

Master of Public Health Field Experience Report

FIELD EXPERIENCE AT SALINE COUNTY HEALTH DEPARTMENT

by

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Summary

The Saline County Health Department is located in Salina, Kansas. The population of the county that the health department serves is 55,740 people and it is 78.5% Non-Hispanic White, 11.7% Hispanic, 3.5% Non-Hispanic Black, 3.1% Asian, 2.4% two or more races, and 0.6% American Indian. The health department offers vaccination, WIC (Women, Infants, and Children assistance program), maternal and child health, home health, and reproductive services. The median income of this area is \$7,000 lower than that of the state of Kansas. Poverty level may be related to lower levels of food safety knowledge. A survey was utilized to investigate if there was a relationship between poverty level and food safety knowledge. The survey was designed from methods retrieved from other studies that evaluated food safety knowledge. The survey was distributed through social media to people in the community. The income level for the household and the number of people in the household was used to determine if respondents were above or below the federally defined poverty level. Of the 140 responses, 121 (86%) of the participants were above the poverty level and 19 (14%) were below the poverty level. For the education levels 116 (83%) of the people surveyed had some sort of education beyond high school, 23 (16%) had only a high school diploma, and 1 person had less than a high school diploma. The ethnicity of the participants was primarily Non-Hispanic white with 125 (89%) people; 5 (4%) were Non-Hispanic black, 7 (5%) were Hispanic and 3 (2%) were other ethnicities. The age brackets for the survey were 18-25, 25-50 and 50+. There were 9 (6%) people in the 18-25 range, 94 (67%) in the 25-50 range and 37 (26%) that were 50+. The participants were asked if they had prior food safety training; 96 (69%) indicated they did and 44 (31%) indicated they did not. The overall mean number of questions answered incorrectly for the 140 participants was 1.8. There were 11 food safety questions in the survey. Participants who were in the 18-25 range had a

higher mean number of questions answered incorrectly than any of the other age groups at 2.4. This is consistent with the research that states that young adults have poor food safety knowledge. SAS (Statistical Analysis System) was used to interpret data by putting poverty level vs the number of questions the participant answered incorrectly in an ANOVA table. This showed that the people above the poverty level answered an average of 1.8 questions incorrectly whereas the people below answered an average of 2.2 questions incorrectly. There was not enough data to determine if there was a correlation between food safety knowledge and poverty level.

Subject Keywords: Food Safety, Poverty Level, Rural Community.

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Chapter 1 - Field Experience Scope of Work

My field experience took place June 13th to July 25th, 2016 at the Saline County Health Department under the main supervision of Jason Tiller, Director of the Saline County Health Department. The Saline County Health Department is located in Salina, Kansas. The population of Saline County is 55,740, of which is 78.5% Non-Hispanic White, 11.7% Hispanic, 3.5% Non-Hispanic Black, 3.1% Asian, 2.4% Two or more races and 0.6% American Indian. The median income of this area is \$7,000 lower than that of the state of Kansas. The health department offers vaccination, WIC, maternal and child health, home health, and reproductive services.

Routine and Non-Routine Meetings

As part of my field experience activities, I accompanied the Director to routine meetings such as the Healthcare Coalition, as well as to non-routine meetings convened on short notice to address urgent unexpected issues, such as a Lead Information Meeting. Saline County had 32 cases of elevated blood lead levels in children from January 1st 2015 to March 31st of 2016. This meeting was held to inform the public about the investigation process. The Kansas Department of Health and Environment convened the information session in conjunction with the Saline County Health Department. After the informational meeting was over, KDHE determined it would be appropriate for the SCHED to conduct limited lead screening in the community. The lead screening was only for citizens of Saline County that had risk factors that qualified for them to be screened. See Figure 1.5 and 1.6 for an example of the screening system that was used. Misinformation made it difficult to screen the correct people. The test only worked on

people who were over the age of 6 months because it was a finger stick test. Children under the age of six months were referred their doctor to be screened via a vein blood draw. Over 300 people were screened, only one of whom was found to have an elevated blood lead level. This person had already been previously identified as having an elevated level. Press relations became a large part of the Director's job. Demonstrating good communication skills and making sure information is clearly presented is a large part of a Director's job.

While at the Saline County Health Department I accompanied the Director to two regional meetings, including a health care coalition meeting of hospitals, health departments, and other entities related to health care in the region, and the Central Kansas Public Health Emergency Preparedness meeting which included the health departments in the region.

The coalition meeting was very interesting. It helped me to gain some knowledge of how the hospitals worked and how they differed from how the health departments work. There was a lot of discussion about funding and current problems in the region at the meeting and KDHE also had a representative there and kept the entities informed on what was going on at the state level with funding. High turnover at KDHE makes the job of county level directors and administrators difficult because they have a lack of a consistent contact person. County-level officials expressed frustration because they feel this makes it difficult for them to get federal and state grants, may hurt their organization, and costs them some of their already-limited funding.

During this meeting a guest speaker talked about human trafficking and what hospitals and health departments should be looking for. She was a forensic nurse at the

hospital in Salina, and her job is to work with patients who are either victims or perpetrators of violent crimes that needed medical attention. She does all the medical photography for the police. She provided training that highlighted the warning signs for a person who may be a victim of human trafficking.

The Central Kansas Public Health Emergency Preparedness meetings focused on making sure that the communities in the area are prepared for any disease or natural disaster that may happen. We watched a demonstration of a product that makes it easy for health related agencies to contact employees in case of emergency. This system also notifies the agency when their employees actually get the message, making it different from other systems that do not offer this feature. For example, this makes it possible to evacuate a building and see if everyone actually is out or if a rescue team is needed, and could make it possible to call people in to work in an emergency and get a reasonable head count. This system also has a new weather system that only notifies people in the path of the storm rather than everyone in the county. This system is more expensive than other systems because of the reply feature and new technology they use but the Central Kansas Public Health Emergency Preparedness group can use grant money to get this system if they think it will benefit the community.

A coalition called “Live Well Salina” meets once a month and the health department is a member of the coalition and partakes in decision making. The mission of the coalition is to provide all Saline County residents opportunities, education, and encouragement for a lifetime of healthy eating and physical activity. The people on the coalition are from many different parts of the community and have a mix of expertise and opinions. The coalition was very focused on food access and healthy eating. The

electronic benefit transfer (EBT) system is for low income families that need government assistance for acquiring enough food for their family. The coalition has systems in place that let people with EBT buy food from the farmers market. They are also trying to get a grant to set up a system where someone can come in and use their EBT money and then the farmers market would give them a voucher for the same amount of money the following week. This way the people in need can get twice as much food for the same price. This is very interesting because people on EBT had been excluded from farmers markets for almost thirty years and they are just now able to use the money at farmers markets. The coalition is also really focused on getting healthy food in the city-run concession stands. The concession stands are contracted to food vendors so the coalition reviewed the contracts and set standards requiring that 25% of the food offered must consist of healthy options. The vendors strongly opposed this change and threatened to leave the city concession stands, so the coalition decided to phase the requirements in over time. The stands must have 10% healthy food and then increase the amount of healthy food each year. This could really impact what a child might be eating at the pool or at the ballpark which could help combat some of the childhood obesity problem and encourage better choices.

I was also able to attend the inaugural meeting of a new coalition established to address the issues of human trafficking. Being located at the junction of two major highways, I-135 and I-70, makes Salina a potential hub for human trafficking. This coalition's purpose is to educate hospitals, health departments, women's shelters and other organizations about how to recognize behavior that may be related to human trafficking and who to contact when something suspicious is happening. Many women

who are victims of sex trafficking will go out and try to sell products such as jewelry around town. The victims may also not have access to their own money or be accompanied by another person everywhere they go, such as a doctor's office.

EpiTrax

The majority of my responsibilities at the Saline County Health Department were related to the use of EpiTrax, the epidemiological tracking system that Kansas uses to track disease in the state. Hospitals and doctors' offices have to report communicable diseases to the state so they can track the spread of disease and outbreaks. Cases of communicable diseases would be assigned to Saline County so that they could be investigated. Each disease has a specific investigation process that seeks to answer a variety of questions to understand where the disease came from and where it might spread. The investigation process for most diseases included gathering demographic information about the person affected and some information that would be needed to indicate the cause of the disease. For example in a *Campylobacter jejuni* case, demographics would be gathered and the person would be asked if they had eaten any undercooked foods, been around any farm animals, or consumed any untreated water. The investigation process outlined in the system is specific to the disease being investigated.

The ongoing investigation of child and adult elevated blood lead level cases required collection of a large amount of demographics for the state. The state would then use those demographics for an in-depth investigation that included an extensive interview with the parents about where the parents worked, their child's behavior, where other than the home the child spent time, and any other factors that could affect their lead levels.

Then the state tested the water in the home, and soil samples near the home for presence of lead. Salina used to have quite a few small family owned gas stations that sold leaded gas that were torn down many years ago and then houses were built on those locations, so the soil was of major interest. The health department and the state had to work together to make sure the public was informed and educated about what was happening. The Director and the head nurse had weekly conference calls with the state to make sure they had all the up-to-date information and that the health department was doing what they were supposed to be. In the beginning of the investigation the state and the county health department were not on the same page so it made for a lot of confusion for both entities and the public.

For adult lead cases, the state let the health department do the majority of the investigation. Adults can be exposed to lead at work or with their hobbies. Most of the adults with high blood lead levels worked at the battery factory where they were in direct contact with lead all day. The factory does take precautionary methods to prevent high lead levels in their employees and they train employees to use the precautionary measures, but people do not always use those precautions or their masks do not fit properly. Many of the people that needed to be contacted were already in EpiTrax because they had previously been identified as having elevated blood lead levels in the past from working at the battery plant. Other than where the person was employed their hobbies were investigated; high-risk hobbies include reloading bullets or making fishing sinkers. The age of their home was also of interest because older homes, typically before 1960, may have lead pipes or copper pipes with lead solder which over time may begin to leach into the water that the household is drinking. It was also important to know if the

person was born in the United States or not because in other countries they use some pottery and other products that contain lead and they may have been exposed to lead in their country of origin.

Other cases that the health department investigated were cases of tularemia, *Campylobacter*, chickenpox, and hepatitis B and C. These cases were harder to gather information for because many people didn't feel comfortable sharing some of the information that was needed to investigate their cases. For hepatitis, the state needed to know if the patients had used IV drugs and how many women or men the patients has had sex with. This can be very sensitive information and difficult to extract from a person. Making sure the person was comfortable and that they understood that the information they shared was confidential was important to get truthful information. Many people were married or had very high standing in the community so if the information got out it could really affect their lives. If the patient wasn't a chronic patient, who was already in the system for hepatitis, we had to call the patient's doctor and make sure they knew that they had this disease before we called them. It is not the health department's place to tell them that they have a serious disease.

There were four *Campylobacter* cases in June and July. Some people were confident that they knew exactly where they got the illness and some people had had this illness for over a month before they went to the doctor. Foodborne illnesses are investigated by the county health department to make sure that there is not a large outbreak going on that KDHE needs to investigate. There was only one small outbreak but the other two people that became ill were not in our jurisdiction so we could not investigate them.

Historical Foodborne Illness

During June and July an inquiry into the historical data of foodborne illnesses in Saline County was needed to see if the health educators were missing an important population in the community. EpiTrax saves all the data that the state has and allows EpiTrax users to go back into the records to understand the patterns of disease. The data showed that there were 20 cases of foodborne illnesses in the past three years. Of the people who had foodborne illness 12 were employed, 5 were unemployed and 3 were students (see figure 1.4). The ethnicity information indicated 19 cases were Non-Hispanic white and 1 was Hispanic (see figure 1.3). The mix of gender was 11 men and 9 women (see figure 1.1). The majority of cases happened in people under the age of 30 (see figure 1.2). This may be because the under 30 population has a lower food safety knowledge and because small children are more susceptible to foodborne illness. This led to county to believe that educational efforts should be targeted at the under-30 population that may have small children.

Community Outreach Events

There were several community outreach events that were based on the needs of Saline County. There was a canning class that taught the importance of proper canning to prevent foodborne illness and a Becoming a Mom program. Becoming a Mom is a program run by Maternal and Child Health in Saline County to educate first-time moms but is also open to women who have had children before. The program is funded by a grant so that the moms can get a prize such as a stroller, a car seat, or a playpen, if they complete all six sessions. Receiving one of these items could make all the difference for someone on a small budget. The women who attended the class ranged anywhere from

high school students to highly successful older women. It makes sure that the women get all the information they need to give their baby a good start in life and to make sure they know what to expect. They also educate the mothers on the “baby blues” and on post-partum depression and what is normal and what is not and when they should seek help. It also gets the women in the Maternal and Child Health system so that when they do in-home checks after the baby is born they already know who the women are. The MCH program was also getting ready to start a daddy class that would accompany the Becoming a Mom class and would teach men the importance of children having a father and how they can help out with an infant.

Tuberculosis Patient Visits

Visiting tuberculosis patients is part of the daily functions of the health department. Patients with confirmed active infection must take medication every day for two months and then every other day for four months. The medication must be administered by a nurse. One of the active infections that the tuberculosis nurse went to visit was being tested for tuberculosis via sputum for further testing. The lab does a one-day growth and a six-week growth, and this man had come back negative for the one-day but positive for the six-week test. He needed to begin the medication the next day so the tuberculosis nurse would have to come to the house every day for two weeks since the man was not allowed to leave the house for two weeks so that the medication could take effect. After two weeks, he could come to the health department every day to take his medication. The man’s family had to end up being tested because his test came back as highly infectious. His wife did end up having latent tuberculosis; she was put medication to ensure she didn’t get an active tuberculosis infection. The other people in the house

tested negative and they will be safe around the gentleman after he has been on his medication for two weeks. The tuberculosis nurse thinks that the patient may have had a latent infection for 20 years or more and probably picked it up in Mexico since his family goes back every year to visit. People who are born in Mexico and many other countries are vaccinated with the Bacillus Calmette–Guérin vaccine to protect them against tuberculosis. This vaccine is not fully protective but for countries with a high tuberculosis infection rate, it is a better option than doing nothing. If a person becomes infected with tuberculosis the state of Kansas pays for the medication if patients do not have insurance because it is so highly infectious the state does not want someone who cannot pay for their medication to infect a large number of people.

Objectives and Competencies

Throughout my field experience I used the five core competencies, (biostatistics, environmental health sciences, epidemiology, health services administration and social and behavioral sciences) established by the MPH program. I had to use my statistics knowledge to put together the data from EpiTrax and to put together the data from the food safety knowledge survey. I think environmental health helped me to understand how lead may have become such a problem in Saline County and how proper clean up could have prevented some of the child lead cases. The epidemiology knowledge I have gained has helped me make assumptions and to better understand data. While learning what the job of director of a health department entailed I learned more about the health services administration and helped me to understand the importance of the information taught in the class. While putting together the survey and thinking of possible ways to improve the

survey and educate the public I used many concepts from the social and behavioral sciences and that knowledge helped me understand how someone might answer a survey.

Figure 1.1- The gender distribution of the reported foodborne illness cases from the past three years in Saline County. Gender distribution is 11 female cases and 9 male cases.

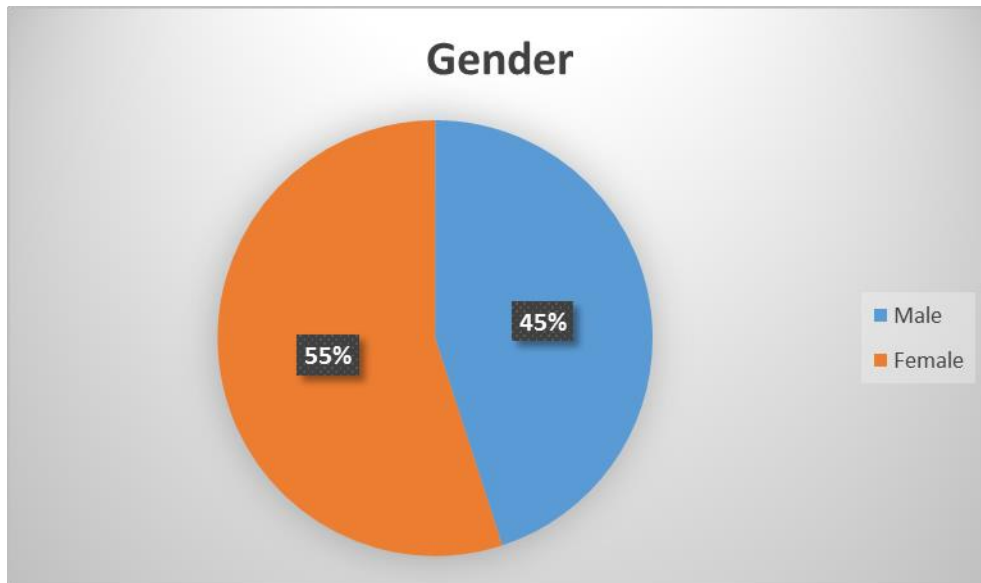


Figure 1.2- The age distribution of the reported foodborne illness cases from the past three years in Saline County. The population under 30 and over 61 were the most common age groups for foodborne illness.

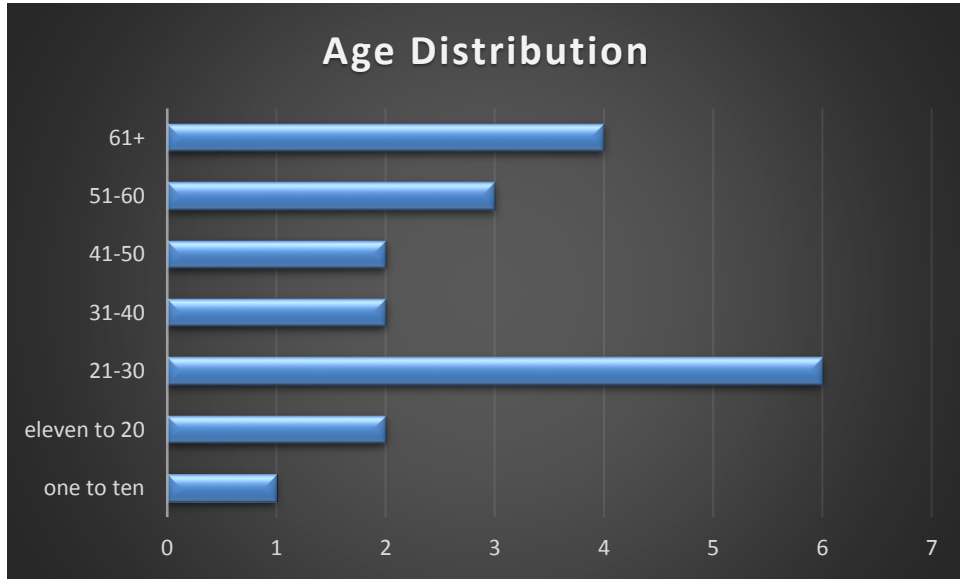


Figure 1.3- The distribution of ethnicity in reported foodborne illness cases from the past three years in Saline County.

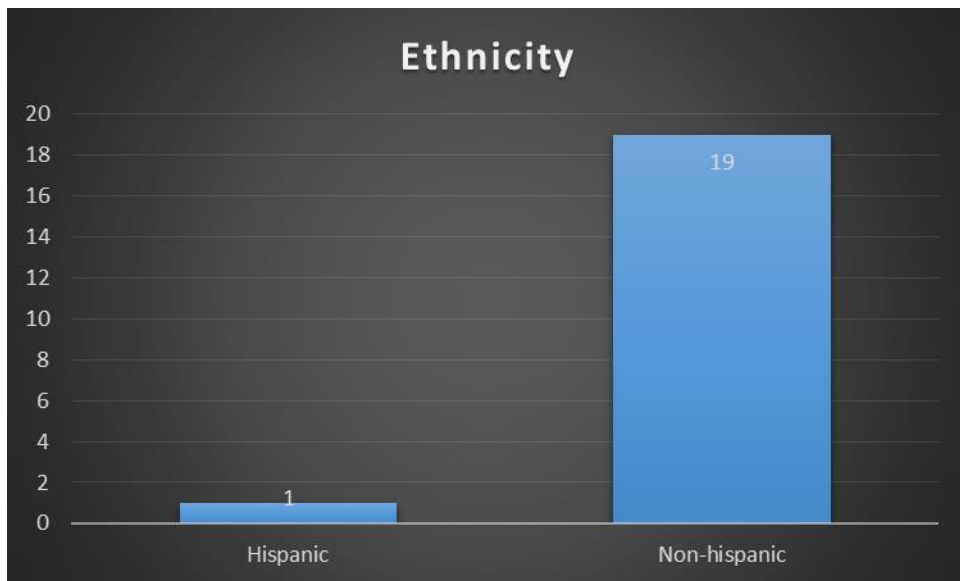


Figure 1.4- The distribution of employment in reported foodborne illness cases from the past three years in Saline County.

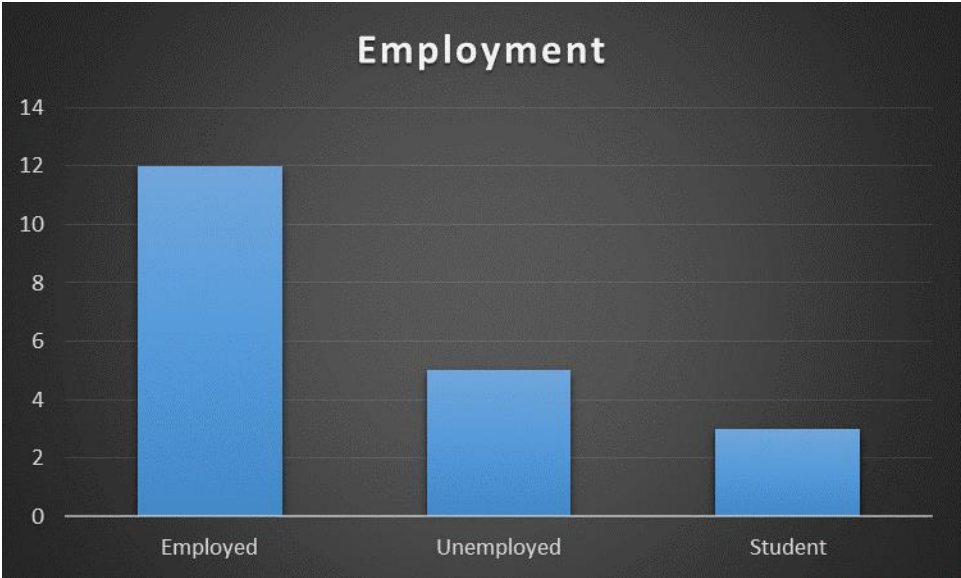


Figure 1.5- Survey utilized to determine if children were candidates for blood lead screening.

Dear Parent/Guardian:

This questionnaire is to determine your child's lead risk. If your child is 6 months to 6 years of age, he/she should have a blood lead test. Please answer the questions and complete the consent at the bottom of the page.

- 1) Does your child live in or regularly visit a house or apartment built before 1960?
YES NO
- 2) Does your child live in or regularly visit a house or apartment built before 1960 with ongoing, previous, or planned renovation? YES NO
- 3) Have a family member with an elevated blood lead level? YES NO
- 4) Interact with an adult whose job or hobby involves lead (battery factory, steel smelter, stained glass, etc.)? YES NO
- 5) Does your child live near a battery plant, lead smelter, or other lead industry?
YES NO
- 6) Does your family use pottery, ceramic, or crystal wear for cooking, eating, or drinking?
YES NO

If the answer is YES or UNKNOWN to any of the questions, a blood lead test is necessary!

I give permission for my child, named on this form, to participate in the Kansas Healthy HOMES and Lead Hazard Prevention Program, including the collection of specimen for a lead test. I understand the following procedures will ordinarily be done in this program.

- 1) Medical and limited information concerning the child and family members will be recorded.
- 2) Specimens of blood will be obtained from the child for laboratory determinations.
- 3) If a child has a blood lead level above 5ug/dL, necessary follow-up tests will be advised and the child referred to a primary care physician.

Child's Name

Street Address

Date of Birth

City, State, and Zip Code

Primary Care Doctor

Parent/Guardian Telephone Number

Gender: Male _____ Female _____

Ethnicity: Hispanic or Latino Yes No

Medical Card Number (if applicable)

Race: ___Asian___Black/AfricanAmerican

___American Indian/Alaska Native

Name of Parent/Guardian

___Pacific Islander/Hawaiian Native

Signature of Parent/Guardian

___White___Unknown/NotReported

Figure 1.6- Survey utilized to determine if adults were candidates for blood lead screening.

ADULT LEAD POISONING QUESTIONNAIRE:

_____ Name	_____ Date of Birth
_____ Street Address	_____ City, State, and Zip Code
_____ Telephone Number	_____ Email Address
_____ Primary Care Doctor	_____ Employer
Gender: ___ Male ___ Female	Ethnicity: Hispanic or Latino Yes No
Race: ___ Asian ___ Black/African American ___ American Indian/Alaska Native	
___ Pacific Islander/Hawaiian Native ___ White ___ Unknown/Not Reported	

EXPOSURE:

Description of Job _____

Job Duties (Check all that apply)

- ___ Metal Work: Cutting/burning/welding painted surfaces or lead containing scrap metal
- ___ Painting and Lead Paint Abatement
- ___ Containment: erecting/removing barriers and covers
- ___ Paint Removal: dry scraping, chemical removal, power sanding, burning, abrasive blasting
- ___ Paint Applications: brushing, spraying
- ___ Cleanup: sweeping, standard vacuum, HEPA vacuum
- ___ Demolition
- ___ Battery manufacturing/recycling
- ___ Lead soldering/Lead smelting
- ___ Auto repair: radiator, etc.
- ___ Wire or cable manufacturing/recycling/working with
- ___ Stained glass work
- ___ Pottery/ceramics
- ___ Firing range
- ___ Home remodeling
- ___ Folk medicines
- ___ Other (please explain) _____

PLEASE ANSWER THE FOLLOWING QUESTIONS

- 1) Do you use any protective measures at work? If so, what? _____
- 2) Do you: Eat or drink in the work area? Yes No
Smoke in the work area? Yes No
Wash your hands before eating, drinking, or smoking? Yes No
Wear work clothes/shoes home? Yes No
- 3) Are facilities available for the following at your workplace?
 - a) Handwashing Yes No
 - b) Showers Yes No
 - c) Clothing changes Yes No
- 4) Do any children live at the address where you live? Yes No
- 5) How many children? _____
- 6) What ages are the children? _____
- 7) Are you or your significant other pregnant or planning to become pregnant? Yes No
- 8) What year was your home built? _____
- 9) Are there any known lead hazards in your home? Yes No
If you answered "Yes", what are they? _____
- 10) Are you currently suffering symptoms of lead poisoning? (Check all that apply.)
None ___ Weight loss ___ Fatigue ___ Poor sleep ___ Metallic taste in mouth ___
Loss of appetite ___ Abdominal pain ___ Nausea/vomiting ___ Constipation ___
Irritability ___ Headaches ___ Memory problems ___ Difficulty in concentrating ___
Numbness or tingling of hands/feet ___ Joint pain ___ Changes in sex drive ___
Other (Please explain) _____

Signature of Client

Date

Signature of Staff

Date

Revised 7/5/2011

Chapter 2 - Capstone Project

Introduction

Saline County is a small county with 55,740 residents, yet the county experiences several reported foodborne illness cases every year with relationship to its size. Not all foodborne illnesses are reported to the state because many people do not go to the doctor for foodborne illnesses until they become severe. With the amount of foodborne illnesses reported and the lower average income of the county it raises the question of how poverty levels relate to food safety knowledge and a person's risk of foodborne illness. The Saline County Health Department wanted this data so that they would be able to determine where best to focus their educational efforts.

Literature Review

Food safety is a major concern for all people but of more concern for people below the poverty level because many health outcomes are influenced by socioeconomic status. If a person has no access to health care because of not having insurance or their location then they may have to pay out of pocket or travel long distances to get to a doctor and may put themselves in debt. This means that we should make sure that people can go to the doctor and seek the medical treatment that they may need for a foodborne illness without fear of a large bill that they may never be able to repay. Since the United States does not have a universal health care system we have huge inequalities in health care. Even with the Affordable Care Act and the expansion of Medicaid, many people are still without healthcare. In rural communities the health inequality may look very different. The person may have some type of insurance but may not have access to a doctor nearby or may not have a car to get to a doctor that may be miles away. In the state of

Kansas Medicaid has not yet be extended, so adults who are below the poverty level are not eligible for Medicaid unless they have special circumstances or have children under the age of 19 (KDHE, 2015).

The World Health Organization estimates that foodborne diarrheal disease caused 420,000 deaths worldwide in 2010 (Lawe-Davies, 2015). This is a large number of people; good hygiene and food safety knowledge could potentially have saved some of these people's lives (Lawe-Davies, 2015). Many of the people who developed foodborne illness were in low-income families and didn't have access to a doctor or the means to go to one. In a low income situation such as being below the poverty level it may be difficult for people to get to a doctor. If the person is in a rural area public transit may not even be an option for those without a car. Other than being just a health issue, foodborne illnesses costs billions of dollars each year. Educating people about how to prevent foodborne illness could save millions of dollars for insurance companies and for the countries themselves if they have a universal health care system (Grace, 2015).

The increased farm-to-fork distance increases the likelihood and spread of foodborne illness due to the globalized nature of the food system (Institute of Medicine, 2012). Many grocery stores such as Walmart and Hy-Vee are attempting to use local produce to try and reduce the farm-to-fork distance. Local food is often loosely defined as food produced within a 400 mile radius (Martinez, 2010). Reducing farm-to-fork distance is not always feasible for some produce that cannot be produced in that region or if the market is small and there is no push for local food, they are going to purchase the food that is the cheapest (Hy-Vee, n.d.). The small markets such as privately owned stores may face challenges because they are small and may not bring in much revenue and may not be able to afford to stock local food.

Research suggests that independent ethnic foodservice facilities such as small ethnic markets may have an increased risk for foodborne illnesses (Quinlan, 2013). They may not have proper training on how to keep food safe for consumption or they do not have the resources to keep food cold or to get the food when it is the freshest. Fresh produce in these places are lacking and if they have them they may have been in the system for longer and been touched by more hands and exposed to more pathogens. Food in a small market or convenience store may not have been stored properly leaving people at higher risk of foodborne illness. Small markets may have barriers that keep the food from being safe for their customers such as pest infestation, poor infrastructure, poor refrigeration, language barriers, and small number of staff that may not be trained properly (Signs, 2011).

The long term health effects of foodborne illness are not fully understood and may lead to health problems later in life (Grace, 2015). Many people do not know what is safe and unsafe when it comes to preparing and storing food; this knowledge gap can lead to foodborne illness which could prove deadly. Many low-income families do not have access to resources such as a thermometer for making sure meat is fully cooked and/or disinfectant/sanitizer for cleaning surfaces and may not be able to fully protect themselves from foodborne illness (Quinlan, 2013). Some people, even here in the United States, do not have access to a refrigerator and so they must be educated on other methods to keep themselves safe. Many people in the United States still die from lack of application of food safety knowledge. People with compromised immune systems such as small children and the elderly are very susceptible to foodborne illness and it can become life threatening for them. Still births and spontaneous abortions can happen from certain foodborne illnesses.

Food safety knowledge in young adults is very poor (Green & Knechtges, 2015). When young adults move away from home and maybe start their own family they lack knowledge of food safety and that may put them at risk. This becomes even riskier when they are responsible for taking care of high risk populations such as the elderly and children. Children and elderly people may have weaker immune systems making them more vulnerable to foodborne disease (Green & Knechtges, 2015). The lack of food safety knowledge in young adults suggests that these young adults aren't being taught about food safety from their parents. Some people do not have time to cook or do not have their children help in the kitchen so they never have a chance to learn. Food safety knowledge may be something that needs to be taught in school or during supplemental programs that could be facilitated by the health departments or extension agencies.

Fresh produce should be washed and cleaned properly to minimize potential contaminants. The FDA and USDA suggest washing produce with running water for at least 30 seconds and scrubbing produce that has a firm surface, such as a potato, with a brush (USDA, 2013). The USDA and FDA do not recommend washing produce with a cleaning product even if it is labeled for produce, many of the cleaning products have not been cleared by the FDA. Many people do not wash their produce before consumption, which could lead to a foodborne illness. Agriculture workers may not have access to hand washing station, portable bathrooms, or hand sanitizer. These workers also may not have proper training on what could lead to a foodborne illness (Grace, 2015).

Research Question

The research question for this survey was “Does food safety knowledge have any correlation to poverty level?” The historical data from EpiTrax did not give any insight to

poverty level of the person who became ill so a survey of the population was done to gather data to understand the population's food safety knowledge.

Methods

A food safety knowledge survey was created for use in this project. The questions for the survey were based on a survey used by Kwon *et al* in 2008, which evaluated the food safety knowledge of WIC participants, and on a government survey that evaluated food safety knowledge of children (North Carolina Department of Agriculture and Consumer Services). The survey was tested by the health educators at the Saline County Health Department to make sure everything was easy for everyone to understand. The questions and answers were targeted at an eighth-grade reading level. The questions in the survey were tested by the health educators at the Saline County Health Department. The survey used in this program included questions about demographics including education level, ethnicity, age, income level, number of members in the household, and if the participants had received any food safety training. The demographic information was used to determine poverty level based on the United States poverty guidelines (Poverty Guidelines, 2016). Income level can also give insight to what kind of stores respondents may have access to. Low-income populations may not have access to large grocery stores where the food is presumed safe, they may only have access to places such as a convenience store and/or a small market (Quinlan, 2013). It is also important to know income level because it may relate to lack of resources such as a thermometer and disinfectant (Quinlan, 2013). The survey also asked if respondents had a foodborne illness in the past two years because that may influence their food safety knowledge. If a person has had a foodborne illness then they may have learned more about food safety to prevent further illnesses.

The survey was distributed via social media on the Saline County Health Department's Facebook page on July 1st and closed on July 8th. Social media had not been used to distribute a survey before at the Saline County Health Department. The data was collected through Google forms and the data was compiled in Excel for analysis. Respondents were categorized as being either above or below the poverty level, based on their income and family size using the government poverty level chart. The number of questions answered incorrectly by the respondents and their poverty level was analyzed using SAS and put into an ANOVA table to determine the mean and standard deviation of the data.

Results and Discussion

The survey received 140 responses. This survey had many limitations; since the survey was distributed via social media the participants are limited to people in the community that follow the Saline County Health Department's Facebook page. A large part of the population may not follow the health department on Facebook or they may not have access to a computer or the internet.

Table 2.1 – Poverty Guidelines for the United States based on income level and family size.

2016 POVERTY GUIDELINES FOR THE 48 CONTIGUOUS STATES AND THE DISTRICT OF COLUMBIA	
PERSONS IN FAMILY/HOUSEHOLD	POVERTY GUIDELINE
For families/households with more than 8 persons, add \$4,160 for each additional person.	
1	\$11,880
2	16,020
3	20,160
4	24,300
5	28,440
6	32,580
7	36,730
8	40,890

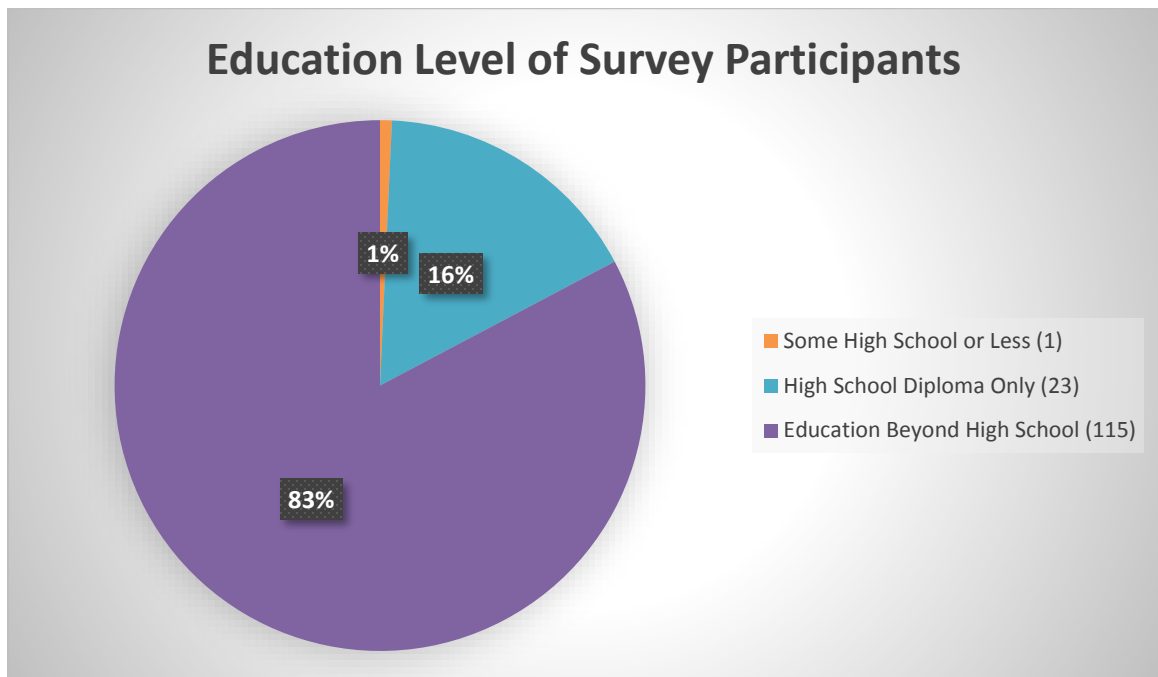
*(United States Department of Health and Human Services, 2016)

After the demographics were collected, the family size and income level were used to determine if the family fit the criteria to be placed above or below the poverty level as per guidelines shown in Table 2.1. A family had to be above the income level stated in the chart to be considered above the poverty level. For families that had more than eight people, \$4,160 had to be added per family member above eight. Of the survey participants 121 (86%) were above the poverty level and 19 (14%) were below. The one-sided nature of this data, having most of the participants above the poverty level and very few below, limits the power and usefulness of the data. If the participants responding to the survey had been more evenly split between those above and those below the poverty level then more assumptions could have been made.

Table 2.2 – Number and percent of survey respondents above and below the poverty level.

Poverty	Number of Participants	Percent
Above	121	86.43
Below	19	13.57

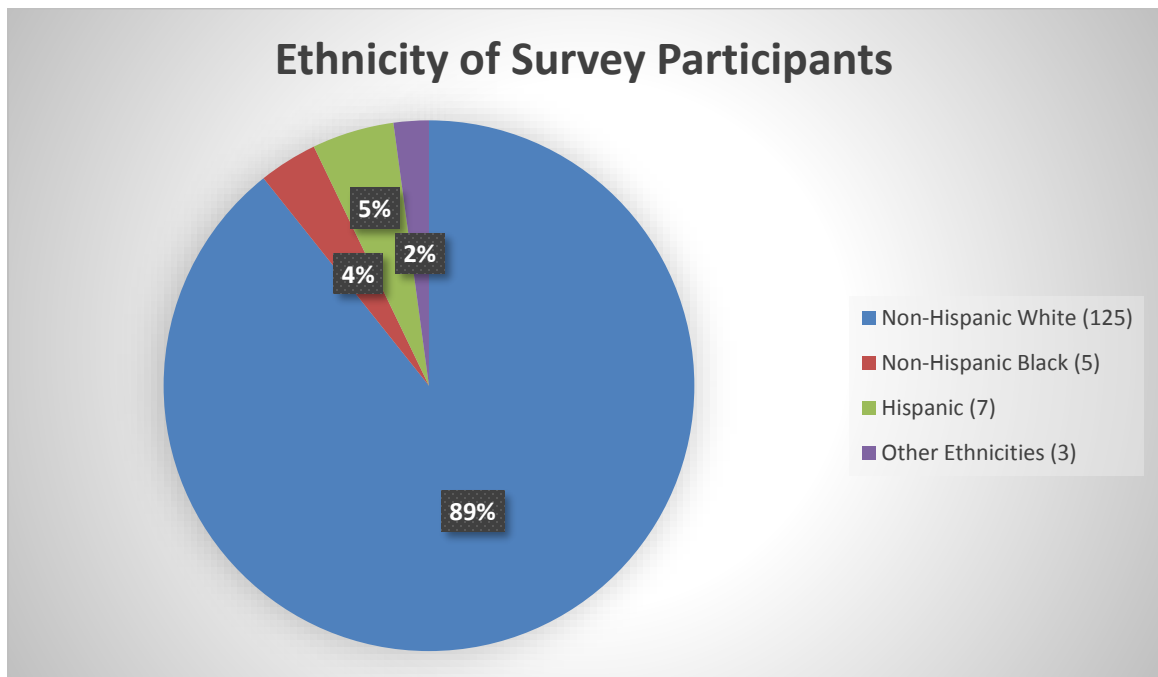
Figure 2.3 - Education level of participants who responded to the food safety survey.



The education level of the participants in the food safety survey is summarized in Figure 2.3. Of the 140 respondents, 115 (82%) had some education beyond high school, 23 (16%) had a high school diploma, 1 person had some high school or less, and 1 person did not respond to this question. Most of the participants in this survey had a higher education level than expected. This

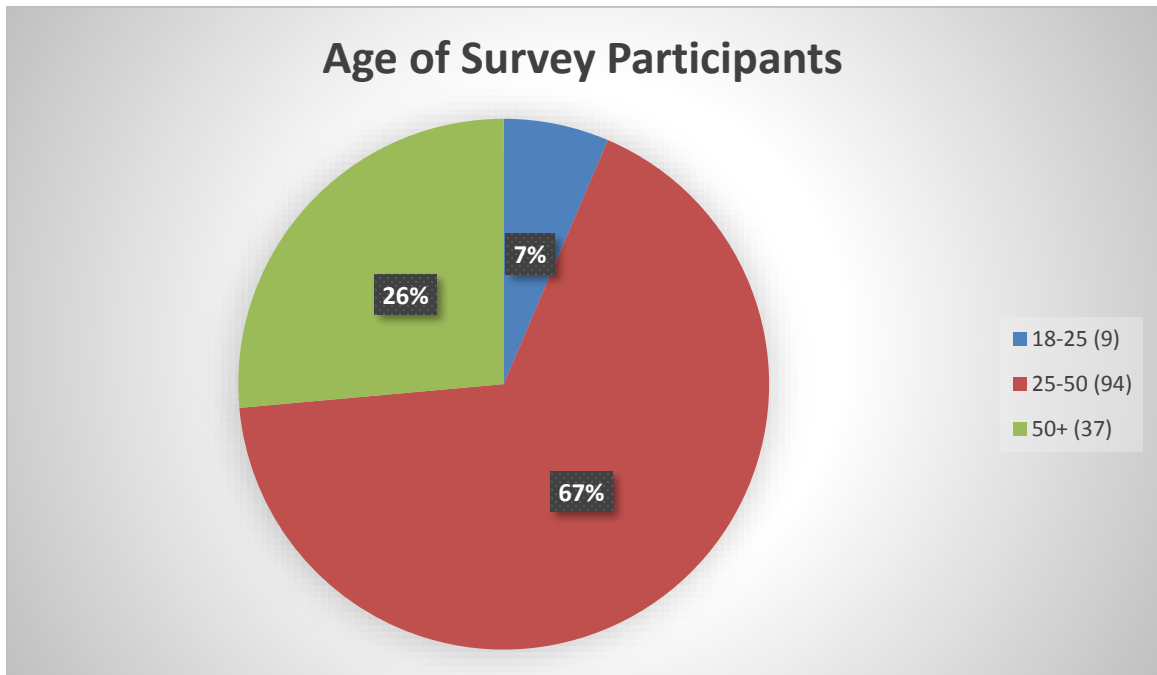
may be because the survey was distributed via Facebook and the people following the health department may have a higher education level. There are 426 followers of the Saline County Health Departments Facebook page. About 33% of the followers of the Saline County Health Department's page answered the survey. The participants may have had a higher education level because people with a higher education level may be more willing to participate in a survey put out by the health department.

Figure 2.4 - Ethnicity of participants who responded to the food safety survey.



The ethnicity of the participants responding to the food safety survey is shown in Figure 2.4. Of the 140 respondents, 125 (89%) were Non-Hispanic white, 5 (4%) were Non-Hispanic Black, 7 (5%) were Hispanic, and 3 (2%) classified themselves as other ethnicities.

Figure 2.5 - Age range of participants who responded to the food safety survey.



The ages of participants were taken in ranges of 18-25, 25-50 and 50+. The ranges were split this way because research has shown that younger adults in the 18-25 range have lower food safety knowledge than their older counterparts (Green & Knechtges, 2015). The ages of people responding to the survey are shown in Figure 2.5. There were 9 (6%) participants in the 18-25 range, 94 (67%) in the 25-50 range, and 37 (26%) in the 50+ range.

Within the survey there were 11 questions related to food safety knowledge. The questions that were answered incorrectly most often were the “How long should food be microwaved?” question, which 72 participants (51%) answered incorrectly and the “What tells you if a ground beef patty is cooked?” question, which 54 participants (39%) answered incorrectly. Overall the mean number of questions answered incorrectly was 1.8 and the standard deviation was 1.24. Mean was used to interpret differences in data because the median was the same for many data sets and did not show any significant differences in the data.

Table 2.6 – Number of food safety questions answered incorrectly by age range.

Questions Answered Incorrectly	18-25 (n=9)		25-50 (n=94)		50+ (n=37)	
	Number of Participants	Percentage	Number of Participants	Percentage	Number of Participants	Percentage
0	1	11%	12	13%	6	16%
1	1	11%	27	29%	8	22%
2	2	22%	31	33%	12	32%
3	3	33%	13	14%	9	24%
4	2	22%	7	7%	1	3%
5	0	0%	3	3%	1	3%
6	0	0%	1	1%	0	0%

Number of Questions Answered Incorrectly			
Age Group	18-25 (n=9)	25-50 (n=94)	50+ (n=37)
Mean	2.4	1.9	1.8
Median	3.0	2.0	2.0
Standard Deviation	1.3	1.3	1.2

The 18-25 age range had the highest mean number of questions answered incorrectly at 2.4, followed by the 25-50 age range with a mean of 1.9 and the 50+ age range had the lowest mean at 1.8 as shown by Table 2.6. This is consistent with the research that states that young adults have very poor food safety knowledge (Green & Knechtges, 2015). The 50+ range had the highest percentage of participants with 0 questions answered incorrectly at 16%. The 25-50 range had the highest percentage of people answering 2 or less questions incorrectly at 75%. The 18-25 range had the highest percentage of people answering 3 or more questions wrong at 55%.

Table 2.7 – Number of food safety questions answered incorrectly by participants based on education level.

Questions Answered Incorrectly	Below High School Diploma (n=1)		High School Diploma (n=23)		Beyond High School (n=115)		No Answer (n=1)	
	Number of Participants	Percentage	Number of Participants	Percentage	Number of Participants	Percentage	Number of Participants	Percentage
0	0	0%	3	13%	16	14%	0	0%
1	0	0%	3	13%	32	28%	1	100%
2	0	0%	9	39%	36	31%	0	0%
3	1	100%	5	22%	19	17%	0	0%
4	0	0%	3	13%	7	6%	0	0%
5	0	0%	0	0%	4	4%	0	0%
6	0	0%	0	0%	1	1%	0	0%

Number of Questions Answered Incorrectly				
Education Level	Below High School Diploma	High School Diploma	Beyond High School	No Answer
Mean	3.0	2.1	2.1	1.0
Median	3.0	2.0	2.0	1.0
Standard Deviation	0.0	1.2	1.2	0.0

Participants with a high school diploma had a mean number of questions answered incorrectly of 2.1 and participants with education beyond high school had a mean of 2.1 as shown by Table 2.7. The beyond high school group had 73% of participants answering 2 or less questions incorrectly and the high school diploma group had 65% of participants answering 2 or less questions incorrectly.

Table 2.8 – Number of food safety questions answered incorrectly based on the participant’s Ethnicity.

Questions Answered Incorrectly	Non-Hispanic White (n=125)		Non-Hispanic Black (n=5)		Hispanic (n=7)		Other (n=3)	
	Number of Participants	Percentage	Number of Participants	Percentage	Number of Participants	Percentage	Number of Participants	Percentage
0	18	14%	1	20%	0	0%	0	0%
1	30	24%	3	60%	1	14%	2	67%
2	40	32%	1	20%	4	57%	0	0%
3	23	18%	0	0%	1	14%	1	33%
4	9	7%	0	0%	1	14%	0	0%
5	4	3%	0	0%	0	0%	0	0%
6	1	1%	0	0%	0	0%	0	0%

Number of Questions Answered Incorrectly				
Ethnicity	Non-Hispanic White (n=125)	Non-Hispanic Black (n=5)	Hispanic (n=7)	Other (n=3)
Mean	1.9	1.0	2.3	1.7
Median	2.0	1.0	2.0	2.0
Standard Deviation	1.3	0.7	1.0	1.2

The Hispanic ethnicity group had the highest mean at 2.3 questions answered incorrectly, followed by the Non-Hispanic White group at 1.9, followed by the “other” group at 1.7 and the Non-Hispanic Black group at 1 as shown by Table 2.8. The Non-Hispanic Black group has the higher percentage of participants answering 2 or less questions incorrectly at 100%, followed by the Hispanic group at 71%, the Non-Hispanic White group at 70% and the “other” group at 67%.

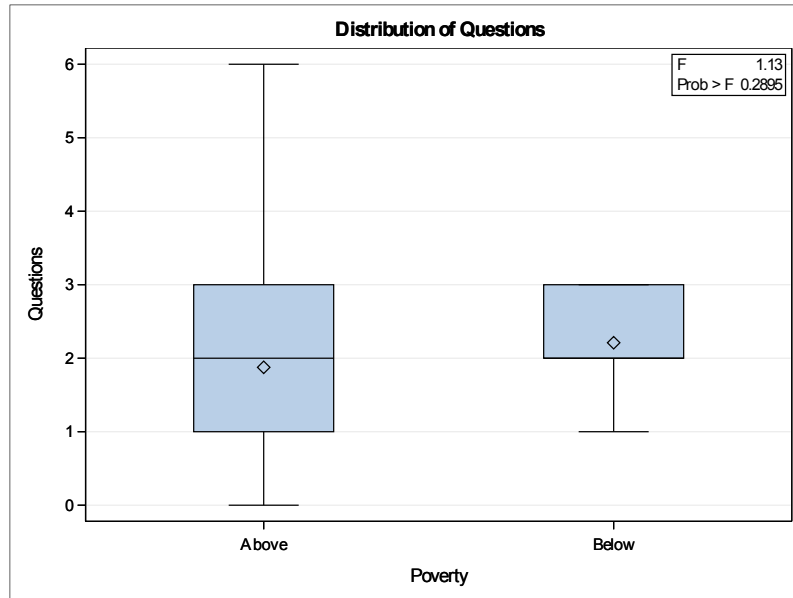
Table 2.9 – The mean number of food safety questions answered incorrectly based on whether participants self-identified as having, or not having, food safety training.

Had Food Safety Training	N	Questions Wrong	
		Mean	Std Dev
No	97	1.9	1.3
Yes	43	2.0	1.3

The participants self-identified whether they had received food safety training or not based on a “yes” or “no” question. This could include food safety training from employers, pamphlets, classes or anything else the participants may have felt taught them about food safety. In the state of Kansas WIC participants are offered a class on food safety or they are given a pamphlet on food safety. They are not required to take the class, they are only required to take the pamphlet. This could be considered food safety training, since food safety training was not defined in the survey, even if they only receive a pamphlet.

As shown in Table 2.9, all of the participants in the survey answered the questions asking if they had received some form of food safety training. Of the respondents 97 (69%) answered “no” and 43 (31%) answered “yes.” The mean number of questions answered incorrectly was 2.0 for participants who indicated they had received some type of food safety training and was 1.9 for those who reported they has no food safety training. These values were not significantly different ($p=0.83$).

Figure 2.10 – Number of food safety questions answered incorrectly by survey respondents based on poverty level status (n=121 above poverty level, n=19 below poverty level).



There were 121 (86%) participants that were considered above the poverty level and 19 (14%) participants that were considered below the poverty level. As shown in Figure 2.10, the number of questions answered incorrectly by participants who were above the poverty level ranged from 0 to 6 questions. The number of questions answered incorrectly by participants below the poverty level ranged from 1 to 3 questions. The median for the participants above the poverty level was 2 questions answered incorrectly and the mean was 1.8 questions answered incorrectly. The median for the participants below the poverty level was 2 questions answered incorrectly and the mean was 2.2 questions answered incorrectly. To determine if the differences in the means are significant the p-value was determined. The two tailed p-value was 0.09. With an alpha or significance level of 0.05, it can be said with 95% confidence that the means aren't

quite statistically different. It would take further data to determine if there is no correlation between poverty level and food safety knowledge.

Figure 2.11 – Survey questions for food safety survey.

Food Safety Questionnaire

Instructions

Please fill out the questionnaire to the best of your knowledge. The information that is shared will be anonymous and your name will not be shared.

Part I: Demographics

- 1) _____ **Education Level**
 - a. Some high school or less
 - b. High school diploma
 - c. Beyond high school
- 2) _____ **Ethnicity**
 - a. Non-Hispanic white
 - b. Non-Hispanic black
 - c. Hispanic
 - d. Other _____
- 3) _____ **Age**
 - a. 18-25
 - b. 25-50
 - c. 50 and above
- 4) _____ **Income level**
 - a. Under \$10,000
 - b. \$10,001-\$20,000
 - c. \$20,001-\$30,000
 - d. \$30,001-\$40,000
 - e. \$40,001 and above

5) _____ **Number of members in your household (including you)**

- a. 1
- b. 2
- c. 3
- d. 4
- e. 5 and above

6) _____ **Have you had any food safety training?**

- a. Yes
- b. No

Part II: Food Safety

1) _____ **A common place for food to get germs is**

- a. Cooking vesicle
- b. Refrigerator
- c. Freezer
- d. Cutting board

2) _____ **To sanitize a surface you should**

- a. Wipe it with a dry dish towel
- b. Wipe it down with soap and water
- c. Use a product containing bleach
- d. Use a window cleaning product

3) _____ **Cutting boards can be used to cut vegetables after it has been used to cut raw meat.**

- a. True
- b. False

4) _____ **How should frozen food be thawed?**

- a. On the counter
- b. In the fridge
- c. In the oven
- d. In the microwave

- 5) _____ **How should left over hot food be cooled and stored?**
- a. Cooled on the counter then put in the refrigerator
 - b. Cover and refrigerate immediately, no cooling
 - c. Leave on counter for later use
 - d. Cool, cover and refrigerate quickly
- 6) _____ **What tells you that a ground beef hamburger patty is cooked?**
- a. Color of the meat
 - b. Temperature of meat
 - c. Firmness of the meat
 - d. Juices that are coming out of the meat
- 7) _____ **If there is mold on cottage cheese, what do you do?**
- a. Throw away the entire package
 - b. Scoop out just the moldy part
 - c. Eat it anyway
 - d. Scoop out the moldy part and then a bit more to make sure you got it all
- 8) _____ **If the food looks and smells fine then it is safe to eat**
- a. True
 - b. False
- 9) _____ **Which is safer to eat?**
- a. Scrambled eggs
 - b. Sunny side up egg
- 10) _____ **How long should you microwave leftover food?**
- a. Till they are warm enough to eat
 - b. Till they are steaming
 - c. If they are cold they are still safe to eat
 - d. I don't reheat food in the microwave
- 11) _____ **When was the last time you had any foodborne illness (food poisoning, diarrhea, vomiting, etc.)**
- a. Under 6 months
 - b. 6 months to 1 year
 - c. 1 year to 2 years
 - d. I have never had a foodborne illness

Conclusions

In conclusion, participants who were below the poverty line answered an average of 2.2 questions incorrectly and participants who were above the poverty line answered an average of 1.8 questions incorrectly for a difference of 0.4 questions. The difference in the means is not significant at a p-value of 0.09. The p-value suggests that there is not quite a difference between the means of participants above and below the poverty level. If the sample size was larger and the data was more representative of the populations above and below the poverty level, then the data would be more useful in determining if there is or is not a correlation. There is not enough data to say that there is or is not a correlation between poverty level and food safety knowledge.

Many of the participants were below the poverty line because of the number of people in their household, making it even more important to educate participants to keep more people safe from foodborne illness. This may be because the participants below the poverty line do not have access to information or supplies to keep their families safe and that programs should be offered to them (Quinlan, 2013). The data also showed that participants that had received some form of food safety training did not score any different than participants without food safety training.

Participants who were in the 18-25 age range had a numerically higher mean number of questions answered incorrectly than any of the other age groups at 2.4. This is consistent with the research that states that young adults have poor food safety knowledge (Green & Knechtges, 2015). Participants with a high school diploma had 2.1 questions answered incorrectly and participants with beyond a high school diploma had 2.1. Hispanics had the numerically highest mean out of the ethnicities at 2.3 questions answered incorrectly. This could be because of many factors but it would be more useful if more data was collected for all ethnicities. If more data was

collected from all ethnicities it would determine if a population in Saline County is being undereducated and health educators could focus efforts on this population.

If more time was available to study data at the Saline County Health Department, the survey could have been administered to the WIC clients and to the mothers in the “Becoming a Mom” class. These two populations have a very important role in food safety because they are often the ones preparing the food and they are taking care of small children who are going to learn habits and cooking methods from their parents. Pregnant women are at a higher risk than the regular person because there are pathogens, such as *Listeria monocytogenes* and toxoplasmosis, which can cross the blood-placenta barrier that can injure the fetus mentally or physically or kill the fetus. They do teach food safety in Becoming a Mom and it is offered with the WIC program but is not required but I think that it would still be some beneficial data to collect.

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