



# Veggies on Campus

WHERE, WHY, & HOW DALHOUSIE STUDENTS ACCESS FRESH  
PRODUCE

ENVS/SUST 3502: Campus as a Living Laboratory, Dalhousie University

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### **Executive Summary**

In this study, the purchasing patterns of fresh produce amongst Dalhousie students on the Halifax campuses are identified and assessed in order to determine correlating factors and variables pertaining to the logistics and motives affecting students' relationship to short local food systems. The objective of the research project was to examine the relationships between pre-existing areas of academic interest - food security, student contributions to sustainable, local economies - and important barriers students face in these areas that have not generally been considered in previous studies. At Dalhousie University, where we conducted our research, there has yet to be a published piece of literature or research focusing on the specific barriers students face in accessing food. Similarly, there lacks a research project focusing on different categories or types of food groups, such as processed food, restaurant meals and so on. This research project focuses on fresh produce as it generally entails less packaging and manufacturing, and therefore the end product contains more nutrients than most processed foods (Bucher et al., 2017). Using a fifteen-question survey, we collected responses focused on potential factors and specific purchasing patterns. These responses were subjected to statistical analysis to test the validity of background research and hypotheses. Two *One Way* ANOVAs were completed to test for significance on paired survey questions that had possibilities of uncovering trends. Qualitative results were coded. In the analysis, one ANOVA suggested significant results between the respondent's living arrangements and the amount of money spent on food items on campus. The survey responses also provided valuable insight on key factors such as accessibility and location as these were some of the primary determinants towards where respondents purchased their fresh produce. Finally, we provide recommendations for food initiatives being conducted at Dalhousie University, such as the Dalhousie Student Union Farmer's Market and the DSU Food Bank. We anticipate that these recommendations could assist in addressing the barriers students face in accessing fresh produce whilst encouraging participation in local food production and providing students with access to fresh local produce as a key aspect of campus growth.

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## **Background and Rationale**

Conventional food production is characterized by the utilization of chemical fertilizers, pesticides and chemical herbicides during production (Cooper, Butler & Leifert, 2011). The negative repercussions of such production and consumption are complex in nature - influencing various aspects of society, such as environmental, individual and public health (Shaw et al., 2018; Cooper et al., 2011). Research documents the impact conventional production and distribution have on environmental issues such as climate change, water pollution, water scarcity, soil erosion and biodiversity loss (Shaw et al., 2018; Cooper, Butler & Leifert, 2011). Recently, a localized food narrative has emerged as a counter-hegemonic force to address the environmental and social injustice surrounding conventional industrial food systems (Albrecht & Smithers, 2017). Rural sociology studies recognize the societal, economic and environmental significance of short, local food chains (Ward, Blackley & Brooks, 2014; Schmitt et al., 2017). Specifically highlighting farmer's markets and their potential to improve citizen access to fresh, local produce and their overall engagement in local food chains further reduce the impacts of conventional production (Ward et al., 2014; Schmitt et al., 2017).

A thorough comprehension of an individual's dietary behaviour is difficult due to the convoluted nature of biological, socio-cultural, economic and technological factors (Thornton, Crawford, Lamb & Ball, 2017). Thus, it is theorized that changes in food production and distribution methods directly impact current food choices and hold environmental consequences (Thornton, et al., 2017). Long food chains such as supermarkets are responsible for close to 80% of the food retail business in 2009 and shadowed a reduction in purchases from traditional and smaller establishments such as farmer's markets and greengrocers (Costa, Claro, Martins, & Levy, 2013; Reardon & Berdegue, 2002). However, recently, consumers are becoming increasingly cognizant of the social and environmental impacts of conventional food production and distribution; consumers are opting for food produced from alternative agricultural and local distribution practices such as Farmers' Markets (Shaw et al., 2018). Research surrounding consumer purchasing habits have declared young adults more willing to pay extra for sustainable goods in comparison to older individuals (Vermeir & Verbeke, 2008; Nielson Company, 2015). Contending research questions the viability of this statement as university students are often economically insecure, affecting their ability to pay extra for sustainable goods (Shaw et al., 2018). Rates of student food insecurity across the country vary by province and institution. In 2016, Meal Exchange conducted the largest evaluation of postsecondary student food insecurity in Canada. Dalhousie University students exhibited one of the highest rates of food insecurity at 46% (Silverthorn, 2016). It is important to note that Dalhousie University's food

bank's research displayed "... 68% of members prioritized tuition costs over food. . ." (Abbott et al., 2015).

Further research has identified the role of educational institutions in promoting, teaching, researching and encouraging sustainable projects such as the initiative to provide affordable and secure access to nutritious foods (Appel & Barragán, 2016). Inevitable life changes occur when students enter secondary education, namely, most receive full autonomy in their food choices for the first time. For students who are living away from home for the first time, managing their diet is a new and somewhat challenging adjustment for some (Tam et al., 2017). Young adulthood is recognized as a critical period where food behaviours are established and set a trajectory for years to come (Riddell et al., 2011). Students enrolled in higher education spend a majority of their time on campus and therefore, the food environments created by institutions may potentially modify a student's nutritional behaviours (Tam et al., 2017). Thus, by providing the university demographic with access to fresh produce provides an opportunity to improve access for a large community at risk of poor dietary intake, whilst simultaneously encouraging participation in local food chains (Ward et al., 2014). It is imperative that secondary education institutions realize the potential they have in supporting the involvement of student populations participating in the local and sustainable food economy to curb the environmental degradation associated with conventional production (Rojas et al., 2007; Schmitt et al., 2017).

Certain departments and initiatives within Dalhousie University have come to affirm its dedication to sustainability, recognizing the importance of supporting local food production and providing students access to fresh local produce (College of Sustainability, n.d.). The university acknowledges the importance, and views it as a key aspect of campus growth, encompassing past and contemporary campus involvement with conventional food production systems (College of Sustainability, n.d.). Recognition of this responsibility has prompted the initiation of various programming such as the Dalhousie Student Union Farmer's Market. Thornton, Crawford, Lamb and Ball's (2017) research highlights the role of individual, neighbourhood characteristics and initiatives as a potential influencer of food purchasing habits. Therefore, this research aims to examine the purchasing patterns of fresh produce amongst Dalhousie students on the Halifax campuses and to analyze what factors influence their participation or lack of engagement in local food chains, like farmer's markets. The market and similar programming may adopt these findings into their development plan - further contributing to the microcosm of the sustainable development goals present on campus (Appel & Barragán, 2016).

### *Goals & Objectives*

The relationship between our proposed study and previously mentioned literature identifies the role universities can play in pushing in implementing these behaviours within the context of students, campus and local sustainable food. This ties into the hypothesis of this research project that states there are specific factors influencing Dalhousie students purchasing patterns of fresh produce, as many of the previously acknowledged studies neglect to mention the barriers preventing students from engaging in such behaviours. Our research project aims to address these barriers, as well as the correlation between students accessing sustainable foods from localized food chains provided by markets such as the DSU Farmer's Market. The DSU Farmers Market is a project initiated by the Dalhousie Student Union (DSU) to promote access to fresh produce on campus (DSU Market, n.d.). They offer a pre-ordered food box program that features close to 13-16 pounds of fresh, local seasonal produce approaching wholesale pricing and currently offers the lowest prices in Halifax (DSU Market, n.d.). Their suppliers are both local and include Abundant Acres Farms and Noggins Farm (DSU Market, n.d.).

Sustainable foods have a conglomerate of different meanings and are disconcerting if not defined. For the purpose of narrowing our scope on sustainable foods, our study refers to only fresh produce. Fresh produce usually entails less packaging and processing, however, it can sometimes be more expensive than more manufactured food, inviting an interesting dynamic of variables affecting food choices (Chen, Gao, Swisher, House & Zhao, 2018). Our research group is interested in locating barriers that impede student participation of local, sustainable food economies by understanding their purchasing patterns of fresh produce. In 2013, a study in Illinois deemed location of student residence an important factor to consider for student food insecurity (Morris et al., 2016).

In relation to the study in Illinois, our study aims to further analyze living situations, as a factor that could influence access to grocery stores within the context of Dalhousie University's Halifax campuses. Despite the DSU Farmers Market's presence across the various campuses (Studley, Sexton and Carlton), we are unsure of the amount of student engagement the project generates. The Dalhousie Student Union's Sustainability Office (DSUSO) collaborated with the DSU Food Bank and The Loaded Ladle to implement a free breakfast program on Sexton Campus in 2018 (Kakembo, 2019). In 2019, 48 Dalhousie students participated in DSUSO's survey that evaluated the food options on the Studley Campus, as shown in Figure 2. The research that has been conducted by DSU Food Bank, DSUSO and by registered charity Meal Exchange all focus on student satisfaction, hardly touching on the barriers that students face (Kakembo, 2019; Abbott et al., 2015; Silverthorn, 2016).

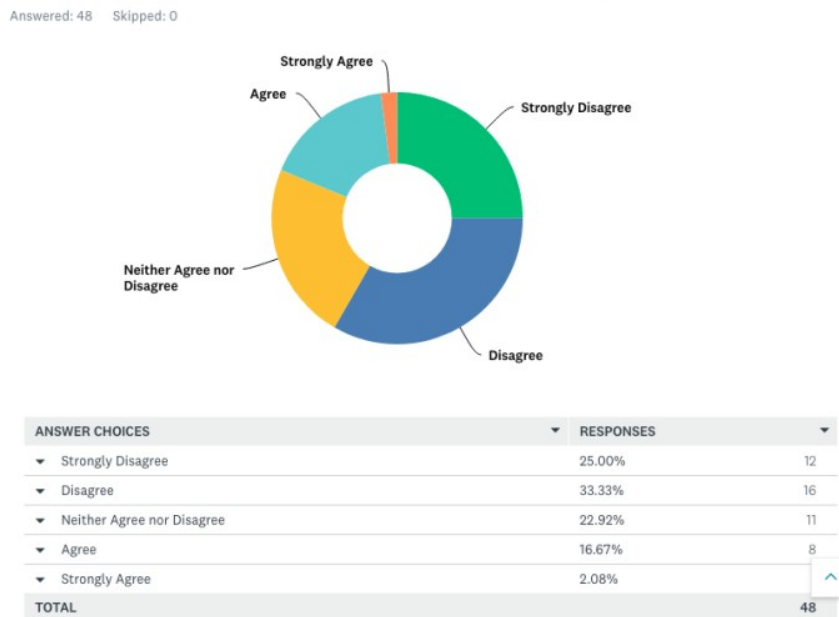


Figure 1. Student Evaluation of whether Dalhousie Campus Food Options are Affordable. Data from DSUSO.

As mentioned, our study aims to identify the barriers of students accessing fresh produce. By gathering information directly from Dalhousie students, we hope to assess correlating factors and variables that pertain to the logistics and motives affecting students purchasing fresh produce and their involvement or non-engagement in short local food systems such as farmer's markets. After gathering this information, statistical analysis will test the validity of background research and hypotheses. The objective of this research project is to study an area of academic interest - food security, student contributions to sustainable, local economies - but tying together important barriers affecting these areas, that generally have not been considered in previous studies.

## **Methods of Research**

### *Designing the Survey*

Our group decided to collect data using a probabilistic online survey for the possibility of collecting large amounts of data from all three campuses in Halifax through this medium. We felt that students were most likely to participate in the survey if it was online and required minimal commitment from respondents. Finally, online surveys require no paper copies, which is in line with our desire to keep this research project as waste-free as possible. The survey questions were designed with the purpose of isolating specific factors that are barriers in student access to fresh produce in Halifax. These factors include the overall grocery budget, and, where and how regularly students shop for produce. The survey questions were designed over the course of in-class tutorial sessions, with the assistance of our assigned teaching assistant. Additionally, we ran the questions by a separate group that had not helped design the survey itself. Their perspectives were useful in that they were not fully aware of the overarching project,

and could then better speak to the clarity of the survey questions themselves. Applying their feedback allowed us to further narrow the scope of the questions, providing more concise answers. It is also in this process that we determined it would not be necessary to collect personal data as part of the surveys as we were researching behavioural patterns of a group - Halifax campus Dalhousie students - as opposed to individuals, or a specific demographic within that larger group. We chose to focus on students enrolled on one of the Halifax campuses as we felt food accessibility realities differ between the cities in which Dalhousie has campuses, which are Halifax and Truro. As students living and studying in Halifax, we felt focusing on the Carleton, Sexton and Studley campuses was a better use of our combined prior knowledge and the resources available to us.

The survey included a consent form at the top, listing our research question (What factors contribute to the purchasing patterns of fresh produce among Dalhousie students on the Halifax Campuses (Carleton, Sexton and Studley) along with every group member's email addresses, should the respondent have any questions. Eligibility (that the participant is a Dalhousie student enrolled on one of the Halifax campuses) and the anticipated amount of time it would take to fill out the survey were also included in this section. The full consent form can be found in annex B, as part of the survey.

#### *Data Collection*

The expected number of participants to represent the Dalhousie population to a 95% confidence interval is 350 people, calculated via a sample size calculator. Previously, we had anticipated approximately 350 survey responses through emailed surveys. This project's method to gather primary information was through a survey using google forms. The survey was initially going to be active for a period of two consecutive weeks, to be shared online via social media and through email lists made available to us. In light of the continuously unfolding COVID-19 pandemic reality, we extended the two-week window by another 5 days. In the end, the survey was open to respondents from March 3th 2020 until March 22nd, 2020. The survey (see appendix B) includes a variety of multiple-choice, select-all and yes or no questions, with options for comment should someone choose to want to add more. The survey does not require any input of personal data and all questions are mandatory for submission, resulting in all responses remaining anonymous. We are researching behaviours of the university community in general, as opposed to individual behaviours. As the single benefit to collecting personal data through the survey would have been to incentivize through the use of a prize, the risks of collecting personal information outweigh the potential benefits. Anonymity also avoids any potential conflicts with the ethical principles of respect, concern for welfare and justice in the process of collecting primary data. With regard to the data from external bodies, we formally requested anonymized data from the former DSUSO food commissioner, the current DSU Farmers Market manager and the foodbank. We believe that this information will be of great benefit for us to disseminate our new data from the surveys. For this, we received ethical approval prior to conducting our research through the submission of REB forms.



Initially, our intention was for each group member to request survey dissemination via their faculty's student email network. This, however, was found to not be random at all. An alternate option, simply sending the survey to every Dalhousie faculty, would be too inefficient and large scale. As there is a multitude of faculty departments, and to avoid personally selecting some, we used a randomized selection method to decide on a handful of options to request to distribute our questions. It was decided to contact twenty departments in order to share the online survey. All of Dalhousie's departments were put into a list. Next, a random number generator by google was used to choose a number between 1 and 75. Each time a number was generated, there would be a corresponding department on the list. This was repeated twenty times until there were twenty departments to contact (Appendix C). This method of probabilistic sampling would thus be classified as a simple random sample since the generator was utilized, making each individual have an equal chance of inclusion (Palys & Atchison, 2013) The directors of each department were contacted and were urged to share the survey link with their students. The downside to this was that there was no confirmation that the directors saw or shared the survey with their respective students.

We also shared the survey via our personal social media accounts (Facebook, Instagram). While this had the potential to narrow our respondent pool, due to our social media audiences being restricted to online friends and followers, we decided to use the platforms following the instructor's recommendation. We felt that as we were only researching students on the Halifax Dalhousie campuses, this did not represent a significant limitation when paired with distribution through faculty email lists.

### *Data Analysis*

There were two methods of analysis utilized in an effort to uncover factors and barriers for purchasing fresh produce. The first was a One Way ANOVA, with three analyses performed. Reviewing the survey questions and answer options, an ANOVA was used to determine whether there were significant (alpha of 0.05) correlations between the variables in groups, compared to factors of another question. Box plots were created with the ANOVA results, to illustrate the relations between questions and identify any outliers. The second method used was analyzing the word answers of optional questions. The single open-ended question in our survey (Question 15, see appendix A) was coded collaboratively in order to draw from multiple perspectives. First, an initial read-through of the responses was done, after which we then wrote down keywords into sections. The data was scanned additionally, line-by-line to be refined into a smaller pool of terms and themes. The goal was to implement interpretive convergence amongst two group members for the coding, for which the aggregated data lined up well with almost full agreement. As the content was not too extensive, we opted to code by hand. In general, we looked primarily at the frequency of terms or concepts relevant to the research question and created a donut chart of pre-decided labels looking at and dividing into positive, negative,

suggestions and indifferent responses. We then followed the posteriori context of creating a word cloud of themes and topic statements that emerged as the data was coded, also related quite closely to the research question in identifying factors that influence student's purchasing patterns.

### *Limitations*

The most significant limitation in completing our research as scheduled was the COVID-19 pandemic. While we had originally intended to collect data via online surveys, we had not predicted this upheaval to student routine. In analyzing the collected data we have acknowledged that many of our survey questions, centred around food purchasing habits and living situations, concern issues potentially directly affected by the pandemic. Examples of areas affected could be whether students live alone or with roommates, whether fresh produce is shared across a household, and whether they have access to alternate methods of purchasing fresh produce, such as markets and grocery stores they would usually access by transit.

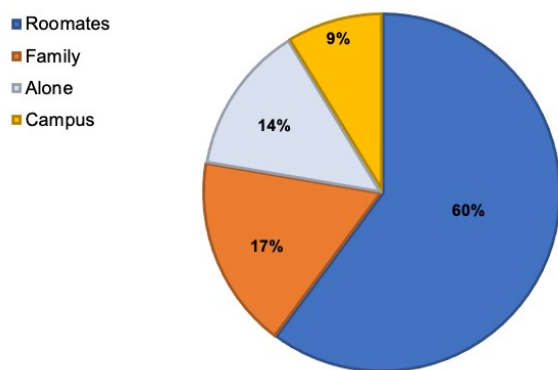
A second limitation resulting from COVID-19 is the number of responses collected. It is important to note that the online nature of the survey did facilitate its continued viability as students moved home or limited their outings in Halifax. Had we relied on walk by survey distribution this would have posed a challenge. Despite this, the influx of information in students' email inboxes, as the university determined its course of action, combined with directions from faculty and instructors as to how and whether their courses would continue going forward, likely resulted in our surveys being passed over. This was not an issue, as the priority in the last month has been facilitating this transition for members of the university community. In addition to the large amount of information being communicated to students via their student email addresses, our group also acknowledged the stress placed on the student community by the constantly changing reality we have faced in the previous month. Students have had to make multiple last-minute decisions, including whether to move home, whether to complete the semester online and navigating online learning environments, adding stress and distraction to what can already be a stressful academic environment. As such, our survey e-blast sent from a faculty email was likely not to warrant the ten minutes it required. We acknowledged this and adjusted our expectations accordingly. With the twenty departments, some containing thousands of students, this was a reasonable expectation. After keeping access to the survey for an additional week, we collected 105 responses. Two of these were deleted as the respondent's stated they were not Dalhousie students, which left us with 103 responses to determine where and why Dalhousie students get their fresh produce.

**Results and Analysis**

There were a total of 103 students surveyed across the three Dalhousie University Halifax campuses. Out of the 103 respondents, 86.4%, 89 respondents reside off-campus, and only 12.6% of those residing off-campus live alone.

The rest, 87.4% lived with someone they identified as either family members, a partner or a roommate. Note that for the purpose of condensing data, those who answered “with partner” were added to the larger group of participants who answered, “with roommates”.

Figure 2. Where survey participants reside.



Participants were asked approximately how often they purchased fresh produce in a month, the responses were 53.4% weekly, while only 9% responded once per month. However, one person made an additional “dumpster diving for vegetables about twice a week.”

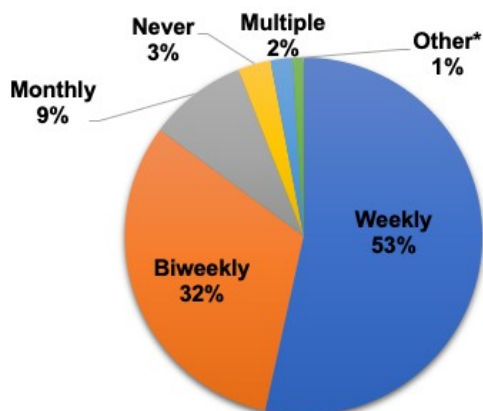


Figure 3 . Frequency that participants purchase fresh produce.

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With regards to the approximate range of money spent in a month on fresh produce, the most common response being 42.7% of respondents recorded a range of \$21-50 spent in a month, while the range for \$0-20 and \$51-80 was responded by 14.6% and 20.4% respectively. \$100+ and “I do not purchase groceries” were both selected by 5.8% of students.

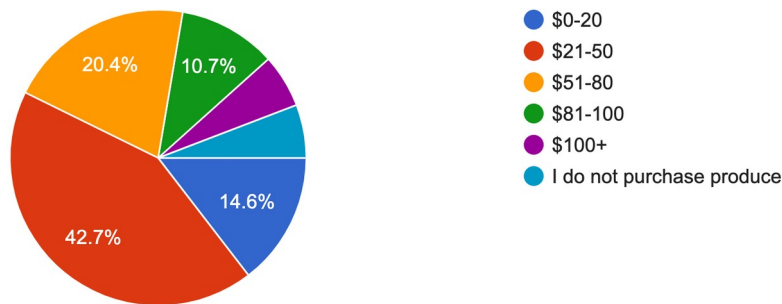


Figure 4. Approximate amount of money participants spent per month, on fresh produce.

When respondents were asked to select the locations they most often purchase fresh produce, Superstore and Sobeys were the most commonly mentioned from our provided options, however, 24.3% of respondents imputed other local Farmer’s Markets such as the Halifax Seaport Market. This survey question had an “other” option for respondents to insert their locations of purchase that were not included in our original list, for which we received a fair amount of additions.

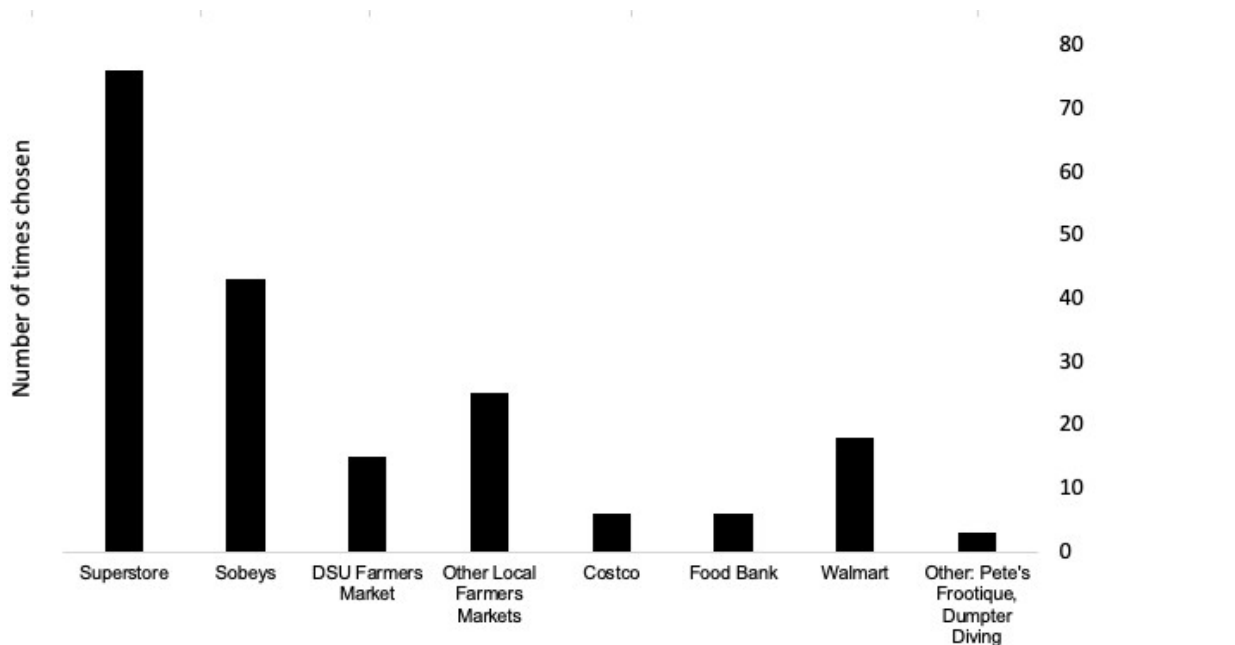


Figure 5. Where participants purchase their fresh produce from.  
 Note: the participants in this question could choose multiple locations.

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Reasons for why respondents chose their desired location to purchase fresh produce included factors of location, prices, quality and variety; each with frequencies of 93, 66, 33, and 21 of respondents selecting the factors respectively. However, some respondents included other factors manually when answering the survey such as supporting local farmers and buying locally produced produce, and two respondents creating an “I do not purchase produce” option, all of which have been factored into the following graph:

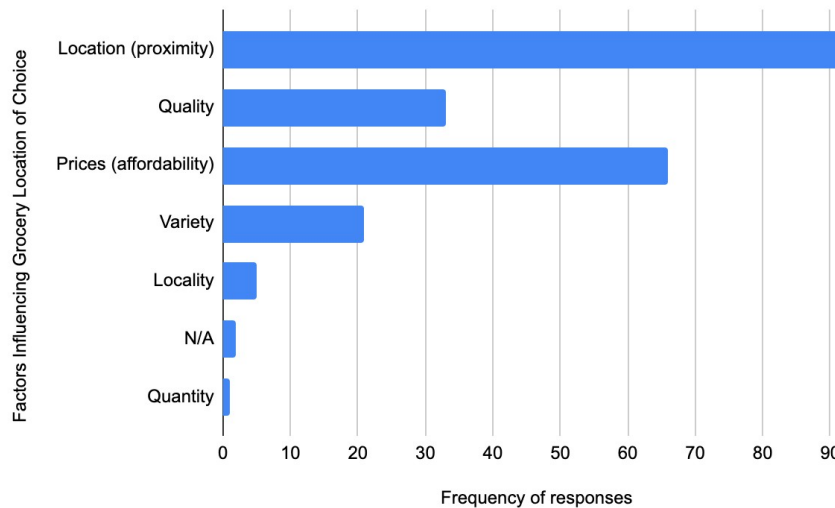


Figure 6. Factors contributing to participants' choice of fresh produce venues.  
 Note: Participants could choose more than one answer.

The primary mode of transport utilized to purchase fresh produce was walking to the desired location, with 66% of respondents selecting this option. The least utilized transportation was the biking option that yielded 13.6%.

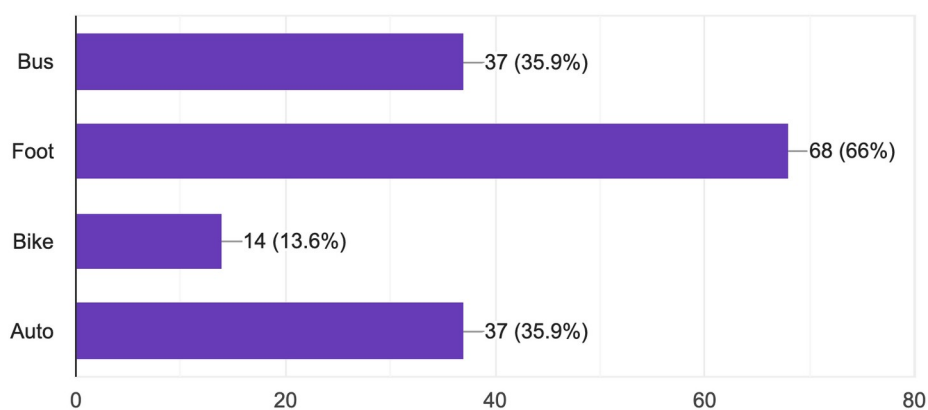


Figure 7. Mode of transportation participants primarily use to purchase groceries  
 Note: Participants could choose all that apply.

When asked about their familiarity with the DSU Farmers Market, 83.5% of respondents were aware of the market however, only 18.4% actually purchased produce from the location.

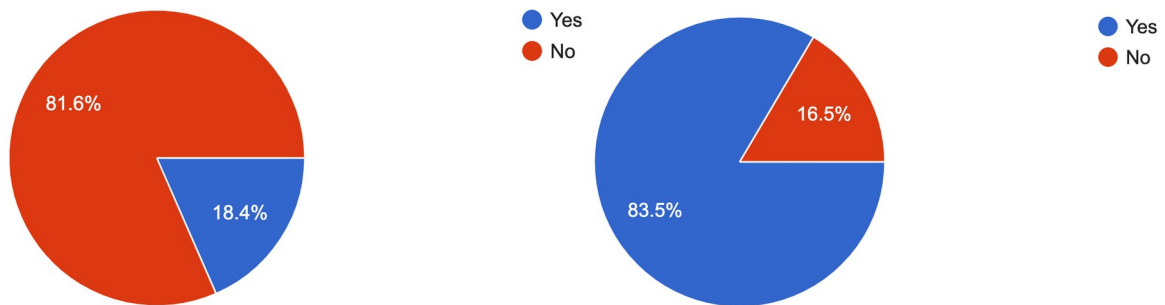


Figure 8. Participant awareness of DSU Market.

Figure 9. Participants who currently purchase from the DSU Market.

Finally, for question 14 of our survey, respondents were asked to rate their overall satisfaction level with fresh produce options on campus on a scale of 1 to 10. Despite this being a Likert scale, a selection of a specific number was required with distance between intervals being even, therefore being considered as interval data (Peters, 2015). The mode was both 5 and 7, with 18 respondents each. Since the intervals are even, we could even calculate the mean and standard deviations, which were 5.825 and 2.18 respectively. As this value is above 1, it indicates that the variability is high, and thus low accuracy with a higher spread. The visual spread can be seen in the following figure:

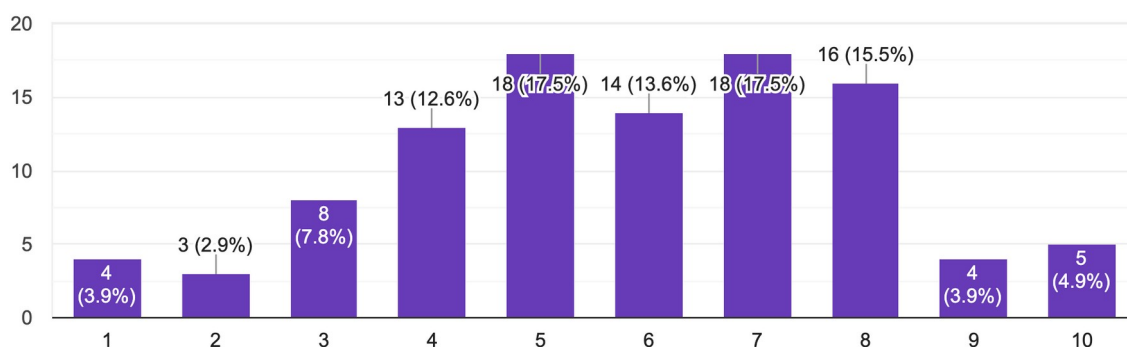


Figure 10. Variability within participants' satisfaction of fresh produce options.

In an attempt to identify the barriers to accessing fresh produce, a one way ANOVA was conducted. The following figure is a box plot depicting the relationship between the living situation of respondents (Question 3, see appendix A) and the amount of money spent on fresh produce (Question 8, see appendix A). A P-value of 0.91 was obtained, which is far from significant ( $\alpha=0.05$ ) at a 95% confidence interval.

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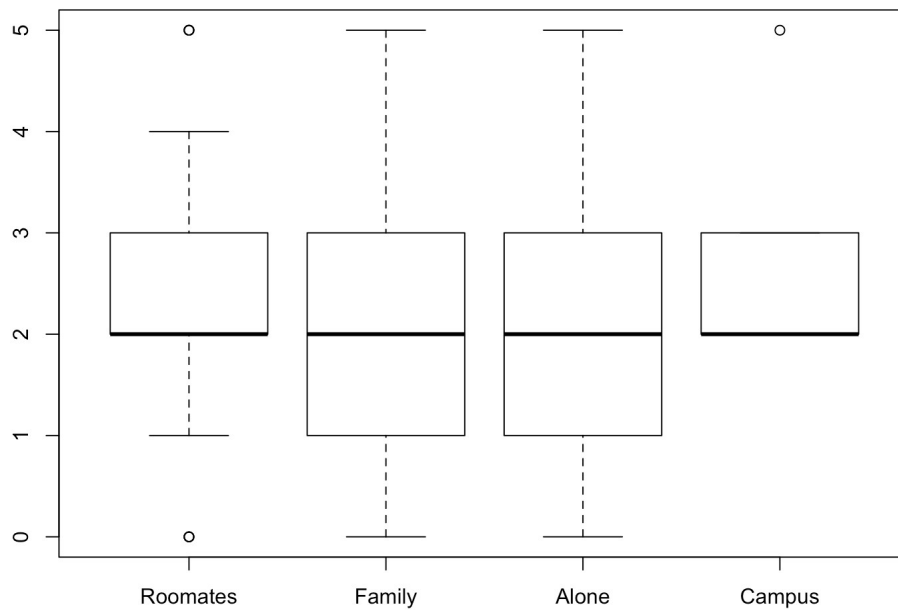


Figure 11. Participant living situation in relation to the interval of money spent on fresh produce.

Along the Y-axis, each number corresponds to an increasing interval of spending on food on campus. ( $\$0-20 = 1$ ,  $\$21-50 = 2$ ,  $\$51-80 = 3$ ,  $\$81-100 = 4$ ,  $\$100+ = 5$ )

Although the ANOVA test above did not yield any significant results, figure 12 shows significance. The questions are as follows: Is there a relationship between the living situation of the student (Question 3, see appendix A) and the amount of money spent on food items on campus (Question 6, see appendix A)? The resulting p-value was 0.03, which falls within the confidence interval of 0.05. Therefore, we would fail to reject the hypothesis.

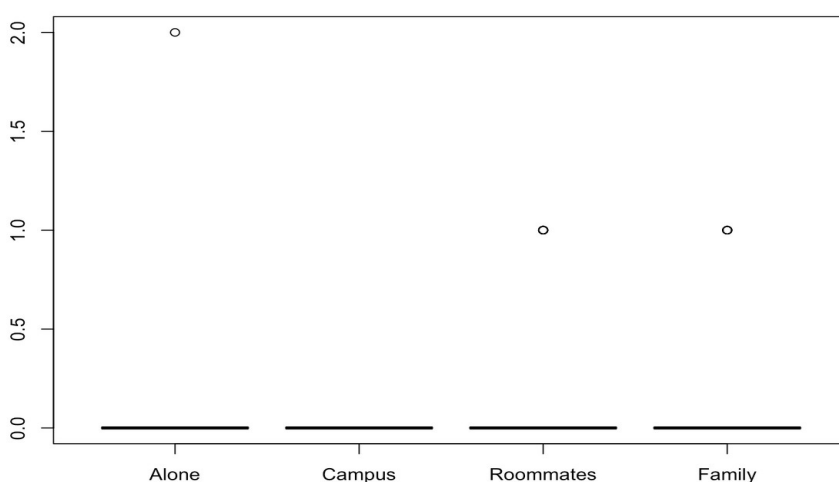


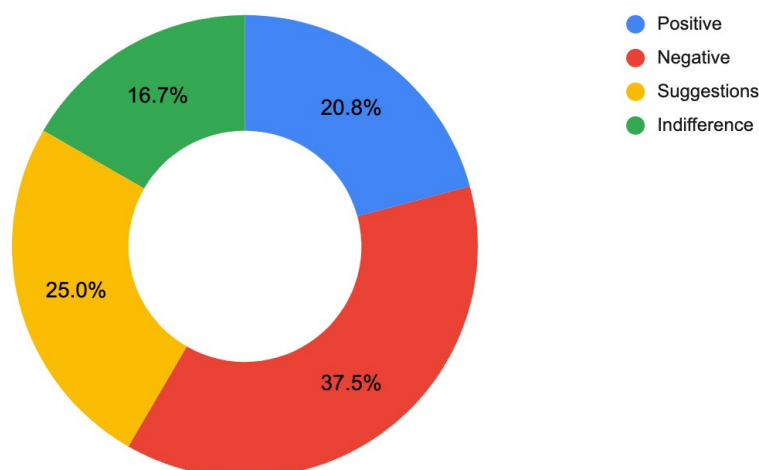
Figure 12. Survey Questions 3 and 6 boxplot comparison.

*Note:* The Y-axis values correspond to an increasing interval of money spent purchasing food on campus. Use the legend above.

### *Qualitative*

For the final question on the survey (see appendix A), participants were asked to optionally provide any comments or suggestions pertaining to their access to produce. There were 21 total responses, with two removed for having responses equivalent to not answering, resulting in a final total of 19 varied responses that were coded.

Overall, 20.8% of respondents expressed positive feedback towards their overall access to fresh produce. 37.5% expressed negative feedback, while 25% provided helpful suggestions they felt would make access easier and more affordable, with one respondent saying “I have adequate access to fresh produce through the DSU food bank, but if there were smaller sized affordable snack options throughout the week for purchase that would contribute to an improvement on campus!”. Lastly, coding showed that 16.7% of respondents were indifferent, indicating that their responses were not relevant to the survey question nor the research question of our study.



*Figure 13.* Priori Codes for comments and suggestions of participants' access to produce.

Several key themes were identified and presented in a word cloud upon further analysis of the responses that emerged through the inductive posteriori method. The two major themes pertaining to respondents' produce access that arose were grievances around affordability (33.3%) and variety



(20.8%). Other factors noted include themes of locality, health, availability and food waste as highlighted in Table 1. Some responses contained more than one theme, thus, when coding, the total frequency of codes was a larger value than the number of respondents.

Theme	Number of times identified
Affordability	8
Locality	4
Health(y)	2
Variety	5
Availability	2
Food waste	3



Table 1. Themes and frequency themes were identified.

Figure 14. Word cloud displaying posteriori method.

## **Discussion**

Our study aims to provide an overview of the purchasing patterns of fresh produce amongst our sample of Dalhousie students on the Studley, Carleton and Sexton campuses where we attempted to explore the correlation between several different data points gathered from our survey results surrounding themes that pertained to our research question. The research goal aimed to highlight how these factors or barriers influenced students' ability to access sustainable foods provided by short, localized food chains such as the DSU Farmer's Market and proved useful in aiding stakeholders in communicating areas in need of improvement and honouring the strategic goals set out by the university regarding Health and Wellness. Upon analyzing survey responses, it is evident that there are specific factors that influence a student's overall purchasing patterns of fresh produce. Students classified factors such as affordability and location as major determinants of their grocery store selections - further challenging literature declaring that young adults are more willing to pay extra for sustainable goods (Vermeir, & Verbeke, 2008; Nielson Company, 2015). Food security was an underlying issue our research identified through understanding correlations between patterns and barriers that exist through an interpretation of the data collected in our distributed survey.

### *Interpretations*

The results of our first ANOVA presented by the boxplot in Figure 11, which sought to compare the living situation of respondents with the amount of money they spent on fresh produce in a month, indicated that there is not a significant correlation between the two factors. This was contrary to our hypothesized expectation and assumption that there would be a significant correlation. Feedback on the survey clarified our results as it demonstrates that respondents clearly view living dynamics as a key factor in their purchasing habits. One respondent said: “I have a family of five (partner and 3 children) my children like fruits but they can sometimes be expensive (like grapes!) I live in a rural area (Indian Brook).” Furthermore, question 3 (Appendix A) on the survey included the options live alone, with family or with roommates. An option was provided for participants to further comment on other living situations as the options listed are not exhaustive. Respondents reiterated some of the responses that were already listed, however, a significant number of respondents listed answers such as “partner,” indicating a clear perceived distinction between a partner or roommate. This reiterates the concept of how living arrangements contributed to the way in which the respondent purchased fresh produce. Some assumptions include the idea that living with roommates is intentionally done as an economically feasible option for students and can result in grocery sharing and therefore a reduced monthly budget spent on produce. While our ANOVA did not yield our assumptions to be true, other research focusing on US college students' food security and intake of fruits and vegetables demonstrated the association of characteristics as differing by housing type (Mirabatur et. al, 2016).

The theme of affordability emerged as an important factor and key determinant of purchasing patterns for respondents. Although “location” was the most common response to explain the respondents’ selection of places they purchase fresh produce from, price (affordability) came in second place (Figure 6). In correlation with the responses for the open-ended question (question 15, see Appendix A), several mentions of produce being “expensive” and the general topic of affordability was apparent. In one response, someone wrote, “produce is very expensive, Superstore offers %10 off to students on Tuesdays”. Superstore was the most popular location selected by respondents, and perhaps this discount might be an explanatory factor for that result.

While the DSU Farmers Market was not particularly highly used with only 19 respondents indicating that they purchased produce from there at the time, one respondent spoke about the fact that the produce there was much cheaper than that found elsewhere on campus. Pete’s ToGoGo in the Student Union Building was utilized as an example when comparing the 0.25 cent apples at the market and the \$1.00 apples sold at their fruit stand. According to a report released from Dalhousie called Canada’s Food Price Report, food prices are projected to increase by 4% in 2020 (Casey,

2019). However, the DSU Farmer's Market offers wholesale pricing and currently provides the lowest prices for fresh produce in Halifax (DSU Market, n.d.).

In line with the project goals, questions 14 and 15 (Appendix A) provided results that were adequate in obtaining a general sense of the satisfaction status students have towards their access to fresh produce on Campus as well as outlining some of the impediments to produce access they may have. As was shown in figure (Figure 10), the ratings varied, with more concentration being found in the middle ranges (4-8). The spread demonstrated by the standard deviation (2.18) in addition to the general variation in results, echoes a similar study we found looking at food consumption of university students in European countries in showing that habits and perceptions can differ across different circumstances (El Ansari, Stock & Mikolajczyk, 2012). Ultimately, each individual is unique in their reasoning for their selection, whether it be a rating of 1 or a rating of 10. Regardless of the variety in the data acquired from questions 14 and 15, research has shown that lower food security can be associated with lower GPA's, academic hiatus and curtailed self-reported health in college students (El Ansari et al., 2012). Adequate intake of produce is generally positively associated with university students, and the Likert scale, as well as the optional open-ended question, might suggest the sentiments that Dalhousie students have in relation to those experiences directly (El Ansari, Stock & Mikolajczyk, 2012).

The second ANOVA test conducted between the respondent's living arrangements (Question 3, see appendix A) and the amount of money spent on food items on campus (Question 6, see appendix A) proved to be significant (Appendix 3). This is an interesting find, considering our sample size was a third in size of the expected. This might be attributed to the fact that the vast majority of answers were the 0-20 dollar range (Figure 12). This remained consistent regardless of the respondent's living situation. We were particularly interested in completing this test because results revealed grounds for people living off-campus to purchase from the DSU Farmer's market. However, one respondent said that the "availability of fresh produce on campus is lacking" and while 83.5% of respondents knew of the market, only 18.4% actually purchase their products from there. It was also noticed that regardless of the mode of transport utilized to obtain fresh produce, most respondents said that location was a primary factor in determining where they decided to purchase. Therefore, if respondents living off-campus are spending more on food items on campus, and the location is a primary factor in determining where they choose to purchase fresh produce, it was interesting to discover that most knew of the DSU Market but a majority did not utilize the service. One respondent mentioned how they usually obtain their vegetables by dumpster diving at dumpsters located on the peninsula. We found the comment very interesting because it provided an extreme scenario that we had not originally considered.

Our data gathered in questions 9, 10 and 15 (Appendix A) demonstrate that young adults are quite environmentally conscious and want to support local production with a number of respondents listing off local markets that they regularly visit and locations they frequently gather fresh produce (ie. gardens) (Figure 5). However, factors such as affordability, variety and location ultimately outweighed the final decision as to where respondents decide to purchase fresh produce. The results do not fit with the theory presented that young adults are more willing to pay extra for sustainable goods in comparison to older individuals, as respondents who purchased produce from larger conventional grocery chains stated that they capitalized on weekly student deals (Vermeir, I., & Verbeke, W, 2008; Nielson Company, 2015). However, results were built upon existing evidence of underlying factors such as food insecurity, which is further demonstrated through the disproportionate amount of individuals struggling with food security on Dalhousie's campuses (Silverthorn, 2016).

There are several different factors not represented in our research data that could aid in explaining the patterns we receive. Factors such as individual preference in eating habits and explicit data collection on financial stability were not accounted for. Students' dietary behaviours vary when under stress, and this was not a factor considered in our research data (Barker et al, 2015). Furthermore, when sending emails requesting departments forward our survey to their student email list, we had no clear way of knowing if each department chosen forwarded the email. If not, this could have greatly impacted the number of respondents we received. It would've been more optimal if we had modified the options listed in Figure 4 to allow respondents to select an option for zero dollars, rather than the range we presented. We neglected to ask specific information pertaining to the logistics of produce purchases in a house with roommates. For example, is the produce shared or does the respondent only purchase for themselves? Such a question should have followed the third question in our survey, as it highlights the importance of acknowledging the different purchasing dynamics involved with living arrangements. It would have been an optimal addition had we assessed the consumption patterns of fresh produce as well. We would've made correlations with the health and wellness of Dalhousie students. Perhaps asking if the respondents actually met the daily recommended servings of fruits and vegetables could have provided more clarity on their purchasing habits and we could discern if the diet itself is a specific barrier as well.

## **Conclusion**

Based on our study, it is apparent that there are compound factors influencing the fresh produce purchasing habits of Dalhousie students. Similarly, we have found a "drive" to contribute to environmental sustainability. Despite this, factors such as affordability seem to be the primary factor influencing where respondents ultimately decide to purchase their fresh produce. This conclusion is

one of the main contributions of our study towards developing more accessible fresh produce infrastructure. The majority of respondents knew of the DSU Farmer's Market however, only few actually utilized the service. Several types of action can take place to promote sustainable food security for Dalhousie students. Recommendations include:

1. Expanding the capacity of the DSU farmer's market and DSU food Bank while also increasing the promotion of these operations for students who may not access fresh produce because of lack of knowledge.
2. Furthermore, to accommodate students struggling with extreme financial constraints, the university administration can work with the market to explore providing subsidized food boxes.
3. The DSU Farmer's Market should consider collaborating with other university-wide operations such as Tiger Patrol to accommodate people with accessibility issues to aid in transporting the food boxes to respective homes.
4. The DSU Farmer's Market should consider collaborating with the DSU Bike Centre to adopt bike-friendly transport options for food when students purchase on campus. This is due to respondents mentioning the difficulty they have when transporting their produce from campus to home.
5. Respondents frequently mentioned how buying fresh produce in bulk is cheaper but are wary of food waste especially when buying from the market. To address food waste and usability, the market should expand its capacity to make the food boxes more customizable for purchasers. Expanding the capacity of the market could make food boxes more customizable.

By incorporating feedback from formal evaluations, perhaps the market could receive tangible research that would provide supportive arguments for increasing vendor, volunteer and administrative support towards the market so that more fresh produce options may be available on campus, further providing an affordable opportunity for students to engage in short, local food chains.

In terms of further research on fresh produce access amongst students, future research should focus on conducting targeted studies specifically on market users to gain direct feedback. In this potential targeted survey, conducting non-probabilistic sampling could be ideal in seeking thoughtful respondents to hear about their experience as users of the DSU Farmers Markets and learn about their perceived areas of improvement that could take suit on behalf of the Student Union and the University. Other research on specifically the wellness of students in relation to their access to fresh produce would also be beneficial for Dalhousie University. This has been done at other universities in both the United States and in England, as we have come to acknowledge from our literature review.

International students have unique experiences relative to domestic students, so conducting future research on their access to fresh produce would also be beneficial to the promoting food security at Dalhousie University.

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## References

- Abbott, B., Abbot, J., Aird, B., Weyman, C., Lethbridge, D., Lei, L. (2015). Food Security Among Dalhousie Students. Retrieved from <https://cdn.dal.ca/content/dam/dalhousie/pdf/science/environmental-science-program/ENVS%203502%20projects/2015/Foodbank.pdf>
- Albrecht, C., & Smithers, J. (2018). Reconnecting through local food initiatives? Purpose, practice and conceptions of 'value'. *Agriculture and Human Values*, 35(1), 67-81.
- Appel, S., & Barragán, D. (2017). Universities, NGOs, and civil society sustainability: Preliminary lessons from Ecuador. *Development in Practice*, 27(4), 472-486.
- Barker, M., Blain, R. & Russell, J. (2015) The influence of academic examinations on energy and nutrient intake in male university students. *Nutr J* 14, 98 <https://doi.org/10.1186/s12937-015-0088-y>
- Bucher, T., Hartmann, C., Rollo, M., & Collins, C. (2017). What Is Nutritious Snack Food? A Comparison of Expert and Layperson Assessments. *Nutrients*, 9(8), 874.
- Casey, E. (2019) *Your groceries are getting more expensive: Dalhousie's agri-food analytics lab tells us why*. Retrieved from <https://www.dal.ca/news/2019/12/04/your-groceries-are-getting-more-expensive--dalhousie-s-agri-food.html>.
- Chen, X., Gao, Z., Swisher, M., House, L., & Zhao, X. (2018). Eco-labeling in the Fresh Produce Market: Not All Environmentally Friendly Labels Are Equally Valued. *Ecological Economics*, 154, 201-210.
- Cooper, J., Butler, G., & Leifert, C. (2011). Life cycle analysis of greenhouse gas emissions from organic and conventional food production systems, with and without bio-energy options. *NJAS - Wageningen Journal of Life Sciences*, 58(3-4), 185-192.

- College of Sustainability. (n.d.). Sustainability at Dalhousie. Retrieved from <https://www.dal.ca/faculty/sustainability/about/sustainability-at-dalhousie.html>
- Costa, Janaína Calu, Claro, Rafael M., Martins, Ana Paula B., & Levy, Renata B. (2013). Food purchasing sites. Repercussions for healthy eating. *Appetite*, 70, 99-103.
- DSU Market. (n.d.). The DSU Market. Retrieved from <http://www.dsumarket.ca/#about>
- El Ansari, W., Stock, C. & Mikolajczyk, R.T. Relationships between food consumption and living arrangements among university students in four European countries - A cross-sectional study. *Nutr J* 11, 28 (2012). <https://doi.org/10.1186/1475-2891-11-28>
- Kakembo, M. (2019). Food Commissioner Transition Report April 2019. Retrieved from DSUSO.
- Mirabitur, E., Peterson, K., Rathz, C., Matlen, S., & Kasper, N. (2016). Predictors of college-student food security and fruit and vegetable intake differ by housing type. *Journal of American College Health*, 64(7), 555-564.
- Morris, L. M., Smith, S., Davis, J., & Null, D. B. (2016). The prevalence of food security and insecurity among Illinois university students. *Journal of nutrition education and behavior*, 48(6), 376-382.
- Palys, T., & Atchison, Chris. (2013). *Research decisions : Quantitative and qualitative and mixed methods approaches* (5th ed.). Toronto: Thomson Nelson.
- Peters, C. (2015) *How to design and analyze a survey*. Retrieved from: <https://zapier.com/learn/forms-surveys/design-analyze-survey/>
- Reardon, T., & Berdegue, J. A. (2002). The rapid rise of supermarkets in Latin America: challenges and opportunities for development. *Development policy review*, 20(4), 371-388.
- Riddell, L., Ang, B., Keast, R., & Hunter, W. (2011). Impact of living arrangements and nationality on food habits and nutrient intakes in young adults. *Appetite*, 56(3), 726-731.
- Rojas, A., Richer, L., & Wagner, J. (2007). University of British Columbia Food System Project: Towards Sustainable and Secure Campus Food Systems. *EcoHealth*, 4(1), 86-94.
- Shaw, A., Capetola, T., Lawson, J., Henderson-Wilson, C., & Murphy, B. (2018). The cost of sustainability in higher education: Staff and student views of a campus food culture. *International Journal of Sustainability in Higher Education*, 19(2), 376-392.



- Schmitt, E., Galli, F., Menozzi, D., Maye, D., Touzard, J., Marescotti, A., Six, J., Brunori, G. (2017). Comparing the sustainability of local and global food products in Europe. *Journal of Cleaner Production*, 165(Online first), 346-359.
- Silverthorn, D. (2016). Hungry for knowledge: Assessing the prevalence of student food insecurity on five Canadian campuses. Toronto: Meal Exchange. Retrieved from: <http://mealexchange.com>
- Tam, R., Yassa, B., Parker, H., Connor, H., Allman-Farinelli, M. (2017). University Students on-campus food purchasing behaviours, preferences, and opinions on food availability. *Nutrition*, 37, 7-13.
- Thornton, L., Crawford, D., Lamb, K., & Ball, K. (2017). Where do people purchase food? A novel approach to investigating food purchasing locations. *International Journal of Health Geographics*, 16(1), 9.
- Vermeir, I., & Verbeke, W. (2008). Sustainable food consumption among young adults in Belgium: Theory of planned behaviour and the role of confidence and values. *Ecological Economics*, 64(3), 542-553.
- Ward, R., Blackley, D., & Brooks, B. (2014). The Development and Implementation of a Student-Led Farmers' Market on a Public University Campus. *Journal of Hunger & Environmental Nutrition*, 9(1), 81-95.

**Appendix A - Survey** (as viewed in google forms)

# Dalhousie University Students Produce Purchasing Habits

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Hello!

This survey is being conducted as part of a research project for ENVS-SUST 3502, Environmental Problem Solving II (Campus as a Living Lab).

This online survey aims to answer the research question of:

What factors contribute to the purchasing patterns of fresh produce among Dalhousie students on the Halifax Campuses (Carleton, Sexton and Studley)?

Eligibility:

Be a Dalhousie University student on any of the Halifax campuses (Carleton, Sexton and Studley).

This survey should take you less than 5 minutes to complete.

Will participants be identified by researchers?

No, you will remain anonymous to the researcher. Personal information such as your name, your email address, your B00 number, address, and income will NOT be collected.

Who are the researchers?

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If you have any questions or concerns please do not hesitate to contact us (emails listed above) or Dr. Heather Cray (hcray@dal.ca)

By filling out this survey, consent will be assumed.

1. Are you a Dalhousie Student? \*

Yes

No

2. Where do you reside? \*

On-Campus

Off Campus

3. If you live off campus, do you: \*

- Live alone
- Live with family
- Live with roommates
- Other...

4. Do you have a mealplan? \*

- Yes
- No

5. How often do you purchase food on campus? \*

- Several times a day
- Daily
- Once a week
- Biweekly
- Never

6. Approximately how much do you spend per week buying pre-packaged food on campus? \*

- \$0-20
- \$21-50
- \$51-80
- \$81-100
- \$100+

7. How often would you say you purchase fresh produce\* groceries in a month? (\*fruits and vegetables that have not been processed in any manner.)

- Weekly
- Biweekly
- Monthly
- Other...

8. Approximately how much money do you spend on fresh produce in a MONTH? \*

- \$0-20
- \$21-50
- \$51-80
- \$81-100
- \$100+
- I do not purchase produce

9. From where do you normally purchase/gather your fresh produce from? \*

- Walmart
- Superstore
- Sobeyes
- DSU Farmers Market
- Food Bank
- Other local farmers markets (ie: Seaport or Brewers Markets)
- Other...

10. Reasons for the previous question; please select all that apply: \*

Location (ie close proximity)

Quality

Prices (affordability)

Variety

Other...

11. What mode of transportation do you primarily use to purchase groceries? [check all that apply]

Bus

Foot

Bike

Auto

Other...

12. Are you aware of the DSU Farmers Market? \*

Yes

No

13. Do you currently purchase produce from the DSU Farmers Market? \*

Yes

No

14. On a scale of 1-10 how satisfied are you with current access to fresh produce options on campus that suit your dietary needs? \*

1    2    3    4    5    6    7    8    9    10

Not satisfied at all                                            Very Satisfied

15. Generally speaking, do you have any other comments or suggestions pertaining to your own access to produce? (optional)

Long-answer text

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**Appendix B**

ANOVA Results

Question 3 and 6



Analysis of Variance (One-Way)							
Descriptive Statistics							
Groups	Sample size	Sum	Mean	Variance			
Alone	13	2	0.15385	0.30769			
Campus	7	0	0	0			
Family	22	5	0.22727	0.18398			
N/A	2	2	1	2			
Roommates	59	7	0.11864	0.10637			
Total	103		0.15534	0.17171			
ANOVA							
Source of Variation	d.f.	SS	MS	F	p-value	F crit	Omega Sqr.
Between Groups	4	1.78913	0.44728	2.78743	0.03058	2.46451	0.06491
Within Groups	98	15.72544	0.16046				
Total	102	17.51456					
Residual standard error	0.40058						
Hartley Fmax	#N/A						
Cochran C (d)	0.76981						
Bartlett Chi-sq Inf	p-value	#N/A					

Question 4 and 6

Analysis of Variance (One-Way)							
Descriptive Statistics							
Groups	Sample size	Sum	Mean	Variance			
No	89	14	0.1573	0.15679			
Yes	14	2	0.14286	0.28571			
Total	103		0.15534	0.17171			
ANOVA							
Source of Var	d.f.	SS	MS	F	p-value	F crit	Omega Sqr.
Between Gro	1	0.00252	0.00252	0.01456	0.90419	3.93519	-0.00966
Within Group	101	17.51204	0.17339				
Total	102	17.51456					
Residual stan	0.4164						
Hartley Fmax	1.82224						
Cochran C (d	0.64567						
Bartlett Chi-s	2.29996	p-value	0.12938				

Question 3 and 8

Analysis of Variance (One-Way)							
Descriptive Statistics							
Groups	Sample size	Sum	Mean	Variance			
Alone	14	31	2.21429	2.02747			
Campus	9	23	2.55556	1.02778			
Family	18	40	2.22222	2.18301			
Roomates	62	144	2.32258	1.30407			
Total	103		2.31068	1.49077			
ANOVA							
Source of Var	d.f.	SS	MS	F	p-value	F crit	Omega Sqr.
Between Gro	3	0.81939	0.27313	0.17879	0.91055	2.69647	-0.0245
Within Groups	99	151.23886	1.52767				
Total	102	152.05825					
Residual stan	1.23599						
Hartley Fmax	2.12401						
Cochran C (d	0.33367						
Bartlett Chi-sc	2.98782	p-value	0.39351				

**Appendix C**

Survey Email Directive:

<b>Faculty</b>	<b>Program</b>
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Medicine	Medicine
Arts and Social Sciences	Classics
Medicine	Pediatrics
Arts and Social Sciences	Philosophy
Management	Resource and Environmental Studies
Management	Rowe School of Business
Arts and Social Sciences	English
Medicine	Health Administration
Engineering	Mechanical Engineering
Arts and Social Sciences	International Development Studies
Medicine	Biomedical Engineering
Medicine	Pathology
Medicine	Emergency Medicine
Arts and Social Sciences	French
Medicine	Obstetrics & Gynaecology
Engineering	Process Engineering & Applied Science (PEAS)
Arts and Social Sciences	Gender and Womens Studies
Dentistry	Dentistry
Engineering	Industrial Engineering
Science	Earth Science
Science	Env Science
Arts and Social Sciences	Indigenous Studies

## **Appendix D**

*Figure 1.* Student Evaluation of whether Dalhousie Campus Food Options are Affordable. Data from DSUSO, Survey Monkey.

*Figure 2.* Where survey participants reside.

*Figure 3 .* Frequency that participants purchase fresh produce.

*Figure 4.* Approximate amount of money participants spent per month, on fresh produce.

*Figure 5.* Where participants purchase their fresh produce from.

*Figure 6.* Factors contributing to participants' choice of fresh produce venues.

*Figure 8.* Participant awareness of DSU Market.

*Figure 9.* Participants who currently purchase from the DSU Market.

*Figure 10.* Variability within participants satisfaction of fresh produce options.

*Figure 11.* Participant living situation in relation to interval of money spent on fresh produce.

*Figure 12.* Survey Questions 3 and 6 Boxplot comparison.

*Figure 13.* Priori Codes for comments and suggestions of participants access to produce.

*Figure 14.* Word cloud displaying posteriori method.

*Table 1.* Themes and frequency themes were identified.