

# **Addressing Food Waste and Food Security Through the Diversion of Avoidable Food Waste on Dalhousie's Studley Campus**

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## Table of Contents

<b>1.0 EXECUTIVE SUMMARY</b>	3
<b>2.0 INTRODUCTION</b>	3
<b>3.0 METHODS</b>	6
3.1 Interviews	6
3.2 Surveys	8
<b>4.0 RESULTS</b>	10
4.1 Interviews	10
4.2 Surveys	11
<b>5.0 DISCUSSION</b>	15
<b>6.0 CONCLUSION</b>	19
<b>7.0 ACKNOWLEDGMENTS</b>	20
<b>8.0 REFERENCES</b>	21
<b>9.0 APPENDICES</b>	24

## **1.0 EXECUTIVE SUMMARY**

The main objective of this research project was to find out whether a food diversion program would be feasible on Dalhousie University's Studley campus. Such a program would redistribute uneaten food to Dalhousie's student population rather than entering the waste stream. Qualitative research methods were used in this research project such as interviews and an online survey. We interviewed potential stakeholders in the Dalhousie Student Union Building (SUB), to find out whether they were willing and legally able to participate in an on-campus food diversion program. We also surveyed Dalhousie students in order to gauge their knowledge and interest in an on-campus food diversion program. After analyzing results from the interviews and surveys, we discovered that the main barriers are health and food safety concerns, policy issues, and stakeholder willingness to participate. Potential opportunities include a community fridge, an existing steady supply of reclaimable food, and support from the student community. We would recommend that future research be done in order to determine implementation costs and the current need for this program, as these fall beyond the scope of our research. Our results indicate that while there are barriers to overcome, there are also significant opportunities that would make the implementation of a food diversion program feasible.

## **2.0 INTRODUCTION**

Avoidable food loss and waste (FLW) is defined as food that has reached its set destination but is not purchased or procured by consumers (Gooch et al., 2019). According to research done by a Canadian food rescue program, Second Harvest, 58% of all food produced in Canada ends up as FLW, and 32% of this is avoidable (Gooch et al., 2019). Our project focuses on avoidable FLW on Dalhousie University's Studley campus. Our research examines the barriers to, and opportunities for, creating a food diversion program that would see uneaten

food reclaimed and diverted for free to Dalhousie's student population. We define uneaten food as items still fit for consumption that have not been claimed by the end period of when it was anticipated to be sold or consumed (e.g. leftover Timbits, unsold sandwiches, leftover vegetables, etc.).

Programs that divert food from entering the waste stream are significant due to their potential to address both food waste and food security. Food diversion programs, although relatively new, exist both in Canada and across the globe and some examples include Second Harvest (Toronto, Canada), The Leftovers Foundation (Calgary, Canada), Food Rescue US (Connecticut, United States of America) as well as the community fridge network Hubbub (Great Britain) (Kaufman, 2019). Food number of diversion programs is increasing globally (Kaufman, 2019) and, the European Union (EU) recently committed to food redistribution, which they define as "a process whereby surplus food that might otherwise be wasted is recovered, collected and provided to people, in particular to those in need" (EU Platform on Food Losses and Food Waste, 2019, p. 5). 15 EU Member States have created programs to address the food redistribution goals (EU Platform on Food Losses and Food Waste, 2019, p. 5). As the literature on diversion, redistribution and reclamation programs is new, research pertaining to their feasibility on university campuses remains to be analyzed (Arcuri, 2019).

Although the feasibility of food waste diversion programs has not been extensively researched, there exists a wealth of research on food waste quantities (Gooch et al., 2019). In Canada, Gooch et al. (2019) quantify avoidable FLW at 11.2 million metric tons, which represents both a physical and economic loss, given the resource input across the entire supply chain and the associated greenhouse gas emissions (Mifflin, 2019). With better infrastructure, e.g. food diversion programs, some of this avoidable FLW could be diverted to support the 2.19 million Canadians (aged 12 and older) who live in food-insecure households (Government of Canada, 2012). The feasibility of a diversion program is dependent upon a regions' specific food donation laws (Kaufman, 2019). Nova Scotia falls under the legal framework of the Volunteer

Services Act (1989) which serves to promote food donation whilst protecting donors. This Act states that donors are not liable for damages unless either (a) the damages were caused by gross negligence or (b) the donor knew the food was unsafe (Volunteer Services Act, 1989). Organizations such as Feed Nova Scotia, the provincial food bank, operate under this Act in order to redistribute food to Nova Scotians to increase their food security (Feed Nova Scotia, 2020).

Food security, according to the United Nations' Committee on World Food Security (CFS), is defined as people having "physical, social and economic access to sufficient, safe, and nutritious food that meets their food preferences and dietary needs for an active and healthy life" (International Food Policy Research Institute, n.d.). People who do not fall under this definition are considered food insecure. This is a global issue and is significant for Nova Scotians, who face the highest rates of food insecurity among all Canadian provinces (FoodARC, 2017; Roshanafshar & Hawkins, 2015). Food insecurity is prevalent among post-secondary students, with reported risk factors including being an ethnic minority, having a low income, receiving financial aid, and living away from home (Lee et al., 2018; Gallegos, Ramsey & Ong, 2013). Students who are food insecure often face poor rates of health and nutrition, substandard academic achievement, decreased cognitive and psychological function, and heightened risk of chronic disease, among other symptoms (Gallegos, Ramsey & Ong, 2013). Dalhousie University is not exempt from this issue; over the past four years, the Dalhousie Student Union Food Bank (DSUFB) has seen a significant rise in demand. In the 2017-2018 academic year, the DSUFB saw a 30% increase in the number of students it served (Burke, 2018).

Although they have not released a plan to address student food insecurity, Dalhousie University, as a leader in environmental sustainability, (McNutt, 2014) has taken significant steps to reduce food waste on campus. This is evident in their 4-bin waste sorting system and the Dalhousie University Sustainable and Health Food Framework (SHFF) (Facilities

Management & Office of Sustainability, 2016; Dalhousie University, 2016). The SHFF is a document aimed at providing on-campus food services in a sustainable and healthy manner and their framework identifies food waste as a significant issue (Dalhousie University, 2016). A future action from this document was to “donate foods (that can be donated based on food safety standards) to local NGOs/on-campus organizations” (Dalhousie University, 2016). However, this is not reflected in their target section and we can thus infer that there is no current infrastructure in place to deal with the university’s avoidable FLW (Dalhousie University, 2016). There are more than 15 food vendors and 3 residence meal halls that serve the Studley campus, and given the university’s commitment to sustainability and their research focus on “food policy, access and distribution”, we believe that there is ample reason to investigate the feasibility of an innovative food diversion program (Dalhousie University, n.d.).

### **3.0 METHODS**

We used qualitative research methods to answer our research question: “What are the barriers to, and opportunities for, creating a food diversion program that would see uneaten food supplied to the Dalhousie student population rather than diverted into the waste stream?”. Data collection was executed through interviews as well as an online survey.

#### **3.1 Interviews**

We identified food vendors on the Studley campus as potential stakeholders and limited the scope to those located in Dalhousie’s Student Union Building (SUB). We used non-probabilistic stakeholder sampling to identify our interviewees due to the limited pool of food vendors in the SUB. We also applied non-probabilistic snowball sampling to identify potential contacts through our interviews.

Our interview data was collected through in-person and phone interviews. 5 interview questions were designed to assess whether the food service providers dispose of edible food,

and if they would be willing and legally able to participate in a food diversion program (see Appendix A). In-person and phone interviews were elected as the most effective method of data collection since they allow the researchers to address any confusion and allow interviewees to clarify their responses.

Potential stakeholders were sent introductory emails explaining the project's background, rationale, and purpose. Emails were sent to Chartwells Catering Services, The Loaded Ladle, Pete's Togogo, Dalhousie Student Union Market, The Grawood, and Mezza Lebanese Kitchen. Four of food vendors in the SUB, Tim Hortons, Taste of India, Booster Juice, and Bento, did not have contact information available online. We intended to contact them in person, however this was not possible due to the closure of all Dalhousie University campuses on March 15th, 2020, as a result of social distancing requirements of the Coronavirus (COVID-19). Of the 6 food vendors contacted, we received 2 responses, from The Grawood and The Loaded Ladle. Interview times were established, and the interviews were recorded on the researchers' cell phone via "Voice Memos", uploaded to a password safe computer, and then deleted from the cell phone to ensure security. These two interviews led us to employ snowball sampling and contact the DSUFB and the Dalhousie Student Union Sustainability Office (DSUSO), of which a DSUSO representative was interviewed. There may exist unintentional bias in the results due to the small quantity of interviews we were able to conduct, which represent 16% of the SUB food service population (n= 12).

The interviews were conducted by researchers April Tucker and Taylor MacDonald, transcribed by all, and uploaded to the open-sourced qualitative coding tool Taguette, to identify key themes. April and Taylor simultaneously coded the transcripts via the online meeting platform Zoom, due to social distancing requirements of COVID-19. After three revisions, 14 codes were created and placed into three main categories: "Barriers", "Opportunities" and "Food Waste" (see Appendix B). A posteriori coding was used since the responses were based on the interviewees' experiences. Descriptive statistics and graphs were created using Microsoft Excel

to display and summarize the results. A one-way chi-square goodness of fit test was conducted on the frequency of identified 'Barriers' and Opportunities to determine if there was a significant difference in the frequency of expected versus observed category mentions. The results of this analysis are shown in section 4.1.

A significant limitation to this research was our reliance on stakeholders to respond to our emails and agree to participate in an interview. Our goal was to conduct at least 5 interviews, out of the 10 food vendors we identified in the SUB. The university closure limited us to the 6 vendors who had publicly available contact information. We only received 2 responses, and thus our data does not accurately represent our sampling frame.

### 3.2 Surveys

The second portion of our research was a 5-question online survey for Dalhousie students who were asked to identify their awareness of edible food waste entering the waste stream, and whether they would classify this as an issue. The survey also measured students' comfort levels in eating uneaten food and if they would benefit from having access to a food diversion program (see Appendix A for survey questions).

The researchers made an online survey through Google Forms to allow students the option of completing the survey either in-person or from an off-campus location. The researchers stood in the SUB for 2 periods of 1 hour and approached every 3rd student that passed by, in an effort to eliminate bias. All students had the option of using the researchers' electronic device or were shown a Quick Response (QR) code to scan and access the survey with their own device. The researchers elected in-person survey methods as opposed to handing out a survey link or QR code, since students are more likely to complete the survey in the presence of a researcher. The in-person method was used until it was no longer feasible due to the university closure. After the university closure, a mass email was sent to students in the Environmental Science department, the survey link was posted on a Dalhousie University community Facebook page, and posted on Twitter by the Dalhousie Student Union.



The survey received 171 responses. Two of the researchers, Siya Sun and Samara Burton, collected the survey responses from Google Forms and input them into a Microsoft Excel spreadsheet in order to conduct further data analysis. A one-way chi-square goodness of fit test was conducted on the responses for each of the questions in order to determine the observed sample distribution and the expected probability distribution according to the null hypothesis. The results of this analysis can be found in Appendix C. The results were then summarized as graphs which can be found in section 4.2.

No identifying information was asked in the survey, and it contained an ethics section at the beginning followed by a statement acknowledging the students' consent. Our intended sample size was 377 students, based on Dalhousie's student population of 19,579 (Dalhousie University, 2019). This excludes students from the Agricultural Campus in Truro, Nova Scotia. We received 171 responses, which is not representative of our population, and could lead to unintentional bias in the results. A limitation of this method includes students' unprompted willingness to complete the survey, due to our inability to approach them in person.

## 4.0 RESULTS

### 4.1 Interviews

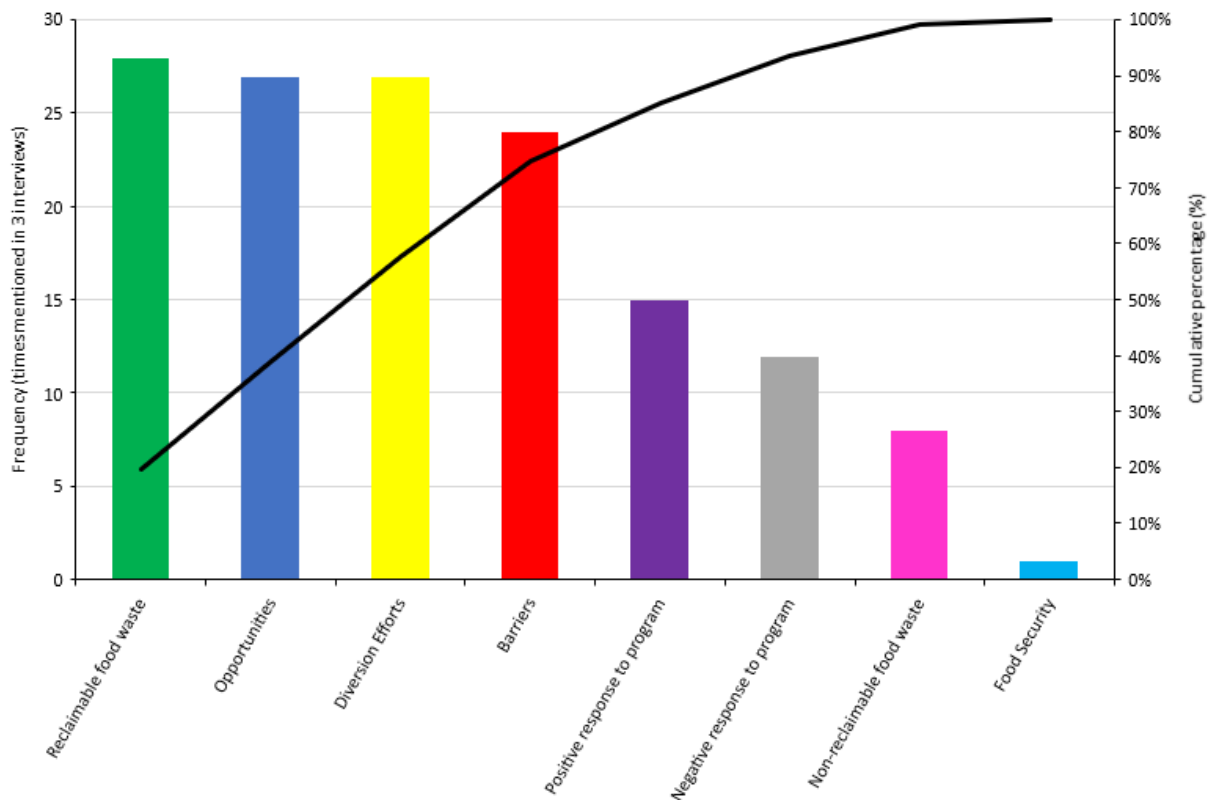


Figure 1. Pareto chart of common topics identified in the interviews, with decreasing frequency.

This Pareto chart shows 8 topics identified in the 3 interviews, which were later condensed into 3 categories 'Barrier', 'Opportunities' and 'Food Diversion'. The most significant topics were reclaimable food waste, opportunities for a food diversion program, diversion efforts, and barriers to a food diversion program.

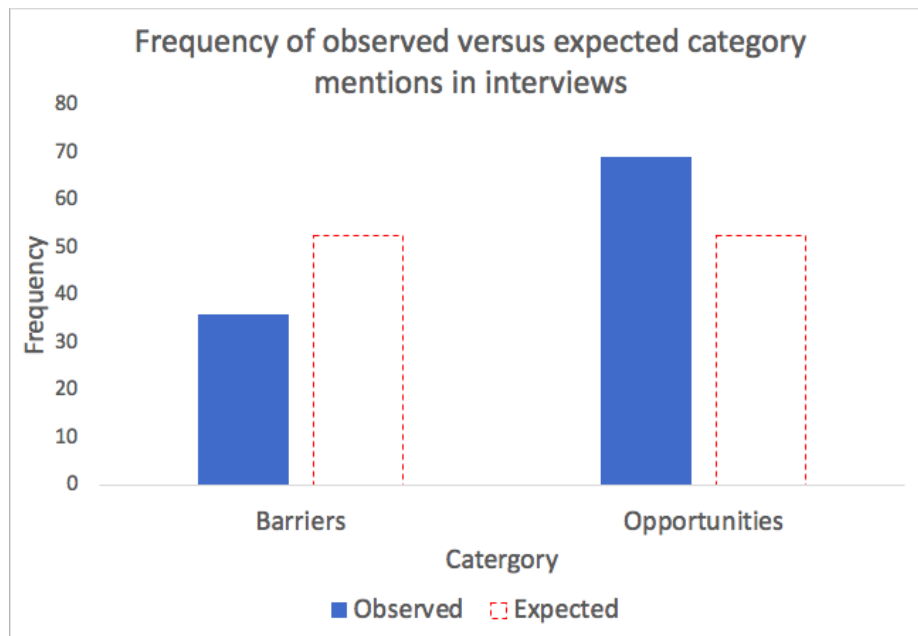


Figure 2. Bar chart indicating the expected frequency of category mentions compared to the observed frequency for both barriers and opportunities.

Fig. 2 shows the expected frequency versus the observed frequency for the categories 'Barriers' (n= 36) and 'Opportunities' (n= 69). A chi-square goodness of fit test was performed to determine whether there was a significant difference between the frequency at which interviewees mentioned barriers and opportunities. We found that there was a significant difference:  $p$  value > 0.05, thereby rejecting our null hypothesis.

#### 4.2 Surveys

The survey results were summarized in bar charts to better understand and visualize the data. One-way chi-square tests were conducted for each of the 5 questions in order to determine any significant difference between the expected and observed values.

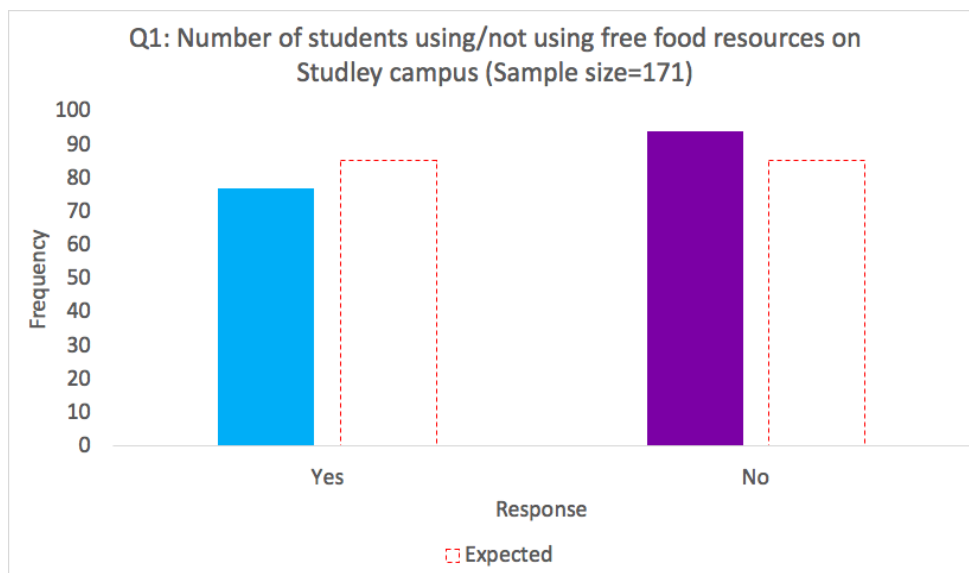


Figure 3: Expected results compared to the observed number of respondents that utilize free food resources on Dalhousie's Studley campus.

Fig. 3 shows the results from question 1 where 55% of respondents (n=94) indicated they do not make use of free food resources on campus, whereas, 45% (n=77) say they do. A one-way chi-square test indicates that there is no significant difference between the observed frequency, and its expected frequency and thus, the null hypothesis cannot be rejected.

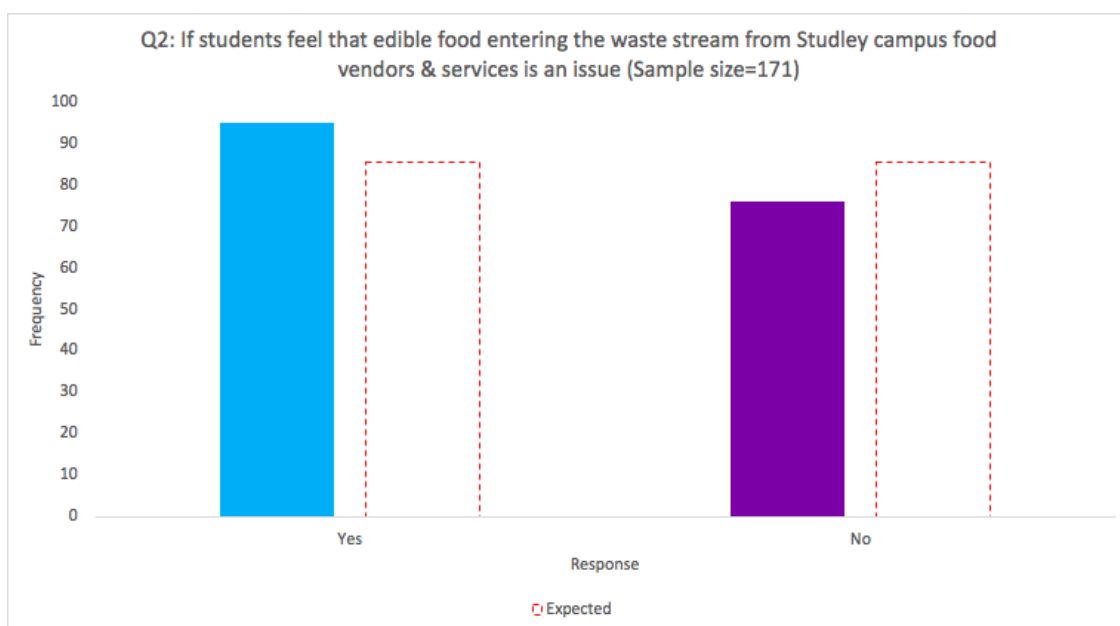


Figure 4: Expected results compared observed results for respondents who were aware that edible food entering the waste stream is an issue.

Fig. 4 shows the results of question 2 which highlighting that 55.6% (n= 95) of students claim to be aware of the issue of edible food entering the waste stream on Dalhousie's Studley campus, whereas, 44.4% (n= 76) claim to be unaware. A one-way chi-square test indicated that there is no significant difference between the observed frequency, and it's expected frequency and thus, the null hypothesis cannot be rejected.

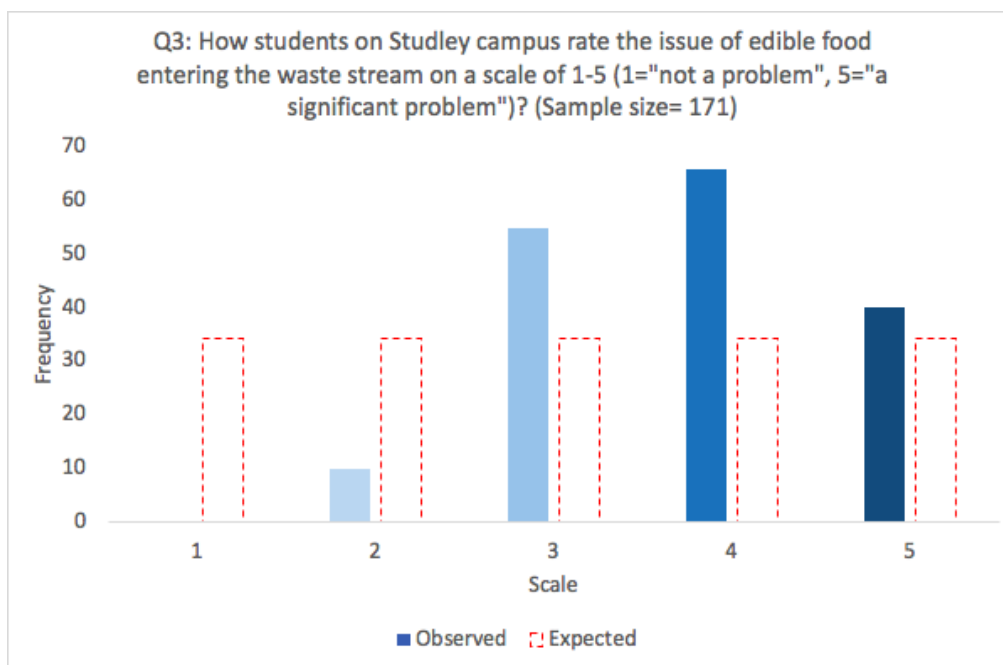


Figure 5: Expected results compared to observed results of respondents rating their perception of the issue of edible food entering the waste stream on Dalhousie's Studley campus.

Fig. 5 shows that the largest percentage of respondents surveyed, 62% (n= 106) felt that food waste was a scale 4 or 5 significant problem. A one-way chi-square test indicated that there was a significant difference between the observed and expected frequency for the values, as a result, the null hypothesis was rejected.

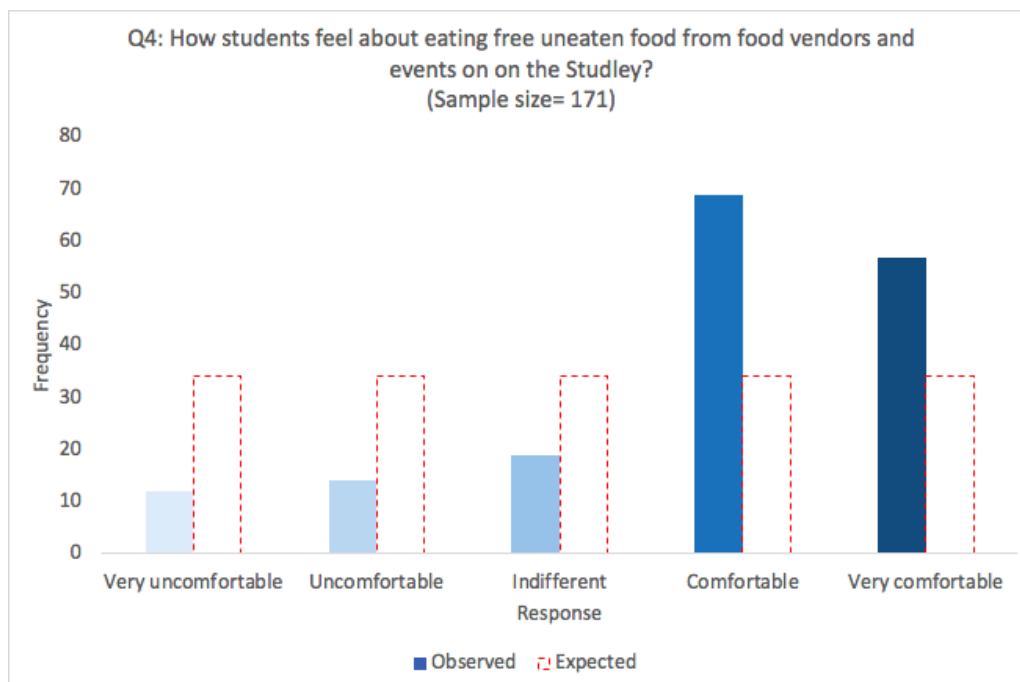


Figure 6: Expected results compared to the observed results for question 4 of the survey regarding respondents' level of comfort eating free uneaten food from on-campus food vendors.

Fig. 6 shows that 73.7% (n= 126) of students surveyed would feel 'comfortable' or 'very comfortable' eating uneaten food as part of a food diversion program on Dalhousie's Studley campus. The percentage of students who feel 'indifferent' represent 11.1% (n=19) of the sample and the combined percentage of those who feel, 'uncomfortable' or 'very uncomfortable' represent 15.5% (n= 26). A one-way chi-square test indicated that the observed frequencies were significantly different than the expected frequency for multiple values, as a result, the null hypothesis was rejected.

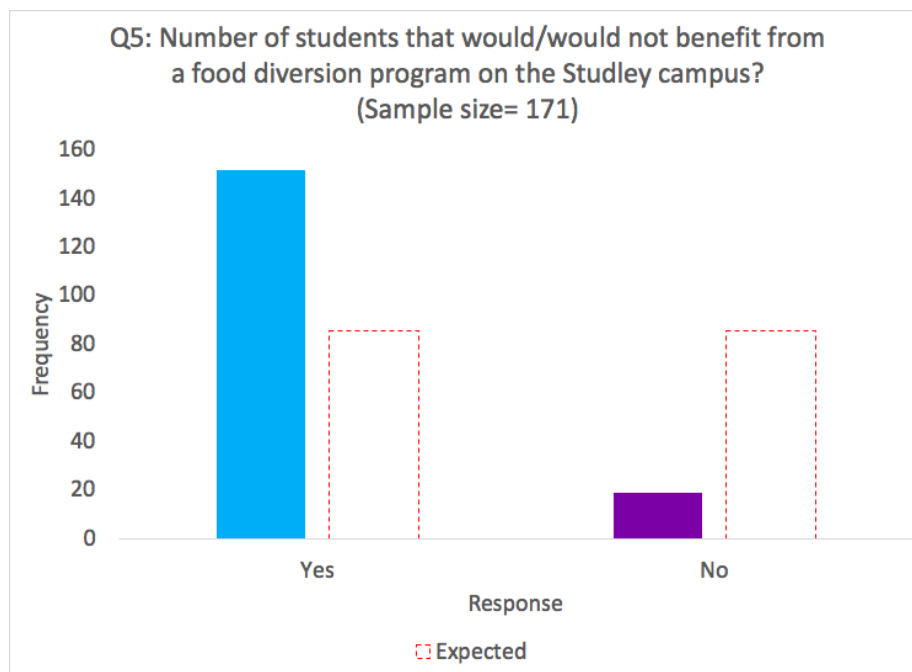


Figure 7: Expected results compared observed results for question 5 regarding the number of respondents who feel that they would benefit from an on-campus food diversion program.

Fig. 7 shows that 88.9% (n= 152) of the students surveyed felt that they would benefit from an on-campus food diversion program. A one-way chi-square test indicated a significant difference between the expected and observed results and therefore, the null hypothesis was rejected.

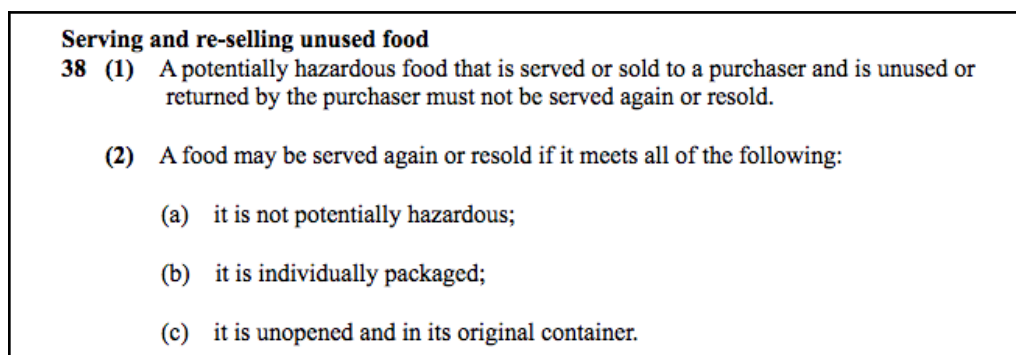
## 5.0 DISCUSSION

This research was intended to gather information from food service providers and students in order to identify barriers and opportunities for the creation of an on-campus food diversion program. While the number of respondents for both the interviews and the online survey was smaller than originally expected due to the university closure in response to COVID-19. However, we were still able to gain valuable information from the respondents which contributed to answering our research question.

The online survey design was unable to gauge the extent of students' knowledge about the issue of food waste, nor were we able to determine the number of students who considered

themselves to be food insecure. However, the results did suggest that the majority of the students surveyed would respond favourably to some type of food diversion program. This is evident in fig. 7, which shows that 88.9% (n=152) of respondents feel they would benefit from an on-campus diversion program that would give them access to a variety of reclaimed food; it was not determined which types of food would be available.

Significant barriers identified in the interviews include health and safety concerns, quick university turnover, stakeholder willingness to participate in a program, and food safety policies. Health concerns and policy issues were the two main barriers identified. One interviewee stated that Dalhousie does not currently have a policy around food waste, but that their operations follow the Nova Scotia Food Safety Regulations. We conducted further research on this document and identified Section 38: “Serving and re-selling unused food”, as pertaining directly to our proposed food diversion program, shown below in *Fig. 8* (Nova Scotia Food Safety Regulations, 2015).



*Figure 8.* Section 38 of the Nova Scotia Food Safety Regulations. Source: (Nova Scotia Food Safety Regulations, 2015).

Potentially hazardous foods are defined as “meat, poultry, fish, eggs and milk, and other foods capable of supporting the growth of pathogenic microorganisms or the production of toxins” (Nova Scotia Department of Agriculture, 2016). Although donors are protected under the Volunteer Services Act (1989), the strict Food Safety Regulations remain a potential barrier for food service vendors’ participation.



Reclaiming food that had already been “touched” or “prepared” was another common health concern in the interviews. However, our results from the student survey indicate a high level of comfortability with eating uneaten food from food vendors on the Studley campus (fig. 6) where 73% (n=124) of students felt ‘comfortable’ or ‘very comfortable’ eating reclaimed food despite it having been previously prepared and/or touched. Our interviews also outlined that food that cannot be resold from the food vendors often ends up in the waste stream despite the 88.9% (n=152) of students surveyed who claim they would benefit from a program that would reclaim and divert the food (fig. 7).

Our research also identified several opportunities (n= 69) for a food diversion program located in the SUB (fig. 2). These include similar programs, as well as current and previous diversion efforts. The Dalhousie Food Collective (DFC) (2017 – 2019) was a previous diversion effort, aimed to increase communication amongst SUB food organizations to address food waste as well as different organizations’ needs. The DFC enabled the communication for a variety of food vendors and organizations and worked closely with the Loaded Ladle to create projects such as the little free store; a small cart with free food items available during the Loaded Ladle regular serving hours. The interviewee, from DSUSO highlighted and has experience working with a similar diversion program called Freedge. Freedge is an international movement that works to help people implement community fridges in their area. A community fridge operates as a space where local restaurants, home cooks and supermarkets can donate excess food in an effort to redistribute or divert the food from becoming food waste (Kaufman, 2019). The Freedge website lists several community fridges operating in Canada, with a Freedge community fridge coming soon to come to Halifax, Nova Scotia (Freedge, n.d.). The interviewee from the Loaded Ladle identified a similar program that operates out of a not-for-profit called Radstorm, located in Halifax’s North End. The interviewee mentioned that the Loaded Ladle currently diverts some of their edible FLW to the community fridge at Radstorm. Although the impact of community fridges may seem minor in their effort to address food

insecurity and food waste, their collective impact is significant. For example, the community fridge network created by the environmental charity Hubbub, installed 50 community fridges across Great Britain which as of 2019, redistributed 25 tons of food equating to 50,000 meals per month (Kaufman, 2019). The success of these community fridge programs across Canada and the world points to the feasibility of a similar program on the Dalhousie University campus.

The highest frequency code was reclaimable food waste, mentioned 28 times within the 3 interviews (fig. 1). This suggests that a supply of reclaimable food exists on-campus that could contribute to a diversion program. Our research also identified the DSU Market and the Loaded Ladle as possible contributors to the program due to a surplus quantity of vegetables or prepared food that occur due to the unpredictable amount of people that access their services.

Our survey results indicated that students felt significantly more favourably towards a food diversion program than expected. Not only were 73.7% (n= 12) of respondents 'comfortable' or 'very comfortable' with eating uneaten food (fig. 6), 88.9% (n=152) stated that they would benefit from this type of program (fig. 7). It is important to note that the number of respondents who currently make use of free food services on campus such as the Loaded Ladle, or the DSU Food Bank, only represented 45% (n= 77) of the students surveyed (fig. 3). There may be a number of reasons for this, for example, the Loaded Ladle only serves plant-based food which may not be appeal to certain students' dietary preferences. Alternatively, some students may feel reluctant to make use of these kinds of services due to stigma attached to accessing free food services (Lee et al., 2018). The usage of the current free on-campus food resources is beyond the scope of our research and is an area that requires further investigation in order to better ascertain the extent of Dalhousie student food insecurity. Based on our research, we cannot claim that students have a significant need for a food diversion program, however, our results indicate that they would benefit from one, and are not uncomfortable with the idea of eating uneaten or reclaimed food.

## 6.0 CONCLUSION

The results from our research on the feasibility of implementing a food waste diversion program on Dalhousie's Studley campus indicate that a program, such as a 'community fridge', would be feasible. Our research shows that although there are barriers to implementing such a program, specifically around health concerns and the Nova Scotia Food Safety Regulations (2015), these can be overcome by the protection through the Volunteer Services Act (1989). The presence and growth of community fridges around the world (Kaufman, 2019) as well as in Halifax, Nova Scotia serves as an indication of the potential success of a similar program on the Studley campus. Proper monitoring, food policy clarification, as well as a desire to participate and contribute could result in the creation and implementation of a community fridge at Dalhousie University. We acknowledge that despite our results indicating its feasibility, our research faces a major limitation in that we did not analyze the current need for this program. Although 89% (n= 152) of our survey respondents claimed they would benefit from a food waste diversion program, further research should be conducted on food insecurity among the student population to identify the need for such a service on campus. Although feasible, an on-campus community fridge could be challenging and time-consuming to implement and manage. Further research, such as a cost benefit analysis of an on-campus community fridge would provide necessary background to assess its feasibility. As well, a proper policy analysis needs to be done to determine how Dalhousie University Food Services and food vendors could support this type of program. We remain hopeful that a food diversion program is possible, and recommend that a partnership between Dalhousie Food Services, on-campus food vendors, and representatives from the student population, such as the previous Dalhousie Food Collective, be a way to move forward.

## **7.0 ACKNOWLEDGMENTS**

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## 8.0 REFERENCES

- Arcuri, S. (2019). Food poverty, food waste and the consensus frame on charitable food redistribution in Italy. *Agriculture and Human Values*, 36(2), 263-275. doi: <https://doi-org.ezproxy.library.dal.ca/10.1007/s10460-019-09918-1>.
- Burke, D. (2018, May 4). Empty bellies and bare shelves: university food banks struggle to meet demand. *CBC News*. Retrieved from <https://www.cbc.ca/news/canada/nova-scotia/university-food-banks-education-school-hunger-1.4644781>.
- Dalhousie University. (2016). *Sustainable and healthy food framework*. Retrieved from [https://cdn.dal.ca/content/dam/dalhousie/pdf/dept/sustainability/Sustainability%20Health%20Food%20Report%202016%20Final%20Report%20\(1\).pdf](https://cdn.dal.ca/content/dam/dalhousie/pdf/dept/sustainability/Sustainability%20Health%20Food%20Report%202016%20Final%20Report%20(1).pdf).
- Dalhousie University. (n.d.) *Food Security*. Retrieved from <https://www.dal.ca/faculty/sustainability/programs.html>.
- EU Platform on Food Losses and Food Waste. (2019). *Redistribution of surplus food: Examples of practices in the Member States*. Retrieved from [https://ec.europa.eu/food/sites/food/files/safety/docs/fw\\_eu-actions\\_food-donation\\_ms-practices-food-redis.pdf](https://ec.europa.eu/food/sites/food/files/safety/docs/fw_eu-actions_food-donation_ms-practices-food-redis.pdf).
- Facilities Management & Office of Sustainability. (2016). *Indoor/outdoor waste bin standards for Dalhousie University*. Retrieved from <https://cdn.dal.ca/content/dam/dalhousie/pdf/dept/sustainability/Waste%20Bin%20Standards%20August%202016%20-%20Final.pdf>.
- Feed Nova Scotia. (2020). *Donate Food*. Retrieved from <https://www.feednovascotia.ca/donate/donate-food>
- FoodARC. (2017). *Can Nova Scotians afford to eat healthy?* Retrieved from

- [https://foodarc.ca/wp-content/uploads/2017/03/2016\\_Food\\_Costing\\_Report\\_LR\\_SPREADS.pdf](https://foodarc.ca/wp-content/uploads/2017/03/2016_Food_Costing_Report_LR_SPREADS.pdf).
- Freedge. (n.d.). *Find a freedge*. Retrieved from <https://freedge.org/locations/>.
- Gallegos, D., Ramsey, R., & Ong, K. W. (2013). Food insecurity: Is it an issue among tertiary students? *Higher Education*, 67(5), 497-510. doi: <https://doi-org.ezproxy.library.dal.ca/10.1007/s10734-013-9656-2>.
- Gooch, M., Bucknell, D., LaPlain, D., Dent, B., Whitehead, P., Felfel, A., Nikkel, L., Maguire, M. (2019). *The Avoidable Crisis of Food Waste: Roadmap; Value Chain Management International and Second Harvest*; Ontario, Canada. Retrieved from <https://secondharvest.ca/wp-content/uploads/2019/01/Avoidable-Crisis-of-Food-Waste-The-Roadmap-by-Second-Harvest-and-VCMI.pdf>
- Government of Canada. (2012). *Household food insecurity in Canada statistics and graphics (2011 to 2012)*. Retrieved from <https://www.canada.ca/en/health-canada/services/nutrition-science-research/food-security/household-food-security-statistics-2011-2012.html>.
- International Food Policy Research Institute. (n.d.). *Food Security*. Retrieved from <https://www.ifpri.org/topic/food-security>.
- Kaufman, R. (2019, Mar 15). Introducing the community fridge, a new way to tackle food insecurity. *Next City.Org*, Retrieved from <http://ezproxy.library.dal.ca/login?url=https://search-proquest-com.ezproxy.library.dal.ca/docview/2264322232?accountid=10406>
- Lee, S. D., Hanbazaza, M., Ball, G. D. C., Farmer, A., Maximova, K., & Willows, N. D. (2018). Food insecurity among postsecondary students in developed countries. *British Food Journal*, 120(11), 2660-2680. doi: <http://dx.doi.org.ezproxy.library.dal.ca/10.1108/BFJ-08-2017-0450>.

- McNutt, R. (2014, April 22). Inside Dal's Sustainability Success. *Dal News*. Retrieved from <https://www.dal.ca/news/2014/04/22/inside-dal-s-sustainability-successes.html>
- Mifflin, K., Tuedmers, P., Allison, E., & Tlusty, M. (2019). Reducing food waste: By what means and for what ends? *Dalhousie University: Literature Review*. [Print].
- Nova Scotia Department of Agriculture. (2016). *Nova Scotia food retail and food services code*. Retrieved from <https://novascotia.ca/agri/documents/food-safety/NSFoodCode.pdf>.
- Nova Scotia Food Safety Regulations* (S.N.S. 2015, c. 4, s 38). Retrieved from <https://www.novascotia.ca/just/regulations/regs/hpafood.html>
- Roshanafshar, S., & Hawkins, E. (2015). Food insecurity in Canada. *Statistics Canada*. Retrieved from <https://www150.statcan.gc.ca/n1/pub/82-624-x/2015001/article/14138-eng.htm>
- Volunteer Services Act*, (R.S.N.S. 1989, c 497). Retrieved from <https://www.canlii.org/en/ns/laws/stat/rsns-1989-c-497/latest/rsns-1989-c-497.html>

## 9.0 APPENDICES

### Appendix A

#### Interview and Survey Questions

##### Interview with Food Service Vendors:

We define **uneaten food** as food that is still fit for consumption and has not been sold or consumed by the end period of when it was anticipated to be sold or consumed. Examples include leftover timbits, unsold sandwiches, leftover vegetables, etc.

1. Does your organization monitor the quantity of uneaten food that ends up in the waste stream from your on-campus organization?
2. Are there any policies in place within your organization that prevent uneaten food from being donated or diverted?
3. Have there been any previous programs or initiatives within your organization to reduce the amount of uneaten food that enters the waste stream?
4. Would your organization be interested in participating in an on-campus, uneaten food diversion program such as a community fridge (uneaten food will be placed in a community fridge open to students, faculty and staff that will be regularly monitored and cleaned)?
5. What are any concerns you would have about implementing a food diversion program?

##### Online Survey Questions for students:

We define **uneaten food** as food that is still fit for consumption and has not been sold or consumed by the end period of when it was anticipated to be sold or consumed. Examples include leftover timbits, unsold sandwiches, leftover vegetables, etc.

1. Do you make use of free food resources on campus such as The Loaded Ladle?  
 Yes  
 No
2. Are you aware of the issue of edible food entering the food waste stream from Dalhousie food services and campus food vendors?  
 Yes



No

3. On a scale from 1-5, with 1 being “not a problem” and 5 being “a significant problem”, how would you rate the issue of edible food entering the food waste stream on Dalhousie Campus?

1 2 3 4 5

4. How comfortable would you feel with eating uneaten food from food vendors and events on campus?

Very uncomfortable \_\_\_

Uncomfortable \_\_\_

Indifferent \_\_\_

Comfortable \_\_\_

Very comfortable \_\_\_

5. Do you feel that you would benefit from a food diversion program that would give you access to uneaten food on-campus?

Yes

No

Thank you for participating in our survey.

## Appendix B

### Interview Results- Codes



Code	Count	Action
Barrier	9	edit
Barrier.HealthConcern	6	edit
Barrier.Policy	9	edit
DiversionEffort	8	edit
DiversionEffort.current	14	edit
DiversionEffort.previous	5	edit
Food Security	1	edit
FoodWaste.Awareness	3	edit
FoodWaste.non-reclaimable	8	edit
FoodWaste.reclaimable	28	edit
Negative Response	12	edit
Opportunity	19	edit
Positive Response	15	edit
Similar program	8	edit

Figure 9. List of codes identified in interview transcripts, and number of occurrences.

## Appendix C

### Survey Results

Question 1: Do you make use of free food resources on campus such as the Loaded Ladle?

<b>Response</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>Yes</b>	77	45
<b>No</b>	94	55

Question 2: Are you aware of the issue of edible food entering the food waste stream from Dalhousie food services and campus food vendors?

<b>Response</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>Yes</b>	95	55.6
<b>No</b>	76	44.4

Question 3: On a scale from 1-5, with 1 being “not a problem” and 5 being “a significant problem”, how would you rate the issue of edible food entering the food waste stream on Dalhousie Campus?

<b>Response</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>1</b>	0	0
<b>2</b>	10	5.8
<b>3</b>	55	32.2
<b>4</b>	66	38.6

5                      40                      23.4

Question 4: How comfortable would you feel with eating free uneaten food from food vendors and events on campus?

Response	Frequency	Percentage (%)
Very uncomfortable	12	7
Uncomfortable	14	8.2
Indifferent	19	11.1
Comfortable	69	40.4
Very comfortable	57	33.3

Question 5: Do you feel that you would benefit from a food diversion program that would give you access to free uneaten food on-campus?

Response	Frequency	Percentage (%)
Yes	152	88.9
No	19	11.1