Public Awareness of the Duties of Environmental Health Officers in Canada

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Abstract

The purpose of the study was to examine the level of public awareness regarding Environmental Health Officers'(EHOs) roles and responsibilities in the public domain. EHOs as public servants are an integral component of the health care system and the recognition of their profession often goes unnoticed. In order to better serve the community, it is important for the public to know where to access resources and consult for help about health related issues. An electronic questionnaire, a service provided by Survey Monkey, was constructed and disseminated on January 12, 2013 via email using snowball sampling and posting on Facebook. There were a total of 161 completed responses by the closing date on February 10, 2013, and the data was statistically analyzed.

For descriptive statistics, the participants had a mean score of 62.25% on their knowledge of EHOs' duties. The public was most aware that EHOs were involved in drinking water quality but least aware of EHOs involvement in land development. Conversely, the public was most aware that EHOs were not involved in social services but least aware that EHOs were not involved in lab testing. For inferential statistics, a one-way ANOVA was performed on each of the three demographic profiles – age, educational level, and field of study/work – in order to compare the mean scores of the different study groups within each profile. There were no statistical significant differences between public's knowledge on EHOs' duties and age groups, educational level, and field of study/work.

This study suggested that public awareness regarding EHOs' involvement in various health service programs needs improvement. Awareness level was higher in health-related matters that have a perceivable direct effect on health and are often placed in the forefront of mass media. The study also indicated that EHOs do not receive enough recognition as educators or consultants of health-related issues. Further research is needed to assess strategies on increasing awareness and the issues identified should be studied with a larger sample population.

Table of Contents

1.0 Introduction

Public health is defined as "preventing disease and optimizing health [by] promoting and supporting the health of the public, rather than treating the illnesses of individuals" (Butler-Jones, 2011). Environmental health officers (EHOs), also known as public health inspectors or sanitary inspectors, safeguard the health of the public by following their mandate to reduce, eliminate, and prevent health hazards.

An EHO's job often goes unnoticed. Therefore, there is a need to raise public awareness about the health services they provide. There are approximately 11 million cases of foodborne illnesses annually in Canada (Canadian Food Inspection Agency, 2012) from an estimated population of 34,880,500(Statistics Canada, 2012), indicating around 32.4% of Canadians get sick from food-related illness every year. These statistics suggest that EHOs assistance is compulsory for monitoring and enforcing health and safety issues.

An analogous study conducted 6 years ago by an undergraduate student (Young Lim) of the Environmental Health program at British Columbia Institute of Technology (BCIT). Lim's objective was to determine an association between gender and public awareness of EHO's roles. No association was found in the study (Young, 2006). No data was used from Lim's study.

EHOs need a strong working relationship with the public; the first step is to raise public awareness of EHO's roles and responsibilities in public health. With that in mind, a survey was drafted to assess the public awareness of EHOs' roles in the community. The survey was focused on evaluating their current knowledge of EHOs' involvement and highlight areas in need of improvement.

2.0 Literature Review

2.1 Background

The emergence of environmental health officers began in England with Edwin Chadwick who campaigned to pass the Public Health Act in 1848,which in turn created the position of Inspector of Nuisances (Chartered Institute of Environmental Health, 2012).In Canada, the emergence of EHOs

began in 1913. Canadian Institute of Public Health Inspectors (CIPHI) entitles the credentials of CPHI(C) to graduates who have successfully passed the Board of Certification(Canadian Institute of Public Health Inspectors, n.d.). The Board of Certification encompasses multiple components to assess the competency as an EHO: completion of post secondary degree program, two written reports, a practicum, and an oral examination (Canadian Institute of Public Health Inspectors, n.d.). However, one can also become an EHO as long as certain qualifications and proper training meets the minster's requirements (Public Health Act, 2008).

As a member of CIPHI, participation in the Continuing Professional Competencies Program is required to strengthen expertise via on-going training and to achieve uniformity in ethics and standards of practice across the nation (Canadian Institute of Public Health Inspectors, n.d.).This year marks the 100th anniversary of the founding of CIPHI in advocating for public health protection and strengthening professional recognition of EHOs (CIPHI100, 2013). Establishing trust in an EHO's capabilities is important for the public's receptivity of the health services they deliver.

2.2 Health Service Programs

EHOs are involved in many health service programs. Figure 1 illustrates thirteen key components of an EHO's job (Crozier, 2011). A brief description of the highlighted health service programs are discussed below.

Figure 1. *EHO's involvement in health service programs*

1. *Air quality* – EHOs monitor the level of contaminants for indoor air quality. In particular, carbon dioxide, carbon monoxide, and ultrafine particulate matter may be harmful to human health when levels are too high (Gunderson, 2006). EHOs investigate complaints of possible adverse health effects related to poor outdoor air quality caused by fire or a spill of toxic material (Fraser Health, 2011a).
2. *Tobacco Control* – EHOs enforce smoking bans in public places and make sure that retail stores are in compliance with tobacco sales and advertising regulations (Ministry of Health, n.d.).
3. *Emergency Measures* – EHOs assist in emergency planning at the municipal level regarding operations, organization, responsibilities, direction, control, and coordination required to respond to an emergency or disaster. EHOs report and give feedback to the Medical Health Officer (MHO) about the emergency situation. Moreover, EHOs inspect and monitor the reception center that provides shelter for the evacuees and delivers services as needed (Crozier, 2012a).
4. *Housing/Recluses* – EHOs investigate whether health hazards are present in housing and recluse cases. They often request assistance from other public health-related agencies such as social services, building inspectors, residential tenancy branch, mental health care, policemen, firemen, or public guardian and trustee investigator when necessary. Along with the Medical Health Officer's authority, a building can be declared "condemned" such that it is not suitable for human habitation (Crozier, 2012b).
5. *Infectious Disease & Outbreak Control* – EHOs identify the cause of a disease outbreak and prevent the spread of the disease. This requires EHOs to interview the population at risk during the outbreak investigation, collect samples for the lab (stool, vomitus, food and water), form a hypothesis, and implement a control strategy. Also, when individuals are diagnosed with a communicable disease that may be of high risk to the public, EHOs will follow up and provide advice on stopping the spread of the disease (Vancouver Coastal Health, 2013a).

6. *Land Development* – EHOs assist in planning and designing communities, in addition review application plans regarding zoning and subdivision amendments. Typically, EHOs provide insight on sewage and water supply system issues (Sidhu, 2012).
7. *Sewage & Waste Disposal* – EHOs inspect septic systems (especially in rural areas) to inspect whether waste is disposed of properly to control ground water contamination and pest manifestations because they pose a risk of transmitting diseases (Ministry of Health, n.d.).
8. *Health Hazard/Complaints Inspection* – During routine or complaint-initiated inspections, EHOs inspect whether health hazards are present and then take appropriate actions to reduce, eliminate or prevent the hazard in order to protect public health (Vancouver Coastal Health, n.d.).
9. *Food Recall* – EHOs work closely with the Canadian Food Inspection Agency checking that recalled food is not being sold in retail stores. EHOs examine the food facility responsible for the recalled food and investigate related food poisoning cases (Fraser Health, 2011b).
10. *Water Quality* – "EHOs routinely inspect, sample, and assess community water systems for compliance with the Drinking Water Protection Act and Regulation" (Fraser Health, 2011c). EHOs also inspect public wells and water haulers. Inspection is required to prevent the spread of water-borne diseases and protect the public from chemical intoxication. EHOs issue "boil water advisories" to protect the public from drinking contaminated water (Vancouver Coastal Health, 2013b).
11. *Pools and Recreation* – EHOs inspect and approve commercial and public pools facilities, hot tubs, and whirlpools for public safety. While inspecting a pool, EHOs take water samples to ensure the pool water chemistry is safe for patrons to swim in. Additionally, they monitor recreational beaches during the swimming season. As part of their beach inspection, they will take water samples for lab testing to determine the level of contaminants in the water and post warning signs if the beach is not safe to swim at (MacLeod, 2012).
12. *Community Care* – EHOs can specialize as a Community Care Facility Licensing Officer to protect and promote the health, safety and well-being of vulnerable children and adults in

licensed care facilities such as day cares, hospitals, long-term care, group homes, and adult care. EHOs license, monitor, and inspect those facilities and investigate unlicensed facility complaints (Vancouver Coastal Health, 2012).

13. *Personal Service Establishment* – EHOs are the only governing bodies which inspect tattoo parlors, body piercing shops, nail and hair salons, spas, tanning salons, and funeral homes. EHO check whether the operator has cleaning and sanitation procedures, has the proper equipment for cleaning and sanitizing, and has functioning sewage and water systems (Crozier, 2012c).

2.3 Duties and Responsibilities

EHOs have considerable responsibility and must have the expertise to make important decisions when working on the job. In the office, EHOs organize their own schedules, write letters and reports, attend staff meetings and participate in training workshops. Each EHO is assigned a geographical area and is involved in the previously mentioned health service programs within that area (Crozier, 2011b). An EHO may collaborate with other EHOs or public health-related agencies to effectively deal with certain situations or complete tasks that require collective work.

The nature of their work is dependent on their location. In a rural area, EHOs usually take a generalist approach and are perceived to be an important member of the community who are called upon to handle a variety of health-related problems. Therefore, it is important for EHOs to establish a good rapport and gain support from key community members such as the mayor, police, firefighters, the school board, water or sewage system experts, and the local residence. In contrast, EHOs take a specialist approach and are responsible for a fewer tasks in an urban setting because they oversee a smaller geographical area with a higher population density. Their tasks in an urban setting have better defined areas of responsibility and jurisdiction(Crozier, 2011c).

2.4 Employment Opportunities

EHOs can find employment at different levels of government: municipal, provincial, and federal*(Appendix A – Table 3)*. Typically an EHO graduate will work in a municipal Health Authority/Unit. At the provincial level, EHOs can work with BC Communicable Disease Control or

Ministry of Health. At the federal level, EHOs may work for Health Canada or the Public Health Agency of Canada. Within these governmental levels, EHOs may be delegated to specialize in a certain program (i.e., tobacco enforcement, community care, slaughterhouse inspection, Aboriginal health, or water protection). In addition, EHOs can find employment with private companies such as consulting firms, HACCP consultant, pest control, or food quality assurance (Crozier, 2011).The job opportunities are abundant and diverse because EHOs receive education and training in many different areas of public health.

2.5 Tools to Safeguard Public Health

2.5.1 Licensing

EHOs have the authority to license a variety of food service establishments (FSEs) including, restaurants, food courts, cafeterias, street vendors, food trucks, and farmers markets. In order to issue an operating permit, an EHO must verify whether the FSE is managed and operated in a manner that protects the public. Therefore, all food service establishments must present a food safety plan, a sanitation plan, and other supporting documentation (Food Premises Regulation, 2012). EHOs also have the authority to license food and meat processing plants, commercial/public pools, whirlpools, hot tubs, other recreational facilities, and community care facilities.

2.5.2 Inspection

Inspections are conducted at FSEs, pools and recreational facilities, community care facilities, personal service establishments, tobacco retail stores and public spaces where EHOs have jurisdiction on. During an inspection, EHOs assess the risk of health hazards and further categorize them as potential health hazards, imminent health hazards or health impediments in order to determine what actions should be taken to protect public health. Evaluation of a facility and the operations within the facility are based on legislated criteria. The inspection reports are posted online, giving the operators the incentive to maintain a safe and sanitary establishment.

Inspections can be categorized as routine or complaint-based. Routine inspections are done to prevent health hazards by monitoring the compliance of public facilities and establishments.

Complaint-based inspections often deal with tenant and landlord issues, recluses, mold growth, noise, air quality, pest control, dog feces and illegal operations such as abattoirs and marijuana grow-ops. While receiving the call from the complainant, the EHO should collect as much information as possible regarding the situation. Sometimes the issue can be easily solved or referred to other relevant agencies. Legally, EHOs must perform routine inspections so they won't be held liable if a health hazard is present (Fraser Health, 2011d).

2.5.3 Education and Communication

Education is a vital tool in disseminating knowledge to the public. EHOs act as consultants on public health-related issues. Education validates a EHOs rationale and brings a sense of empowerment that may lead to behavioral changes in an operator. For instance, an operator of an illegal slaughterhouse may find the motivation to get an approved license if the tools and resources were shown to help them progress into compliance.

Good communication skills are essential to EHOs because they provide professional knowledge, advice and feedback with other health officials, agencies, and services. An EHO is like a relay-center for information, especially when it comes to communicable disease outbreaks, foodborne illness outbreaks and emergencies situations like natural disasters. Under these circumstances, EHOs participate in surveillance, reporting, and investigations to prevent further damage and harm to the environment and the public.

2.5.4 Enforcement

EHOs have various enforcement powers *(Appendix A – Table 1);* some powers require delegation from the MHO or from other authorities. EHOs are encouraged to use progressive enforcement to gain compliance with operators: first with education, persuasion, written warnings or orders, violation tickets or fines, suspension of permit or closure of premise, and finally court proceedings (Crozier, 2011d). This is to ensure that the operators are given the chance to make corrective actions and sustain long-term cooperativeness. The type of enforcement actions required is based on the severity of the risk to public health. The level of risk is assessed by identifying the

potential cause of the hazard, where the hazard exists, how the public may be exposed and how the public may respond to the hazard.

Using an outcome-based approach is necessary when ordering operators to take corrective actions. Outcome-based approach protects EHOs liability when dealing with problems that do not have prescribed solutions in legislation; in other words, if a health hazard is present, the order is to simply fix it, but not how to fix it. This approach also allows flexibility for the operators while complying with the intent of the legislation (British Columbia, 2008). Tobacco control is one area that progressive enforcement efforts have helped in decreasing the smoking rate of Canadians from 25% in 1999 to 17% in 2010 (Health Canada, 2011).In some cases, EHOs have limited jurisdiction and resources therefore they consult other agencies for help and support.

2.6 Public Health Significance

The demand for EHOs is dependent on the population's awareness of public health and environmental issues (Service Canada, 2012).Unlike the positive perception of police officers and firefighters, EHOs are perceived unfavorably as "enforcers" (Campbell, Foggin, Elliott, & Kosatsky, 2011). Recognition and support from the public and governmental bodies are needed in order for EHOs to serve the public more effectively. The efforts of EHOs do not receive enough credit since there is a lack of awareness and understanding about environmental health and safety issues such as what are health hazards or potential health risks (Chociolko *et al.*, 2010). Websites created for Canadian cities such as www.vancouver.ca,www.cnv.org, www.richmond.ca, www.burnaby.ca, and www.toronto.ca,are great resources made available to help the people living and those doing business in the district. However, these websites lack focus and clarity on the involvement of Health Authorities and their roles or services provided in safeguarding the public. The importance of public health is downplayed because public health is often not represented as a key agency whereas the efforts of the fire and police departments are well acknowledged on the city websites.

The recent incident with a XL Foods plant closure associated to an *E. coli* outbreak in Canada has drawn attention towards the efforts of health officials in handling the situation. Because of this

incident like other foodborne illness outbreaks, the role of EHOs became visible in the news for investigating food poisoning cases and inspecting facilities for recalled products (The Sudbury Star, 2012).In addition, television shows such as A Life of Grime, Food Inspectors, and Health Inspectors provide some insight on the duties of an EHO but they do not exactly reflect what an EHO does. Raising awareness is essential for the public to beneficially access the resources and services provided by EHOs because they should be the "go-to" place for general public concerns regarding health and safety issues (Chociolko *et al.,* 2010).

3.0 Purpose of Study

The purpose of the study is to identify knowledge gaps in the public's awareness of the health service programs provided by EHOs. Similar to other public servants such as policeman and firefighters, EHOs' professional legitimacy need public recognition to gain support and cooperation while they perform their duties. The objective of the study is to quantitatively determine the level of public awareness regarding EHO's involvement in selected health service programs by disseminating an electronic questionnaire.

4.0 Methodology

4.1 Materials

Materials used:
Personal computer
Internet access
Microsoft Excel
NCSS[8] statistical analysis
Survey Monkey (on-line surveying tool)

4.2 Study Design and Description

There is an increase in the public's awareness of public health and environmental health issues according to Service Canada (2012). This led the researcher to design an electronic questionnaire to assess public's awareness regarding EHO's involvement in different health service programs and employment options. This study examined the relationship between participants' level of awareness of EHO's duties and their age, education level and occupation.

Using Survey Monkey, a questionnaire was constructed and sent out on January 12, 2013. There were 3 sections to the questionnaire that was designed to collect or assess (1) demographical information, (2) public's level of awareness of EHOs' involvement in various health service programs, and (3) public's level of awareness of EHOs' employment options (*Appendix C).* Twelve health service programs and six employment options that pertain to EHOs are listed in Table 2 and Table 3 *(Appendix A*). The twelve health service programs were selected to represent common duties of EHOs. Participants are asked to select which health service programs (from a list of 24) and which employment options (from a list of 12) pertain to EHOs.

As a scoring system, participants gained one point for every item selected correctly but lost one point for every item selected incorrectly. Participants can obtain a maximum score of 12 if they correctly select all 12 health service programs and a maximum score of 6 if they correctly select all 6 employment options that pertain to EHOs. Conversely, participants may obtain the lowest score of -12 for health service programs section and -6 for employment options section if they select all of the items incorrectly. Obtaining above a score of 0 would be considered a passing score. Their answers to the questionnaire were recorded in the raw data entry sheet on Microsoft Excel (*Appendix D).*

The on-line questionnaire was released to individuals from the author's e-mail contact list. For sampling convenience, snowball-sampling method was used to reach the public; the questionnaire requested participants to forward the e-mail to their personal contacts who then further forwards the e-mail to their acquaintances. This sampling technique increases response rate because individuals are more likely to participate if they know the sender (Beatty & Lecy, 2012). The author also posted the questionnaire on Facebook and asked personal acquaintances to pass it along to their friends.

Administering an on-line survey is a cost-efficient method of data collection that can quickly reach a wide range of individuals (Kaplowitz, Hadlock, & Levine, 2004). This short and simple questionnaire combined with the use of snowball sampling increases the response rate (Deutskens,

Ruyter, Wetzels, & Oosterveld, 2004). Data was continuously monitored and the survey was concluded on February 1, 2013.

4.3 Alternative Methods

In the event that the on-line survey did not generate enough responses to give statistically meaningful results, in-person and telephone surveys could be considered. In-person surveys could be conducted using smart phones with internet access to enter participants' responses at high traffic areas in public places, such as shopping malls and large supermarkets. However, this method is subjected to geographical bias, selection bias, and is time-consuming. Also, participants are more likely to select more items on the questionnaire in an in-person survey compared to an on-line survey (Heerwegh & Loosveldt, 2008). Lastly, the questionnaire's URL address could be handed out to participants who prefer to complete the survey during their own time or in the privacy of their own home. Telephone surveys were not considered because generally they yield a lower response rate (Kempf & Remington, 2007).

4.4 Pilot Study

A pilot study was conducted in December 2012 to receive input and feedback from colleagues at BCIT. Their responses were noted and resulted in changes to increase the validity and reliability of the questionnaire. For example, it was brought to the author's attention that there needed to be a question identifying EHOs and environmental health students, as they will be excluded to eliminate bias. Also, certain questions were reworded and the layout of the questionnaire was reformatted, both to improve clarity.

4.5 Validity and reliability

A questionnaire asking participants to select which health service programs and employment options pertain to EHOs was the most effective method to measure the public's level of awareness. The validity of this surveying tool relied on participant's knowledge when selecting the items that pertain to EHOs. However, the public's knowledge on EHO's involvement in each health service

program was only assessed once. There were no repeated questions measuring the same variable, therefore there was no internal consistency built into the questionnaire (Heacock & Crozier, 2011).

The public's level of awareness regarding EHOs' duties was evaluated by a scoring system based on the number of correct responses. The questions were designed to be short and simple enough for the general public to understand. A brief description of each health service program was provided to aid the participant's understanding. This reduced confusion so that the participants' true level of awareness was not dependent on their understanding of the vocabulary within the question but rather their knowledge on the subject area. There was a good inter-rater reliability in this study because close-ended questions provided a clear response to better quantify and analyze survey data in which respondents' answers did not have multiple meanings. (Heacock & Crozier, 2011).

When there is a representative sample, the results gathered from the sample population can be extrapolated to reflect the greater population. A good representative sample is dependent on the size and type of the sample population. In this study, generalizations of the public were made when there were more than 30 participant responses in each study group. A snowball sample that was not large enough and sampling methods that had geographical bias reduced external validity (Heacock & Crozier, 2011).

4.6 Inclusion and Exclusion Criteria

Inclusion and exclusion criteria helped shape a representative sample by determining whether an individual is permitted to participate in the study. Those included are individuals who have internet access and are part of the snowball chain of sampling. Those excluded from the study are individuals who are undergraduates of the Environmental Health program, former or current EHOs, or live outside of Canada. (Heacock & Crozier, 2011).

4.7 Ethical Considerations

An informed consent form at the beginning of the questionnaire described the nature of the study and allows for data collection (*Appendix B).* This study was approved by the BCIT Research Ethics Review Board (Policy No. 6500) and was conducted under the supervision of faculty members

Helen Heacock and Vincent Crozier. Participation did not pose any harm or discomfort. All information provided by the participant remained confidential and there was no penalty for withdrawing at any point in time. A summary of results will be delivered upon request via e-mail and the researcher's contact information was provided for any inquiries.

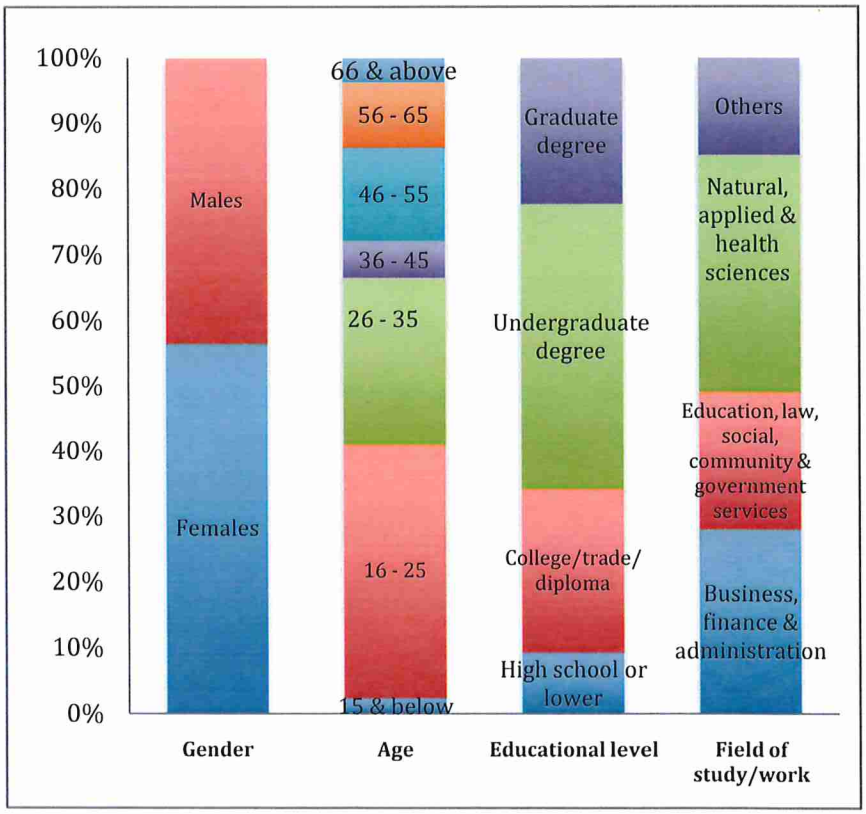
5.0 Statistical Analysis and Results

Microsoft Excel was used for recording raw data of participants' answers to the questionnaire *(Appendix D)* and for descriptive statistics. NCSS[8] statistics software was used for inferential statistics. The survey included both numerical and nominal data. There were 178 responses collected which 6 respondents did not live in Canada, 7 did not complete the entire questionnaire, and 4 were EHOs or are taking/have taken the Environmental Health Program. Therefore, statistical analyses were only performed on the remaining 161 responses that fully completed the questionnaire and met the inclusion criteria.

5.1 Descriptive Statistics of the Results

Using Microsoft Excel, a stacked bar graph was generated to show the proportion of participants in each demographic profile – gender, age, educational level, and field of study/work in Graph 1. Response rate from females (90) were higher than males (71). The most predominant group of respondents was between the ages of 16 to 25 that accounted for 38.5% of all participants. Also, the largest

Graph 1. *The proportion of participants in each demographic profile*



group of respondents had an undergraduate degree as their highest level of educational (43.5%). There were 58 participants with a natural, applied & health sciences background, followed by 45 participants with a business, finance, & administration background, 34 with a education, law, social, community & government services background, then 24 with others as their field of study/work.

Descriptive statistics of all participants' awareness score on the questionnaire are presented in Table 8. Descriptive statistics included the mean, median, mode, range, maximum, minimum, and standard deviation. (Heacock, 2012a).According to the calculated mean percentage score, participants had more knowledge on EHOs employment opportunities than EHOs involvement in various health service programs.

Table 8. Descriptive statistics of 161 participants' score on the questionnaire

	Awareness score of EHOs duties (Possible scoring range: -12 to +12)	**Awareness score of EHOs employment opportunities** (Possible scoring range: -6 to +6)	**Total awareness score** (Possible scoring range: -18 to +18)
Mean	2.944099379	2.552795031	5.496894
Median	3	3	5
Mode	3	3	5
Range	10	3	17
Maximum	12	6	18
Minimum	-2	-2	-1
Standard Deviation	2.545212288	1.760328879	3.57443
Calculated mean % score	(12+2.94)/24 = 62.25%	(6+2.55)/12 = 71.25%	(18+5.50)/36 = 65.28%

Next, analysis was completed to assess public's level of awareness on each health service program that respondents believed EHOs are involved in *(Appendix E – Graph 2).* 91.3% of participants were most aware of EHOs involvement in drinking water quality, 86.3% of food service establishment, and 81.4% of air quality. Conversely, participants' awareness was least in land development (24.0%), followed by tobacco control (32.3%), then emergency situations and natural disasters (40.0%). The top 3 health service programs that respondents incorrectly selected were EHOs involvement in lab testing (69.6%), milk and dairy (67.1%), and pest extermination (56.5%). On the other hand, 86.3% of participants were aware that EHOs were not involved in social services, 79.5% for medical services and 77.0% for new development and construction.

5.2 Inferential Statistics of the Results

Inferential statistics were used to examine the 3 hypotheses below. Each demographic profile (age group, education level, and field of study/work) was broken down into study groups; see Appendix A - Table 5, Table 6, and Table 7. A parametric one-way ANOVA was performed on each demographic profile in order to compare the mean scores of the different study groups within each profile (Heacock, 2012b).Both the public's knowledge of EHOs duties in public health and EHOs employment opportunities were statistically analyzed against each demographic profile *(Appendix F)*. However for the purpose of this study, only the public's knowledge of EHOs duties was discussed in this report.

Hypothesis

H_o = There is no significant difference between public's awareness level of EHOs duties and their

a) age group
b) education level
c) field of study/work

H_a = There is a significant difference between public's awareness level of EHOs duties and their

a) age group
b) education level
c) field of study/work

According to the ANOVA results, data was normally distributed and had equal variance in all3 hypotheses testing. An alpha error is the probability of concluding that a significant difference between study groups exists when in fact, there is no difference. Alpha error is assessed to determine the significant level of a test and is only a concern if p-value is between 0.01 – 0.05. To test whether the null hypotheses can be rejected, beta error is evaluated for the probability of concluding that no significant difference exists when in fact a difference actually exists. Normally, a beta error less than 0.2 is sufficient to reject the null hypotheses (Heacock, 2012a).

Table 9.*Inferential statistics results*

Hypotheses of public's knowledge	P – value	H_o decision	Alpha error	Beta error	Power (1 – ß)
Age group	0.444174	Do not reject	N/A	0.812239	0.187761
Educational level	0.086979	Do not reject	N/A	0.443717	0.556283
Field of study/work	0.746771	Do not reject	N/A	0.869956	0.130044

In conclusion, all 3 test results were not statistically significant with p-values greater than 0.05 (thus it is not applicable to assess for alpha errors); all 3 null hypotheses were rejected. Therefore, there were no significant differences between the public's awareness and their age, educational level, and field of study/work. The strength of all 3 tests had relatively low power – power greater than 0.80 is ideal – which indicated that the sample size was not large enough to exclude the chance of a beta error (Heacock, 2012b).

6.0 Discussion

As speculated, the general public had minimal knowledge regarding EHOs' involvement in various health service programs in which, on average 62.35% of the questions were answered correctly by the participants in this study. The visibility of EHOs' work is often obscured because of the preventative nature of their job. In addition, their role in public health is muddled as they take on a diversity of tasks in different health-related areas. Academic journals published by, organizations such as CIPHI and the National Environmental Health Association and National Collaborating Centre for Environmental Health are great resources that provide insight on EHOs' involvement in environmental health and safety matters. However, it is questionable that the general public would review academic journals at their leisure and some journals are only accessible to members. Mass media including the newspaper, television, radio, educational pamphlets and environmental health-specific magazines also raise awareness on current public health issues but they may lack information and clarity about EHOs involvement.

Concerning the 12 selected health service programs that pertain to EHOs, 91.3% of participants were aware that EHOs are involved in drinking water quality, 86.3% in food service establishment, 81.4% in air quality, and 75.0% in infectious disease & outbreak control. Health-related issues that revolve around those 4 health service programs are common health topics presented in the news. As public servants, EHOs are more likely to be associated to those health service programs because it may be more apparent for the public to see the direct health effects that

are related to those programs. Also, those 4 health service programs are main topic areas of a monthly newsletter called Health Watch published by Vancouver Coastal Health (Vancouver Coastal Health, 2013c).

Health Watch is available for public viewing on the internet and provides a summary of health indicators within the Vancouver Coastal Health district. It is not surprising that the public believes EHOs are involved in those 4 health service programs because the local Health Authority puts more emphasis on them as being major determinants of health. Moreover, Food Inspectors (BBC, 2013) and Health Inspectors shows (Food Network, 2013) may have influenced participants' perception on EHOs involvement in food service establishments since these television shows present EHOs predominantly as food inspectors.

Laboratory testing is commonly perceived as microbial or chemical analysis of food, water, specimens, and environmental samples. While majority of the public felt that EHOs are involved in drinking water quality, food service establishment, and infectious disease & outbreak control, 69.6% of participants incorrectly believed that laboratory testing on samples are performed by EHOs. Milk & dairy was the second most incorrectly selected health service program. Participants may have believed that EHOs are inspectors of foods including milk and dairy products; EHOs do not have the jurisdiction over that industry. On the other hand, the majority of participants correctly identified that EHOs are not involved in social services, medical services, and new development & construction. The rationale behind this is quite straightforward. There are clear descriptions of distinct personnel that are responsible in those 3 health service programs: the public is able to associate social workers to social services, nurses and doctors to medical services, and building inspectors and engineers to new development & construction.

EHOs are perceived to be regulatory enforcers rather than consultants or educators of public health issues. Participants' awareness of EHOs duties were least in land development (24.0%) and emergency situation & natural disasters (40.0%).Although EHOs may serve an enforcement role, they act as consultants and educators across all health service programs. Concurrently, the Health

Authority advocates for public health programs that addresses local health needs to major players in municipal operations. Particularly in land development and emergency situation & natural disasters, EHOs are involved in the planning process, liaising information between key agencies and the public, and overall providing a health-prospective lens on matters of concern (Vancouver Coastal Health, 2006). It is a new emerging role for Health Authorities to be involved in land development such as designing healthy built environments (British Columbia, n.d.). Lastly, 56.5% of participants mistakenly believed that EHOs are involved in pest extermination. EHOs are not responsible for extermination, instead they provide advice on pest control management. Generally, the level of public's awareness was the same across the study groups of different demographic profiles suggesting that there is an overall lack of awareness on EHOs involvement in public health protection.

7.0 Limitations

There were shortcomings in this study design due to inadequate resources such as time, technology, labor supply and financial funding. Certain questions in the survey could be revised or added to improve the quality of the raw data collected and enhance the meaningfulness of the analyzed results. Participants who have Canadian citizenship or are residents of Canada should have been included to increase response rate. Other questions could have been included for instance "do you feel that EHOs are important in public health protection or where do you derive knowledge of EHOs?" to assess whether there is an association with public's level of awareness regarding EHOs duties. "Would you want to learn more about how EHOs safeguard the public, in what ways or means would you prefer to receive more information about EHOs and public health issues, and how likely are you going to review the information?" are questions that can be asked to suggest methods to effectively raise awareness. The participants were subjected to guess answers because the design of the questionnaire required them to select the item(s) that either pertains or does not pertain to EHOs. Therefore the participant's answer on individual items might not accurately reflect their level of

awareness. However, the scoring system used to evaluate their overall knowledge on all the items buffers the guessing factor.

The sample population was prone to geographical bias since the survey was initially disseminated to the author's contacts that live within close proximity. Also, snowball sampling was short-lived; the response rate declined abruptly after the initial invitation of the questionnaire was electronically sent out via email or posted on Facebook. The population size of several study groups had less than 30 responses and some study groups were combined to increase sample size. Consequently, the validity of the results was reduced such that the results showed no significant differences among study groups within all 3 demographic profiles. Lastly, public participation in this study could be impeded due to the credibility as a student researcher.

8.0 Conclusion

There is a general lack of awareness in the public regarding EHOs' involvement in different health service programs. Since EHOs are involved in a vast number of programs, their tasks become unclear and complicating to the public. This study suggested that the public was more aware of EHOs' involvement in matters that (1) have a perceivable direct effect on health and (2) are given more attention to in mass media as major determinants of health. Conversely, the role of other public servants such as police officers and firefighters are better defined because of the inherent perception of risk to the public concerning criminals and fires, respectively. This study also suggested that there is a common misconception of EHOs as primarily enforcers and the public neglects their role as educators in health promotion, sharing knowledge on health-related issues. Overall, those factors can create challenges on EHOs' protective work; trust and cooperation from the public can be hampered while EHOs deliver their services. As integral players in public protection and promotion, EHOs' efforts need public's recognition and funding from the government in order to continue safeguarding and improving the health of their community and, to a larger extent, Canada.

9.0 Recommendations

Since EHOs provide a broad scope of health protection and promotion services, their importance in every community needs recognition in order to improve the health of the public, in the short-term and long-term. The lack of public awareness can be addressed by:

- Increasing awareness about environmental determinants of health. Public health issues can be implemented into early childhood education as children begin to develop life skills and have control over their health
- Increasing exposure of EHOs' efforts and communicating health and safety risks in the mass media, particularly in the news and popular social networks
- Health Authorities engaging with key community members to gain buy-in on proposed public health promotion strategies and programs
- Canadian Institute of Public Health Inspectors Association actively promoting an existing event, public health week. Setting up information booths, mini games, and prize giveaways in common areas such as community centers, institutions, schools, libraries and shopping centers to stimulate public involvement and exposure regarding EHOs' duties in current public health issues at the local level
- At the federal level, Public Health Agency of Canada advocating to establish a national holiday for public health awareness
- Implementing public relation training– taking a health promotional approach rather than holding an enforcement persona when interacting with the public – for all EHOs to maintain uniformity across Canada

10.0 Future Studies

The information gained from this research can be further supplement future studies that:

- Examine the correlation of the public's perceived knowledge and their actual knowledge of EHOs' duties

- Investigate where the public derives their knowledge regarding EHOs' duties
- Compare public's awareness score of EHOs' duties and the awareness score of the duties performed by police officers or fire fighters
- Compare public's level of awareness regarding EHOs' duties in countries other than Canada
- Evaluate publics' or operators' perception of EHOs' roles as health professional educators

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Appendix A – Tables

Table 1. *Legislations commonly used by EHOs in British Columbia, Canada*

1	Public Health Act ▪ Pool Regulation ▪ Food Premises Regulation ▪ Health Hazards Regulation ▪ Sewerage System Regulation
2	Drinking Water Protection Act ▪ Drinking Water Protection Regulation
3	Food Safety Act ▪ Meat Inspection Regulation
4	Tobacco Control Act ▪ Tobacco Control Regulation
5	Community Care and Assisted Living Act ▪ Child Care licensing Regulation ▪ Community Care and Assisted Living Regulation ▪ Residential Care Regulation
6	Fish Inspection Act ▪ Fish Inspection Regulation
7	Milk Industry Act
8	School Act
9	Offense Act

Table 2. *A list of 12 selected health service programs that EHOs are involved in*

1	Infectious disease & outbreak control
2	Drinking water quality
3	Food service establishment
4	Food recall
5	Air quality
6	Sewage system
7	Land development
8	Swimming pools and recreational facilities
9	Personal service establishments
10	Tobacco control
11	Emergency situation & natural disaster
12	Complaint-based investigation

Table 3.*Employment options for EHOs*

1	Health Authorities/Units
2	Public Health Agency of Canada
3	Ministry of Health
4	BC Centre of Disease Control

5	Canadian Food Inspection Agency
6	Health Canada

Table 5. *Age groups*

1	25 and below
2	26 – 45
3	46 and above

Table 6. *Education levels*

1	High school or lower
2	College/trade/diploma
3	Undergraduate degree
4	Graduate degree

Table 7. *Field of study / work*

1	Business, finance & administration
2	Education, law, social, community & government services
3	Natural, applied, & health sciences
4	Others

Appendix B – Informed Consent Form

Purpose of this Study:

This is a study conducted by Vanessa Ip, an undergraduate student from the Environmental Health Program at the British Columbia Institute of Technology (BCIT). The study is part of the graduation requirements in the Environmental Health Program. The purpose is to assess the public's awareness regarding the roles of Environmental Health Officers (EHOs), also referred to as Public Health Inspectors (PHIs).

Participation and Benefits:

You will complete a 3-minute "yes or no" type of questionnaire in which all the information you provide will be completely confidential and only used for academic purposes. Please read the questionnaire carefully and answer truthfully. You can provide your e-mail address if you wish to be entered in a randomized draw for a chance to win a prize. The BCIT Marketing and Communications Department is sponsoring a 8GB flash drive, a wireless mouse, and fleece throw.

Ethical Considerations:

Participation in this study is voluntary and confidential. There is no penalty for withdrawing at anytime if you feel uncomfortable answering the questions. Participation does not pose any anticipated risk or discomfort. This study has been approved by the BCIT Research Ethics Review Board (Policy No. 6500) and is conducted under the supervision of program faculty.

Findings:

The findings will identify any knowledge gaps of the public's awareness of the health service programs provided by EHOs. EHOs are public servants similar to police officers and firefighters. Their professional legitimacy needs public recognition to gain support and cooperation while they perform their duties. This recognition and understanding of their job description is currently lacking among some members of the general public.

The summary of results will be disseminated to individuals upon request via e-mail.

Researcher's contact information:

Vanessa Ip
Vip11@my.bcit.ca

Thank you for taking the time to read this.

Click the next button to confirm your consent to participate!

Appendix C – Questionnaire

1) Please provide your email address if you wish to enter in the randomized draw for a chance to win a prize.

2) Do you live in Canada?
    a. Yes
    b. No

3) Are you an EHO or an undergraduate / graduate of Environmental Health Program?
    a. Yes
    b. No

4) What is your age?

a. ≤15
b. 16 – 25
c. 26 – 35
d. 36 – 45
e. 46 – 55
f. 56 – 65
g. ≥66

5) What is your gender?
   a. Male
   b. Female

6) What is your highest educational level?
   a. High school or lower
   b. College/trade/diploma
   c. Undergraduate degree
   d. Graduate degree

7) The type of community that you live in:
   a. Urban
   b. Rural

8) What is your field of study / work?
   a. Business, finance, & administration
   b. Natural & applied sciences
   c. Health care
   d. Education, law, social, community & government services
   e. Art, culture, recreation, & sport
   f. Sales &service
   g. Trades, transport, & equipment operators
   h. Natural resources, agriculture & related production
   i. Manufacturing & utilities

From the list below, select any services that you believe Environmental Health Officers / Public Health Inspectors perform in their jobs.

Infectious Disease & Outbreak Control (Example: identifies the cause of a disease and prevents the spread of others)	☐
Forestation (Example: manage the usage of natural resources such as timber, water, fish, wildlife, soil, plants and recreation)	☐
Drinking Water Quality (Example: inspect wells and drinking water systems)	☐
Food Service Establishment	

(Example: inspect restaurants, food courts, community kitchens, mobile food carts, or cafeterias)	☐
Laboratory Testing (Example: examine contaminants levels and microbial growth in water and food)	☐
Food Recalls (Example: check that recalled food is not being sold in retail stores)	☐
New Development & Construction (Example: approve building and housing plans)	☐
Sewage Systems (Example: inspect septic and sewerage systems)	☐
Medical Services (Example: provide patient consultation and medical treatment)	☐
Land Development (Example: plan and design communities)	☐
Border Services (Example: inspect imported goods and regulate exported goods)	☐
Swimming Pools &Recreational Facilities (Example: inspect pools, whirlpools, hot tubs, stream baths and beaches)	☐
Pest Extermination (Example: exterminate pest such as cockroaches, rodents, bedbugs, rats, and mosquitos)	☐
Personal Service Establishments (Example: inspect tattoo parlors, nail and hair salons, spas, tanning salons, or funeral homes)	☐
Immunization (Example: order vaccines and administer them)	☐
Tobacco Control (Example: make sure that retail stores are in compliance with tobacco sales regulations)	☐
Social Services (Example: assist individuals who need rehabilitation)	☐
Oceans & Fisheries (Example: monitor illegal fish catching and selling)	☐
Emergency Situations & Natural Disasters (Example: public consultants and liaison between management authorities/agencies)	☐
Weather Alert (Example: monitor weather changes and notify public in case of severe weather)	☐
Animal Control (Example: isolate or remove dangerous animals from the public)	☐
Complaint-based investigations (Example: investigate and respond to received complaints)	☐
Air Quality (Example: take samples of contaminant level present in indoor or outdoor air)	☐
Milk & Dairy (Example: inspect dairy plants and farms)	☐

From the list below, select any of the places you believe Environmental Health Officers / Public Health Inspectors are employed.

Hospitals	☐
Health Authorities / Units	☐
Ministry of Forests	☐
Correctional Department	☐
Ministry of Government Services	☐
Public Health Agency Canada	☐
Canadian Border Services Agency	☐
Canadian Food Inspection Agency	☐
Health Canada	☐
BC Centre for Disease Control	☐
Ministry of Transportation and Highways	☐
Ministry of Health	☐

Appendix D – Raw Data Entry Sheet

This spreadsheet excludes participants who (1) do not live in Canada, (2) are EHOs or (3) is taking or have taken the Environmental Health Program. A total of 161 participants met the inclusion criteria and fully completed the questionnaire.

Subjects	Age	Gender	Educational level	Community type	Field of study/work	Awareness score of EHOs duties	Awareness score of EHOs employment opportunities
1	46 - 55	Female	Graduate degree	Urban	Business, finance & administration	4	3
2	26 - 35	Female	Undergraduate degree	Urban	Natural & applied sciences	0	2
3	46 - 55	Female	Graduate degree	Urban	Health care	7	6
4	46 - 55	Female	Graduate degree	Urban	Education, law, social, community & government services	6	5
5	26 - 35	Male	College / trade / diploma	Urban	Sales & service	3	5
6	≤15	Male	High school or lower	Urban	Natural & applied sciences	5	2
7	46 - 55	Female	College / trade / diploma	Urban	Business, finance & administration	5	3
8	16 - 25	Female	Undergraduate degree	Urban	Health care	2	5
9	46 - 55	Female	Graduate degree	Urban	Education, law, social, community & government services	7	3
10	26 - 35	Female	Undergraduate degree	Urban	Education, law, social, community & government services	0	0
11	16 - 25	Female	High school or lower	Urban	Education, law, social, community & government services	1	2
12	36 - 45	Male	Undergraduate degree	Urban	Business, finance & administration	0	1
13	46 - 55	Male	Graduate degree	Urban	Education, law, social, community & government services	3	4
14	26 - 35	Female	College / trade / diploma	Urban	Art, culture, recreation & sport	2	4
15	26 - 35	Male	College / trade / diploma	Urban	Art, culture, recreation & sport	7	4
16	26 - 35	Female	Undergraduate degree	Urban	Education, law, social, community & government services	4	1
17	26 - 35	Male	Undergraduate degree	Urban	Sales & service	6	3
18	26 - 35	Female	Undergraduate degree	Urban	Health care	2	0
19	46 - 55	Female	Graduate degree	Urban	Health care	3	4
20	16 - 25	Female	Graduate degree	Urban	Health care	3	3
21	16 - 25	Male	Undergraduate degree	Urban	Natural & applied sciences	7	3
22	26 - 35	Male	Undergraduate degree	Urban	Business, finance & administration	6	2
23	16 - 25	Male	Undergraduate degree	Urban	Natural resources, agriculture & related production	3	2
24	26 - 35	Male	Graduate degree	Urban	Sales & service	3	3
25	26 - 35	Male	College / trade / diploma	Urban	Natural & applied sciences	3	0
26	46 - 55	Male	Graduate degree	Urban	Education, law, social, community & government services	3	5
27	26 - 35	Male	Undergraduate degree	Urban	Education, law, social, community & government services	7	1
28	26 - 35	Male	Undergraduate degree	Urban	Health care	-1	2
29	56 - 65	Male	Graduate degree	Urban	Education, law, social, community & government services	2	2
30	56 - 65	Male	Graduate degree	Urban	Education, law, social, community & government services	1	2
31	26 - 35	Female	Graduate degree	Urban	Natural resources, agriculture & related production	0	0
32	26 - 35	Female	Undergraduate degree	Urban	Health care	6	4
33	26 - 35	Male	Undergraduate degree	Urban	Natural & applied sciences	3	1
34	16 - 25	Female	Undergraduate degree	Urban	Natural & applied sciences	2	3

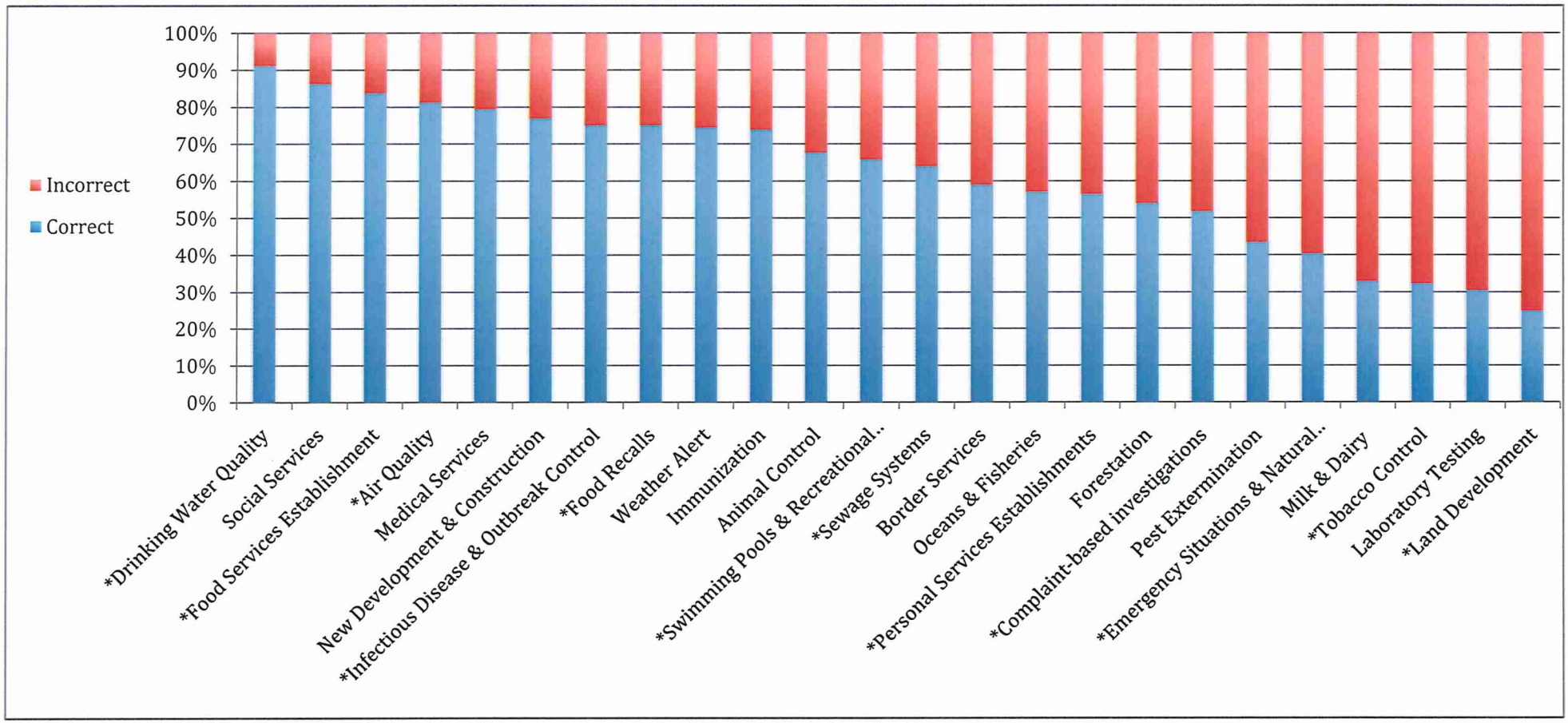
35	16 - 25	Female	Graduate degree	Urban	Health care	0	2
36	16 - 25	Male	Undergraduate degree	Urban	Health care	1	2
37	46 - 55	Female	Graduate degree	Urban	Education, law, social, community & government services	6	5
38	56 - 65	Female	Graduate degree	Urban	Education, law, social, community & government services	3	3
39	26 - 35	Female	Graduate degree	Urban	Natural & applied sciences	1	2
40	36 - 45	Female	Undergraduate degree	Urban	Health care	6	3
41	56 - 65	Male	Graduate degree	Urban	Natural resources, agriculture & related production	9	3
42	26 - 35	Female	Graduate degree	Urban	Health care	3	5
43	26 - 35	Female	Graduate degree	Urban	Education, law, social, community & government services	7	1
44	16 - 25	Female	Graduate degree	Urban	Art, culture, recreation & sport	2	2
45	26 - 35	Male	Graduate degree	Urban	Education, law, social, community & government services	2	0
46	46 - 55	Female	Graduate degree	Urban	Natural & applied sciences	6	3
47	16 - 25	Female	College / trade / diploma	Urban	Business, finance & administration	4	2
48	16 - 25	Male	High school or lower	Urban	Health care	1	0
49	16 - 25	Male	College / trade / diploma	Urban	Trades, transport & equipment operators	1	0
50	16 - 25	Female	Undergraduate degree	Urban	Health care	2	0
51	16 - 25	Female	Undergraduate degree	Urban	Sales & service	2	4
52	16 - 25	Male	Undergraduate degree	Urban	Health care	2	1
53	16 - 25	Female	Undergraduate degree	Urban	Health care	3	1
54	16 - 25	Male	Undergraduate degree	Urban	Natural & applied sciences	3	1
55	16 - 25	Male	College / trade / diploma	Rural	Business, finance & administration	6	3
56	46 - 55	Male	Graduate degree	Urban	Education, law, social, community & government services	5	4
57	56 - 65	Male	Graduate degree	Urban	Education, law, social, community & government services	5	-3
58	16 - 25	Male	Undergraduate degree	Urban	Health care	2	0
59	46 - 55	Female	Undergraduate degree	Urban	Business, finance & administration	6	4
60	16 - 25	Male	Undergraduate degree	Urban	Business, finance & administration	-1	2
61	26 - 35	Female	Undergraduate degree	Urban	Health care	2	3
62	46 - 55	Female	College / trade / diploma	Urban	Business, finance & administration	-2	3
63	16 - 25	Male	Undergraduate degree	Urban	Health care	6	4
64	16 - 25	Male	Undergraduate degree	Urban	Health care	0	2
65	46 - 55	Female	College / trade / diploma	Urban	Health care	2	4
66	16 - 25	Female	High school or lower	Urban	Sales & service	4	4
67	16 - 25	Male	Undergraduate degree	Urban	Education, law, social, community & government services	1	5
68	56 - 65	Female	Graduate degree	Urban	Health care	3	1
69	16 - 25	Male	College / trade / diploma	Urban	Business, finance & administration	4	3
70	36 - 45	Male	College / trade / diploma	Urban	Trades, transport & equipment operators	3	2
71	16 - 25	Female	College / trade / diploma	Urban	Education, law, social, community & government services	3	2
72	≥66	Female	High school or lower	Urban	Education, law, social, community & government services	-2	1
73	26 - 35	Female	College / trade / diploma	Urban	Business, finance & administration	-1	4
74	16 - 25	Male	Undergraduate degree	Urban	Art, culture, recreation & sport	1	4
75	≤15	Male	High school or lower	Urban	Sales & service	5	3
76	≤15	Female	High school or lower	Urban	Sales & service	0	0
77	≥66	Female	College / trade / diploma	Rural	Business, finance & administration	4	5
78	56 - 65	Female	College / trade / diploma	Urban	Business, finance & administration	2	3
79	36 - 45	Female	College / trade / diploma	Urban	Business, finance & administration	1	3

80	16 - 25	Male	Undergraduate degree	Urban	Natural & applied sciences	7	2
81	56 - 65	Male	Graduate degree	Urban	Education, law, social, community & government services	3	4
82	16 - 25	Female	Undergraduate degree	Urban	Health care	2	2
83	56 - 65	Female	College / trade / diploma	Urban	Health care	2	3
84	56 - 65	Male	High school or lower	Urban	Business, finance & administration	1	1
85	16 - 25	Female	Undergraduate degree	Urban	Health care	1	1
86	16 - 25	Male	College / trade / diploma	Rural	Business, finance & administration	5	2
87	26 - 35	Female	Undergraduate degree	Urban	Health care	4	0
88	16 - 25	Female	Undergraduate degree	Urban	Health care	3	1
89	56 - 65	Male	College / trade / diploma	Urban	Sales & service	0	0
90	56 - 65	Female	College / trade / diploma	Urban	Business, finance & administration	1	2
91	≤15	Female	High school or lower	Urban	Education, law, social, community & government services	-1	4
92	36 - 45	Female	Graduate degree	Urban	Business, finance & administration	0	0
93	≥66	Female	High school or lower	Urban	Business, finance & administration	4	5
94	56 - 65	Male	College / trade / diploma	Urban	Business, finance & administration	0	-1
95	≥66	Male	College / trade / diploma	Urban	Business, finance & administration	0	0
96	46 - 55	Male	College / trade / diploma	Urban	Business, finance & administration	4	1
97	56 - 65	Male	College / trade / diploma	Urban	Trades, transport & equipment operators	2	3
98	≥66	Male	Undergraduate degree	Urban	Education, law, social, community & government services	8	4
99	46 - 55	Male	Undergraduate degree	Urban	Business, finance & administration	4	5
100	26 - 35	Male	Undergraduate degree	Urban	Business, finance & administration	0	0
101	26 - 35	Female	Undergraduate degree	Urban	Business, finance & administration	4	5
102	36 - 45	Male	Graduate degree	Urban	Education, law, social, community & government services	-1	3
103	26 - 35	Female	Undergraduate degree	Urban	Health care	6	3
104	16 - 25	Female	Undergraduate degree	Urban	Natural & applied sciences	2	0
105	16 - 25	Female	Undergraduate degree	Urban	Natural resources, agriculture & related production	5	2
106	26 - 35	Male	Undergraduate degree	Urban	Education, law, social, community & government services	5	1
107	56 - 65	Female	Undergraduate degree	Urban	Business, finance & administration	6	4
108	46 - 55	Female	Graduate degree	Urban	Business, finance & administration	6	4
109	26 - 35	Male	Undergraduate degree	Urban	Business, finance & administration	3	2
110	16 - 25	Male	Graduate degree	Urban	Business, finance & administration	1	2
111	36 - 45	Female	College / trade / diploma	Urban	Business, finance & administration	0	3
112	≥66	Female	High school or lower	Urban	Business, finance & administration	4	1
113	56 - 65	Female	High school or lower	Urban	Business, finance & administration	7	6
114	46 - 55	Female	College / trade / diploma	Urban	Business, finance & administration	1	2
115	46 - 55	Female	College / trade / diploma	Urban	Business, finance & administration	3	3
116	26 - 35	Female	Graduate degree	Urban	Business, finance & administration	1	0
117	46 - 55	Female	College / trade / diploma	Urban	Business, finance & administration	-1	3
118	26 - 35	Female	College / trade / diploma	Urban	Education, law, social, community & government services	4	2
119	46 - 55	Female	College / trade / diploma	Urban	Business, finance & administration	0	3
120	16 - 25	Female	Undergraduate degree	Urban	Health care	5	3
121	26 - 35	Male	College / trade / diploma	Urban	Art, culture, recreation & sport	4	1
122	26 - 35	Female	Undergraduate degree	Urban	Education, law, social, community & government services	4	1
123	26 - 35	Female	Undergraduate degree	Urban	Business, finance & administration	5	6
124	26 - 35	Male	Graduate degree	Urban	Natural & applied sciences	0	3

125	16 - 25	Male	College / trade / diploma	Urban	Trades, transport & equipment operators	5	5
126	26 - 35	Female	Undergraduate degree	Urban	Health care	3	4
127	16 - 25	Female	Undergraduate degree	Urban	Natural & applied sciences	4	2
128	26 - 35	Male	College / trade / diploma	Urban	Art, culture, recreation & sport	2	5
129	26 - 35	Male	Graduate degree	Urban	Health care	12	6
130	16 - 25	Male	Undergraduate degree	Urban	Natural & applied sciences	2	5
131	16 - 25	Female	Undergraduate degree	Urban	Education, law, social, community & government services	5	6
132	46 - 55	Female	High school or lower	Urban	Business, finance & administration	-1	3
133	26 - 35	Female	Undergraduate degree	Urban	Education, law, social, community & government services	4	1
134	16 - 25	Male	Undergraduate degree	Urban	Natural & applied sciences	-1	0
135	16 - 25	Female	Undergraduate degree	Urban	Education, law, social, community & government services	0	2
136	36 - 45	Male	College / trade / diploma	Urban	Business, finance & administration	3	5
137	16 - 25	Female	College / trade / diploma	Rural	Sales & service	0	0
138	16 - 25	Female	Undergraduate degree	Urban	Education, law, social, community & government services	3	4
139	16 - 25	Male	Undergraduate degree	Urban	Health care	3	3
140	16 - 25	Female	Undergraduate degree	Urban	Natural & applied sciences	1	2
141	16 - 25	Female	Undergraduate degree	Urban	Health care	0	4
142	16 - 25	Female	Undergraduate degree	Urban	Health care	3	3
143	16 - 25	Male	College / trade / diploma	Urban	Business, finance & administration	5	4
144	16 - 25	Male	Undergraduate degree	Urban	Health care	5	3
145	16 - 25	Female	Undergraduate degree	Urban	Education, law, social, community & government services	0	0
146	46 - 55	Female	Graduate degree	Urban	Natural & applied sciences	0	3
147	16 - 25	Female	College / trade / diploma	Urban	Education, law, social, community & government services	0	2
148	16 - 25	Female	Undergraduate degree	Urban	Business, finance & administration	5	5
149	16 - 25	Female	Undergraduate degree	Urban	Health care	0	0
150	16 - 25	Female	High school or lower	Rural	Education, law, social, community & government services	6	1
151	16 - 25	Female	Undergraduate degree	Urban	Health care	6	5
152	16 - 25	Male	College / trade / diploma	Rural	Health care	2	3
153	16 - 25	Female	Undergraduate degree	Urban	Health care	-1	5
154	26 - 35	Male	College / trade / diploma	Urban	Sales & service	1	-2
155	26 - 35	Male	Undergraduate degree	Urban	Natural & applied sciences	6	2
156	16 - 25	Male	High school or lower	Urban	Business, finance & administration	1	4
157	16 - 25	Female	Undergraduate degree	Urban	Business, finance & administration	1	2
158	16 - 25	Female	Undergraduate degree	Urban	Health care	7	3
159	16 - 25	Male	Undergraduate degree	Urban	Natural & applied sciences	7	3
160	26 - 35	Male	Graduate degree	Urban	Business, finance & administration	7	6
161	36 - 45	Male	Graduate degree	Urban	Education, law, social, community & government services	6	4

Appendix E– Descriptive Statistics Results

Graph 2. *Proportion of participants who answered correctly regarding the health service programs that pertain to EHOs (*The health service programs that EHOs are involved in)*



Appendix F – Inferential Statistics Results

Report 1a. *Age group and knowledge of EHOs duties*

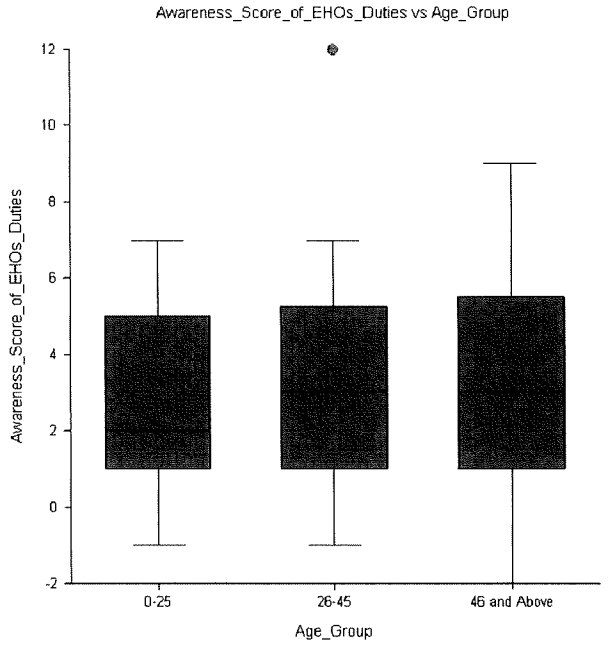
Analysis of Variance Report

Dataset Untitled
Response Awareness_Score_of_EHOs_Duties

Tests of Assumptions Section

Assumption	Test Value	Prob Level	Decision (0.05)
Skewness Normality of Residuals	1.6708	0.094760	Accept
Kurtosis Normality of Residuals	-0.4106	0.681377	Accept
Omnibus Normality of Residuals	2.9602	0.227619	Accept
Modified-Levene Equal-Variance Test	0.6631	0.516694	Accept

Box Plot Section



Expected Mean Squares Section

Source Term	DF	Term Fixed?	Denominator Term	Expected Mean Square
A: Age_Group	2	Yes	S(A)	S+sA
S(A)	158	No		S(A)

Note: Expected Mean Squares are for the balanced cell-frequency case.

Analysis of Variance Table

Source Term	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (Alpha=0.05)
A: Age_Group	2	10.59306	5.296528	0.82	0.444174	0.187761
S(A)	158	1025.904	6.493062			
Total (Adjusted)	160	1036.497				
Total	161					

* Term significant at alpha = 0.05

Analysis of Variance Report

Dataset	Untitled
Response	Awareness_Score_of_EHOs_Duties

Kruskal-Wallis One-Way ANOVA on Ranks

Hypotheses

H0: All medians are equal.
Ha: At least two medians are different.

Test Results

Method	DF	Chi-Square (H)	Prob Level	Decision(0.05)
Not Corrected for Ties	2	1.461694	0.481501	Accept H0
Corrected for Ties	2	1.482117	0.476609	Accept H0

Number Sets of Ties	10
Multiplicity Factor	57504

Group Detail

Group	Count	Sum of Ranks	Mean Rank	Z-Value	Median
0-25	66	4996.50	75.70	-1.2013	2
26-45	50	4203.00	84.06	0.5590	3
46 and Above	45	3841.50	85.37	0.7402	3

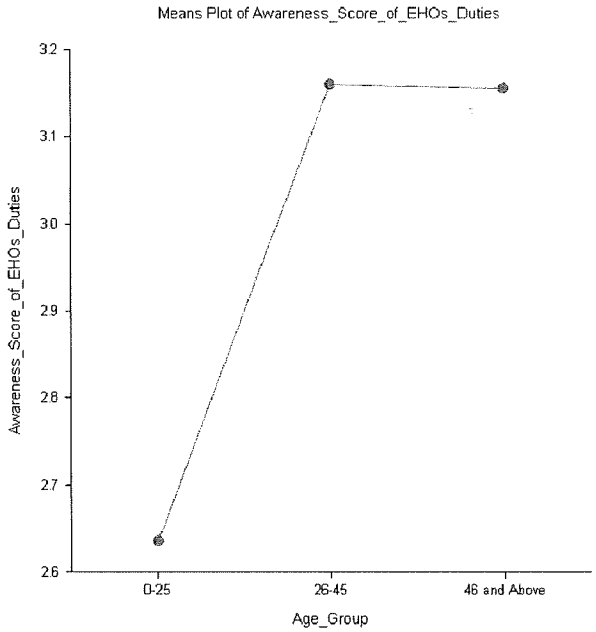
Means and Effects Section

Term	Count	Mean	Standard Error	Effect
All	161	2.944099		2.983973
A: Age_Group				
0-25	66	2.636364	0.3136554	-0.3476094
26-45	50	3.16	0.3603626	0.1760269
46 and Above	45	3.155555	0.3798556	0.1715825

Analysis of Variance Report

Dataset Untitled
Response Awareness_Score_of_EHOs_Duties

Plots of Means Section



Scheffe's Multiple-Comparison Test

Response: Awareness_Score_of_EHOs_Duties
Term A: Age_Group

Alpha=0.050 Error Term=S(A) DF=158 MSE=6.493062 Critical Value=2.4711

Group	Count	Mean	Different From Groups
0-25	66	2.636364	
26-45	50	3.16	
46 and Above	45	3.155555	

Notes:
This report provides multiple comparison tests for all possible contrasts among the the means. These contrasts may involve more groups than just each pair, so the method is much stricter than need be. The Tukey-Kramer method provides more accurate results when only pair wise comparisons are needed.

Analysis of Variance Report

Dataset	Untitled
Response	Awareness_Score_of_EHOs_Duties

Tukey-Kramer Multiple-Comparison Test

Response: Awareness_Score_of_EHOs_Duties
Term A: Age_Group

Alpha=0.050 Error Term=S(A) DF=158 MSE=6.493062 Critical Value=3.3461

Group	Count	Mean	Different From Groups
0-25	66	2.636364	
26-45	50	3.16	
46 and Above	45	3.155555	

Notes:
This report provides multiple comparison tests for all pair wise differences between the means.

Report 1b. *Age group and knowledge of EHOs employment options*

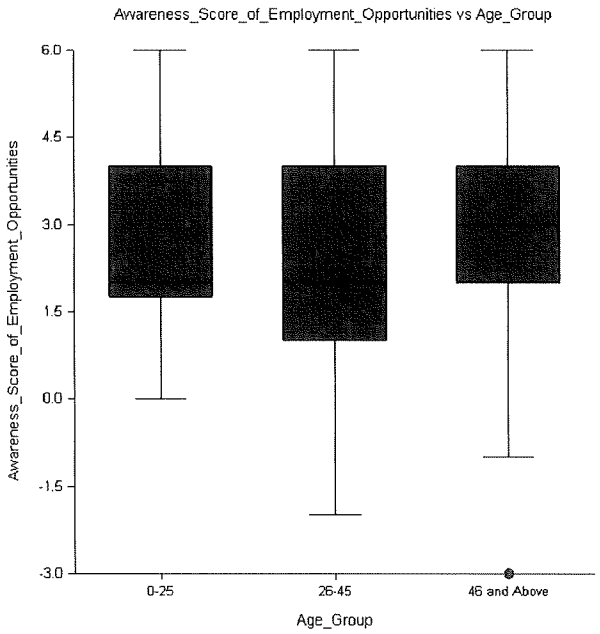
Analysis of Variance Report

Dataset Untitled
Response Awareness_Score_of_Employment_Opportunities

Tests of Assumptions Section

Assumption	Test Value	Prob Level	Decision (0.05)
Skewness Normality of Residuals	-1.0058	0.314501	Accept
Kurtosis Normality of Residuals	0.2155	0.829387	Accept
Omnibus Normality of Residuals	1.0581	0.589161	Accept
Modified-Levene Equal-Variance Test	1.4185	0.245141	Accept

Box Plot Section



Expected Mean Squares Section

Source Term	DF	Term Fixed?	Denominator Term	Expected Mean Square
A: Age_Group	2	Yes	S(A)	S+sA
S(A)	158	No		S(A)

Note: Expected Mean Squares are for the balanced cell-frequency case.

Analysis of Variance Table

Source Term	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (Alpha=0.05)
A: Age_Group	2	9.417605	4.708803	1.53	0.219804	0.321699
S(A)	158	486.3836	3.078377			
Total (Adjusted)	160	495.8012				
Total	161					

* Term significant at alpha = 0.05

Analysis of Variance Report

Dataset	Untitled
Response	Awareness_Score_of_Employment_Opportunities

Kruskal-Wallis One-Way ANOVA on Ranks
Hypotheses
H0: All medians are equal.
Ha: At least two medians are different.

Test Results

Method	DF	Chi-Square (H)	Prob Level	Decision(0.05)
Not Corrected for Ties	2	4.411416	0.110173	Accept H0
Corrected for Ties	2	4.542468	0.103185	Accept H0

Number Sets of Ties	7
Multiplicity Factor	120396

Group Detail

Group	Count	Sum of Ranks	Mean Rank	Z-Value	Median
0-25	66	5105.50	77.36	-0.8266	2
26-45	50	3738.50	74.77	-1.1380	2
46 and Above	45	4197.00	93.27	2.0794	3

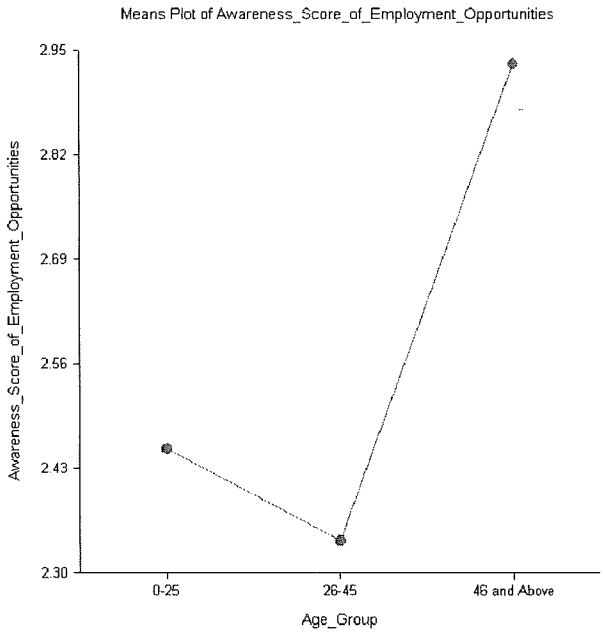
Means and Effects Section

Term	Count	Mean	Standard Error	Effect
All	161	2.552795		2.57596
A: Age_Group				
0-25	66	2.454545	0.2159678	-0.1214141
26-45	50	2.34	0.2481281	-0.2359596
46 and Above	45	2.933333	0.26155	0.3573737

Analysis of Variance Report

Dataset Untitled
Response Awareness_Score_of_Employment_Opportunities

Plots of Means Section



Scheffe's Multiple-Comparison Test

Response: Awareness_Score_of_Employment_Opportunities
Term A: Age_Group

Alpha=0.050 Error Term=S(A) DF=158 MSE=3.078377 Critical Value=2.4711

Group	Count	Mean	Different From Groups
0-25	66	2.454545	
26-45	50	2.34	
46 and Above	45	2.933333	

Notes:
This report provides multiple comparison tests for all possible contrasts among the the means. These contrasts may involve more groups than just each pair, so the method is much stricter than need be. The Tukey-Kramer method provides more accurate results when only pair wise comparisons are needed.

Analysis of Variance Report

Dataset	Untitled
Response	Awareness_Score_of_Employment_Opportunities

Tukey-Kramer Multiple-Comparison Test

Response: Awareness_Score_of_Employment_Opportunities
Term A: Age_Group

Alpha=0.050 Error Term=S(A) DF=158 MSE=3.078377 Critical Value=3.3461

Group	Count	Mean	Different From Groups
0-25	66	2.454545	
26-45	50	2.34	
46 and Above	45	2.933333	

Notes:
This report provides multiple comparison tests for all pair wise differences between the means.

Report 2a. *Educational level and knowledge of EHOs duties*

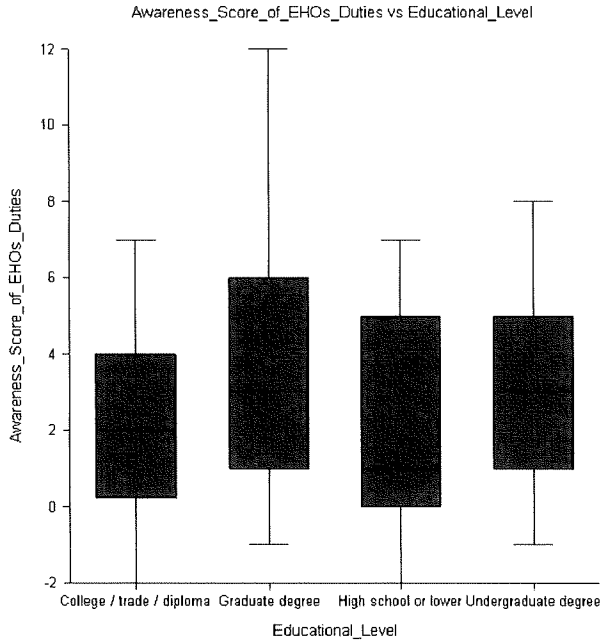
Analysis of Variance Report

Dataset	Untitled
Response	Awareness_Score_of_EHOs_Duties

Tests of Assumptions Section

Assumption	Test Value	Prob Level	Decision (0.05)
Skewness Normality of Residuals	1.4927	0.135506	Accept
Kurtosis Normality of Residuals	-1.1520	0.249336	Accept
Omnibus Normality of Residuals	3.5553	0.169036	Accept
Modified-Levene Equal-Variance Test	1.1698	0.323140	Accept

Box Plot Section



Expected Mean Squares Section

Source Term	DF	Term Fixed?	Denominator Term	Expected Mean Square
A: Educational_Level	3	Yes	S(A)	S+sA
S(A)	157	No		S(A)

Note: Expected Mean Squares are for the balanced cell-frequency case.

Analysis of Variance Table

Source Term	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (Alpha=0.05)
A: Educational_Level	3	42.34213	14.11404	2.23	0.086979	0.556283
S(A)	157	994.1548	6.332196			
Total (Adjusted)	160	1036.497				
Total	161					

* Term significant at alpha = 0.05

Analysis of Variance Report

Dataset Untitled
Response Awareness_Score_of_EHOs_Duties

Kruskal-Wallis One-Way ANOVA on Ranks
Hypotheses
H0: All medians are equal.
Ha: At least two medians are different.

Test Results

Method	DF	Chi-Square (H)	Prob Level	Decision(0.05)
Not Corrected for Ties	3	5.062382	0.167286	Accept H0
Corrected for Ties	3	5.133114	0.162305	Accept H0

Number Sets of Ties	10
Multiplicity Factor	57504

Group Detail

Group	Count	Sum of Ranks	Mean Rank	Z-Value	Median
College / trade / diploma	40	2771.00	69.28	-1.8348	2
Graduate degree	36	3235.50	89.88	1.2963	3
High school or lower	15	1069.00	71.27	-0.8491	1
Undergraduate degree	70	5965.50	85.22	1.0077	3

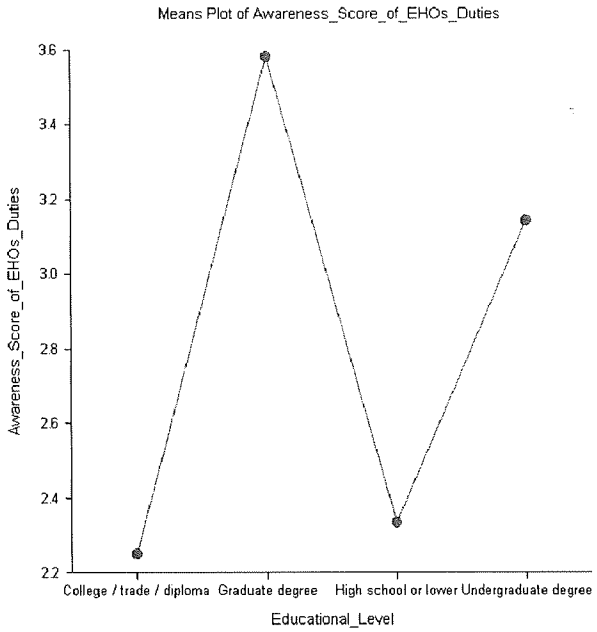
Means and Effects Section

Term	Count	Mean	Standard Error	Effect
All	161	2.944099		2.827381
A: Educational_Level				
College / trade / diploma	40	2.25	0.3978755	-0.577381
Graduate degree	36	3.583333	0.4193976	0.7559524
High school or lower	15	2.333333	0.6497279	-0.4940476
Undergraduate degree	70	3.142857	0.3007656	0.3154762

Analysis of Variance Report

Dataset Untitled
Response Awareness_Score_of_EHOs_Duties

Plots of Means Section



Scheffe's Multiple-Comparison Test

Response: Awareness_Score_of_EHOs_Duties
Term A: Educational_Level

Alpha=0.050 Error Term=S(A) DF=157 MSE=6.332196 Critical Value=2.8261

Group	Count	Mean	Different From Groups
College / trade / diploma	40	2.25	
Graduate degree	36	3.583333	
High school or lower	15	2.333333	
Undergraduate degree	70	3.142857	

Notes:
This report provides multiple comparison tests for all possible contrasts among the the means. These contrasts may involve more groups than just each pair, so the method is much stricter than need be. The Tukey-Kramer method provides more accurate results when only pair wise comparisons are needed.

Analysis of Variance Report

Dataset Untitled
Response Awareness_Score_of_EHOs_Duties

Tukey-Kramer Multiple-Comparison Test

Response: Awareness_Score_of_EHOs_Duties
Term A: Educational_Level

Alpha=0.050 Error Term=S(A) DF=157 MSE=6.332196 Critical Value=3.6724

Group	Count	Mean	Different From Groups
College / trade / diploma	40	2.25	
Graduate degree	36	3.583333	
High school or lower	15	2.333333	
Undergraduate degree	70	3.142857	

Notes:
This report provides multiple comparison tests for all pair wise differences between the means.

Report 2b. ***Educational level and knowledge of EHOs employment options***

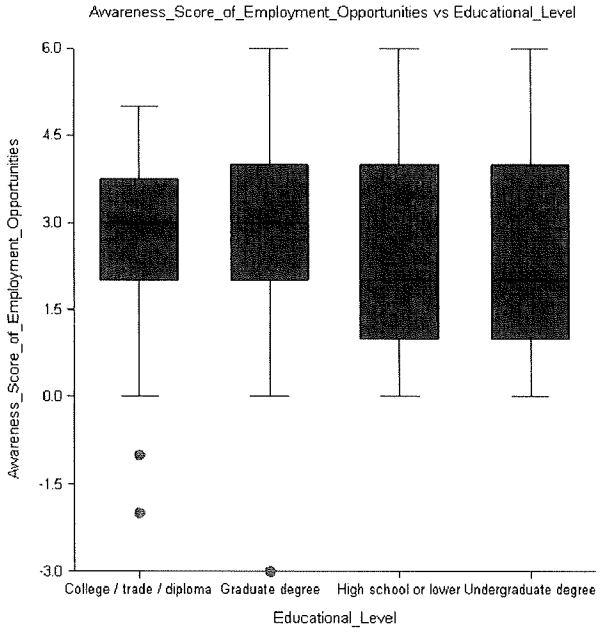
Analysis of Variance Report

Dataset Untitled
Response Awareness_Score_of_Employment_Opportunities

Tests of Assumptions Section

Assumption	Test Value	Prob Level	Decision (0.05)
Skewness Normality of Residuals	-1.1502	0.250069	Accept
Kurtosis Normality of Residuals	-0.1860	0.852474	Accept
Omnibus Normality of Residuals	1.3575	0.507251	Accept
Modified-Levene Equal-Variance Test	0.2024	0.894596	Accept

Box Plot Section



Expected Mean Squares Section

Source Term	DF	Term Fixed?	Denominator Term	Expected Mean Square
A: Educational_Level	3	Yes	S(A)	S+sA
S(A)	157	No		S(A)

Note: Expected Mean Squares are for the balanced cell-frequency case.

Analysis of Variance Table

Source Term	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (Alpha=0.05)
A: Educational_Level	3	4.415925	1.471975	0.47	0.703411	0.143490
S(A)	157	491.3853	3.129843			
Total (Adjusted)	160	495.8012				
Total	161					

* Term significant at alpha = 0.05

Analysis of Variance Report

Dataset Untitled
Response Awareness_Score_of_Employment_Opportunities

Kruskal-Wallis One-Way ANOVA on Ranks
Hypotheses
H0: All medians are equal.
Ha: At least two medians are different.

Test Results

Method	DF	Chi-Square (H)	Prob Level	Decision(0.05)
Not Corrected for Ties	3	2.015073	0.569284	Accept H0
Corrected for Ties	3	2.074936	0.557000	Accept H0

Number Sets of Ties	7
Multiplicity Factor	120396

Group Detail

Group	Count	Sum of Ranks	Mean Rank	Z-Value	Median
College / trade / diploma	40	3223.00	80.58	-0.0665	3
Graduate degree	36	3253.50	90.38	1.3693	3
High school or lower	15	1158.50	77.23	-0.3286	2
Undergraduate degree	70	5406.00	77.23	-0.9003	2

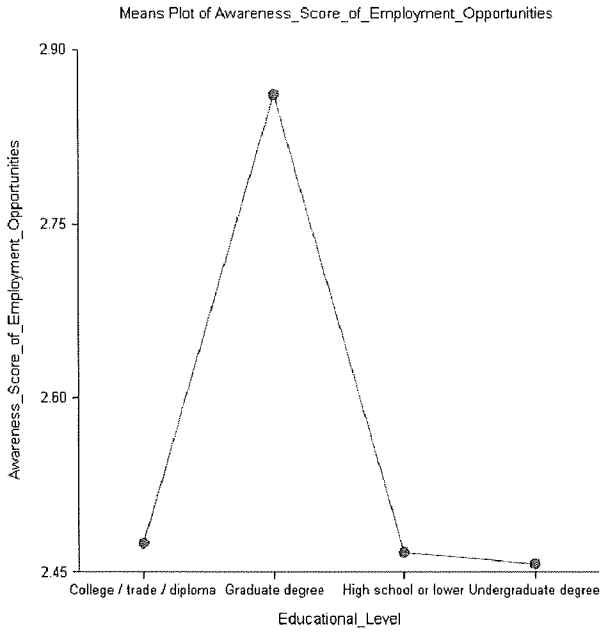
Means and Effects Section

Term	Count	Mean	Standard Error	Effect
All	161	2.552795		2.56498
A: Educational_Level				
College / trade / diploma	40	2.475	0.279725	-0.08998016
Graduate degree	36	2.861111	0.294856	0.296131
High school or lower	15	2.466667	0.456789	-0.0983135
Undergraduate degree	70	2.457143	0.2114522	-0.1078373

Analysis of Variance Report

Dataset Untitled
Response Awareness_Score_of_Employment_Opportunities

Plots of Means Section



Scheffe's Multiple-Comparison Test

Response: Awareness_Score_of_Employment_Opportunities
Term A: Educational_Level

Alpha=0.050 Error Term=S(A) DF=157 MSE=3.129843 Critical Value=2.8261

Group	Count	Mean	Different From Groups
College / trade / diploma	40	2.475	
Graduate degree	36	2.861111	
High school or lower	15	2.466667	
Undergraduate degree	70	2.457143	

Notes:
This report provides multiple comparison tests for all possible contrasts among the the means. These contrasts may involve more groups than just each pair, so the method is much stricter than need be. The Tukey-Kramer method provides more accurate results when only pair wise comparisons are needed.

Analysis of Variance Report

Dataset	Untitled
Response	Awareness_Score_of_Employment_Opportunities

Tukey-Kramer Multiple-Comparison Test

Response: Awareness_Score_of_Employment_Opportunities
Term A: Educational_Level

Alpha=0.050 Error Term=S(A) DF=157 MSE=3.129843 Critical Value=3.6724

Group	Count	Mean	Different From Groups
College / trade / diploma	40	2.475	
Graduate degree	36	2.861111	
High school or lower	15	2.466667	
Undergraduate degree	70	2.457143	

Notes:
This report provides multiple comparison tests for all pair wise differences between the means.

Report 3a. *Field of study/work and knowledge of EHOs duties*

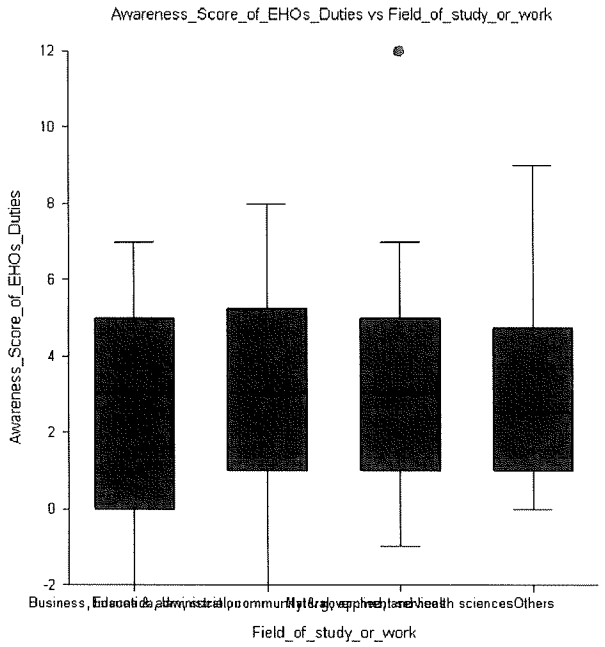
Analysis of Variance Report

Dataset Untitled
Response Awareness_Score_of_EHOs_Duties

Tests of Assumptions Section

Assumption	Test Value	Prob Level	Decision (0.05)
Skewness Normality of Residuals	1.8786	0.060305	Accept
Kurtosis Normality of Residuals	-0.3746	0.707956	Accept
Omnibus Normality of Residuals	3.6693	0.159669	Accept
Modified-Levene Equal-Variance Test	0.5604	0.641954	Accept

Box Plot Section



Expected Mean Squares Section

Source Term	DF	Term Fixed?	Denominator Term	Expected Mean Square
A: Field_of_study_or_work	3	Yes	S(A)	S+sA
S(A)	157	No		S(A)

Note: Expected Mean Squares are for the balanced cell-frequency case.

Analysis of Variance Table

Source Term	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (Alpha=0.05)	
A: Field_of_study_or_work	3	8.037102	2.679034	0.41	0.746771	0.130044	
S(A)	157	1028.46	6.550699				
Total (Adjusted)	160	1036.497					
Total	161						

* Term significant at alpha = 0.05

Analysis of Variance Report

Dataset Untitled
Response Awareness_Score_of_EHOs_Duties

Kruskal-Wallis One-Way ANOVA on Ranks
Hypotheses
H0: All medians are equal.
Ha: At least two medians are different.

Test Results

Method	DF	Chi-Square (H)	Prob Level	Decision(0.05)
Not Corrected for Ties	3	1.127366	0.770472	Accept H0
Corrected for Ties	3	1.143118	0.766677	Accept H0

Number Sets of Ties	10
Multiplicity Factor	57504

Group Detail

Group	Count	Sum of Ranks	Mean Rank	Z-Value	Median		
Business, finance & administration			45	3431.00	76.24	-0.8061	3
Education, law, social, community & government services			34	2970.50	87.37		
	0.8967	3					
Natural, applied, and health sciences			58	4726.50	81.49	0.1004	3
Others	24	1913.00	79.71	-0.1471	2.5		

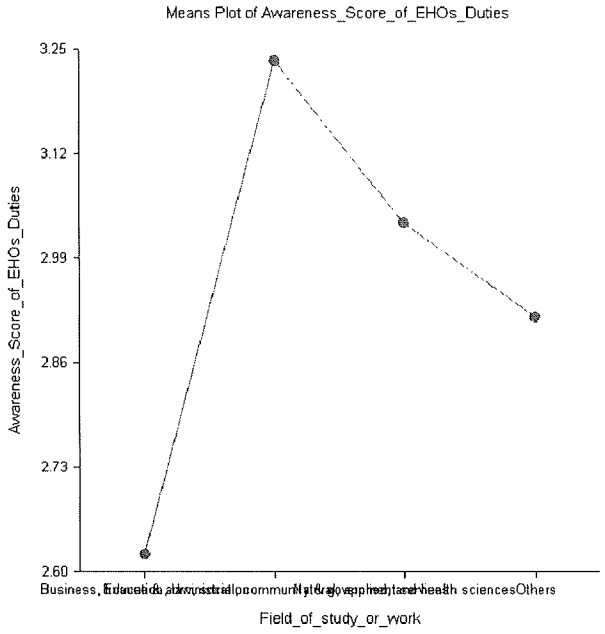
Means and Effects Section

Term	Count	Mean	Standard Error	Effect	
All	161	2.944099		2.952167	
A: Field_of_study_or_work					
Business, finance & administration	45	2.622222	0.3815378	-0.3299442	
Education, law, social, community & government services			34	3.235294	0.4389392
	0.2831277				
Natural, applied, and health sciences	58	3.034483	0.3360701	0.08231632	
Others	24	2.916667	0.5224422	-0.03549977	

Analysis of Variance Report

Dataset Untitled
Response Awareness_Score_of_EHOs_Duties

Plots of Means Section



Scheffe's Multiple-Comparison Test

Response: Awareness_Score_of_EHOs_Duties
Term A: Field_of_study_or_work

Alpha=0.050 Error Term=S(A) DF=157 MSE=6.550699 Critical Value=2.8261

Group	Count	Mean	Different From Groups
Business, finance & administration	45	2.622222	
Education, law, social, community & government services	34	3.235294	
Natural, applied, and health sciences	58	3.034483	
Others	24	2.916667	

Notes:
This report provides multiple comparison tests for all possible contrasts among the the means. These contrasts may involve more groups than just each pair, so the method is much stricter than need be. The Tukey-Kramer method provides more accurate results when only pair wise comparisons are needed.

Analysis of Variance Report

Dataset Untitled
Response Awareness_Score_of_EHOs_Duties

Tukey-Kramer Multiple-Comparison Test

Response: Awareness_Score_of_EHOs_Duties
Term A: Field_of_study_or_work

Alpha=0.050 Error Term=S(A) DF=157 MSE=6.550699 Critical Value=3.6724

Group	Count	Mean	Different From Groups
Business, finance & administration	45	2.622222	
Education, law, social, community & government services	34	3.235294	
Natural, applied, and health sciences	58	3.034483	
Others	24	2.916667	

Notes:
This report provides multiple comparison tests for all pair wise differences between the means.

Report 3b. *Field of study/work and knowledge of EHOs employment options*

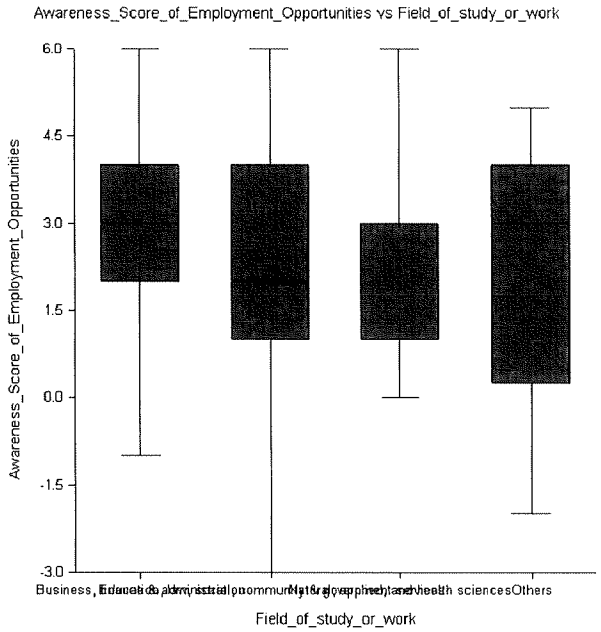
Analysis of Variance Report

Dataset Untitled
Response Awareness_Score_of_Employment_Opportunities

Tests of Assumptions Section

Assumption	Test Value	Prob Level	Decision (0.05)
Skewness Normality of Residuals	-0.9097	0.362991	Accept
Kurtosis Normality of Residuals	-0.7843	0.432883	Accept
Omnibus Normality of Residuals	1.4426	0.486122	Accept
Modified-Levene Equal-Variance Test	0.4774	0.698436	Accept

Box Plot Section



Expected Mean Squares Section

Source Term	DF	Term Fixed?	Denominator Term	Expected Mean Square
A: Field_of_study_or_work	3	Yes	S(A)	S+sA
S(A)	157	No		S(A)

Note: Expected Mean Squares are for the balanced cell-frequency case.

Analysis of Variance Table

Source Term	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (Alpha=0.05)
A: Field_of_study_or_work	3	6.309914	2.103305	0.67	0.568825	
	0.190178					
S(A)	157	489.4913	3.117779			
Total (Adjusted)	160	495.8012				
Total	161					

* Term significant at alpha = 0.05

Analysis of Variance Report

Dataset Untitled
Response Awareness_Score_of_Employment_Opportunities

Kruskal-Wallis One-Way ANOVA on Ranks
Hypotheses
H0: All medians are equal.
Ha: At least two medians are different.

Test Results

Method	DF	Chi-Square (H)	Prob Level	Decision(0.05)
Not Corrected for Ties	3	1.687108	0.639804	Accept H0
Corrected for Ties	3	1.737228	0.628689	Accept H0

Number Sets of Ties	7
Multiplicity Factor	120396

Group Detail

Group	Count	Sum of Ranks	Mean Rank	Z-Value	Median		
Business, finance & administration			45	3989.00	88.64	1.2959	3
Education, law, social, community & government services			34	2650.50	77.96	-0.4287	2
Natural, applied, and health sciences			58	4511.00	77.78	-0.6585	3
Others	24	1890.50	78.77	-0.2539	3		

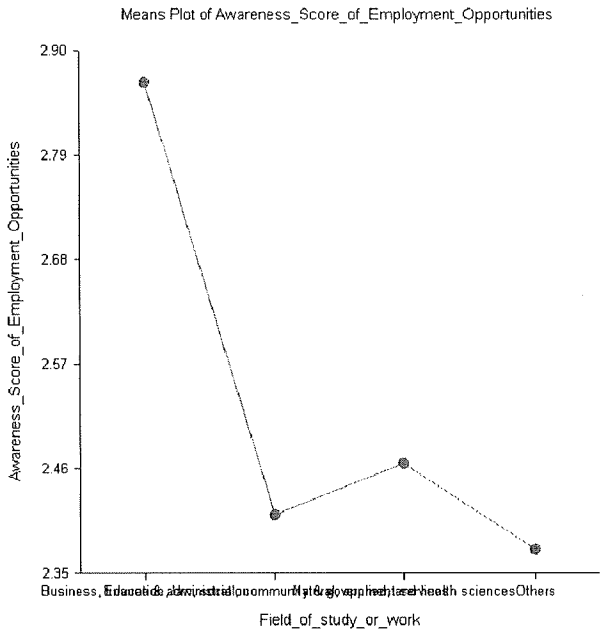
Means and Effects Section

Term	Count	Mean	Standard Error	Effect	
All	161	2.552795		2.529737	
A: Field_of_study_or_work					
Business, finance & administration	45	2.866667	0.2632185	0.3369295	
Education, law, social, community & government services	34	2.411765	0.3028191	-0.1179724	
Natural, applied, and health sciences	58	2.465517	0.2318508	-0.06421991	
Others	24	2.375	0.3604268	-0.1547372	

Analysis of Variance Report

Dataset Untitled
Response Awareness_Score_of_Employment_Opportunities

Plots of Means Section



Scheffe's Multiple-Comparison Test

Response: Awareness_Score_of_Employment_Opportunities
Term A: Field_of_study_or_work

Alpha=0.050 Error Term=S(A) DF=157 MSE=3.117779 Critical Value=2.8261

Group	Count	Mean	Different From Groups
Business, finance & administration	45	2.866667	
Education, law, social, community & government services	34	2.411765	
Natural, applied, and health sciences	58	2.465517	
Others	24	2.375	

Notes:
This report provides multiple comparison tests for all possible contrasts among the the means. These contrasts may involve more groups than just each pair, so the method is much stricter than need be. The Tukey-Kramer method provides more accurate results when only pair wise comparisons are needed.

Analysis of Variance Report

Dataset	Untitled
Response	Awareness_Score_of_Employment_Opportunities

Tukey-Kramer Multiple-Comparison Test

Response: Awareness_Score_of_Employment_Opportunities
Term A: Field_of_study_or_work

Alpha=0.050 Error Term=S(A) DF=157 MSE=3.117779 Critical Value=3.6724

Group	Count	Mean	Different From Groups
Business, finance & administration	45	2.866667	
Education, law, social, community & government services	34	2.411765	
Natural, applied, and health sciences	58	2.465517	
Others	24	2.375	

Notes:
This report provides multiple comparison tests for all pair wise differences between the means.