Final Exercise

Epi-Ready

FINAL EXERCISE

Outbreak, Out West

Outbreak, Out West

This exercise will reinforce some concepts of the course. Working in your table groups, read the inject and answer the questions that follow. There will be short discussion following each inject.
On Wednesday, August 3rd, the West County Health Department received notice from the West Regional Hospital’s clinical laboratory that they just identified two cases of STEC with a syndromic, multi-analyte culture-independent diagnostic test, BioFire \textsuperscript{®} FilmArray \textsuperscript{®} System. The panel is a test that targets 22 pathogens. The two individuals stated they are traveling together and were in West County to participate in an all-day seminar on birds of prey in Peregrine State Park. The seminar was held on Saturday, July 31st but they were going to spend a few days after the seminar to see the sites in West County. As they were readying to drive home when Case A came down with a severe case of diarrhea and vomiting and decided that she needed to go to the hospital. Case B had stomach cramps and had a loose stool that morning and decided to get checked out just in case she may be coming down with a similar illness as her traveling companion. Their healthcare provider advised them it may not be a good time to travel so they extended their stay at the West Country Inn.

Question 1. Would you consider this an outbreak? Why or why not?

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Question 2. If you were the epidemiologist at the West County Health Department, what would be your next steps?

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Thursday Morning

As a member of the local health department team, would you notify the state health department at this time?

At this point, three cases have identified an event and three cases have yet to be interviewed. How would you approach these newly-identified cases?

On Thursday morning at 8:30, the local health department convened their “foodborne outbreak response team” to review the initial findings. The findings from interviewing the Case A and Case B were discussed with the team. Two additional cases have been identified by the hospital’s clinical lab by CIDT. The results came in after 5:00 P.M. and the results were retrieved off the electronic lab reporting system this morning. No follow up has been conducted on these possible cases. A complaint was received late Wednesday afternoon and the complainant was interviewed with the standard enteric disease reporting form. This case stated that they called because the diarrhea episode he was having concerned him as it is now bloody. The interviewer recalled that complainant-case also attended the all-day seminar this past Saturday. Two additional calls were received on the after-hours hot line. The messages have not been followed up upon but both individuals stated that they were ill with vomiting and diarrhea and one of the callers stated they were going to urgent care in the morning. Of the individuals interviewed, all stated that a box lunch was included as part of the experience. Case A stated that her box lunch contained a chicken sandwich and chips. Case B had a box lunch of a prepared salad. She recalled that her salad had a label that she always reads the ingredients label as she has dairy allergies. She did not recall if the label stated who made the salad. The complainant also recalled that he had a box lunch at the event but did not recall what he ate.
Thursday Afternoon

- How might participants at the event be identified?
- If the boxed lunch appears to be the focus of the investigation, what may be the next steps of the response team?

A follow up meeting Thursday afternoon of the outbreak response team revealed that the two newly-identified cases and the two callers also the had also attended the event. The caller that went to the urgent care clinic had also tested positive for STEC. The lead epidemiologist called the state epidemiology department to notify of the additional cases. The epidemiologist was informed that they have been notified by the neighboring state’s public health department that they have two confirmed cases of STEC in cases that have recently traveled to West County within the incubation period of STEC.
It appears apparent to the outbreak investigation team that they should focus on the birds of prey event and the box lunch.

Question 5. How might participants at the event be identified?

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Question 6. If the boxed lunch appears to be the focus of the investigation, what may be the next steps of the response team?

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_____________________________________________________________________________________
_____________________________________________________________________________________

Friday Morning

Friday Morning

- With the understanding that there are approximately 55 participants, and you possess a good description of the food consumed, what type of analytic study would you consider? Why?
- By reviewing the recipes, is there a boxed lunch that concerns you? Why?
- For this outbreak response a case definition would be:

Friday morning the team assembles to review the gathered information and establish the next steps. The environmental investigators have identified the vendor that supplied the boxed lunches as Raptor Deli. Raptor Deli is a concessionaire at the state park and is known for its homemade condiments and for the use of locally-sourced foods. The vendor supplied four different boxed lunches for the event. Sixty boxes were prepared for fifty-five participants.
Participants picked up their lunches at 11:00 AM prior to a short hike to observe some birds of prey in their native habitat. Raptor Deli supplied the following:

- 15 turkey sandwich boxes
- 15 chicken salad wrap boxes
- 20 ham sandwich boxes
- 10 mixed green salads

In addition to the main entree, the boxes contained a bag of potato chips, an apple, and a chocolate chip cookie. Participants were encouraged to provide their own beverages as state park policy did not allow the purveyance of commercially-bottled water.
The ingredients of the entrees were obtained from the vendor and are provided below.

<table>
<thead>
<tr>
<th>Mixed Green Salad Ingredients:</th>
<th>Chicken Salad Wrap:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4 cup extra-virgin olive oil</td>
<td>2/3 cup olive oil</td>
</tr>
<tr>
<td>2 tablespoons fresh lime juice</td>
<td>1/4 cup lime juice</td>
</tr>
<tr>
<td>1 tablespoon freshly grated gingerroot</td>
<td>1/4 cup minced fresh cilantro</td>
</tr>
<tr>
<td>Salt and freshly ground black pepper</td>
<td>1/2 teaspoon ground cumin</td>
</tr>
<tr>
<td>6 cups mixed greens</td>
<td>1/2 teaspoon salt</td>
</tr>
<tr>
<td>2 tomatoes diced</td>
<td>1/4 teaspoon crushed red pepper flakes</td>
</tr>
<tr>
<td>1 cup peeled and diced cucumber</td>
<td>4 cups torn leaf lettuce</td>
</tr>
<tr>
<td>1 cup sliced red onion</td>
<td>2 cups cubed cooked chicken</td>
</tr>
<tr>
<td>1/8 cup chopped fresh mint leaves</td>
<td>Flour tortilla wraps</td>
</tr>
<tr>
<td>3/4 cup fresh picked cilantro leaves</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ham Sandwich:</th>
<th>Turkey Sandwich:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thinly-sliced ham</td>
<td>Thinly sliced turkey breast</td>
</tr>
<tr>
<td>Mild cheddar cheese</td>
<td>4 pieces of bacon</td>
</tr>
<tr>
<td>Leaf lettuce</td>
<td>Provolone cheese slice</td>
</tr>
<tr>
<td>Tomato slices</td>
<td>½ Thinly sliced avocado</td>
</tr>
<tr>
<td>Dill pickle</td>
<td>Tomato slices</td>
</tr>
<tr>
<td>Homemade mustard in single service containers</td>
<td>Leaf lettuce</td>
</tr>
<tr>
<td>Homemade mayonnaise in single service containers</td>
<td>Homemade mustard in single service containers</td>
</tr>
<tr>
<td></td>
<td>Homemade mayonnaise in single service containers</td>
</tr>
</tbody>
</table>

Question 7. With the understanding that there are approximately 55 participants, and you possess a good description of the food consumed, what type of analytic study would you consider? Why?

_____________________________________________________________________________________
_____________________________________________________________________________________

11-7
Question 8. By reviewing the recipes, is there a boxed lunch that concerns you? Why?
_____________________________________________________________________________________
_____________________________________________________________________________________

Whichever design is considered; it would be appropriate to develop a cases definition. A case
definition should include information regarding person, place, time, and clinical symptoms.

Question 9. For this outbreak response a case definition would be:
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_____________________________________________________________________________________
_____________________________________________________________________________________

Cohort Study

Cohort Study and Statistical Significance

- Based on the attack rate table and the relative risk, what are you considering? What else would you like to see?
- What does this new information tell you about the association of becoming ill and the consumption of certain foods?
- Does the p-value calculation support the findings of the confidence intervals as a measure of statistical significance?
- Review the findings of the cohort study and the ingredients of the entrees in the boxed lunches. Is there an ingredient that concerns you?

As you recall from module 6, a cohort study is an analysis where people are categorized as to whether they ate a particular food or not and a proportion is determined of the ill in each of the groups (eat or not).

A cohort study was conducted with all participants interviewed (will wonders never cease!). The following attack rate table with associated relative risks are provided below.
Question 10. Based on the attack rate table and the relative risk, what are you considering? What else would you like to see?

_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________

Confidence Intervals and P-values
The following table includes the confidence intervals for each of the foods.

<table>
<thead>
<tr>
<th>Foods Served</th>
<th>Ate the Food</th>
<th>Did Not Eat the Food</th>
<th>Relative Risk</th>
<th>Confidence Intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ill (a)</td>
<td>Not Ill (b)</td>
<td>Ill (c)</td>
<td>Not Ill (d)</td>
</tr>
<tr>
<td>Chicken Salad Wrap</td>
<td>11 4</td>
<td>73% 8 32 20%</td>
<td>3.67</td>
<td>1.8375 7.3166</td>
</tr>
<tr>
<td>Mixed Green Salad</td>
<td>6 4</td>
<td>60% 12 33 27%</td>
<td>2.25</td>
<td>1.1166 4.5338</td>
</tr>
<tr>
<td>Ham Sandwich</td>
<td>3 15</td>
<td>17% 19 18 51%</td>
<td>0.32</td>
<td>0.1103 0.9553</td>
</tr>
<tr>
<td>Turkey Sandwich</td>
<td>2 11</td>
<td>15% 20 22 48%</td>
<td>0.32</td>
<td>0.0868 1.2018</td>
</tr>
<tr>
<td>Chips</td>
<td>15 27</td>
<td>36% 7 6 54%</td>
<td>0.66</td>
<td>0.6517 1.9555</td>
</tr>
<tr>
<td>Apple</td>
<td>19 20</td>
<td>49% 3 13 19%</td>
<td>2.60</td>
<td>0.08916 7.5722</td>
</tr>
<tr>
<td>Cookie</td>
<td>16 23</td>
<td>41% 6 10 38%</td>
<td>1.09</td>
<td>0.524 2.2839</td>
</tr>
</tbody>
</table>
Question 11. What does this new information tell you about the association of becoming ill and the consumption of certain foods?
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________

P-value Calculation

<table>
<thead>
<tr>
<th>Foods Served</th>
<th>Ate the Food</th>
<th>Did Not Eat the Food</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ill (a)</td>
<td>Not Ill (b)</td>
</tr>
<tr>
<td>Chicken Salad Wrap</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>Mixed Green Salad</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Ham Sandwich</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Turkey Sandwich</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>Chips</td>
<td>15</td>
<td>27</td>
</tr>
<tr>
<td>Apple</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>Cookie</td>
<td>16</td>
<td>23</td>
</tr>
</tbody>
</table>

Question 12. Does the p-value calculation support the findings of the confidence intervals as a measure of statistical significance?
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________

Question 13. Review the findings of the cohort study and the ingredients of the entrees in the boxed lunches. Is there an ingredient that concerns you?
_____________________________________________________________________________________
_____________________________________________________________________________________
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11-10
### Case-Control Study

- Why are results similar but not as close to the results observed with the cohort study?
- Does the case-control study have validity?

Another way to estimate association may be to conduct a case-control study. The 19 ill case-patients were matched against 19 controls.

<table>
<thead>
<tr>
<th>Foods Served</th>
<th>Cases</th>
<th>Did not eat</th>
<th>Odds Ratio</th>
<th>Lower Limit</th>
<th>Upper Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicken Salad Wrap</td>
<td>11</td>
<td>2</td>
<td>11.68</td>
<td>2.082</td>
<td>65.608</td>
</tr>
<tr>
<td>Mixed Green Salad</td>
<td>6</td>
<td>18</td>
<td>6.00</td>
<td>1.078</td>
<td>33.379</td>
</tr>
<tr>
<td>Ham Sandwich</td>
<td>3</td>
<td>9</td>
<td>0.17</td>
<td>0.0367</td>
<td>0.777</td>
</tr>
<tr>
<td>Turkey Sandwich</td>
<td>2</td>
<td>14</td>
<td>0.33</td>
<td>0.0552</td>
<td>1.965</td>
</tr>
<tr>
<td>Chips</td>
<td>15</td>
<td>3</td>
<td>0.70</td>
<td>0.1344</td>
<td>3.6774</td>
</tr>
<tr>
<td>Apple</td>
<td>14</td>
<td>4</td>
<td>0.75</td>
<td>0.1661</td>
<td>3.3566</td>
</tr>
<tr>
<td>Cookie</td>
<td>16</td>
<td>2</td>
<td>0.63</td>
<td>0.0924</td>
<td>4.2587</td>
</tr>
</tbody>
</table>

Question 14. Why are results similar but not as close to the results observed with the cohort study? Does the case-control study have the same validity?
Monday Morning

- Review the ingredients of the four entrees and look for a common ingredient that may be associated with illness.
- What are your next steps?

Monday morning the outbreak response team convenes to share any findings. The epidemiologic investigator shares the results of the cohort study and states that those that ate the chicken salad wrap and the mixed green salad were more likely to become ill than those that did not eat either of the foods.

Question 15. Review the ingredients of the four entrees and look for a common ingredient that may be associated with illness. What are your next steps?

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Monday Afternoon

The health department has received information back from the state public health lab that the first three STEC samples that were sent to PulseNet for cgMLST indicate that the three isolates differed by 3 alleles or less. Note that the soft “cut-off” established by the CDC is 10 alleles or less for relatedness of strains. They were also informed that there were two cases of STEC from a neighboring county that were closely related to the three from West County. They are not on the participants list for the birds of prey seminar. The environmental investigation team shared the finding of their investigation of the Raptor Deli.
Monday Aug 8th  RAPTOR DELI
Meeting w Addy Eagleton, Owner

Salad
- Mixed Greens purchased through Restaurant Supply (Packaged lot 168)
- Tomato and Cucumber also from Restaurant Supply - Boxed
- Cilantro from Herbs from Herbari
  - Product stored in walk in (right side)
  * Mixed in large stainless steel bowl and portioned into single service container

Wrap
- Lettuce purchased through Restaurant Supply
- Cilantro from Herbas
- Chicken cooked day before, boiled, cubed and stored in walk-in
  * Chicken sized mid Saturday morning and wrapped in tortilla immediately

All Boar lunchs stored in reach in coolers beyond counter

Park 1
The cilantro is obtained from a local source this time of year. Herbs by Herbert is the local producer and delivers to only a few retail establishments – Raptor Deli and two small grocery
stores catering with a health food section. Their product is organic and it has been USDA certified. Cilantro was obtained from Raptor Deli.

The environmental investigators visited the small farm where the cilantro was grown. All product had been harvested from the raised containers.

**Monday Afternoon**

- With this new information what are the next steps of the response team?
- If production occurred as depicted in the photo, what would be the main focus of an environmental assessment of the production facility?

**Question 16.** With this new information what are the next steps of the response team?

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_____________________________________________________________________________________
Question 17. If production occurred as depicted in the photo, what would be the main focus of an environmental assessment of the production facility?

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_____________________________________________________________________________________
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The outbreak has now been contained as all cilantro from Herbs by Herbert has been removed from the distribution. An environmental assessment of the producer revealed that the water supply to the cilantro may have been contaminated during some recent heavy rains. Runoff from a neighboring property was evident. The neighbor raises cattle.

Coming Up Next

Evaluation and Testing