

An Investigation of the Effect of Awareness and Knowledge on Emergency Planning for Food Service Establishment Operators

Leni Rose¹ Vanessa Karakilic²

1 Lead Author, School of Health Sciences, British Columbia Institute of Technology, Burnaby, BC

2 Supervisor, School of Health Sciences, British Columbia Institute of Technology, Burnaby, BC

ABSTRACT

INTRODUCTION: Current legislative deficit could leave food service establishments without sufficient food safety plans allowing food safety standards to decline during emergencies and increasing risk for foodborne illness. Relevant research indicates there is likely to be a lack of planning and action and lack of accessible resources on the behalf of operators and governmental agencies respectively (Story, 2007).

OBJECTIVES: The primary objective of this research was to elucidate the relationship between the dependent variable: food service establishment operator's level of emergency planning and two independent variables: their level of knowledge and level of awareness.

METHODS: A list of suitable candidates was generated using Yellowpages and potential candidates were randomly selected by numerical draw. These individuals were surveyed in person and this process was repeated until 30 contacts were acquired. The data was compiled in Excel for differential statistical analyses and SAS for Chi-squared testing for statistical significance.

RESULTS: Chi-square testing indicated a p-value of >0.05 for both data sets; therefore, no association was found between both food operator's knowledge and awareness and their level of emergency planning and both null hypotheses were rejected. Mean, median, and mode values were determined to fall within the neutral-high value for the ordinal scale.

CONCLUSION: Neither awareness and knowledge had a statistically significant relationship to the level of the operator's level of emergency planning. All tested categories were of neutral-high score values meaning the surveyed data did not find a deficiency in operator planning. These results could be indicative of error in survey design meaning further research on this topic will be necessary to determine a conclusive relationship between these variables.

KEYWORDS: Food Operators, Emergency Planning, Awareness, Knowledge

INTRODUCTION

During an emergency situation, food service establishment operators may find it difficult to maintain food safety standards as these standards become secondary to other concerns. Fire, flood, and power outage can all cause equipment malfunction and pose a significant risk to causing foodborne illness outbreaks. Due to a current legislative deficit, there is little that ensures operators

have composed sufficiently thorough food safety plans possibly leaving them unprepared. Since many of these situations often have a rapid onset, the best emergency plans are developed long before they are needed. However, even the most thorough plans may not encompass the unique challenges that occur in these situations. During these situations, operators will heavily rely on environmental health officers

to provide ongoing consultation and guidance. When widespread emergency occurs, the constraints of Health Authorities may be apparent as environmental health officers will find themselves overburdened and operators left without the materials needed to maintain food safety standards.

As demonstrated by the recent wind storm in the Lower Mainland which left 500000 residents without power on August 29, 2015, the lack of emergency preparedness and planning does not become apparent until acute issues, such as foodborne illness outbreak, arise (News 1130, 2015). These issues can largely be eliminated through the application of proper preventative tactics such as planning and education. Therefore, using the participatory method of survey, this research seeks to elucidate the relationship of the dependant variable: food service establishment operator's planning and two independent variables: their level of knowledge and awareness. This makes the following the null and alternative hypotheses respectively:

H₀: There is no association between the level of knowledge of emergency situations and the level of emergency preparedness for Lower Mainland food operators.

H_a: There is an association between the level of knowledge of emergency situations and the level of emergency preparedness for Lower Mainland food operators.

H₀: There is no association between the level of awareness of emergency situations and the level of emergency preparedness for Lower Mainland food operators.

H_a: There is an association between the level of awareness of emergency situations and the level of emergency preparedness for Lower Mainland food operators.

Defining this relationship will aid public health practitioners in the design and implementation of future preventative measures and establish targeted approaches

to increase the overall level of operator participation in emergency planning.

EVIDENCE REVIEW

The current relationship between food service establishment operators and emergency preparedness is not well studied, documented, or monitored. Information directly related to this topic is fairly scarce at a governmental, legal, and academic level. Much of the information available is directed at the public and not at a commercial level.

Relevant Legislation

Legislation specific to operators with respect to emergency preparedness was found to be limited in British Columbia. The two most relevant pieces of legislation with respect to this topic were found to be at the provincial level: the *Public Health Act* and its regulation the Food Premises Regulation. The *Public Health Act* contains purposefully ambiguous statements that are broadly applicable to various situations during emergencies; however, it is largely irrelevant to the specifics of prevention and planning. Legally, it is likely not to be called upon unless willful ignorance plays a role in operator behaviour (Part 3, Division 1, Section 15), an operator fails to comply with essential food service establishment duties (Part 3, Division 2, Section 18 (1)-(4)), or an environmental health officer requires to take emergency action (Part 5, Divisions 1-3, Section 51-60) (BCPHA, 2015). The Food Premises Regulation specifically requires food safety plans; however, they do not specifically address the need for emergency preparedness leaving it to operator discretion (in Part 3, Division 6, Section 23 (1)-(4)).

This regulation also requires food premise operators to take FOODSAFE, which does not contain any information on emergency preparedness (BCFPR, 1999). Both food safety plan and FOODSAFE requirements could be modified in a manner which would promote operator awareness and preparedness during emergency situations. For this reason, these two aspects of food safety should be the major focus of improvement to the legislative deficit in operator emergency preparedness.

Government Documents

Health authorities and related agencies are the expected providers of information relevant to operators under emergency situations. Of the five health authorities of British Columbia only two provided any information relevant to food service establishments and emergency preparedness. One health authority offered the most detailed information, but only for flooding and no other type of emergencies (Fraser Health, n.d). It would be beneficial to see health authorities adapt all other types of emergencies outlined in a similar manner. Another health authority put forth a guideline which briefly mentions operator emergency planning that states written procedures should be in place to deal with unforeseen circumstance; however this was only implemented during the 2010 winter Olympics (Vancouver Coastal Health, 2012). This clause if stated within an Act or Regulation would greatly improve food safety standards during emergencies; however, guidelines are, unfortunately, only recommendations and not legally enforceable.

The most valuable information was found outside the province in Manitoba outlined in the Guideline on Emergency Action Plans for Food Establishments. This guideline has in depth information about diverse emergency situations and coping with the general issues that arise from them (Government of Manitoba, 2011). Health authorities could emulate this document to create their own more topical guideline or disseminate in its current state prior to or during emergencies to aid operators to maintain food safety standards. Ontario also provided a relevant document titled Food Safety during a Power Failure. Although aimed at a household level, much of the information could be relevant to or translated to be applicable to food service establishments (Wellington-Dufferin-Guelph, 2015). Health authorities could develop similar documents on a commercial level to allow for operators to decide which foods should be kept or discarded to streamline the reopening process after an emergency

Academic Literature

An exhaustive search of electronic databases yielded three directly comparable studies. Yoon and Shanklin (2007) studied the relationship food service establishment operators and their perception and practices with respect to food bioterrorism. They determined operators with the smallest gaps in perception of importance and practice not only had the greatest awareness, but also performed the most preventative measures. They concluded that raising the level of awareness with these operators through education about preventative tactics will

significantly increase their level of preparedness. They argue accessibility of information is a large barrier to operator awareness and that the onus should be on governmental agencies to make the information more readily available and in a digestible format. For educating stakeholders about agroterrorism prevention and response action, Levin et al. (2005) noted statistically significant improvement in evaluation of pre- and post-workshop scores by delivering information in workshop format. Further supporting the notion of modified FOODSAFE for operators would be an effective method of education. When centralized school food service operations were surveyed, training on emergency procedures was found to be performed in less than half of them. Of the greatest limitations to implementing proper training, money was noted to be top three (Story, 2007). Since foodborne illness outbreak, especially what is possible during widespread emergency, has expensive economic implication, government financing or subsidy of such training could be expected; therefore, alleviating some of the barriers to implementing proper training.

Academically the relationship between food service establishment operators and emergency preparedness is not well documented or studied. As biosecurity is a burgeoning topic of public health, it can be expected that future research initiatives will be directed at this or similar topics. In Canada, certain facilities are already required to have emergency management plans; as such, emergency preparedness for food service establishments can be modeled

after their existent plans (British Columbia Community Care and Assisted Living Act, 2002). For example, Richter (1997) outlines in his article, "Hospital Disaster Preparedness: Meeting a Requirement or Preparing for the Worst?" an extensive list of considerations for emergency planning many of which are applicable to food service establishments. Similarly, other successful public health operations may be emulated. For example, the Sydney Olympics in which no communicable disease outbreaks were reported whose success is largely emphasized by thorough planning (Jorm, 2004).

Justification for Research

Unprepared food premise operators pose a great liability to the health of British Columbians as foodborne illness can easily arise in uncontrolled situations. Due to a deficit in the current legislation, emergency preparedness is up to the discretion of operators. These individuals are also faced with the barrier that there is little accessible information for planning or taking action when these situations occur. Research trends to indicate operators are currently underprepared and that governmental agencies need to play a vital role in educating, disseminating information, and ensuring emergency planning and preparation occur. British Columbian health authorities may choose to emulate other successful models by implementing strategic planning and monitoring and offering educational sessions as increasing awareness has demonstrably been shown to improve food premise operator practice

METHODS AND MATERIALS

Materials

The materials required to complete this research were the following an internet enabled computer with access to a word processor; the statistical analysis program SAS; Google; and random number generator, an internet enabled electronic device with access to Google Docs, and the survey including the survey; consent form, cover letter; and script.

Methods

This research was conducted via written survey delivered in person. To perform this task, a list of suitable candidates was generated, data was collected on a minimum of 30 individuals, and this data was then analyzed with the proper statistical program.

A list of eligible candidates was drawn from electronic YellowPages. Inclusion factors for candidacy required the selected contacts be in the defined geographic radius within Surrey and be a definable food service establishment (one which is serving food to patrons rather than processing food for distribution and sale). The individual who took the survey must have been currently employed as part of the upper echelon of the food service establishment's hierarchy (owner, manager, executive chef) and was reachable by car. The contacts were then assigned a numeric value and a random number generator was used to select and compile a list of a minimum of 30 individual contacts. 30 individuals were selected since a minimum of 30 data points are required to ensure beta errors do not occur. Eligible

candidates were contacted in person and asked for participation consent and contact information in the form of physical written copy. If they did not wish to participate, the next individual contact was randomly selected.

Data collection required several steps including dissemination of the survey, collection of the survey results, and compilation of the data. Once a list of a minimum of 30 individual contacts was generated in Excel, these individuals were contacted in person. Responses were collected in an Excel document and prepared in a format useable for statistical analysis. Statistical analysis was performed using the program SAS. All data was assigned value on a five point numeric scale. Independent variable data was converted to an associated nominal scale in accordance with Table 1.

Numeric Value	Assigned Nominal Value
1	Very Low
2	Low
3	Neutral
4	High
5	Very High

The dependant variable data was converted into two nominal categories: "prepared" and "not prepared" in accordance with Table 2.

Numeric Value	Nominal Value
0-2.4	Not Planned
2.5-5	Planned

Two chi-squared tests were conducted to determine if the null hypothesis was rejected and test the association between: level of knowledge of emergency situations and level of awareness of emergency situations and level of emergency preparedness.

Ethical Considerations

There are three main ethical considerations when conducting research with human subjects: justice, autonomy, and beneficence (Adams, 2013; Heacock, 2015). Ethical selection of participants, or “justice”, proposes avoiding those who may be unjustly coerced into participation. Autonomy can then be defined as informed consent free from coercive influence (Adams, 2013). For this research’s purposes, justice and autonomy, will be fulfilled through random generation of contacts as well as full disclosure consent form, Beneficence is defined as the necessity of the researcher to maximize benefits to both individuals and society while minimizing any potential harm to the individual (Adams, 2013). With respect to survey methodologies, the researcher must consider privacy by allowing individuals to remain anonymous and minimizing any discomfort posed by survey questions by allowing individuals to select “prefer not to say”.

RESULTS AND STATISTICAL ANALYSES

Inferential Statistics

Statistical analysis is a valuable tool for determining the significance of research. For survey data, chi-square is the conventional method for making such determinations. By

comparing the observed and expected outcomes of data, chi-square testing allows researchers to contrast varying opinions across groups making it a valuable tool for survey research (Ray, 2006). Secondly, chi-square can determine if two variable are dependant or independent of one another (Polaris Marketing Research, 2015) Within this research, food operator’s level of knowledge and awareness are defined as the independent variables; whereas, the level of planning for food operators is dependent. Independent variable was given a 5 point numeric value as well as corresponding nominal value (Table 1). This will allow for comparison to be made between the self-assessment awareness questions and knowledge testing questions of the independent variables. The dependent variable was given a similar 5 point numeric scale which will allow for the categorical division of planned and not planned operators to be made (Table 2). Self-assessment questions for both awareness and planning will be multichotomous ordinal; whereas, knowledge based questions will dichotomous nominal. Inferential statistics in the form of two chi-square tests was performed to determine if an association exists between operator self-assessed awareness and emergency planning and operator tested knowledge and planning. Similar research has demonstrated effective use of chi-square tests to determine if an association exists between perception and practice of food operators with respect to food bio-terrorism (Yoon and Shanklin, 2007). Using the output p value ($p \leq 0.05$) on statistical package SAS, a determination

of significance can be made and the null hypothesis rejected or failed to be rejected.

Performance of trial data sets were successfully conducted using chi-square on SAS. Data sets included 30 individual contacts with corresponding responses for both awareness and knowledge. Chi-square testing indicated a p-value of >0.05 for both data sets; therefore, no association was found between both operator's knowledge and awareness and their level of emergency planning and both null hypotheses failed to be rejected. Specifically, a p-value of 0.5770 was obtained for the knowledge data set and a p-value of 0.02533 was obtained for the awareness data set (Fig. 1, 2).

Figure 1: Chi-square data for knowledge based questions.

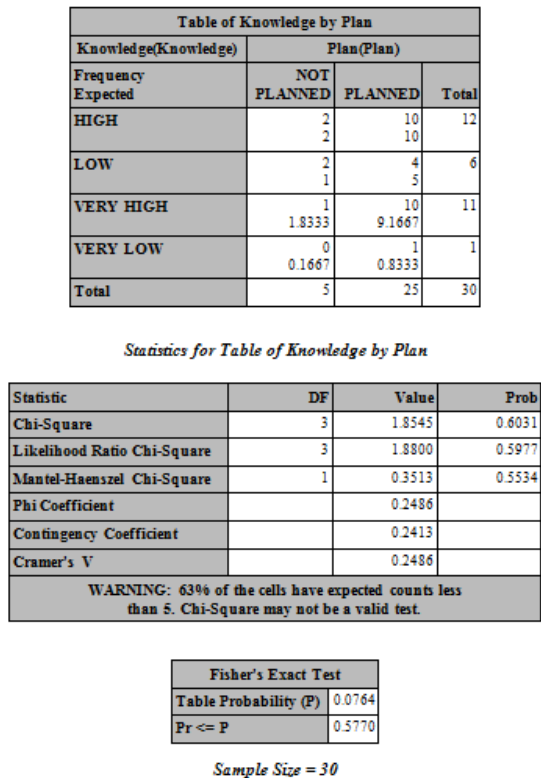
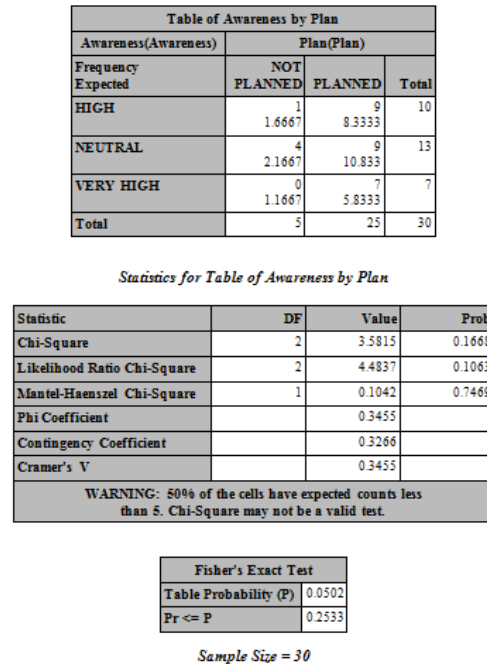


Figure 2: Chi-square data for awareness based questions



Descriptive Statistics

Special design considerations were applied to allow for nominal and ordinal values to have corresponding numeric values allowing for descriptive statistics to be analyzed (Table 1 & 2). Converting the data into numeric form allowed for measures of central tendency, mean, median, and mode, to be performed using statistical packages available on Microsoft Office: Excel. Performing such analyses allows for general trends to be observed among the data by converting large data sets into discrete comprehensible terms.

Performance of descriptive statistics was successful for the survey data. The mean score for planning for operators was 3.34 out of a possible 5 (Fig. 3). This mean score was the lowest for any surveyed category;

however, still in neutral to high range on the corresponding nominal scale. The collected data indicated the large majority (25/30) of all surveyed food service establishments were considered to be sufficiently planned. This unexpectedly high score may be indicative of content validity issues within the survey design. One complicit factor may lie within the interpretation of the survey question. For instance, when asked if written plans exist, this may encompass only a very small amount of written planning with no distinction from those who have a large amount of planning. For planning, median value was determined to be 3.67 which is similar to the mean demonstrating a narrow distribution of values around the mean (Fig 3). This is supported by the mode and median being equal. These close values in mean, median, and mode demonstrate the data are approaching perfect normal distribution.

Mean scores were the highest for knowledge based questions (Fig 3, 4). These values fall in the high nominal category when converted from numeric data. This result is favourable as high levels of emergency planning knowledge are significant in the protection of public health. However, these results were also unexpectedly high. The culprit again may fall on the possible issue of improper survey design.

One issue may be the dichotomy of wrong and right answers giving the respondent a 50% likelihood of answering correctly entirely by chance. Another complicating factor exists as a result of the survey population as those who participate have

differing characteristics than those who don't. These characteristics are likely reflective of personal investment or interest. Median and mode for knowledge were more similar than the mean for this category. This is likely indicative of the mean being affected with extreme outliers.

Figure 3: Mean, median, and mode for all categories.

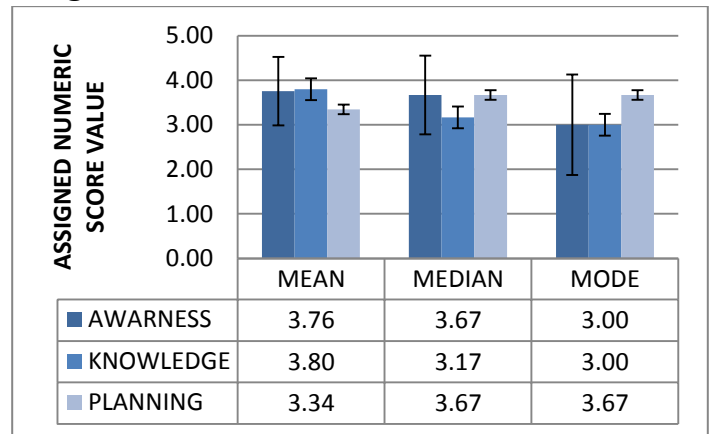
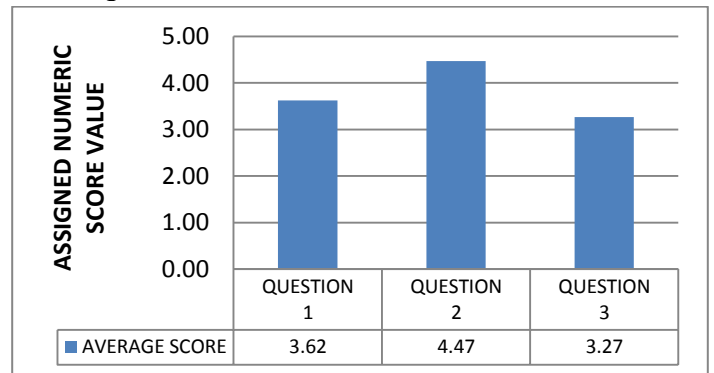


Figure 4: Mean scores for knowledge based questions



Awareness scores also fell within the high nominal category. Mean and median were similar in value with scores of 3.76 and 3.67 respectively (Fig 3). While the mode was 3, a neutral converted nominal score. This relative alignment of the mean and median means there were few respondents who

ranked their emergency planning awareness as unimportant and very unimportant. These values were also unexpectedly high. The results of these questions are a reflection of personal attitude, or the attitude which the respondent wishes to portray, Therein, lies the issue, respondents may wish to portray a certain image because they fear a negative association of themselves of their business. Although respondents were assured of anonymity, it is impossible to determine the sincerity with which they answered these questions.

Demographics

Demographic and general questions were asked to allow for emerging trends to be observed. Within demographics, a diverse sampling of cuisine was surveyed with a large range in number of patrons served daily, from 50-400 persons/day. No obvious trends arose with respect to type of cuisine or number of served patrons and their level of planning. With only 30 samples and such diversity, observing such trends may be difficult and may become more apparent with a greater number of samples.

Operator’s experience level was also quite diverse ranging from 1-30 years. It seems unplanned operators tended to be in the midrange of those values. These variables require further research to establish any definitive correlation. General inquiries established a neutral rating of access to adequate information to create emergency plans. (Table 3).

Table 3: Operator belief in adequate access to information to create emergency plans.

Very low	2
Low	3
Neutral	15
High	6
Very high	3

This may be a result of individuals not being previously aware of the diversity of emergencies that may arise or the depth of information that could be available. Essentially, neutral values may be synonymous with lack of opinion on the matter. When asked what the greatest barrier to performing emergency planning, time, information and money being were offered as the greatest impediments (Table 4). Due to the type of research conducted, further investigation may be needed to elucidate the reason for certain individuals selecting the undetermined category.

Table 4: Operator surveyed greatest barrier to emergency planning (interpreted results).

Time	9
Information	6
Money	6
Training	4
Employee turnover	1
Undetermined or None	9

DISCUSSION

Research on the topic emergency planning and food service establishments is limited. A single identified academic article conducted a similar hypothesis investigation: food bioterrorism and the food service establishment operator’s level of perception

and preventative practices (Yoon and Shanklin, 2007). This research suggested there would be an association between an operator's level of awareness and their preventative practices; whereas, this experimental study found none (Yoon and Shanklin, 2007). It is important to note that even though no association was found during hypothesis testing this does not mean that the possibility of an association is entirely eliminated. This can only be interpreted to mean under these experimental conditions there was no evidence found to suggest an association exists (Higgins and Green 2011).

Previous research suggested a large gap would be found in operator knowledge with respect to emergency situations as few individuals would have received proper information or training on the subject (Story, 2007). Experimental results from this research indicated an above midline score, neutral to high on the ordinal ranking system, for emergency planning related knowledge. This did not indicate a knowledge related deficit on the operator's behalf. That same research indicated written emergency plans needed to be developed and increased employee training with respect to emergency planning (Story, 2007). Experimental results indicated neutral to high scoring values for planning which does not indicate a deficit of planning in the examined facilities.

Both experimental and academic review yielded similar barriers to be identified as problematic to performing emergency planning. Academic review identified

accessibility, money, and time (in no specific order) as the greatest barriers to emergency planning (Yoon and Shanklin, 2007; Story, 2007). Experimental data indicated time to be the greatest barrier followed by access to information then money. This similarity in results gives public health practitioners a focus for allocating resources to remove the most significant barriers and improve emergency planning practices of operators.

RECOMMENDATIONS

Due to the probable interference of limitations within this study, it is important to use this experimental method as a foundation for improving future studies. This entails addressing the controllable limitations and mitigating the uncontrollable limitations. Improving survey design is the foremost concern for overall experimental improvement. Survey design is variable across experiments; however, there are general recommendations that can be made. For example ensuring content validity of questions, reducing chance of correct answers, and asking a breadth of questions to eliminate extreme values affecting mean score values are all recommended. Researcher experience is a factor and will play a role in survey design and validity (Mora, 2010). For awareness and planning, the obtained p-value was near the statistical limit. Increasing the number of samples may increase the statistical significance of this result by increasing the experimental confidence and decreasing experimental uncertainty (Biau, Kerneis, and Procher, 2008). More samples would also allow for

trends to be observed within the demographic data. Moreover, it is recommended to provide set answers to question rather than open ended as these results will require further interpretation and possible obfuscate the original meaning of the participant. These questions also function on how well participants can express themselves which introduces an uncontrollable bias (Visser, Krosnick, and Lavraakas, 2000).

Although in person written surveying has many advantages, individuals may not take it seriously and complete it essentially randomizing answers (United Nations Food and Agriculture Organization, n.d.). This means participant attitude also has a large effect on the limitations of this study; however, these limitations are largely uncontrollable. However, response vs. non-response bias can be partially alleviated through offering of desirable compensation (Fluid Surveys, 2013). For future students, it is recommend to take as much as the allotted funding as possible and putting it toward a gift card. Time was another uncontrollable factor within this project. This limitation is best mitigated by designing an experiment which is most suitable to the allotted time frame. With respect to this research, testing a single hypothesis may have improved the experimental outcome.

Increasing the level of emergency planning within food service establishments will improve the safety and security of the foods served within these establishments and ultimately aid in the protection public health. The study sought to identify measures which

public health practitioners could target to encourage emergency planning behaviours within these operators. Although neither operator awareness nor their level of knowledge could be correlated to their level of planning, these results can be used to eliminate those methods as the most viable options. This can be used to guide further research to explore other avenues to identify the best method. Once identified public health practitioners can use this information to maximize the ability to foster a culture of emergency planning within operators while expending the least resources. Both literature review and experimental results identified similar barriers to operator emergency planning: time, accessible information, and the cost of planning (Yoon and Shanklin, 2007; Story, 2007). Once the culture of emergency planning has been instilled, these barriers can be targeted for removal to increase operator's ability to create emergency plans. When emergencies occur in food service establishments, maintaining food safety standards may become difficult and operators may not abide by such standards (Minnesota Department of Health, 2014). With proper preparation, these operators will be more likely to have the ability to maintain these standards lessening the probability of foodborne illness, intoxication, or other undesirable outcome. This will also act to reduce operator dependency upon public health agencies as proper preparation will empower operators to make informed decisions about food safety and legal procedure.

LIMITATIONS

There were notable limitations within this study that may have led to inaccuracy of the experimental data. These limitations can be generally categorized into controllable and uncontrollable factors.

Controllable limitations include survey and sample size issues. The absence of previous survey design experience on behalf of the researcher may have created low content validity within the survey (Cheek, 2008). For example when the operators were asked if they have written plans, it did not specify if there were written plans for all categories of emergencies or just or a single emergency type. Also, the dichotomy of right and wrong answers within the knowledge section creates a 50% likelihood of answering correctly by chance. These scenarios may have led to higher than expected value scoring. Although the pilot test indicated the survey should be shortened, having only three questions per category may have reduced the statistical significance of the data and made it more prone to extreme values affecting their mean score for that category. Although a sample size of 30 was sufficient to remove beta error, the obtained p-values may be indicative of a need for a greater sample size, as these values were near the acceptable limit. This need for a greater sample size is especially apparent when examining the obtained demographic data. No trends were observable as there were too few samples in similar categories. An improvement to future studies may then be to include at a minimum 30 individual respondents per demographic category.

Uncontrollable limitations were generally more dependent upon attitude of participants (Mora, 2011; Wyse, 2012). Although they were assured otherwise, the participants may have believed their results could have negative consequences. Therefore, these individuals may have responded with what they believed would be the “best” responses not their own genuine responses (Wyse, 2012). This study’s ability to conduct truly random sampling was hindered by respondent vs. non-respondent bias. Many selected individuals did not wish to participate, and those that do will have different characteristics than those who do not (Berkowitz, n.d.). This bias can also cause unexpectedly high value scoring. Time was another uncontrollable factor as this research has to be completed within the constraints of completion of classes.

FUTURE RESEARCH

With modern society’s expansion into preventative care measures, fields such as food security and safety are a significant focus of public health research. Similar studies could be conducted by performing testing the same hypothesis but delving into specific types of emergencies. Other studies could investigate operator self-perception on how prepared they believe they are contrasting that perception to the reality of their level of preparedness. This study could examine self-perception as a barrier to emergency planning. Demographic categories such as culture or cuisine could also be studied to identify unique challenges to emergency preparedness within these

groups. These cultured based studies could examine whether there is an association between being of a certain culture or cuisine type and more or less emergency planning. Aside from further theoretical surveying, more practice based techniques can be applied. One prospective study could examine the ability of barrier removal to increase operator emergency planning. For example, operators could be supplied with accessible information and then studied to see if emergency planning does increase post-exposure. Similarly, they could be given a set of knowledge testing questions then retested after a period of time to see if that the exposure to that type of test would incite interest in the subject. This type of applied research could be performed on general populations and extrapolated to operators because, in reality, this would be difficult for students to complete.

CONCLUSIONS

Chi-square testing indicated no association between operator knowledge and awareness or their level of planning. However, the obtained p-values were close to the acceptable limit value. This may indicate that experimental limitations have reduced the statistical significance of the data. Although operator attitude comprises the majority of the uncontrollable limitations, many controllable limitations could be alleviated by improving experimental design or increasing sample size. Increasing sample size may also lead to improved ability to observe trends within demographic data which is significant to using this information to improve public health practices.

Experimental data indicates targeting improvements in operator awareness or level of knowledge will not greatly impact their level of planning. This allows public health practitioners to eliminate these approaches as the best method of improving operator emergency planning. Similar to other academic literature reviewed, three barriers were commonly identified to hindering operator planning: time, accessible information, and money. This indicates that public health resource allocation to elimination of these barriers will be the most beneficial to operator's ability to plan for emergency situations. Future studies may wish to use an applied exploration to fully identify the best method of improving operator planning. These studies could explore both barrier elimination, to give operators the ability to emergency planning, and method of information dissemination, which will foster a culture of desire for emergency planning. This information can be used to tailor future measures to create the most resource efficient method of improving emergency planning within operators.

ACKNOWLEDGEMENTS

This research was completed with the support of supervisors Vanessa Karakilic and Helen Heacock as well as the Environmental Health Program at the British Columbia Institute of Technology.

COMPETING INTEREST

This research was concluded with the declaration of no competing interests.

REFERENCES

Adams, L. (2013). *Research ethics*. Retrieved from: <https://depts.washington.edu/bioethx/topics/resrch.html>

Berkowitz, J. (n.d.) *Survey Designs (II)*. Retrieved from <http://med-fom-familymed-research.sites.olt.ubc.ca/files/2012/03/StudyDesignsII21714.pdf>

Biau, D., Kerneis, S., and Porcher, R. (2008). Statistics in Brief: The Importance of Sample Size in the Planning and Interpretation of Medical Research. *J. Clinical Orthopaedics and Related Research*, 466(9). Pp. 2282–2288.

British Columbia Community Care and Assisted Living Act. (2002). *British Columbia Gazette Part II*, 75. Retrieved from: http://www.bclaws.ca/civix/document/id/complete/statreg/02075_01

British Columbia Food Premises Regulation (BCFPR). (1999). *British Columbia Gazette Part II*, 210(99). Retrieved from: http://www.bclaws.ca/Recon/document/ID/free/11_210_99

British Columbia Public Health Act (BCPHA). (2015). *British Columbia Gazette Part II*, 28. Retrieved from: http://www.bclaws.ca/civix/document/id/complete/statreg/08028_01

Cheek, J (2008) *Research Design: The Sage Encyclopedia of Qualitative Research Methods*. London: Sage. Fluid Surveys.

(2013). How to Avoid Non-reponse Error. Retrieved from <http://fluidsurveys.com/university/how-to-avoid-nonresponse-error/>

Fraser Health (n.d.) *FloodWatch Tips: Flood Information for Food Premises*. Retrieved from: https://www.fraserhealth.ca/media/Flood_FoodPremises.pdf

Government of Manitoba. (2011). *Guideline on Emergency Action Plans for Food Establishments*. Retrieved from: <http://www.gov.mb.ca/health/publichealth/environmentalhealth/protection/docs/eapfe.pdf>

Heacock, H. (2015). Research Methods Module 4. Lecture conducted from BCIT, Burnaby.

Heacock, H. (2015). Research Methods Module 5. Lecture conducted from BCIT, Burnaby.

Higgins, J. and Green, S. (2011). *Cochrane Handbook for Systematic Reviews of Interventions*. Hoboken, New Jersey: Wiley-Blackwell. Minnesota Department of Health. (2014). Food Safety in Emergencies. Retrieved from <http://www.health.state.mn.us/foodsafety/emergency/>

Interior Health. (2015). Food Safety Resources. Retrieved from: <https://www.interiorhealth.ca/YourEnvironment/FoodSafety/Pages/Resources.aspx>.

Jorm, L. (2004). *The Sydney Olympics: A Win for Public Health*. *NSW Public Bulletin*, 14(3), 43-45. Retrieved from <http://www.phrp.com.au/wpcontent/uploads/2014/10/NB03012.pdf>

Levin, J., Gilmore, K., Nalbone, T., and Shepherd, S. (2005). Agroterrorism Workshop: Engaging Community Preparedness. *Journal of Agromedicine*, 10(2), 7-15. doi:10.1300/J096v10n02_03

Mora, M. (2010). Does A Large Sample Size Guarantee A Representative Sample? Retrieved from: <http://www.relevantinsights.com/representative-sample#sthash.b66KvJiI.dpuf>

Mora, M. (2011). *Validity and reliability in surveys*. Retrieved from <http://www.relevantinsights.com/validity-and-reliability#sthash.bprv0kUg.dpbs>

News 1130. (2015). *UPDATE. Thousands of Lower Mainland customers without power*. Retrieved from <http://www.news1130.com/2015/08/31/estimated-58000-lower-mainland-customers-without-power/>

Northern Health Authority. (n.d.). *Environmental Health*. Retrieved from <https://northernhealth.ca/YourHealth/EnvironmentalHealth.aspx>

Polaris Marketing Research. (2015). *Chi square test*. Retrieved from: <http://www.polarismr.com/polaris-help-center/chi-square-test>

Ray, A. (2006). *Understanding Chi Square*. Retrieved from: <http://practicalsurveys.com/reporting/chisquare.php>

Richter, P. (1997). *Hospital Disaster Preparedness: Meeting a Requirement or Preparing for the Worst?* Healthcare facilities management series, 1-11. Retrieved from: <http://burndisaster.com/HospitalDisasterPreparedness.pdf>

Story, C., Sneed, J., Oakley, C., and Stretch, T. (2007). Emergency Preparedness Needs Assessment of Centralized School Foodservice and Warehousing Operations. *Journal of the American Dietetic Association*, 107(12):2100-4.

United Nations Food and Agriculture Organization. (n.d.) Advantages and disadvantages of survey method. Retrieved from: <http://www.fao.org/ag/humannutrition/332510a0b0928c3532ed36c3b6624d54d73f86.pdf>

Wellington-Dufferin-Guelph. (2015). *Food Safety during a Power Failure*. Retrieved from: [https://www.wdgppublichealth.ca/sites/default/files/wdgphfiles/HPDFS\(FS\)51_Food%20Safety%20During%20a%20Power%20Failure_05_2015.pdf](https://www.wdgppublichealth.ca/sites/default/files/wdgphfiles/HPDFS(FS)51_Food%20Safety%20During%20a%20Power%20Failure_05_2015.pdf)

Wyse, S. (2012). *Advantages and Disadvantages of Surveys*. Retrieved from <http://www.snapsurveys.com/blog/advantages-disadvantages-surveys/>

Vancouver Coastal Health. (2012).
*Guidelines for Food Safety Management
Plans*. Retrieved from:
[https://www.vch.ca/media/Guidelines_Food
SafetyManagementPlans.pdf](https://www.vch.ca/media/Guidelines_Food_SafetyManagementPlans.pdf)

Visser, P., Krosnick, J., and Lavrakas, P.
(2000) *Handbook of research methods in
social and personality psychology*. New
York, NY: Cambridge University Press.

Yoon, E. and Shanklin, C.(2007).Food
Terrorism: Perceptual Gaps Between
Importance and Performance of Preventive
Measures. *Journal of Foodservice Business
Research*, 10(4), 3-23.
doi:10.1300/J369v10n04 02