

Food Wasting Attitudes and Behaviours Among Residence Meal Hall Users at Dalhousie University, Halifax, Nova Scotia

ENVS 3502 | Environmental Problem Solving II

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Dalhousie University has undertaken multiple initiatives in recent years to produce less food waste within their dining halls. This study aimed to develop a relation between the attitudes and behaviours towards food waste of those students who dine at Dalhousie University Howe Hall meal hall. The issues regarding waste management techniques at the meal halls is continuously being improved to lessen the amount of food waste created by the students and staff. Oral researcher-administered and individual self-administered questionnaires were applied to students dining at Howe Hall during three separate dates. The results of the study showed that 87% of students do not consume their meals entirely and discard of their uneaten food. In contrast, no correlation between food wasting attitudes and behaviours in respondents. Rather, the low-quality food which the respondents did not wish to consume, and an inability to take leftovers from a meal for later consumption caused an increase in wasted food. To reduce the amount of food waste the university produces, recommendations such as displaying ingredient lists; providing samples to meal hall users before they select a meal to reduce the likelihood of choosing a dish the consumer will find unappetizing; and allowing for students to package their uneaten food rather than having no option but to dispose of it.

TABLE OF CONTENTS

| | |
|---|-----------|
| 1.0. Introduction..... | 1 |
| 1.1. Background & Rationale..... | 1 |
| 1.2. Objective | 2 |
| 2.0. Methods..... | 3 |
| 2.1. Data Collection | 3 |
| 2.2. Statistical Analyses..... | 3 |
| 3.0. Results | 5 |
| 4.0. Discussion..... | 8 |
| 4.1. Interpretation of Results | 8 |
| 4.2. Limitations and Recommendations for Further Study | 9 |
| 4.3. Recommendations for Dalhousie University | 9 |
| 5.0. Conclusion | 11 |
| 6.0. References | 12 |
| Researcher-Administered Survey..... | 14 |
| APPENDIX B | 15 |
| Self-Administered Survey | 15 |
| APPENDIX C | 16 |
| Consent Script | 16 |
| APPENDIX D..... | 17 |
| Researcher Code of Conduct | 17 |

LIST OF FIGURES

- Figure 1- Frequency distribution of respondent Howe Hall meal hall use frequency (n = 99). 5
- Figure 2- Frequency distribution of self-identified reasons for not finishing the meal (n = 67),
and frequency of participants who did finish their meal (n = 32)..... 6
- Figure 3 - Chart identifying percentages of respondents who would prefer to take leftover meals
with them (black), prefer to not take food with them (light gray). 7

1.0. Introduction

1.1. Background & Rationale

As millions of people in multiple African countries are expected to suffer from famine in the next few months (CBC News, 2017), questions of food security and food waste are increasing in political discussions. Roughly one third of food produced for human consumption is wasted from field-to-fork, amounting to a global annual total of 1.3 billion tons (Gustavsson et al., 2011). Food wasted along this trajectory is fit for human consumption (Gustavsson et al., 2011), and could have provided struggling nations with much-needed nutrition. Furthermore, the large volume of food waste has measurable environmental impacts, due to the wasted natural resources used in the growing, processing, packaging, transporting, and marketing of the food (FAO, 2015). The unnecessary greenhouse gases produced by wasted food are estimated at 3.3 Gigatonnes of carbon dioxide (FAO, 2013). Additionally, 250 km³ of groundwater and nearly 30% of the Earth's agricultural land is used to grow food which is never eaten (FAO, 2013). As climate change places increasing pressures Earth's natural resources, it is imperative that these resources are used efficiently and are not unnecessarily wasted.

Universities have always been notorious for excessive food waste. Universities in the United States have been estimated to collectively produce 540 million tonnes of food waste annually (Creighton, 1999), and the university meal hall setting has been identified as a potentially significant source of this food waste (Kua et al., 2016). Numerous studies have been conducted to attempt to find the causes of food waste and solutions to limit it. Written messages, trayless dining operations, and improved food quality have all been identified as contributors to reducing the volume of food waste produced in dining halls (Brannon et al., 2013; Costello et al., 2015; Lazell, 2016).

This research project was conducted at Dalhousie University, a public research university with its main campus located in Halifax, Nova Scotia. Dalhousie has undertaken food waste reduction initiatives, including displaying informative signage regarding the composting of food and adopting a trayless dining operation, and has stated that it is actively engaged in reducing food waste during meal preparation (Dalhousie University, 2017a). However, Dalhousie food waste reduction initiatives have thus far not directly included students utilizing dining hall facilities. The university dining hall environment may provide greater opportunity for food waste, as one pays a flat rate for an all-you-can-eat buffet. Therefore, the residence meal halls are an important focus point for food waste initiatives on campus.

1.2. Objective

This research aims to develop an understanding of the correlation of student attitudes and behaviours toward food waste in the Dalhousie University Howe Hall student residence meal hall. By providing information on student attitudes, behaviours, awareness, and avoidance of food waste this research aims to aid in the development of further food waste reduction initiatives in Dalhousie University dining facilities.

2.0. Methods

2.1. Data Collection

Oral researcher-administered and individual self-administered questionnaires were used to gather data. Researcher-administered questionnaires were preferentially administered individually, but were occasionally administered to groups due to limited number of researchers. Surveys were modeled after a similar study conducted by Kuppig et al. (2016), and adhere to the Palys and Atchison (1971) guidelines for high-quality questionnaires. The researcher-administered and self-administered questionnaires are included in Appendix A and B, respectively.

Target sample size was $n = 250$, modeled after the Nash (2014) study, adjusted for difference in population size, examining university student's attitudes toward green eating, including food waste reduction. Data was collected over three days (March 16th, 18th, and 20th, 2017) during dinner time at the Howe Hall meal hall (16:30 - 18:45). A total of $n = 99$ responses were collected; target sample size was not obtained. However, during the second and third sampling round, several respondents indicated they had already participated in the survey, and due to the limited timeframe of our project, the realized sample size was deemed adequate.

Questionnaires were administered circumstantially in the Dalhousie Howe Hall residence meal hall. Two researchers were stationed at a booth located outside the meal hall entrance to administer the researcher-administered questionnaire and distribute the self-administered questionnaire. To recruit and screen participants, researchers asked people entering the meal hall if they were interested in taking part in an anonymous study concerning food waste being conducted as course requirement in ENVS 3502. Upon receiving an affirmative answer, the respondents were asked if they were currently a student of Dalhousie University, respondents indicating they were not were excluded from the study. After participant screening was completed the researcher obtained participant consent via the oral consent script (Appendix C) before proceeding with the oral researcher-administered questionnaire. Following the completion of the orally-administered questionnaire, the individual researcher-administered survey was distributed to the participants. The participants were requested to complete the survey upon finishing their meal and place the ballots in designated buckets at the meal hall exits.

During this study all researchers were expected to adhere to the Researcher Code of Conduct as outlined by Appendix D.

2.2. Statistical Analyses

All raw data was considered nominal as per Palys and Atchison (1971), and was therefore processed and displayed in a contingency table. Frequency distribution of respondent meal hall

use and reasons for not finishing a meal, and pie chart of leftover preferences of were constructed in Excel.

Questionnaire responses were coded to enable use within the Statistical Package for the Social Sciences (SPSS). The SPSS Fisher's Exact statistical test was used to evaluate the correlation between food waste awareness and avoidance. The Fisher's Exact test was used because the expected count assumption of the Chi Squared test was violated. 75% of the total data ($n = 99$) had an expected count of less than 5, indicating the sample size was too small for a Chi Squared test. The Fisher's Exact statistical test produces more exact results given a small sample size (Palys & Atchison, 1971). The two-sided exact significance was compared to $p=0.05$ to determine significance, where:

H_0 : There is no correlation between food waste awareness and food waste avoidance in participants.

H_a : There is a correlation between food waste awareness and food waste avoidance in participants.

The SPSS Fisher's Exact statistical test was also used to evaluate the correlation between food wasting attitudes; food waste avoidance and food waste behaviours as the expected count assumption of the Chi Squared test was violated; 68% of the total data ($n = 99$) had an expected count of less than 5. Food waste avoidance was represented by participant response to "To what degree do you agree with the statement 'I try to limit the amount of food waste I generate?'"', and food wasting behaviour was represented by the quantity of food thrown out, indicated by participant response to "How much of your food did you throw away today?". The two-sided exact significance was compared to $p = 0.05$ to determine significance, where:

H_0 : There is no correlation between food waste attitudes and food waste behaviours among participants.

H_a : There is a correlation between food waste attitudes and food waste behaviours among participants.

To identify how representative study results were of was of participant-identified reasons for food wasting habits, the researcher-administered responses to the question "Why do you usually discard your uneaten food" were compared to the self-administered response of "Why did you throw away your food today?". The responses were coded into two categories; too full, or unappetizing. The coded responses were analyzed using a Chi Squared test in the SPSS software using the two-sided significance using $p = 0.05$, where:

H_0 : There is no correlation between the predicted and actual reasons for food wasting habits of participants.

H_a : There is a correlation between the predicted and actual reasons for food wasting habits of participants.

3.0. Results

The majority of respondents frequented the Howe Hall meal hall more than twice a day ($n = 56$), followed by (in order of frequency) once to twice a day ($n = 31$), every other day ($n = 8$), once a month to once a week ($n = 3$), and less than once a month ($n = 1$) (Figure 1). The total number of respondents was $n = 99$.

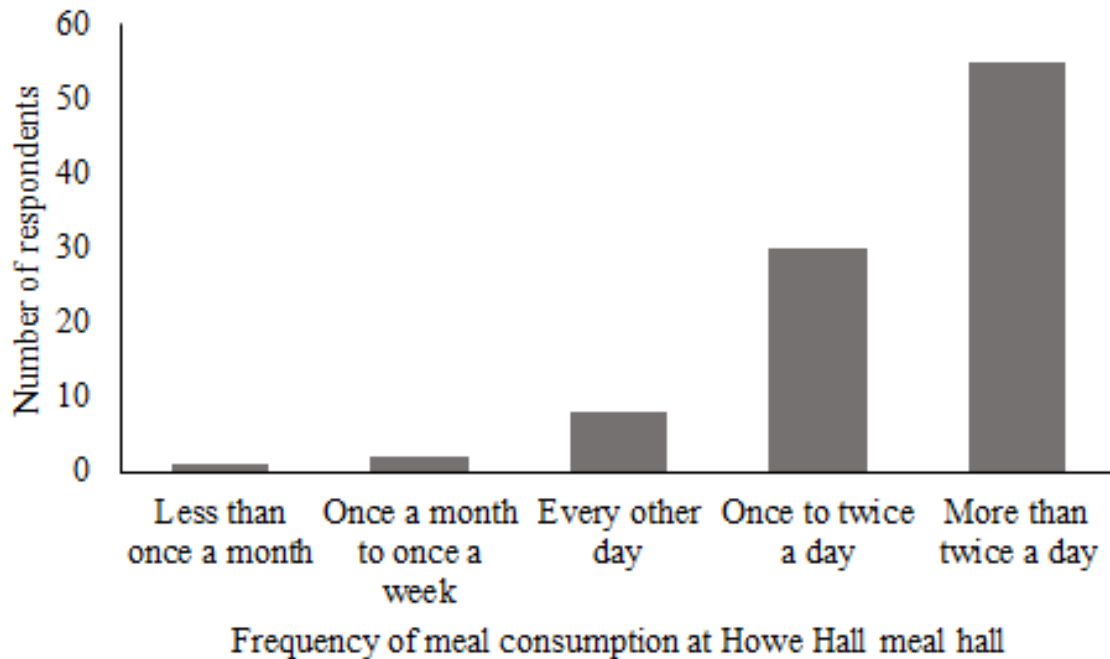


Figure 1 Frequency distribution of respondent Howe Hall meal hall use frequency ($n = 99$). This data was obtained March 16th, 18th, and 20th, 2017 during dinner time at the Howe Hall meal hall (16:30 - 18:45).

No significant correlation was found between food wasting attitudes and food wasting behaviours ($p = 0.210$). H_0 was accepted; there was no correlation between food waste attitudes and food waste behaviours among participants

A moderately positive, significant, correlation was found between food waste awareness and food waste avoidance ($p = 0.02$, $r = 0.485$). H_0 was rejected, therefore, there was a correlation between food waste awareness and food waste avoidance in participants.

No significant correlation was found between predicted (“Why do you usually discard your uneaten food”) and actual reasons (“Why did you throw away your food today?”) for participant food wasting habits ($p = 0.650$). H_0 was accepted; there was no correlation between the predicted and actual reasons for food wasting habits of participants.

87% of participants (n=86) indicated they did not finish their meal, of those who did not finish their meal (n=67) 78.1% indicated the reason for doing so was “It was unappetizing” (Figure 2).

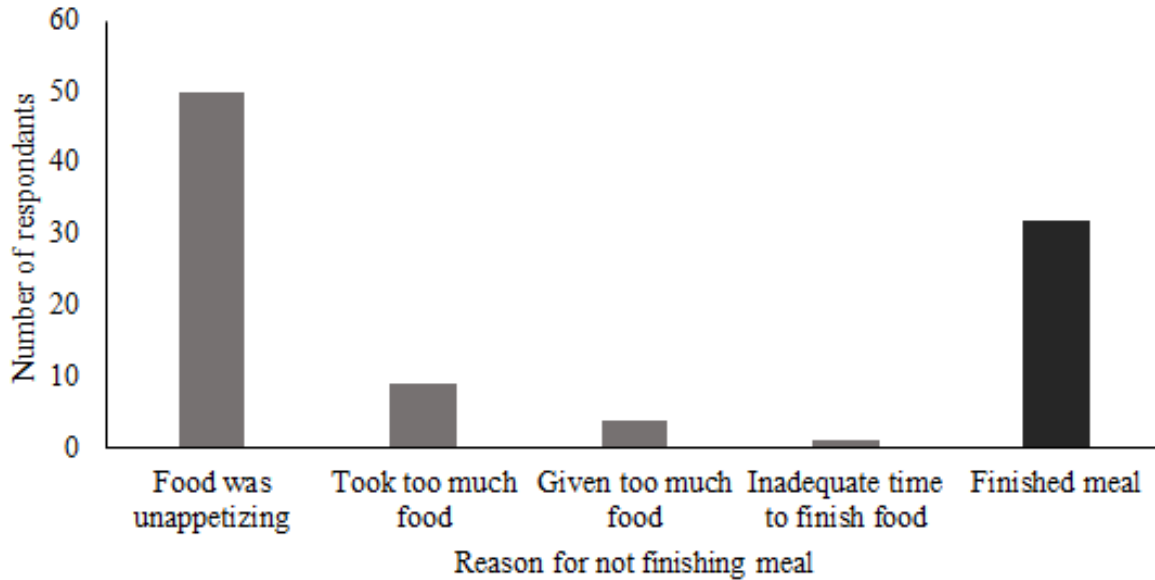


Figure 2 Frequency distribution of self-identified reasons for not finishing the meal (n = 67), and frequency of participants who did finish their meal (n = 32). This data was obtained March 16th, 18th, and 20th, 2017 during dinner time at the Howe Hall meal hall (16:30 - 18:45).

87% of participants did not finish their entire meal (n = 86), of those who did not finish their meal, 63% (n = 54) indicated they would prefer to take their leftovers with them to consume at a later point in time, while 37% (n = 32) indicated that they would prefer to not take their leftovers (Figure 3). n = 5 respondents provided additional feedback regarding the reason they would prefer to not take their leftovers with them; all cited the unappetizing nature of the food as the reason for not taking leftovers.

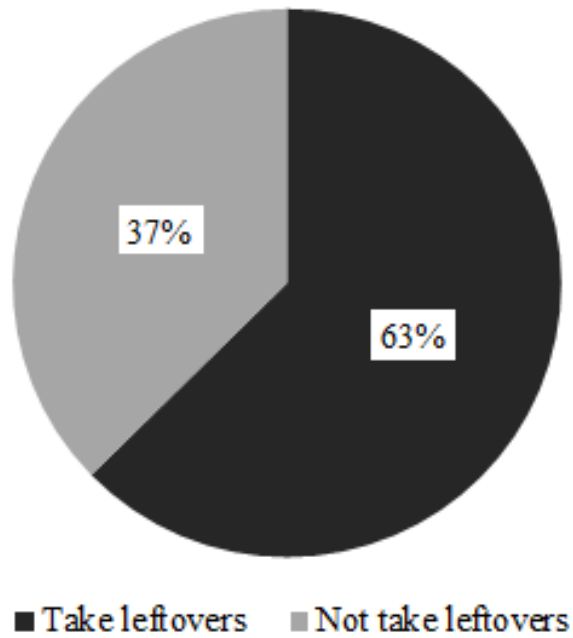


Figure 3 Students who would prefer to take leftover meals with them (black), prefer to not take food with them (light gray). This data was obtained March 16th, 18th, and 20th, 2017 during dinner time at the Howe Hall meal hall (16:30 - 18:45).

4.0. Discussion

4.1. Interpretation of Results

This study provides an overview of Dalhousie University student attitudes and behaviours regarding food waste. Responses were primarily collected from students who frequently dine at Howe Hall; 57.3% frequented the meal hall more than twice a day, and 31.3% once to twice a day. This sample allowed representative conclusions to be made regarding student views on Dalhousie University dining halls.

No significant correlation was found between food wasting attitudes and food wasting behaviours ($p = 0.210$), supported by the finding that 87% of students did not finish their meals. 78% of students who did not finish their meal identified the reason for wasting food was that it was unappetizing, indicating that the volume of wasted food could be decreased by increasing the quality of foods served in the Dalhousie University meal halls.

A moderately positive, significant correlation was found between self-identified food waste awareness and food waste avoidance ($p = 0.02$, $r = 0.485$). This finding was supported by the desire of participants to take their leftovers with them to consume later. However, the majority (87%) of students engaged in food wasting behaviours, indicating that only a small portion of students are classified in the behavioural modification stage of food waste reduction (Nash, 2014). These findings are supported by the findings in Dahm et al. (2009) where a small portion of participants undertook action based on beliefs, while most did not. The majority of students engaged in food wasting behaviours (78.1%) indicate doing so due to the unappetizing nature of the food served.

Although students indicated that they primarily did not finish their meals due to the unappetizing nature, 63% of students stated that if possible, they would package their leftovers to eat at a later time. This indicates that the Dalhousie meal hall policy which states that users may not bring leftover food with them (Howe Hall Residence Life Manager, personal communication, March 16th, 2017) contributes to the large volume of food waste produced. However, researchers noted that some students indicated that they consumed their entire meal, but also wanted to take additional food. This may have biased our results by indicating that a larger proportion of food waste would have been diverted if students were allowed to take their leftovers with them. These results showed that although the students are typically wasting food because it is unappetizing, there is a desire to avoid wasting food. This suggests that students are unable to exhibit behaviour corresponding to their attitudes toward food waste due to the limited behavioural options in the meal hall setting; where students can either (1) consume their entire meal regardless of food quantity or quality, or (2) throw leftovers out.

4.2. Limitations and Recommendations for Further Study

A number of study limitations have been identified which may have influenced the results. Firstly, the study was conducted solely at Howe Hall, one of four residence dining halls options available at Dalhousie University, this may have influenced our results as meal hall menus vary per location (Dalhousie University, 2017b). Location may also influence the quality of available food, and therefore the questionnaire responses regarding the reasons for disposing of leftovers. Secondly, samples were gathered within the same time frame (16:30 - 18:45) during each sampling round. This may have biased our responses as literature indicates that the largest quantity of food waste is generated during dinner in university meal hall settings (Sarjahani et al., 2009; Costello, 2016). Additionally, some students indicated that they had previously completed the survey and we had collected their information twice. This may have biased our results by skewing the proportions of the categorical responses. Thirdly, the sampling done on March 18th, 2017, was conducted on the day after St. Patrick's Day, a holiday associated with copious alcohol consumption. During sampling, the response rate was very low due to student's post-St. Patrick's Day condition. More thorough planning of sampling dates would have likely resulted in a higher response rate. Fourth, responses to the oral researcher-administered questionnaires were not independent when the questionnaire were distributed within a group, as most students would simply agree with what a prior student had stated instead of formulating a personal response. Additionally, the lack of correlation between predicted and actual reasons for disposing of food indicates that participant answers to the orally researcher-administered questionnaire may have been influenced by researcher presence. Further studies should administer the researcher-administered questionnaires exclusively via pen-and-paper, as opposed to orally. Finally, the Howe Hall meal hall has multiple entrances, which was not accounted for in this study as researchers were stationed at only one entrance. A higher response rate may have been obtained by stationing researchers at each entrance.

4.3. Recommendations for Dalhousie University

Regardless of the efforts that Dalhousie University has implemented to promote a sustainable campus (Dalhousie University, 2017a), the student action in reducing food waste is limited by meal hall policy, and quality of foods offered. To reduce food waste in Dalhousie University dining halls these two points must be addressed.

The inability to take leftovers is increasing food waste production in Howe Hall meal hall; indicated by the majority of students who did not finish their meal, but would have preferred to take their leftovers as opposed to disposing of them. It is therefore suggested that the meal hall regulation prohibiting taking leftover food be changed to allow students to take their leftover food

with them. To prevent increasing waste from disposable packaging, it is suggested that the students should be able to take their leftovers with them in their own reusable containers.

The majority of students indicated that the reason they did not finish their meals was due to the unappetizing nature of their food. Although taste preferences are subjective, students could be better informed in their choice of food by being provided ingredients lists, or being offering samples prior to the selection of their meal. This may limit food waste which is related to disliking or being dissatisfied with the meal.

5.0. Conclusion

This study aimed to determine the correlation between attitudes and behaviours toward food waste of students dining in the Dalhousie University Howe Hall meal hall. Results concluded that there was no correlation between food wasting attitudes and food wasting behaviours in respondents. Reasons for the limited behaviour to reduce food waste were identified to be low quality food, which the respondents did not wish to consume, and an inability to take leftovers from a meal for consumption later. Research results may have been influenced by non-ideal sampling dates, researcher presence, and limited sample size. However, based on the findings of this study, recommendations were made for further food waste reduction initiatives undertaken by Dalhousie University. These initiatives include displaying ingredient lists and providing samples to meal hall users before they select a meal to reduce the likelihood of choosing a dish the consumer will find unappetizing.

Dalhousie University has undertaken multiple initiatives in recent years to divert waste in from landfills (Dalhousie University, 2017a). The findings of this study indicate that additional food waste reduction measures are required to further reduce dining hall food waste. By implementing the suggested changes the university will be continuing their sustainability initiative to “passionately focus on reducing the environmental impact within their operations” (Dalhousie University, 2017a), and positively contribute to the reduction of the global food waste problem.

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APPENDIX A
RESEARCHER-ADMINISTERED SURVEY

Response Number: _____

1. How often do you consume a meal at Howe Hall meal hall?

- Less than once a month Once a month to once a week Every other day
 Once to twice a day More than twice a day

2. When you hear the words “food waste”, what does that mean to you?

For the sake of this study, “food waste” is defined as discarding food which is still fit for human consumption (including scraps and unfinished portions). For example, pizza crusts and leftover salad are considered food waste, but banana peels and chicken bones are not.

3. To what degree do you agree with the statement “I am aware of the food waste I generate?”

- Strongly disagree Disagree Neutral Agree Strongly agree

4. To what degree do you agree with the statement “I try to limit the amount of food waste I generate?”

- Strongly disagree Disagree Neutral Agree Strongly agree

5. When throwing food in the garbage/compost after a meal, why do you usually do so?

APPENDIX B

SELF-ADMINISTERED SURVEY

Response number: _____

1. Approximately how much of your original serving of food are you throwing away?

- None, I ate all the food I originally had on my plate
- ¼ of original serving
- ½ of original serving
- ¾ of original serving
- All of my original serving

2. Why are you throwing the remainder of your food away?

- It was unappetizing
 - I took more food than I could eat
 - I was given more food than I could eat
 - I ran out of time to finish eating my food
 - N/A
 - Other: _____
-

3. If possible, would you have taken your leftover food with you to eat later?

- Yes
- No
- N/A

APPENDIX C
CONSENT SCRIPT

Before we begin this survey and had you the self-administered survey:

1. The purpose of this study is to gather information regarding student attitudes and behaviours towards food waste.
2. All information provided by you will be anonymously recorded and will not be traceable back to you.
3. You are under no obligation to answer any of the survey questions, may stop at any time, and may request your response be removed from the study by contacting Lobke Rotteveel (lobke.rotteveel@dal.ca).

Please ensure you retain your response number so your feedback can be removed from the study

APPENDIX D

RESEARCHER CODE OF CONDUCT

The researcher administering the questionnaire will:

1. Ensure participant confidentiality: participant names or other identifying information will not be recorded or discussed with third parties.
2. Acknowledge that participation is voluntary: participants will not be coerced into responding to the study.
3. Refrain from influencing participants: the researcher will conduct themselves in a neutral and objective manner during administering the group questionnaire and all other contact with participants.
4. Conduct themselves in a respectful manner and heed all applicable Dalhousie University regulations and code of conduct.