# LFS 350 Community-Based Food Systems Project: Healthy Options in Vending Machines on Campus

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**LFS 350**

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# LFS 350 Community-Based Food Systems Project: Healthy Options in Vending Machines on Campus

LFS 350 001 GROUP 26
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**Table of Contents**

## I. EXECUTIVE SUMMARY

Last year, University of British Columbia (UBC) Land and Food Systems (LFS) students audited the Vancouver campus' snack vending machines against BC's "Healthier Choices Vending Machine Policy" (HCVMP), and found the majority of items being offered were "Not Recommended" by the HCVMP's nutritional guidelines (Ma et al., 2012). In response to this, the "Gage Snack Vending Model" (GSVM) was implemented: a model guided by the HCVMP, offering healthy foods low in fat, sugar, and sodium.

This year, our team of seven LFS students worked alongside project manager Liska Richer and community partner Victoria Wakefield, to assess the performance of the GSVM, as well as examine UBC beverage vending machines (BVM). Our research community included campus students, visitors, faculty, and staff. Our research goals were to identify how the GSVM can be improved, and how it can be expanded to include BVM.

Our group conducted a survey on 207 random participants across campus to investigate snack and beverage preferences. We also performed an audit of nine vending machines in the Student Union Building, and two at Gage residence, to see where currently available snacks and beverages stand under the HCVMP, and to review snack vending machine adherence to HCVMP labelling.

Our survey results indicated that a majority of respondents use vending machines and are aware of the HCVMP, and yet rarely purchase "Choose Most" items (the healthiest ones). Primary purchasing motivations were cost, then taste. Beverage preferences were water and fruit juice; respondents would like to see more bars and fruit snacks added. Our audit revealed that healthy options have decreased at all GSVM machines examined, and are on average 19% more expensive than their unhealthy (high in fat, sugar, and/or sodium) counterparts. The majority of beverages were found to be unhealthy according to the HCVMP, and many snacks were (HCVMP) mislabelled.

These vending machines currently do not promote food security because they offer limited access to healthy choices, and exhibit improper labelling and higher prices for those healthy options. To improve, we recommend a greater proportion of healthy options, more-accurate labelling of them, and a lowering of their cost. We further recommend following the HCVMP more closely for snacks, and applying it to beverages as well.

Our audit's accuracy is limited by the always-changing placement of products in the machines. Future students could do a health assessment of specific item ingredients, or explore potential benefits of adding refrigerated BVM.

## II. INTRODUCTION

Consumption of processed foods high in fat, sugar, and sodium is prevalent among university students (Kearny, 2011). Over time, this can lead to obesity and mortality due to diabetes, heart disease, and cancer (Black & Macinko, 2008). The vending machines on the University of British Columbia's (UBC) Vancouver campus are a considerable supplier of highly processed snacks. In terms of physical accessibility, these vending machines offer a high degree of convenience; however, they offer limited access to nutritious and personally desirable food choices, which is a form of food insecurity.

In 2012, Ma et al., a previous team of Land and Food Systems (LFS) students, audited UBC Food Services (UBCFS) snack vending machines against BC's "Healthier Choices Vending Machine Policy" (HCVMP). UBCFS is the campus' main food provider. The HCVMP categorizes food products as "Choose Most" (CM), "Choose Sometimes" (CS), "Choose Least" (CL) or "Not Recommended" (NR), based on preset nutritional guidelines (Ministry of Health, 2013).

That audit's results revealed that the majority of offerings were unhealthy (CL/NR: high in fat, sugar, and/or sodium) (Ma, V., et al. 2012). In response to these findings, UBCFS rolled out the "Gage Snack Vending Model" (GSVM), a model based loosely on the HCVMP, to help address food insecurity by having more vending machines carry more healthy options (CM/CS: low in fat, sugar, and sodium).

Our research team included seven students of the LFS faculty, along with project manager Liska Richer, and community partner Victoria Wakefield, who is the UBCFS Purchasing Manager. Our Community-Based Experiential Learning (CBEL) project was to audit the performance of the GSVM, to investigate community snack and beverage preferences, and to identify stockable healthy products that meet them, in order to improve access to healthy snacks and beverages. Our research community, in Metro Vancouver, consisted of UBC students, faculty, staff and visitors; as of the 2012 winter session, there were 49,522 students enrolled (The University of British Columbia, 2013). In this project, we assessed the GSVM and UBC beverage vending machines (BVM).

### II.a. Research Questions

The GSVM is now used in twenty machines across campus (personal communication, November 7, 2013). The model's introduction was a positive change, but it is not yet ideal. To continue developing the GSVM, we investigated the following:

1) *What improvements can be made to the Gage Snack Vending Model already in place on UBC campus?*
2) *How can the scope of the model be expanded to include beverage vending machines?*

## III. RESEARCH METHODS

Our research was conducted through a community-based research (CBR) approach using both qualitative and quantitative methods. As advised by Withers and Burns (2013), a defining component of our CBR was the development of a good working relationship with our community partner, in order to understand the GSVM and formulate an effective approach to our project. Our community-based learning extended from our mixed-method design: our group connected with our community by conducting surveys (quantitative) and observing vending machines (qualitative) naturalistically, i.e. without experimental manipulation (Friesen, 2013). Specifically, our group conducted a survey within our research community to determine snack and beverage preferences, and audited the GSVM machines and BVM in terms of stocking, signage, and arrangement of healthy options. As per Victoria, our community service was incorporated into our research as the time spent studying the machines and the community (personal communication, September 23, 2013).

Initially, the plan was to explore new healthy options through product taste tests; however, in our first meeting with Victoria, it was decided that it did not fit our timeframe: it takes too long for VendMaster (the UBCFS-contracted snack supplier) to determine whether or not they can offer a specific product (personal communication, September 23, 2013). Victoria offered that the University Nutritionist was available to us as a resource, but working with her was not required if we could obtain the information we needed by ourselves (personal communication, November 7, 2013). Thus, with approval from Victoria and Liska, certain components of the project were dropped.

A key resource for us, which provided insight into previous vending research done at UBC, was the 2012 audit report by Ma et al. External resources used included the HCVMP, BC's Brand Name Food List website (which classifies food products into HCVMP categories), and Coca-Cola Canada's website (the UBCFS-contracted beverage supplier).

To collect data, our team first distributed pilot surveys to ten random participants on campus, to check for measurement or wording errors (Friesen, 2013). From this, we made several changes to create our final survey (Appendix A). This survey, consisting of seven questions, was randomly distributed to 207 participants at Irving Library, Woodward Library, the Student Union Building (SUB), and the bus loop. The GSVM machines and BVM on the main floor of the SUB (across from Pie R Squared) and on the main floor of Gage residence were examined for cleanliness, correct HCVMP signage, and item arrangement within the machine. The items offered in each machine were recorded, and classified by HCVMP category using BC's Brand Name Food List database or (for unlisted products) HCVMP's nutritional guidelines. Data was managed via statistical analysis; tables and bar charts were used to report our results. Responses to qualitative survey questions were coded into categories to make statistical analysis possible (Appendix B, Tables

4-5).

In compliance with the *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans*, surveys were given regardless of ethnicity, gender, or religious affiliation. No personal identifying information was collected, and the respondents were informed of how the results were to be used (Canadian Institutes of Health Research, 2010).

## IV. FINDINGS

### IV.a. Results

From quantitative survey results, we discovered 57% of 207 respondents use vending machines, and 53% were aware of the HCVMP. On average, people rarely purchase CM items (mean=1.94). 37% of respondents would "sometimes" consider purchasing from vending machines if newly available items were labelled as such. The average respondent rarely considered if vending purchases were local (mean=2.25). The leading beverage preferences were Water (31%), Fruit Juice (23%), and Cold Tea (15%). (Appendix B, Tables 1-3)

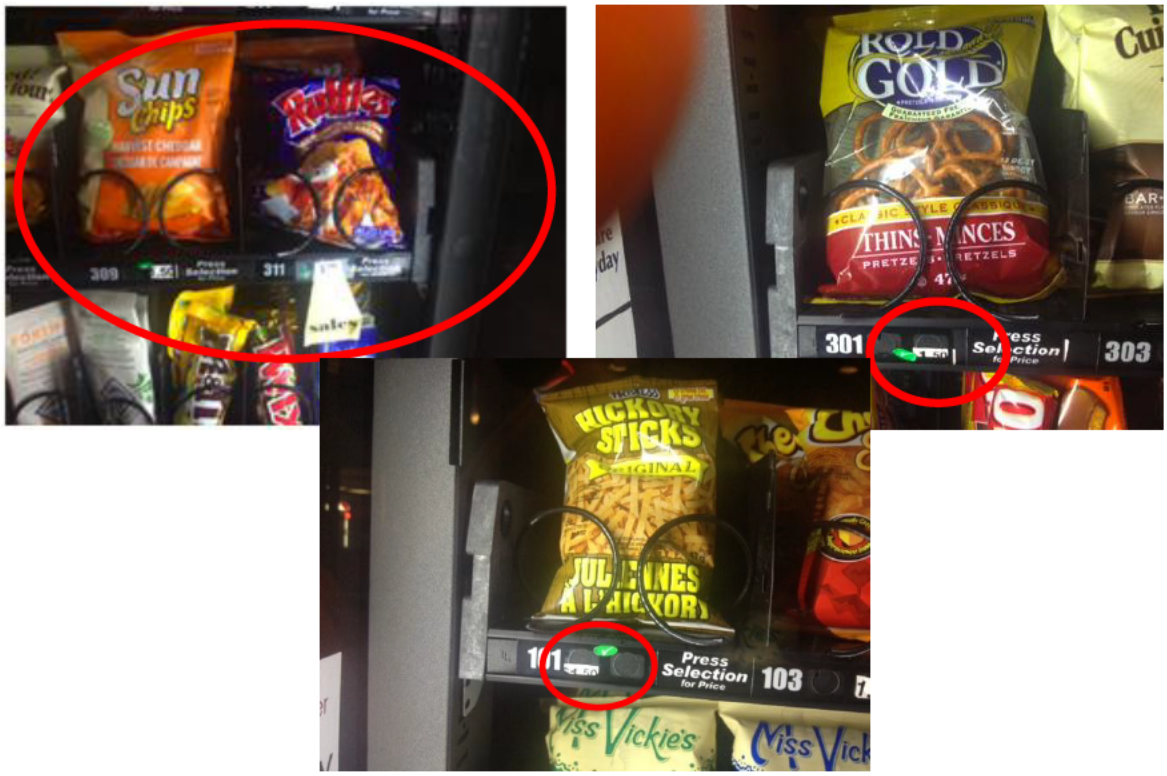
From qualitative survey results, the primary motivations for making decisions at a vending machine were cost (32%) and taste (28%). Many respondents (27.3%) had no preference for adding items, while others would like to see healthier options (10.2%). The three most-requested snacks were Healthy Fruit Snacks (8.6%), Energy/Protein Bars (4.1%), and Granola/Cereal Bars (4.1%). (Appendix B, Tables 4-5)

From audit results, healthy beverages were placed throughout the machines; most healthy snacks were eye-level or lower. Gage Residence GSVM machines contained 3% CM, 13% CS, 25% CL, and 59% NR items. Both SUB GSVM machines combined contained 3% CM, 9% CS, 25% CL, and 63% NR items (Appendix C.3). Auditing the SUB and Gage Residence BVM, we found 17% CM, 23% CS, 4% CL, and 56% NR (Appendix C.8).

Unhealthy (CL/NR) snack items averaged $1.74 in price; healthy (CM/CS) items averaged $2.07 (Appendix C.2). Machines were acceptably clean.

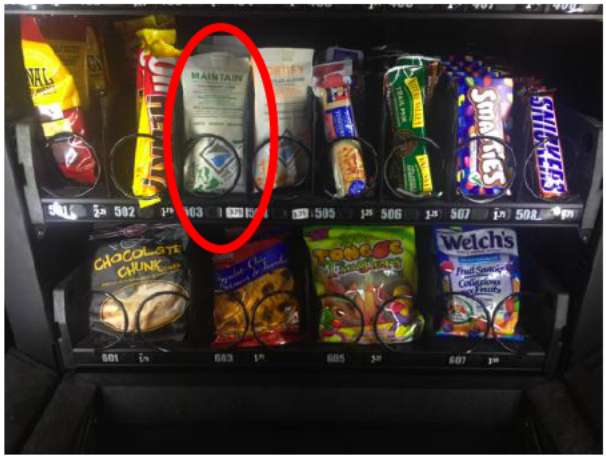
HCVMP signage adherence:

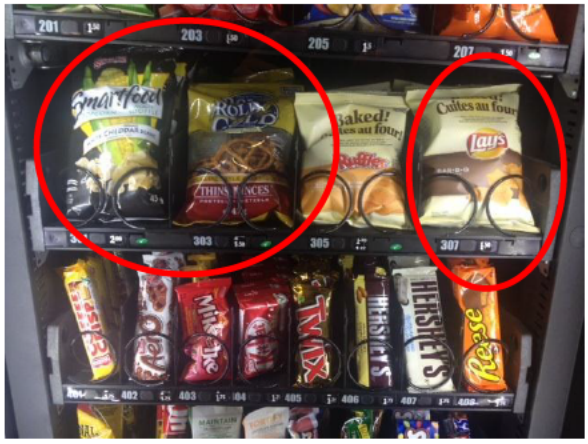
- Signage in SUBGSVM1 for Rold Gold pretzels (RGP), Ruffles, Sun Chips, and Hickory Sticks were mislabeled as CS; they should be CL or NR.




- In SUBGSVM2 RGP, Dan-D-Pak Rice Crackers, Super Wormies, and Quaker Chewy Granola bars were mislabeled as CS; they should CL or NR.

- In Gage Residence GSVM, Smart Food Popcorn, Old Dutch Crunchy Nacho Cheese, and RGP were mislabelled as CS (should be NR), while Baked Lays Bar-B-Q were unlabelled (should be CS).




- The Edge Maintain bars in all machines were unlabelled but should be CM (Appendix C.1).

## IV.b. Discussion

Since a majority of respondents use campus vending machines, the machines are an important provision on the part of UBCFS. Half of respondents are aware of the HCVMP, yet rarely purchase CM items, meaning current healthy offerings may not match student preferences, which may be due to any of: improper HCVMP labelling, lack of "new" labelling, taste, and/or cost (on average, healthy snacks are 19% more expensive than unhealthy ones).

Currently, respondents are not concerned if vending purchases are locally sourced, which may be because food security is not yet widely discussed in the community. Stocking more local products would help UBC demonstrate good food citizenship by creating demand for alternative sustainable consumption (as discussed in class).

The survey results offer clear snack and beverage preferences: it is important to stock preferred healthy items, because even shelf-stable products have expiration dates. Reducing food waste acts to increase food security (Abdulla et al. 2010).
For product arrangement, healthy items were often placed low in the machines, which is good since research shows people are more comfortable looking down than up (Donnelly & Seth-Smith, 1999). Comparing

the GSVM's performance against the 2012 audit, HCVMP is being adhered to less now for the Gage Residence GSVM, which now contains a higher %NR items (Ma et al. (2012) found 7% CM, 36% CS, 10% CL, and 47% NR items) (Appendix C.4). SUB GSVM now has more CM, but fewer CS items (Ma et al. (2012) found it contained 0% CM, 17% CS, 20% CL, and 63% NR items). Since the 2012 audit, the percentage of available healthy options has decreased.

To expand our scope to BVM, we audited the SUB and Gage Residence BVM against the HCVMP, and the results indicated the majority of offerings were deemed unhealthy (60%) according to the HCVMP's thresholds: e.g. containing more than 16 g of sugar/250 mL (Ministry of Health, 2013). The consumption of sugar-sweetened beverages is associated with obesity (Black & Macinko, 2008). Having predominantly unhealthy beverages in BVM contributes to food insecurity by limiting availability of nutritionally adequate choices (Vasquez et al. 2007). (Appendix C.7)

A notable limitation in our survey data is the potential bias introduced by the examples given in Question 6; we chose to add these after the pilot survey because initial respondents were confused and asked us for direction (Appendix A). A limitation of our audit is that the products placed in the vending machines are not static: item stocking and arrangement will vary over time. Our findings are further limited because HCVMP labelling seems to be updated less frequently than item placement changes: the identified mislabellings are probable evidence of this. According to Donnelly and Seth-Smith (1999), consumers create mind maps to help them find products; so inconsistent product arrangement could be reducing healthy purchases.

## V. RECOMMENDATION

Based on our findings, and community-based experiences, there is room for improvement in campus vending machines. To start, our group recommends applying HCVMP categorization to BVM. Victoria would like to see 50% or more healthy beverages in every BVM (personal communication, November 7, 2013), and using the HCVMP would help to accomplish this.

To help ensure that new healthy beverages sell, we suggest adding the curated selection of CS beverages in Appendix D, since they match community preferences, and are all available through Coca-Cola Canada.

We also suggest following the HCVMP more closely for snacks, increasing the number of CM items offered, as advised by Ma et al. (2012). Increasing the number of healthy foods and beverages in vending machines would increase overall physical accessibility to them, and thus increase campus food security. We suggest adding more healthy bars and healthy fruit snacks to machines, since these were popular

requests among survey respondents. Victoria recommended we keep suggestions general (i.e., not brand-specific) (personal communication, September, 23, 2013).

Similarly, as Ma et al. (2012) advised, we suggest lowering the cost of the healthy options, and increasing the cost of unhealthy options to compensate. This would also increase campus food security by increasing the economic accessibility of healthy foods.

Since many respondents were unaware of HCVMP, we propose having the HCVMP explanation panel visible in all machines that carry the labels. We also recommend educating the staff that restock the machines, so that items have the correct HCVMP labelling. Perhaps having moveable HCVMP stickers would help with this.

Currently, all UBCFS BVM are non-refrigerated. Future LFS teams could perform taste testing within the community, to determine preferences for the sensory properties of shelf-stable milk (UHT) versus regular milk (pasteurized). If shelf-stable milk is unenjoyable, it may be worth introducing refrigerated BVM. They could also survey to determine if room-temperature beverages are a purchasing deterrent.

To advance CBEL, we recommend future teams do health assessments of specific item ingredients (rather than the broad-stroke assessment of the HCVMP): e.g., “How healthy are certain preservatives?” Moreover, they could examine the HCVMP itself: e.g., “How does a product size affect its categorization?” Victoria expressed interest in having these details, but this exceeded the attainable scope of our project (personal communication, November 7, 2013).

## VI. CONCLUSION

Our GSVM audit revealed few improvements since 2012, and in some cases the model has regressed, revealing that the GSVM is currently not succeeding; reasons for this may include higher cost of healthy snacks, improper labelling, and a higher proportion of unhealthy options. Our recommendations include: adding the healthy beverages and snacks that were preferred by survey respondents, lowering the cost of healthy options, using the HCVMP for BVM, and adding signage to all vending machines to improve HCVMP awareness. Any of these would improve food security at UBC, and create a positive precedent for future vending policy.

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# *APPENDICES*

## Appendix A: Pilot Survey & Final Survey

**PILOT:** Vending Machine Experience Survey

1. Are you aware of British Columbia's vending machine "Healthier Choices" policy?

   Yes No

2. How often do you purchase an item from the "Choose Most" category from campus vending machines?

   Please circle a number: never 1 2 3 4 5 6 7 always

3. Would you like to see dried fruit added to campus vending machines? (e.g. apple chips, fruit leather…)

   Please circle a number: never 1 2 3 4 5 6 7 always

4. How often do you consider purchasing local products from a campus vending machine? (local = British Columbia)

   Please circle a number: never 1 2 3 4 5 6 7 always

5. Describe your dominant motivational factor when making a decision at a vending machine?

6. What categories of non-perishable snacks or beverages would you like to see added to vending machines campus-wide?

**FINALIZED: Vending Machine Experience Survey**

1. Are you aware of British Columbia's vending machine "Healthier Choices" policy?

   **Yes** **No**

2. How often do you purchase an item from the "Choose Most" category from campus vending machines?

   **Please circle a number:**

| Never | Rarely | I Don't Know | Sometimes | Always |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

3. Would you be more inclined to consider purchasing from the vending machine if new healthy options were clearly labeled as "new item"?

   **Please circle a number:**

| Never | Rarely | I Don't Know | Sometimes | Always |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

4. How often do you consider purchasing local products from a campus vending machine? (local = British Columbia)

   **Please circle a number:**

| Never | Rarely | I Don't Know | Sometimes | Always |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

5. What types of beverages do you prefer to drink?

   **Please circle up to 3 options:**

   **Water** **Soda Pop** **Fruit Juice** **Cold Tea**
   **Milk** **Low-Sweet Carbonated** **Other**

6. Describe your dominant motivational factor when making a decision at a vending machine (e.g. Taste, cost, etc.)?

7. What categories of snacks or beverages would you like to see added to vending machines campus-wide?

## Appendix B: Survey Results (QUANTITATIVE)

**Table 1: Questions 1-5.**

| Questions | Total | Yes | No | | | | Total |
|---|---|---|---|---|---|---|---|
| **1. Do you use campus vending machines?** | 207 | 57% | 43% | | | | 100% |
| **2. Are you aware of British Columbia's vending machine "Healthier Choices" policy?** | 206 | 53% | 47% | | | | 100% |
| **Questions** | **Total** | **Always** | **Often** | **Sometimes** | **Rarely** | **Never** | **Total** |
| **3. How often do you purchase an item in the "Choose Most" category from campus vending machines?** | 207 | 0% | 5% | 22% | 35% | 38% | 100% |
| **4. Would you be more inclined to consider purchasing from the vending machines if new options were clearly labeled as "new item"?** | 207 | 1% | 10% | 37% | 32% | 19% | 100% |
| **5. How often do you consider purchasing local products from a campus vending machine? (local = British Columbia)** | 206 | 2% | 10% | 25% | 35% | 27% | 100% |

**Table 2**

| **Purchasing factors (ranked by how often done; max. of 5.0), n = 210.** | **Mean*** |
|---|---|
| **How often, on average, people purchase items from the "choose most" category** | 1.94 |
| **How often, on average, people would consider purchasing from campus vending if new items were clearly labeled** | 2.43 |
| **How often, on average, people consider whether they are purchasing local items from campus vending** | 2.25 |
| *** 1 = Never; 2 = Rarely; 3 = Sometimes; 4 = Often; 5 = Always.** | |

**Table 3: Question 6**

| Beverage Types | Total | Water | Soda Pop | Fruit Juice | Cold Tea | Milk | Low-Sweet Carbonated | Other | Total |
|---|---|---|---|---|---|---|---|---|---|
| Surveyed individuals' beverage preferences | 456* | 31% | 13% | 23% | 15% | 11% | 2% | 5% | 100% |

*Each individual surveyed could choose up to 3.

**(QUALITATIVE)**

**Table 4 Question 7**

| Motivation at vending machines | Total | Cost | Taste | Healthy Options | Convenience | Hunger | Craving | Only Options | Brand | Thirst | Orange | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Categorized motivation percentages** | 274* | 32% | 28% | 11% | 9% | 6% | 6% | 3% | 3% | 1% | 1% | 100% |

* Surveyed individuals chose more than one factor, 10 individuals left the field blank.

**Combined Categories Legend**: included responses like "filling, and quantity" into "Cost", and "quality" into "Taste". Added all health related options into "Healthy Options", and all "nothing open" into "Only Option". Included "card-payment" into "Convenience", and finally included the one response about "gluten-free" into "Healthy Options".

**Table 5: Question 8**

| Types of snacks & beverages to add to campus vending machines | Healthy Fruit Snacks | Energy/ Protein Bars | Granola/ Cereal Bars | Healthy Chips | Candies | Dried Vegetable Snacks | Crackers | Chocolate |
|---|---|---|---|---|---|---|---|---|
| Percentage of surveyed individuals | 8.6% | 6.1% | 4.1% | 3.7% | 3.3% | 2.9% | 2.9% | 2.9% |
| | **Nuts** | **Cookies** | **Cookies** | | | | | |
| Percentage of surveyed individuals | 2.4% | 2.4% | 2.4% | | | | | |
| | **Tea** | **Fruit Juice** | **Coffee** | **Soda Pop** | **Protein Shakes** | **Milk** | **Vitamin Water** | **Smoothies** |
| Percentage of surveyed individuals | 3.7% | 2.9% | 2.4% | 1.2% | 1.2% | 1.2% | 0.8% | 0.8% |
| | **Energy Drinks** | **Coconut Water** | **Carbonated Water** | | | | | |
| Percentage of surveyed individuals | 0.8% | 0.4% | 0.4% | | | | | |
| | **Don't Know/ Care/ None** | **Healthier Options** | **Cheaper** | **Alternative Products** | **Local/ Organic** | **Stationary** | **Beer** | **Total** |
| Percentage of surveyed individuals | 27.3% | 10.2% | 2.0% | 2.0% | 1.6% | 0.8% | 0.8% | 100.0% |

**Combined Categories Legend:**
Healthy Fruit Snacks: Dried fruits (apple, mango etc.)
Dried Vegetable Snacks: kale, veggies
Energy/Power Bars: energy bars, meal supplements, power bars, protein bars, high fibre/protein, more filling snacks, higher nutrition meal supplements, Lara bars, Cliff Bars
Healthy Chips: Dill/Jalapeno, popcorn
Milk: chocolate, plain
Nuts: unsalted, trail mix
Healthier Options: Healthier choices, healthier alternatives, healthier snacks, good tasting healthy snacks, more nutritional options, healthy but tasty alternatives, healthier options, healthier stuff, More of low calorie snacks, More healthier drink options, Lower fat content, Natural foods, raw/unprocessed
Don't Know/Care/None: Do not care, Don't Know, Never thought of, none, blanks, N/A, I'm satisfied, inappropriate choices = perishable
Alternative Products: Gluten Free, Sugar Free, Vegan, Environmentally friendly packaging
Crackers: Asian snacks, pretzels, crackers

**Table 5.a: Question 8 - Significant Results to Discuss**

| Types of snacks to add to campus vending | Healthy Fruit Snacks | Energy/ Protein Bars | Granola/ Cereal Bars | Don't Know/Care/None | Healthier Options |
|---|---|---|---|---|---|
| Percentage of surveyed individuals | 8.6% | 6.1% | 4.1% | 27.3% | 10.2% |

**Appendix C:** *Audit Results of SUB & Gage Residence GSVM & and Beverage Vending Machines (BVM)*

**C.1:** *Snack Vending Machine (GSVM) Audit Results*

| **SUB (VENDING CORRIDOR) aka SUB PIZZA from previous groups audit** | | | | |
|---|---|---|---|---|
| **SUB GSVM 1** | | | | |
| Product Name | Size (g) | Food Group | Category | Price ($) |
| Cheetos Crunchy | 51 | Grains | Not Recommended | 1.50 |
| Original Munchies | 43 | Grains | Not Recommended | 1.50 |
| Doritos Nacho Cheese | 45 | Grains | Not Recommended | 1.50 |
| Lays Classic | 40 | Veg/Fruit | Choose Least | 1.50 |
| Lays Bar-B-Q | 43 | Fruit/Veg | Not Recommended | 1.50 |
| Miss Vickies Salt & Vinegar | 40 | Veg/Fruit | Choose Least | 1.50 |
| Miss Vickies Sweet Chili & Sour Cream | 40 | Veg/Fruit | Choose Least | 1.50 |
| Old Dutch Crunchy Nacho Cheese | 55 | Grains | Not Recommended | 1.50 |
| Lays Ketchup | 43 | Fruit/Veg | Not Recommended | 1.50 |
| Fritos Hoops BBQ | 50 | Grains | Not Recommended | 1.50 |
| Ruffles Sour Cream'n Onion | 43 | Fruit/Veg | Choose Least | 1.50 |
| Rold Gold Pretzels | 47 | Grains | Not Recommended | 1.50 |
| Baked Lays Bar-B-Q | 32 | Fruit/Veg | Choose Sometimes | 1.50 |
| Smartfood (with Cheddar) Popcorn | 45 | Grains | Not Recommended | 2.00 |
| Baked Lays Ruffles Cheddar and Sour Cream | 32 | Fruit/Veg | Choose Sometimes | 1.50 |
| Sun Chips Harvest Cheddar | 40 | Grains | Choose Least | 1.50 |
| Ruffles Sour Cream'n Bacon | 40 | Fruit/Veg | Not Recommended | 1.50 |
| Mr. Big | 60 | Candies | Not Recommended | 1.75 |
| Oh Henry | 62.5 | Candies | Not Recommended | 1.75 |
| Reese | 51 | Candies | Not Recommended | 1.75 |
| Aero | 42 | Candies | Not Recommended | 1.75 |
| Snickers | 53 | Candies | Not Recommended | 1.75 |
| Coffee Crisp | 50 | Candies | Not Recommended | 1.75 |
| The Edge (Replenish) | 75 | Energy Bars | Choose Least | 3.75 |
| The Edge (Fortify) | 65 | Energy Bars | Choose Least | 3.75 |

| | | | | |
|---|---|---|---|---|
| The Edge (Maintain) | 65 | Energy Bars | Choose Most | 3.75 |
| M&M's | 48.3 | Candies | Not Recommended | 1.75 |
| Twix | 56.7 | Candies | Not Recommended | 1.75 |
| Excel Gum | 2.8 | Candies | Choose Sometimes | 1.50 |
| Crispy Crunch | 48 | Candies | Not Recommended | 1.75 |
| Kit Kat | 50 | Candies | Not Recommended | 1.75 |
| Caramilk | 52 | Candies | Not Recommended | 1.75 |
| Hershey's Cookies n' Cream | 45 | Candies | Not Recommended | 1.75 |
| Hershey's Almond | 43 | Candies | Not Recommended | 1.75 |
| Mike & Ike | 60 | Candies | Not Recommended | 1.75 |
| Mike & Ike | 60 | Candies | Not Recommended | 1.75 |
| Skittles | 61.5 | Candies | Not Recommended | 1.75 |
| Mars | 53 | Candies | Not Recommended | 1.75 |
| Nature Valley Trail Mix (granola bar) | 35 | Grains | Choose Least | 1.25 |
| Quaker Yogurt (granola bar) | 36 | Grains | Not Recommended | 1.25 |
| English Bay Dark and White Chocolate Chunk Cookie | 100 | Grains | Choose Least | 1.75 |
| Dan-D-Pak Mountain Trail Mix | 100 | Nuts | Not Recommended | 2.25 |
| Smarties | 50 | Candies | Not Recommended | 1.50 |
| Sour Tongue Tinglers | 143 | Candies | Not Recommended | 2.25 |
| Super Wormies | 143 | Candies | Not Recommended | 2.25 |
| Welch's Fruit Snacks | 64 | Candies | Choose Least | 1.50 |
| English Bay Chocolate Chip Cookie | 43 | Grains | Choose Least | 1.75 |
| **SUB GSVM 2** | | | | |
| Product Name | Size (g) | Food Group | Category | Price ($) |
| Original Munchies | 43 | Grains | Not Recommended | 1.50 |
| Hickory Sticks (Original) | 50 | Fruit/Veg | Not Recommended | 1.50 |
| Smartfood (with Cheddar) Popcorn | 45 | Grains | Not Recommended | 2.00 |
| Lays Bar-B-Q | 43 | Fruit/Veg | Not Recommended | 1.50 |
| Lays Classic | 40 | Veg/Fruit | Choose Least | 1.50 |
| Rold Gold Pretzels | 47 | Grains | Not | 1.50 |

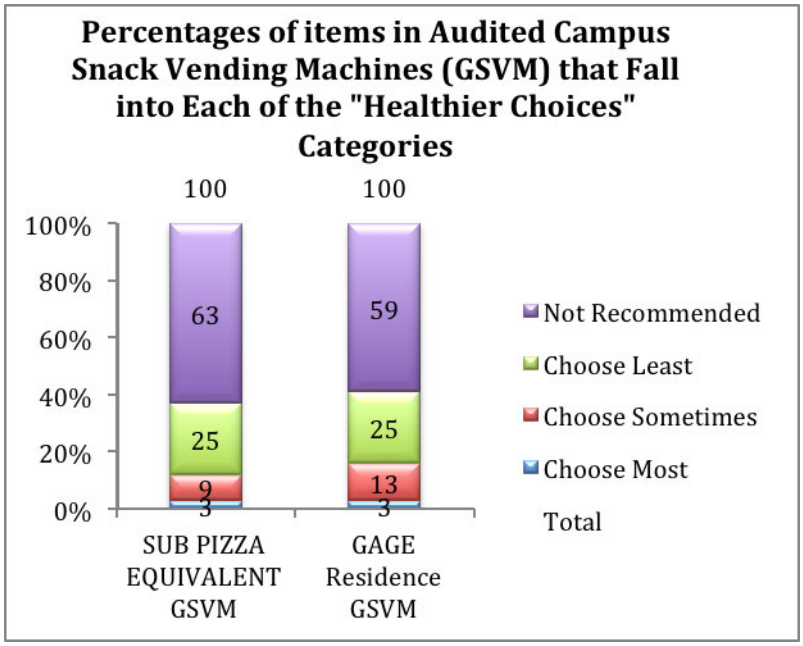
| | | | | |
|---|---|---|---|---|
| | | | Recommended | |
| Baked Lays Bar-B-Q | 32 | Fruit/Veg | Choose Sometimes | 1.50 |
| Baked Lays Original | 32 | Fruit/Veg | Choose Sometimes | 1.50 |
| Baked Lays Ruffles Cheddar and Sour Cream | 32 | Fruit/Veg | Choose Sometimes | 1.50 |
| Dan-D-Pak Rice Crackers | 80 | Grains | Not Recommended | 1.75 |
| Old Dutch Crunchy Nacho Cheese | 55 | Grains | Not Recommended | 1.50 |
| Ruffles Loaded Potato Skins | 40 | Fruit/Veg | Not Recommended | 1.50 |
| Sun Chips Harvest Cheddar | 40 | Grains | Choose Least | 1.50 |
| Miss Vickies Salt & Malt Vinegar | 43 | Fruits/Veg | Choose Least | 1.50 |
| Lays Ketchup | 43 | Fruit/Veg | Not Recommended | 1.50 |
| Aero | 42 | Candies | Not Recommended | 1.75 |
| Snickers | 53 | Candies | Not Recommended | 1.75 |
| M&M's | 48.3 | Candies | Not Recommended | 1.75 |
| Reese | 51 | Candies | Not Recommended | 1.75 |
| Hershey's Almond | 43 | Candies | Not Recommended | 1.75 |
| Coffee Crisp | 50 | Candies | Not Recommended | 1.75 |
| The Edge (Maintain) | 65 | Energy Bars | Choose Most | 3.75 |
| The Edge (Replenish) | 75 | Energy Bars | Choose Least | 3.75 |
| Nature Valley Trail Mix (granola bar) | 35 | Grains | Choose Least | 1.25 |
| Quaker Chewy Chocolate Chip (granola bar) | 26 | Grains | Choose Least | 1.25 |
| Norma's Chocolate Chunk Cookie | 100 | Grains | Choose Sometimes | 1.75 |
| English Bay Dark and White Chocolate Chunk Cookie | 100 | Grains | Choose Least | 1.75 |
| Sour Tongue Tinglers | 143 | Candies | Not Recommended | 2.25 |
| Super Wormies | 143 | Candies | Not Recommended | 2.25 |
| Welch's Fruit Snacks | 64 | Candies | Choose Least | 1.50 |
| **Gage Residence GSVM** | | | | |
| Product Name | Size (g) | Food Group | Category | Price ($) |
| Lays Bar-B-Q | 43 | Fruit/Veg | Not Recommended | 1.50 |
| Cheetos Crunchy | 51 | Grains | Not Recommended | 1.50 |
| Doritos Nacho Cheese | 45 | Grains | Not Recommended | 1.50 |
| Lays Classic | 40 | Veg/Fruit | Choose Least | 1.50 |
| Miss Vickies Jalapeno | 43 | Fruits/Veg | Choose Least | 1.50 |

| | | | | |
|---|---|---|---|---|
| Sun Chips Garden Salsa | 40 | Grains | Choose Least | 1.50 |
| Miss Vickies Sweet Chili & Sour Cream | 43 | Fruits/Veg | Choose Least | 1.50 |
| Old Dutch Crunchy Nacho Cheese | 55 | Grains | Not Recommended | 1.50 |
| Smartfood (with Cheddar) Popcorn | 45 | Grains | Not Recommended | 2.00 |
| Rold Gold Pretzels | 47 | Grains | Not Recommended | 1.50 |
| Baked Lays Ruffles Cheddar and Sour Cream | 32 | Fruit/Veg | Choose Sometimes | 1.50 |
| Baked Lays Bar-B-Q | 32 | Fruit/Veg | Choose Sometimes | 1.50 |
| Coffee Crisp | 50 | Candies | Not Recommended | 1.75 |
| Aero | 42 | Candies | Not Recommended | 1.75 |
| Mike & Ike | 60 | Candies | Not Recommended | 1.75 |
| Kit Kat | 50 | Candies | Not Recommended | 1.75 |
| Twix | 56.7 | Candies | Not Recommended | 1.75 |
| Hershey's Almond | 43 | Candies | Not Recommended | 1.75 |
| Hershey's Cookies n' Cream | 45 | Candies | Not Recommended | 1.75 |
| Reese | 51 | Candies | Not Recommended | 1.75 |
| Billy Bob's Beef Jerky | 15 | Meat/Alternatives | Choose Sometimes | 2.25 |
| Oh Henry | 62.5 | Candies | Not Recommended | 1.75 |
| The Edge (Maintain) | 65 | Energy Bars | Choose Most | 3.75 |
| The Edge (Fortify) | 65 | Energy Bars | Choose Least | 3.75 |
| Quaker Yogourt (granola bar) | 36 | Grains | Not Recommended | 1.25 |
| Nature Valley Trail Mix (granola bar) | 35 | Grains | Choose Least | 1.25 |
| Smarties | 50 | Candies | Not Recommended | 1.50 |
| Snickers | 53 | Candies | Not Recommended | 1.75 |
| Norma's Chocolate Chunk Cookie | 100 | Grains | Choose Sometimes | 1.75 |
| English Bay Chocolate Chip Cookie | 43 | Grains | Choose Least | 1.75 |
| Sour Tongue Tinglers | 143 | Candies | Not Recommended | 2.25 |
| Welch's Fruit Snacks | 64 | Candies | Choose Least | 1.50 |

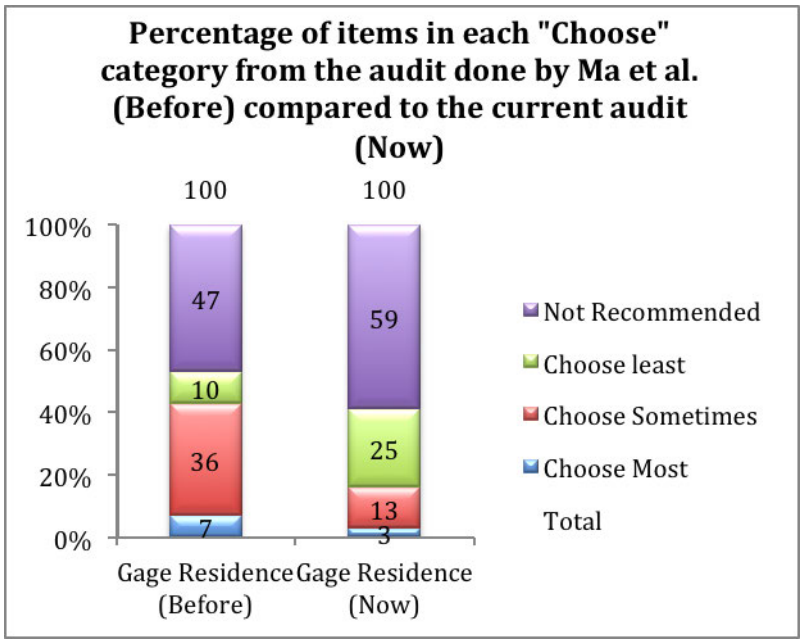
### C.2: Average cost of Unhealthy (CL/NR) vs. Healthy (CM/CS) snacks

| Category Type | Average Cost |
|---|---|
| CL/NR | 1.74 |
| CM/CS | 2.07 |

### C.3: Bar chart using C.1 Results



**C.4: Bar Chart Using above results, and results found by Ma et al. (2012)**

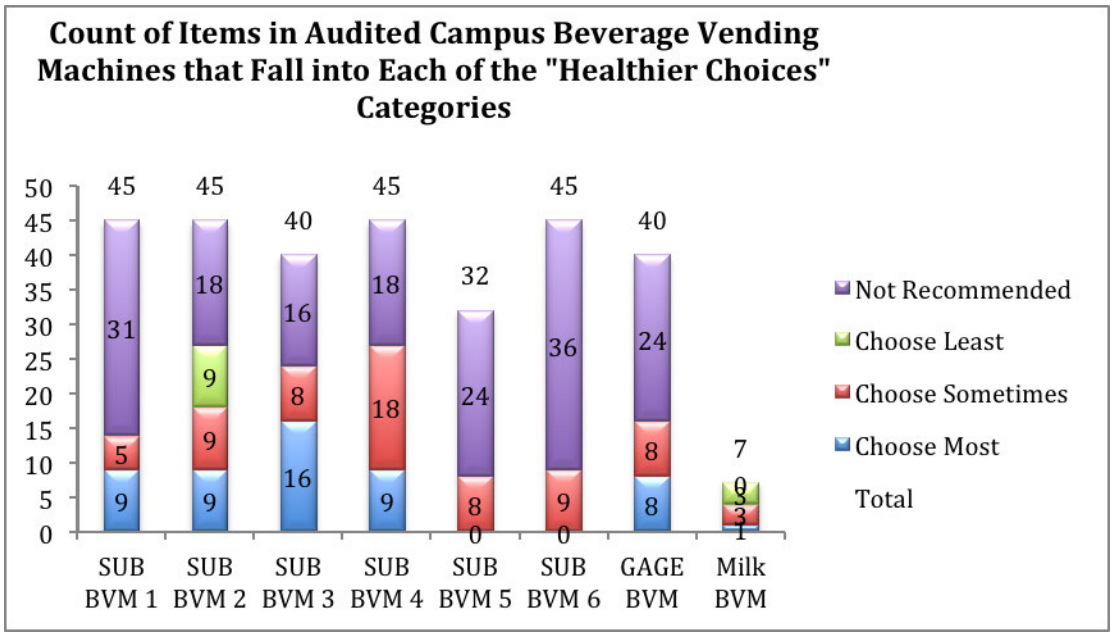



**C.5:** *Beverage Vending Machine Audit Results*

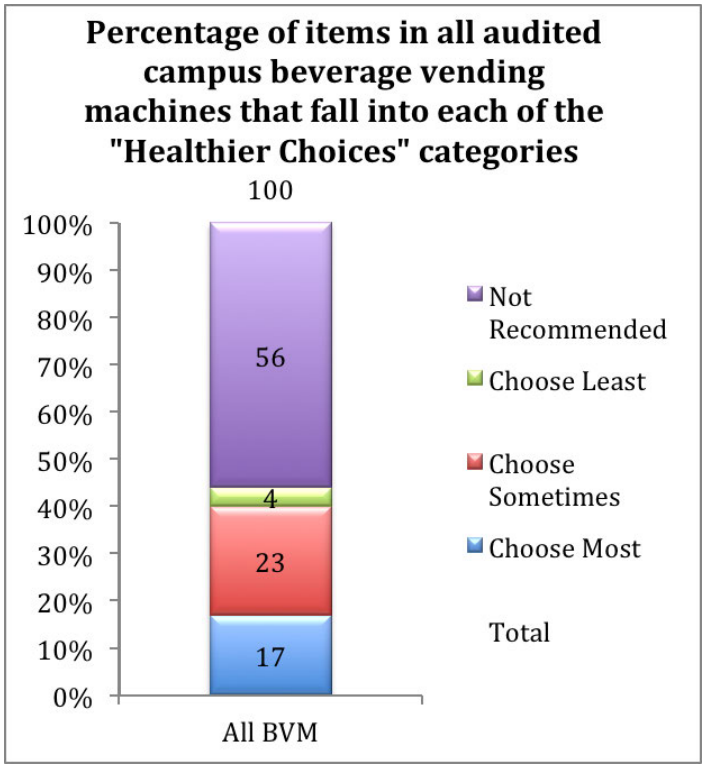
| **SUB (VENDING CORRIDOR) aka SUB PIZZA from previous groups audit** | | | | |
|---|---|---|---|---|
| **SUB BVM (ALL)** | | | | |
| Product Name | Size (mL) | Food Group | Category | Price ($) |
| Pepsi Cola | 591 | Beverage | Not Recommended | 2.00 |
| Diet Pepsi | 591 | Beverage | Choose Sometimes | 2.00 |
| 7 Up | 591 | Beverage | Not Recommended | 2.00 |
| Dr. Pepper | 591 | Beverage | Not Recommended | 2.00 |
| Brisk Iced-Tea | 591 | Beverage | Not Recommended | 2.00 |
| Dr. pepper | 591 | Beverage | Not Recommended | 2.00 |
| Mountain Dew | 591 | Beverage | Not Recommended | 2.00 |
| Water | 591 | Beverage | Choose Most | 2.00 |
| Rockstar | 591 | Beverage | Not Recommended | 3.00 |
| Starbucks (Mocha/Vanilla Double Shot) | 591 | Beverage | Not Recommended | 3.00 |
| Dole (Apple) | 450 | Beverage | Choose Sometimes | 2.25 |
| Dole (Orange) | 450 | Beverage | Choose Sometimes | 2.25 |
| G2 (Grape, Punch, Blueberry) | 591 | Beverage | Choose Sometimes | 2.25 |
| Powerade | 591 | Beverage | Not Recommended | 2.00 |
| Powerade (Zero Calorie) | 591 | Beverage | Choose Sometimes | 2.00 |
| Regular Nestea | 500 | Beverage | Not Recommended | 2.00 |

| | | | | |
|---|---|---|---|---|
| Green Tea Nestea | 500 | Beverage | Not Recommended | 2.00 |
| Minute Maid (Orange) | 450 | Beverage | Choose Sometimes | 2.00 |
| Minute Maid (Apple) | 450 | Beverage | Choose Sometimes | 2.00 |
| Vitamin Water | 591 | Beverage | Choose Sometimes | 2.50 |
| Regular Coke | 591 | Beverage | Not Recommended | 2.00 |
| Coke Zero | 591 | Beverage | Choose Sometimes | 2.00 |
| Diet Coke | 591 | Beverage | Choose Sometimes | 2.00 |
| Sprite | 591 | Beverage | Not Recommended | 2.00 |
| Canada Dry | 591 | Beverage | Not Recommended | 2.00 |
| Regular Nestea | 591 | Beverage | Not Recommended | 2.00 |
| Barq's Root Beer | 591 | Beverage | Not Recommended | 2.00 |
| C Plus | 591 | Beverage | Not Recommended | 2.00 |
| Monster | 473 | Beverage | Not Recommended | 3.00 |
| Milk 2 Go: Plain 2% | 350 | Beverage | Choose Most | 2.00 |
| Milk 2 Go: Chocolate | 350 | Beverage | Choose Sometimes | 2.00 |
| Milk 2 Go: Strawberry Splash | 350 | Beverage | Choose Sometimes | 2.00 |
| Milk 2 Go: Vanilla Vibe | 350 | Beverage | Choose Least | 2.00 |
| Milk 2 Go: Caramilk | 350 | Beverage | Choose Least | 2.00 |
| Milk 2 Go: Crispy Crunch | 350 | Beverage | Choose Least | 2.00 |
| Steaz raspberry & Peach Mango | 473 | Beverage | Choose Sometimes | 2.50 |
| **Gage Residence BVM** | | | | |
| Product Name | Size (mL) | Food Group | Category | Price ($) |
| Regular Coke | 591 | Beverage | Not Recommended | 2.00 |
| Coke Zero | 591 | Beverage | Choose Sometimes | 2.00 |
| Diet Coke | 591 | Beverage | Choose Sometimes | 2.00 |
| Sprite | 591 | Beverage | Not Recommended | 2.00 |
| Canada Dry | 591 | Beverage | Not Recommended | 2.00 |
| Regular Nestea | 500 | Beverage | Not Recommended | 2.00 |
| Monster | 473 | Beverage | Not Recommended | 3.00 |
| Water | 591 | Beverage | Choose Most | 2.00 |

**C.6: Bar Chart using C.5 results**




**C.7: Bar chart using C.6 results**



**Appendix D: Suggested Coca Cola beverage additions for campus vending**

| Suggested healthier Coca Cola beverage additions for campus machines | | | | | |
|---|---|---|---|---|---|
| **Product name** | **Flavour** | **Size (mL)** | **Food Group** | **Category** | **Survey beverage preference** |
| Minute Maid 100% Juice | Tropical Fruit Blend | 341 | Juice | Choose Sometimes | Fruit Juice |
| Minute Maid 100% Juice | Mixed Berry | 341 | Juice | Choose Sometimes | Fruit Juice |
| Dasani Essentials | Pomegranate Blackberry | 591 | Other Beverage | Choose Sometimes | Water |
| Dasani | Raspberry | 591 | Other Beverage | Choose Sometimes | Water |
| Dasani | Strawberry | 591 | Other Beverage | Choose Sometimes | Water |
| Dasani | Citrus | 591 | Other Beverage | Choose Sometimes | Water |
| Nestea Zero Iced Tea | Natural Lemon Flavour | 341 | Other Beverage | Choose Sometimes | Cold Tea |

**Appendix E: Personal Reflections**

*Each member of our group has written a personal reflection below:*

**Aveir Chang:** By being part of the vending machine project, I feel that we are actually moving toward food security. Although the GSVM does not seem to have made much improvement from currently existing model, the process of identifying that UBC students as being subjected to food insecurity and trying to come up with solutions is what's important. This CBEL project has demonstrated that vending machines do play a big role in UBC community's food system and as the result has shown, the CM categories do not necessarily represent personal preferences. So I'm hoping that in the future, the vending suppliers would take our survey result into consideration since preferences and cultural acceptability are part of the definition to food security.

**Tyra Duggan:** Through my involvement in this project, I was initially surprised to learn that UBC Food Services is attempting to improve the quality of snacks and beverages offered through vending, since vending machines are often thought of as inherently unhealthy due to the highly-processed nature of their goods. I never considered that there could be "healthier" processed food selections, and it is rewarding to know that through our efforts these selections could take the place of some of the less healthy options currently provided. By offering healthier options, UBC Food Services is increasing accessibility to nutritionally adequate foods for those who frequent the machines on campus.

**Carmen Sham:** Prior to the project, I would never have made the connection that vending machines also contribute to food security in a community. I was disappointed to see that the Gage Snack Vending model had little success over the last year, but I also have to keep in mind that change does not happen overnight. I am definitely excited to see whether or not our audits and suggestions will make an impact on the food security of vending machines on campus in the years to come. I also hope that we have piqued the interest of our survey participants to become more aware of the decisions they make at vending machines and in turn increase their food knowledge and food security.

**Alexandra Lyn Shyuan Tan:** Food security is something I have never heard of before, until I took LFS250. I have really enjoyed being a part of this faculty, which tries to promote food security and food citizenship. This project has really shown me how much society has limited us from being food secure. It is important for us "youths" to change the way our community looks at food, to make them more aware of the food they consume, because our society as a whole is moving toward a very unhealthy lifestyle - of fast food and prepackaged meals which are full of salt, sugar and fat.

**Judy Tung:** I was excited to be involved in this project because I believe it is important to improve the accessibility and availability of healthy options into

vending machines. Students often rely on vending machine to fuel themselves with energy late night when food establishments are closed. Before this project, my first impressions of vending machine snacks was that they were unhealthy. At first, I was frustrated to learn that we can only recommend beverages from the Coca-Cola company because I thought that the company supplied beverages high in sugar. Through research, I learned that there are many healthy beverage products my group could recommend such as Zico coconut water and Odwalla. All in all,, my perspective on UBC vending machines changed because I am more aware of the past and current initiatives UBC is taking to support the local food system through the vending machines.

**Katherine Wang:** As we learned in class, food security is defined as having access to to sufficient, safe, nutritious food to maintain a healthy life. Most of time, students use vending machines for convenience. However, these machines are often filled with products that are not nutritious, such as high fat and sugar contents which leads to food insecurity. The goal for our project is to replace these unhealthy foods with more nutritious and local products in vending machines. Therefore, I believe that this project can make our campus more food secure and sustainable by providing healthier and local products. Moreover, this may provide opportunities for others to practice and become more knowledgeable in food security.

**Rosemary Wright:** This experience brought about a stir of emotions: Initially, I was frustrated with the assignment because of the broad project description given to my team. As the term progressed, the objectives became clearer, bringing our anxiety of finishing the project down. As I look back, this experience as a whole has been eye opening: I appreciate how LFS 350 integrates classroom learning into the local community; this sort of teaching helps me make valuable connections and understand the importance of education. The most important thing I learned doing this assignment was realizing the lack of communication that exists between individuals involved with the UBC vending machines. It is nice to know that small changes brought by our group can make students aware of healthy snack and beverage options in vending machines, potentially improving their health. These small changes can help contribute to a healthier and sustainable community.