)  
2 = BMI from 18.5-24.99 (Normal Weight)  
3 = BMI from 25.0-29.99 (Overweight )  
4 = BMI of 30.0+ (Obese)                | 4   | 4   | 1   |
| CHAINVISIT | frequency of purchasing food from one of the top 30 chain restaurants     | 1=low frequency  
2= moderate frequency  
3= high frequency  
4= very high frequency               | 1   | 4   | 1   |
| AGE        | age of primary respondent                                                 | 1=Teenager (18-19)  
2= 20-35  
3= 36-59  
4= 60-65  
5= 66+                                           | 3   | 5   | 1   |
| INCOME     | income of the individual's household                                      | 0= No income reported  
1= $0.1-24,999  
2= $25,000-34,999  
3= $35,000-49,999  
4= $50,000-74,999  
5= $75,000-99,999  
6= $100,000-149,999  
7= $150,000-199,999  
8= $200,000+                  | 1   | 8   | 0   |
<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Variable values</th>
<th>Mode</th>
<th>Max</th>
<th>Min</th>
</tr>
</thead>
</table>
| EDUCATION  | Highest level of completed education by the primary respondent | 1=Some H.S  
2= H.S Diploma  
3= Some College  
4= Bachelors Degree  
5= Masters Degree | 3    | 5   | 1   |
| GENDER     | Gender of the primary respondent                     | 1 = Male  
2= Female | 2    | 2   | 1   |
| RACE       | Race/Ethnicity of the primary respondent             | 1= White  
2= Black  
4= Asian  
5= Other | 1    | 5   | 1   |
Results and Discussions

Respondent characteristics (N=2,100)

- Most of the respondents were between the ages of 36-59 (42.4%) with the ages 20-35 making up the next largest category (35.3%).

- More of the respondents were female (71.7%) as opposed to Male (28.3%).

- When it came to race/ethnicity a majority of the respondents were white (69.1%). Blacks represented 15.4%, Asians represented 4.6% and the Other category represented 10.9%.

- Most of the respondents possessed some college education/an Associates degree (34%). The next largest category was represented by H.S Diplomas (28.3%). Respondents with Bachelors degrees represented 16.3% and those with only some H.S represented 14.9%.
• A similar number of respondents reported not working (50%) and working (50%).

• When it came to their income a majority or respondents had an income of between $0.1 and 24,999 (36.1%). The categories of $25,000-34,999 had 15.2% of respondents, $35,000-49,999 had 15.5% and $50,000-74,999 had 16% of the sample.

• In terms of BMI the respondents were almost equally represented with not overweight representing 31.5%, overweight representing 31.6% and obese representing 36.5% (largest category).

• When it came to eating out at chain categories, having a low frequency of eating out accounted for the most respondents (44.9%), moderate frequency accounted for 25.3%, high frequency represented 13.6% and very high represented 16.3%. (N=2,100).
## Relationship between frequency of chain use and obesity (N=2,100)

Table 3. Chain Use and Selected Variables Crosstabulation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Null Hypothesis</th>
<th>Correlation values</th>
<th>Inference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OBESITY</strong></td>
<td>No relation between frequency of chain use and obesity</td>
<td>0.053 (p-value: 0.016*)</td>
<td>Weak correlation exists</td>
</tr>
<tr>
<td><strong>AGE</strong></td>
<td>No relation between age and chain use</td>
<td>-0.711 (p-value: 0.001***)</td>
<td>Moderate correlation exists</td>
</tr>
<tr>
<td><strong>INCOME</strong></td>
<td>No relation between income level and chain use</td>
<td>-0.031 (p-value: 0.157)</td>
<td>No relation exists</td>
</tr>
<tr>
<td><strong>EDUCATION</strong></td>
<td>No relation between education level and chain use</td>
<td>0.069** (p-value: 0.002)</td>
<td>Weak Correlation Exists</td>
</tr>
<tr>
<td><strong>RACE</strong></td>
<td>No relation between race/ethnicity and chain use</td>
<td>15.282 (p-value: 0.083)</td>
<td>No association exists</td>
</tr>
<tr>
<td><strong>GENDER</strong></td>
<td>No relation between gender and chain use</td>
<td>-0.024 (p-value: 0.269)</td>
<td>No association exists</td>
</tr>
</tbody>
</table>
### Table 4. Discriminant Analysis Results

<table>
<thead>
<tr>
<th>Variables</th>
<th>β</th>
<th>Wilks Lambda’</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAINVISIT</td>
<td>0.262</td>
<td>0.999</td>
<td>2.596</td>
<td>0.107</td>
</tr>
<tr>
<td>EDUCATION</td>
<td>-0.705</td>
<td>0.987***</td>
<td>26.098</td>
<td>0.000</td>
</tr>
<tr>
<td>INCOME</td>
<td>-0.024</td>
<td>0.979***</td>
<td>43.488</td>
<td>0.000</td>
</tr>
<tr>
<td>AGE</td>
<td>0.680</td>
<td>0.997</td>
<td>5.471</td>
<td>0.019</td>
</tr>
</tbody>
</table>

Wilks’ Lambda: .964  
Chi Square: 74.246  
Df: 4  
Sig: .000

The estimated DA model:

\[ Z = \logit(Y(BMI)) = -0.377 + 0.262CHAIN + -0.705EDUCATION + -0.024INCOME + 0.680AGE + \varepsilon, \]
68.7% of original cases were classified correctly by the DA.
Conclusions and Implications

- It is evident that chain use is not equal among all individuals.
- Age, education and obesity were found to be correlated with chain use, while no such correlation was found for the other variables.
- The profile of those who were predicted to be obese category (yet were not obese due to their reported BMI) had the following characteristics: high chain use, lower education and lower income.
- Our D.A model was not able to successfully discriminate between obese and not obese for all the data. The DA model does not look at causality, it just shows us the characteristics and probability of someone belonging to a specific group. A logistic model is needed for this which my thesis will explore.
Thank you!

Q&A

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