Name _____ Total Score _____/79

Disease Detectives – Test

1. What is NOT a purpose of public health surveillance?
    a. as an early warning system for impending public health emergencies
    b. to decrease the likelihood of outbreaks by using the placebo effect
    c. to document the impact of an intervention
    d. to inform public health policy and strategies

2. Which of the following is least likely to cause disease?
    a. bacteria
    b. fungi
    c. archaea
    d. viruses

3. During hot, wet seasons, diseases are more common. List 2 possible reasons as to why.

4. Which type of pathogen can Koch's Postulates be used for?
    a. Viruses
    b. Prions
    c. Parasites
    d. Bacteria

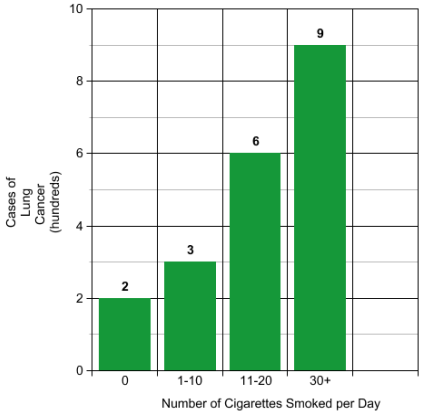
5. Microbe X is used in Koch's Postulates, but when Microbe X is injected into a healthy animal, the animal does not get sick. What can we conclude?
    a. X didn't cause the disease
    b. The disease isn't caused by a microorganism
    c. a and b
    d. None of the above

6. What is a case definition used for?
    a. to define what caused the outbreak
    b. to define who has a disease
    c. to define the importance of taking health precautions
    d. to define the mortality rate

7. List the necessary components of a case definition below.

8. What is the epidemiological triad of agent/host/environment used for?
    a. to show the importance of taking health precautions
    b. to find outbreaks
    c. to define who has a disease
    d. to find what caused the outbreak

9. What can be concluded using only information from the graph to the right? Circle all that apply.
    a. the more you smoke, the more likely you are to get lung cancer
    b. smoking is unrelated to lung cancer
    c. the less you smoke, the less likely you are to get lung cancer
    d. age and lung cancer are correlated



10. List how each of the following diseases are transmitted.
    a. malaria

    b. cholera

    c. chicken pox

    d. influenza

    e. Chagas disease

    f. hemophilia

11. What's the difference between droplet and airborne transmission?

12. A scientist hypothesizes that mosquitoes cause malaria, with the mosquito larvae invading the bloodstream. Which of the following best shows that this relationship is untrue?
    a. Weak specificity: mosquitoes have been found to cause yellow fever as well
    b. Weak dose-response: locations with higher amounts of mosquitoes don't have higher malaria rates
    c. Weak temporality: people get malaria before mosquitoes are introduced to the environment
    d. Weak coherence: mosquito larvae generally aren't small enough to invade human bodies through

(Questions 13-20) An outbreak of *E. coli* O157:H7 occurred after a picnic party.

13. *E. coli* is transmitted by the _____-_____ route.

14. O157:H7 is a serotype of *E. coli*. This serotype produces _____ toxins due to transduction from _____ affecting *E. coli*.

A line listing of the cases of *E. coli* was made.

Case	Sex	Grade	Date of Onset
A	F	12	September-1
B	M	11	August-26
C	M	11	August-26
D	M	12	June-28
E	F	11	September-3
F	M	11	September-3
G	F	10	September-5

15. Create an epi curve using data from the line listing above.

16. Which case is the index case?

17. *E. coli* O157:H7 has a median incubation period of 4 days with a range from a minimum of 3 days to a maximum of 8 days. Ignoring the index case, what is the period of exposure? Show work.

Suspicious that foods served at the party lead to the outbreak, Disease Detectives found the remaining non-diseased partygoers and interrogated both parties mercilessly about which foods they remembered consuming.

18. What type of risk measure (odds ratio/relative risk) should be used to analyze this data?

18. Fill out the table below using the risk measure stated above.

Food	**Ill**			**Not ill**			**Risk measure**
	Ate	**Didn't eat**	**Total**	**Ate**	**Didn't eat**	**Total**	
Pizza	6	1	7	18	3	21	
Salad	2	5	7	11	10	21	
Ice Cream	3	3	7	3	18	21	
Cookies	4	3	7	15	6	21	
Soda	5	2	7	5	16	21	
George's fried chicken w/ drippy fish	3	4	7	6	15	21	

20. What food(s) most likely caused the outbreak? Explain with use of the odds ratio.

21. Matching: Match the terms to the definitions.

_____	a. Outbreak	1. The number of infected individuals out of the number of susceptible individuals
_____	b. Pandemic	2. The likelihood of an event causing an effect calculated as the effect happening after the event divided by total times the effect occurred
_____	c. Epidemic	3. A sudden increase in the occurrence of a disease in a particular time and place
_____	d. Cluster	4. The rapid spread of an infectious disease in an intercontinental scale over a period of time
_____	e. Prevalence	5. A small aggregation of a disease or other health defect occurring at the same time and in the same place

_____	f. Incidence	6. The rapid spread of an infectious disease in a relatively large geographic area within a short period of time
_____	g. Risk	7. Proportion of a population affected by a disease

22. Matching: Match the terms to the examples.

_____	A. Vector	1. A Lyme disease carrying tick is this
_____	B. Fomite	2. A toy car contaminated with norovirus
_____	C. Zoonosis	3. Mode of spread of most STDs
_____	D. Agent	4. A doorknob on a restroom that someone just sneezed on
_____	E. Direct Transmission	5. Human with malaria
_____	F. Indirect Transmission	6. How swine flu came to be
_____	G. Herd Immunity	7. Mode of spread of vector-borne diseases
_____	H. Hyperendemic	8. Lead is the _____ of lead poisoning
_____	I. Host	9.Time period where host is infected but not yet spreading disease
_____	J. Environmental Factor	10. 26 cases per year when there are normally 10, for several years
_____	K. Reservoir	11. Bob has AIDS, but is less likely to get a cold from the remainder of the vaccinated population due to _____
_____	L. Vehicle	12. Time period where diseases can be spread by a host
_____	M. Incubation Period	13. A rainstorm creates a lot more mosquito habitats, and is a _____
_____	N. Infectious Period	14. The mosquito habitats created by the rainstorm are _____

(Questions 23-30) The US normally has about 14 *Campylobacter* cases each year per 100,000 persons. In Cacough, which has a population of 80, there are 9 cases of *Campylobacter* in one week.

23. Is an outbreak occurring in Cacough? Show work and explain.

The chart below shows cases A-I as they occur from 8/26 to 9/1. Assume that a person can't be re-infected by *Campylobacter* in this timespan. | indicates the time of onset, > the time of recovery, and + the time of death.

Case	**8/26**	**8/27**	**8/28**	**8/29**	**8/30**	**9/1**
A	|--	-------->				
B			|----------	----------	->	
C	-----+					
D	|--------	----------	----->			
E		|----------	----->			
F					|---------->	
G		|----------	----------	----------+		
H					|------	-->
I			|--------	-->		

24. Calculate the point prevalence at the end of each day. Show work.
    a. 8/26

    b. 8/27

    c. 8/28

    d. 8/29

    e. 8/30

25. Calculate the incidence rate from 8/27 to 8/28.

A new *Campylobacter*-detection method was used on these patients. 70% of *Campylobacter* cases get a positive result, and 10% of patients who don't have *Campylobacter* get a positive result.

26. Fill the remaining boxes in this 2 by 2 table. Show work.

	Positive test result	**Negative test result**	**Total**
Has *Campylobacter*			0.1125
Doesn't have *Campylobacter*			
Total			1

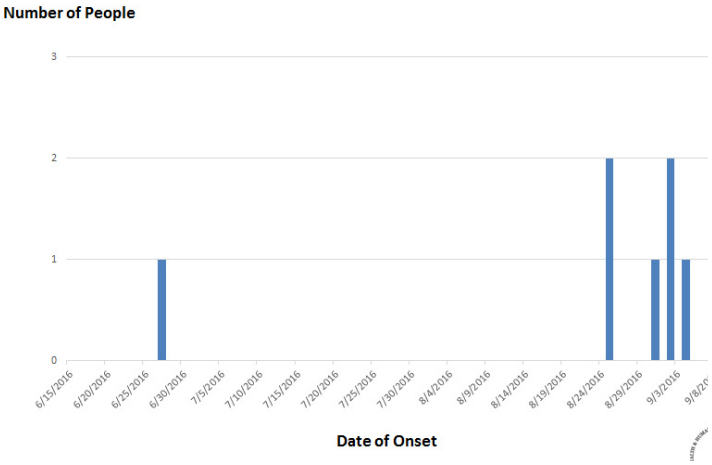
27. What is the likelihood that someone that tests positive has *Campylobacter*? What is this probability known as in epidemiology?

28. What is the likelihood that someone that tests negative doesn't have *Campylobacter*? What is this probability known as in epidemiology?

29. Calculate the positive likelihood ratio. Interpret this measure.

30. These *Campylobacter* cases originated from the cross-contamination of raw poultry. Food handlers at Cacough were confused as to how this might occur, since they always washed their hands before and after handling ingredients. Describe 2 other food-handling practices that food handlers might follow to limit cross-contamination.

Answers

1. b (1)
2. c (1)
3. pathogens multiply faster (1), mosquitoes transmit disease (1)
4. d (1)
5. d (1)
6. b (1)
7. clinical symptoms (0.5), host characteristics (0.5), time (0.5), place (0.5)
8. d (1)
9. d (1)
10.
    a. vectorborne (1)
    b. vehicular (1)
    c. airborne (1)
    d. droplet (1)
    e. vectorborne (1)
    f. genetic (1)
11. Droplets are large (>5 μm) and are usually transmitted by sneezing or coughing (1), while airborne disease particles are < 5μm and can be transmitted as aerosols (1).
12. c (1)
13. fecal, oral (1)
14. Shiga (1), bacteriophages/phages (1)
15. 

(Adapted from http://www.cdc.gov/ecoli/2016/o157h7-09-16/epi.html)

(1) for correctly-placed bars

(1) for x AND y labels

16. d (1)
17.

Min incubation period: 8/26/16 - 3 days = 8/23/16

Max incubation period = 9/5/26 - 8 days = 8/28/16

(1) for work shown above

Range is from 8/23/16 to 8/28/16

(1) for right answer

18. (1) Odds ratio (this is a case-control)
19. (3) For each incorrectly calculated odds ratio, -0.5. If relative risk was used instead of odds ratio, give no points.

Food	Ill			Not ill			Risk Measure
	Ate	Didn't eat	Total	Ate	Didn't eat	Total	
Pizza	6	1	7	18	3	21	1
Salad	2	5	7	11	10	21	0.363636364
Ice Cream	3	3	7	3	18	21	6
Cookies	4	3	7	15	6	21	0.533333333
Soda	5	2	7	5	16	21	8
Geroge's fried Chicken With drippy fish	3	4	7	6	15	21	1.875

20. ice cream (1) and soda (1), both have high odds ratios. People who ate ice cream were 6x as likely to be ill than those who didn't, and those who drank soda 8x of those who didn't. (1 for specific mention of odds ratios)
21.
    a. 3 (1)
    b. 4 (1)
    c. 6 (1)
    d. 5 (1)
    e. 7 (1)
    f. 1 (1)
    g. 2 (1)
22.
    a. 1 (1)
    b. 4 (1)
    c. 6 (1)
    d. 8 (1)
    e. 3 (1)
    f. 7 (1)
    g. 11 (1)
    h. 10 (1)
    i. 5 (1)
    j. 13 (1)
    k. 14 (1)

l. 2 (1)
m. 9 (1)
n. 12 (1)

23. Expected cases: (14 cases/100000 person-year) * (1 year/52 weeks) * (80 people) = 0.000215 cases/week (1)

Yes, since the actual number of cases in a week was far greater than expected. (1)

24. The denominator is the population begins at 80, and decreases as people die. -2.5 if no work is shown.
    a. 2/79 = 0.0253 (1)
    b. 3/79 = 0.0380 (1)
    c. 3/79 = 0.0380 (1)
    d. 1/78 = 0.0128 (1)
    e. 1/78 = 0.0128 (1)
25. Incidence is the number of people who are newly infected/number of vulnerable (never infected).
    4/77 = 0.0519 (2)
26.

	Positive test result	Negative test result	Total
Has *Campylobacter*	0.7*0.1125 = 0.07875 (1)	0.3*0.1125 = 0.03375 (1)	0.1125
Doesn't have *Campylobacter*	0.1*0.8875 = 0.08875 (1)	0.9*0.8875 = 0.79875 (1)	0.8875 (1)
Total	0.1675 (1)	0.8325 (1)	1

27. 0.07875/0.1675 = 0.4701 (1)

Sensitivity or true positive rate (1)

28. 0.79875/0.8325 = 0.9595 (1)

Specificity or true negative rate (1)

29. 0.4701/(1-0.9595) = 11.607 (1)

Since this value is far greater than 1 (1), it indicates that the test result is highly associated with the disease (1).

30. (2) Any 2 of the following: wash food-preparation surfaces, separate raw and cooked foods, cook to safe temperatures, refrigerator foods promptly, rinse vegetables and fruits