Pathogen Tracker

Stage Two: Find the Contaminated Food

Level I Student Worksheet

Answer Sheet

Vocabulary: control group, infected group, matched-pairs analysis, statistical analysis

Describe in detail the steps to be followed in a matched-pairs analysis.

Step 1: For each infected person (case), a non-infected person (control) with similar characteristics, such as age, gender, race, and health status, is selected. All of the non-infected people will make up the *control group*

Step 2: Both the infected group and the control group are interviewed to learn what ate, at least 1 week, before illness onset. The time period of interest to interview the case regarding their food exposure history is dependent on the incubation period of the pathogen (average time from exposure to illness onset).

Step 3: The two groups are compared using statistical analyses to see if there are any foods the infected group was more likely to eat than the control group.

Explain thoroughly the differences between the control group and the infected group.

A control group is the group of test subjects who have not been infected with a foodborne illness. People in the infected group (experimental group) have been infected with the foodborne illness. The two groups are compared in the test.

Create a table for the matched-pairs analysis. Your table should include the members of the Infected Group with the matched pair from the Control Group, as well as your reasons for making this match.

Table for Matched-Pairs Analysis		
Infected Person	Control Person	Common Characteristics
Amodini Khan Age 26	Jaishree Srinivasian Age 32	Female; Indian; Pregnant
Matt Rufello Age 9	James Malrovia Age 10	Male; Caucasian; Kidney Transplant
Roger Martin Age 68	Herbert Wellsley Age 72	Male; Caucasian; Diabetic
Franklin Spoon Age 45	Reginald Jackson Age 34	Male; African American; Leukemia
Aimee Ferguson Age 20	Sarah Ryan Age 22	Female; Caucasian; HIV Infected

List the foods commonly associated with each of the following microorganisms: *L. monocytogenes, E. coli,* and *Salmonella.*

Escherichia coli (E. coli) O157:H7*:* beef (particularly ground beef), poultry, raw milk, apple cider, cantaloupe, vegetables

Listeria monocytogenes (L. monocytogenes): deli meats (sliced turkey, roast beef etc.), hot dogs, smoked fish, soft cheese (Camembert, Brie etc.), milk, raw milk, butter, ice cream, raw vegetables, deli salads

Salmonella: meat, poultry, shellfish, eggs, milk, chocolate, vegetables, fruits, peanuts

Create a table listing each of the foods that could be possible contaminants, tell whether or not you will include it in the simulated interview, and give the reasons for your choice.

Food	Yes/No	Reason
Hamburger	No	Not listed under *Listeria*
Poultry	No	Not listed under *Listeria*
Milk	Yes	Listed under *Listeria*
Raw Potato	No	Not listed under *Listeria*
Apple Cider	No	Not listed under *Listeria*
Hot Dogs	Yes	Listed under *Listeria*
Smoked Fish	Yes	Listed under *Listeria*
Soft Cheese	Yes	Listed under *Listeria*
Raw Vegetables	Yes	Listed under *Listeria*
Nuts	No	Not listed under *Listeria*
Steak	No	Not listed under *Listeria*
Oysters	No	Not listed under *Listeria*
Ice Cream	Yes	Listed under *Listeria*
Deli Salad	Yes	Listed under *Listeria*
Coffee	No	Not listed under *Listeria*
Deli Meats	Yes	Listed under *Listeria*
Eggs	No	Not listed under *Listeria*
Butter	Yes	Listed under *Listeria*
Citrus Fruit	No	Not listed under *Listeria*
Miracle Whip	No	Not listed under *Listeria*

How successful were you in choosing the correct foods to include in the interview?

Answers will vary depending on how successful the student was in choosing the foods to include in the interview.

Create a matrix to list all of the foods eaten by the members of both the infected group and the control group, as well as which foods were eaten by which members.

Foods Eaten by the Infected Group and the Control Group

Food eaten	Amodin	Jaishree	Matt	James	Roger	Herbert	Franklin	Reginald	Aimee	Sarah
Milk	X	X	X	X	X	X	X			X
HD	X		X	X	X		X		X	
SF	X				X			X		
SC	X	X				X		X	X	
RV	X	X	X		X	X		X	X	X
IC	X		X	X		X	X	X	X	X
DS		X		X			X	X	X	X
DM		X	X	X	X	X	X			X
Butter		X	X	X	X		X	X	X	X

BEFORE YOU CONTINUE THE GAME, using the data in the table above, create a graph to display the foods that were eaten, the number of people from the infected group who ate that food, and the number of people from the control group who ate that food.

Students should create a bar graph with the foods that were eaten on the X axis and the numbers from the Infected Group and the Control Group who ate those foods on the Y axis.

In reviewing the data in the table and in the graph, what food do you think is the possible source of the outbreak? What reasons do you have for making this choice?

Hot dogs are the cause of the outbreak – more people in the infected group than in the control group ate hot dogs. The hot dog was the food that showed the largest difference between the two groups.

CONTINUE THE GAME

Explain in detail the similarities and differences between your graph and the graph "Incidence of Food Consumption" used in the game. In your opinion, which is the better graph and why?

Answers will vary based on the kind of graph the student created. A bar graph is the best graph to represent the data.

Now that you have completed Stage Two, go back to Stage One and review any revisions you might have made to the steps for solving a foodborne illness outbreak. What additional revisions do you want to make to these steps? Be sure to explain why you are making those revisions.

Students should review their list of steps and add this one: Patients are interviewed to determine what foods they have eaten and a matched-pairs analysis is done with a control group to determine which of the foods the infected group ate could be the cause of the outbreak.
Password to continue to Stage Three: HOTDOG. Note: It is important for the students to enter the password as one word – if they enter HOT DOG – the password will not work.