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March 3, 2011

### **Proposal—Student Consumption of Caffeine On Campus**

- A. Numerous health studies have demonstrated the damaging effects of excessive caffeine consumption on cardiac wellbeing in addition to psychological and mental health. Many people are concerned that students today consume large amounts of caffeine to keep up with their academic workload or enhance their performance in sports activities. We plan to survey student consumption of caffeine at Carnegie Mellon University, and the primary use of consumption – leisure, exercise, party, or late-night studying. We hope that the outcome of this survey may convince campus administrators to reconsider vending machines with caffeinated drinks, and replace them with healthier drinks. In addition, we believe that a route to bettering the health of students is to hinder unnecessary motivations for caffeine consumption. One way this can be done is by curtailing the largest coffee distributor, CulinArt, with a distribution tax or lobbying to place a price increase during late hours. We will therefore approach campus administrators with our results in order to (supported by the data) argue for efforts to curtail caffeine consumption on campus.
- B. Planned Questions:
- How much caffeine do students consume on a daily basis?
  - What is your primary motivation for consuming caffeine?
  - What types of caffeine drinks are most prevalent (coffee, espresso, Red Bull, etc.)?
  - How does caffeine consumption vary across college/major and year in school?
  - Is there a correlation between caffeine consumption and GPA?
  - Is there a correlation between caffeine consumption and the degree to which the student is involved in extracurricular activities?
  - How often do you exercise in any given week?
  - What is the relationship between amount of caffeine consumed and the amount of leisure time the student has?
  - Are you consuming more or less caffeine than you are comfortable with?
- C. Existing Research:
- Mayo Clinic “Caffeine”: (<http://www.mayoclinic.com/health/caffeine/NU00600>)
    - i. This article by the Mayo Clinic medical staff describes the numerous adverse health effects of excessive caffeine consumption. Further, the article provides guidelines for the specific amounts of caffeine which are harmful; this will be very useful in analyzing student feedback.
    - ii. Found by Bassem.
  - CSPI “Caffeine Content in Food and Drinks” (<http://www.cspinet.org/new/cafchart.htm>)
    - i. This resource will be very helpful in identifying and translating various brands and drinks into actual milligrams of caffeine, so we can standardize our data.
    - ii. Found by Christopher.

- The Standard Online “Caffeine Addiction Problem” (<http://media.www.the-standard.org/media/storage/paper1059/news/2008/02/05/Features/The-Caffeine.Addiction.Problem-3189385.shtml>)
  - i. This article details the extent to which college students are addicted to caffeine. This type of survey is the impetus for our research.
  - ii. Found by Prerna.
- TIME “Back to Campus” ([http://www.time.com/time/specials/2007/article/0,28804,1651473\\_1651472\\_1651348,00.html](http://www.time.com/time/specials/2007/article/0,28804,1651473_1651472_1651348,00.html))
  - i. This is a resource detailing the effect of caffeine on student class performance.
  - ii. Found by Abigail.
- CBSNEWS "Caffeine Withdrawal is Real" (<http://www.cbsnews.com/stories/2004/09/30/health/webmd/main646620.shtml>)
  - i. This article investigates the realness of caffeine addiction and the symptoms of dependency for various purposes.
  - ii. Found by Yong-Gyun Choi

**D. Sampling Frame:**

- Our sampling frame will be the C-book. The population that we plan to sample from is the people whose email addresses are listed in C-book.

**E. Target Population:**

- The target population is all Carnegie Mellon undergraduate students on the Pittsburgh campus. This is the population about whom we wish to make inferences.
- Students can opt-out of being included in C-book. Therefore, all undergraduates who opted to not be included in C-book will be in our target population but not in our sampling frame. This is a coverage issue.
- Errors:
  - i. *Sampling Error*: An example of sampling error which could occur in our survey is sampling bias. This would occur if certain individuals in C-book had a smaller chance of selection than other students. Our solution to tackle this issue is to randomly select students from C-book.
  - ii. *Non-Sampling Error*: An example of non-sampling error could occur in our survey if survey respondents were not representative of the larger population. For instance, if caffeine-consuming individuals are too busy on average to respond to the survey, this could lead to a unrepresentative result. One way to tackle this issue is to provide a neutral incentive such as entering survey respondents into raffle to win a \$50 Amazon gift card.

**F. Mode of Data Collection:**

- The survey data would be collected as an anonymous SurveyMonkey survey. We would compose the survey online and email it to our sample. The advantages of this method include anonymity, ease in data compilation and minimal time requirement on the part of the respondents so as to maximize response rate for busy students.

**G. Variables:**

- Caffeine Amount
- Caffeine Type

- Motivation for Consumption
- Activity Level (includes extracurricular activities and leisure time)
- College
- Year in School
- G.P.A.
- Exercise
- Caffeine consumption vs. comfort level

I. (See attached).

J. (See attached).

K. The sampling scheme we will use is a simple random ~~survey~~ <sup>sample</sup> without replacement. We will be using a random number generator to generate two numbers, which we will use to randomly draw names from our sampling frame, the C-book. This will be done for 500 iterations, and 1 email will be sent to each person selected. The CMU undergraduate population is comprised of approximately 6,000 students, so a sample of 500 individuals represents about 8% of the entire target population. We will stratify our survey by year in school (freshman, sophomore, etc.). This will allow us to draw inferences about the behaviors of each of these sub-groups in the target population. We will stratify proportionally. That is, we will determine the proportion of each of these groups in the target population, and then send out survey invitations (randomly of course), such that our sample proportionally represents the target population.

We would prefer this as opposed to doing some post-survey adjustment, such as weighting underrepresented components of the sample, so that we can draw separate inferences about each of the classes.

L.

1. What is your year at CMU?
  - a. Freshman
  - b. Sophomore
  - c. Junior
  - d. Senior
  - e. Fifth year undergraduate student
2. What college is your primary major in? (For interdisciplinary, select both)
  - a. CIT
  - b. H&SS
  - c. CFA
  - d. SCS
  - e. MCS
  - f. Heinz
  - g. Tepper
3. What is your GPA?
  - a. 0.0-2.5
  - b. 2.6-3.0
  - c. 3.0-3.5
  - d. 3.6-4.0

4. What is your gender?
  - a. Male
  - b. Female
5. How many units are you taking this semester?
  - a. 36 or less
  - b. 37-45
  - c. 45-55
  - d. More than 55
6. Do you have any additional majors or minors?
  - a. Yes
  - b. No
7. If so, which statement best describes your situation?
  - a. I have a minor
  - b. I have more than one minor
  - c. I have an additional major
  - d. I have an additional major and an additional minor
  - e. I have more than one additional major
  - f. I have more than one additional major and more than one minor
8. About how many hours a day, on average, do you spend on extracurricular activities such as clubs, student organizations, ROTC, or inter-mural sports (this includes attending and preparing for meetings or events)?
  - a. None
  - b. Less than 2 hours per day
  - c. 2-4 hours per day
  - d. 4-6 hours per day
  - e. More than 6 hours per day
9. How much personal leisure time do you have in a given day? This includes all waking hours spent on activities you consider optional (i.e., NOT class, work, athletics, extracurricular obligations).
  - a. None
  - b. Less than 2 hours per day
  - c. 2-4 hours per day
  - d. 4-6 hours per day
  - e. More than 6 hours per day
10. How many hours outside of class per day, on average, do you spend doing classwork?
  - a. None
  - b. Less than 2 hours per day
  - c. 2-4 hours per day
  - d. 4-6 hours per day
  - e. More than 6 hours per day
11. How many hours do you sleep on an average week night?
  - a. Less than 3 hours
  - b. 3-5 hours
  - c. 5-8 hours
  - d. More than 8 hours
12. Do you have a part-time job (employed on or off campus)?
  - a. Yes; I work for less than 5 hours per week.

- b. Yes; I work for less than 10 hours per week.
  - c. Yes; I work for less than 15 hours per week.
  - d. Yes; I work for more than 15 hours per week.
  - e. No; I do not have a job.
13. How often do you exercise in an average week?
- a. None
  - b. Once a week
  - c. 2-4 times per week
  - d. More than 4 times per week
14. What types of caffeine beverages do you consume? Select all which are relevant.
- a. Coffee
  - b. Tea
  - c. Espresso
  - d. Caffeine tablets
  - e. Redbull/energy drinks
  - f. Soda
  - g. Chocolate
  - h. I do not consume caffeine.
  - i. Other \_\_\_\_\_
15. How much caffeine do you consume on a daily basis, where 1 serving is one item (eg. One cup of coffee, one espresso shot, one can of soda, one bar of chocolate, etc..)
- a. None
  - b. Less than 2
  - c. 2-4
  - d. 4-6
  - e. More than 6
16. What is your primary motivation for consuming caffeine?
- a. Pleasure/Leisure
  - b. To stay awake/maintain energy
  - c. Partying
  - d. Other \_\_\_\_\_
17. Are you consuming more or less caffeine than you are comfortable with?
- a. I am consuming more caffeine than I am comfortable with.
  - b. I am consuming a comfortable amount of caffeine.
  - c. I am drinking less caffeine than I am comfortable with
18. Do you feel that your personal caffeine consumption is more or less than the average consumption of your undergraduate peers at Carnegie Mellon?
- a. I believe I consume an above average amount of caffeine.
  - b. I believe I consume an average amount of caffeine.
  - c. I believe I consume a below average amount of caffeine.
19. Do you believe that consuming more caffeine positively impacts your performance in school work, employment, athletics, or extracurricular activities?
- a. Yes
  - b. No
20. Do you believe that consuming more caffeine negatively impacts your health?
- a. Yes
  - b. No

21. Do you experience any of the following on a regular basis (on most days)? Choose all that apply.
- a. Insomnia
  - b. Nervousness/anxiety throughout the day
  - c. Restlessness
  - d. Irritability
  - e. Nausea/gastrointestinal problems
  - f. Fast or irregular heartbeat
  - g. Muscle Tremors
  - h. Headaches
  - i. I do not experience any of these symptoms.
22. Do you smoke?
- a. Yes
  - b. No
  - c. I do not wish to disclose
23. How frequently do you consume alcohol?
- a. None
  - b. Less than twice a week
  - c. 2-4 times per week
  - d. More than 4 times per week

**M.** We are using a proportionally stratified sample by class. We need to know  $f$ , the proportion of each stratum to sample. We can use the mean error equation to calculate  $f$ , as we already know or can estimate everything in that equation. The equation is as follows:

$$ME = 1.96 \times \sum_{h=1}^H W_h^2 (1-f) \frac{s_h^2}{n_h}$$

This equation can also be written:

$$ME = 1.96 \times \sum_{h=1}^H \frac{N_h}{N} (1-f) \frac{s_h^2}{(N_h \times f)}$$

We can estimate the standard deviation for the question “How many servings of caffeine do you consume on an average day?” to be about 2 based on the pretests that we did. The population and the strata populations can be found here: [http://www.cmu.edu/ira/factbook/pdf/facts2011/4\\_enrollment-final-as-of-24\\_11.pdf](http://www.cmu.edu/ira/factbook/pdf/facts2011/4_enrollment-final-as-of-24_11.pdf). If we want a ME of 0.1 then our  $f=0.012805953560913$ . With this sample proportion we need 20 Freshmen, 18 Sophomores, 18 Juniors, 17 Seniors, and 3 Fifth-Years. We can expect a response rate of about 25%, considering the generous incentive of a \$50 Amazon gift card, meaning that we need to quadruple our sample from each stratum. This gives us 80 Freshmen, 72 Sophomores, 72 Juniors, 68 Seniors, and 12 Fifth-Years for a total sample size of 304.

Since we need 304 responses, but will sample 500 students, we can afford a response rate of 15%. We believe this to be a very reasonable estimate, and are comfortable with proceeding with sampling 500 students.

**looks great**