

Disease Detectives 2017-18 Tryout Test **KEY**

50 minutes total

You may use a non-graphing, non-programmable calculator only.

Show your work (if applicable) in the space provided. Be sure to write clearly and legibly.

Part I: Multiple choice/Quick Answer (3 pts each)

- 1) Which of the following would not be considered a point source outbreak? Circle all.
 - a) **The water in one well was infected with cholera, causing an outbreak in the city of London.**
 - b) **One person contracted measles. 10 days later, three other cases developed. 10 days after that, seven more people contracted measles.**
 - c) A colony of *Legionella pneumophila* develops in an office building. Four office workers fall violently ill. A week later, the FBI comes to investigate and all the agents contract the same disease.
 - d) The squirrel meat served at a party was infected with a parasite and everyone who ate it got sick.

- 2) What are the four components of a case definition?
 - a) **Clinical information**
 - b) **Characteristics of infected people**
 - c) **Location**
 - d) **Time Sequence**

- 3) What pathogen type does not adhere to Koch's postulates? **Viruses or prions**

- 4) Which of the following are (a) zoonotic disease(s)?
 - a) **Leptospirosis**
 - b) **Campylobacteriosis**
 - c) Chlamydia
 - d) *Clostridium difficile*
 - e) **Listeria**

- 5) Which of the following is considered the absolutely essential criterion to determine causation?
 - a) coherence
 - b) specificity
 - c) **temporal relationship**
 - d) dose-response relationship
 - e) strength

For questions 6-8, refer to the contingency table.

	Has <i>E.coli</i>	No <i>E.coli</i>	Total
Ate rolled ice cream	23	12	35
Did not eat rolled ice cream	31	34	65
Total	54	46	100

- 6) Data was collected from every single person who attended this soiree on Friday night. What kind of epidemiological study is this?
- a) Cross-sectional
 - b) Retrospective cohort**
 - c) Prospective cohort
 - d) Case-control
 - e) Controlled experiment
- 7) What is the relative risk? $a(a+b)/c(c+d) = 0.657/0.476 = 1.380$
- 8) In which step of the 10 steps of outbreak investigation would this analysis be performed in?
- a) 1
 - b) 3
 - c) 5
 - d) 7**
 - e) 9
- 9) *E.coli*'s ability to cause severe disease (measured as the proportion who fall severely ill or die) is best described as its?
- a) virulence**
 - b) pathogenicity
 - c) infectivity
 - d) mortality
 - e) prevalence
- 10) Turns out Snarglesnofitis is a propagated outbreak. Propose a potential prevention technique to stop any further cases.

Quarantine was the most common answer. Answers will vary.

- 11) What rare disease can result from complications from a Campylobacter infection?
- Guillain-Barré syndrome**
- 12) Which of the following best represents the "danger zone" of temperatures for bacterial growth?
- a) 0-100° F
 - b) 40- 140° F**
 - c) 60- 200° F
 - d) 120° F
- 13) Stool specimen from ill birthday party attendees were submitted to the state lab. Four specimens tested positive for Norovirus and enteric bacteria. What intervention measure would you suggest?
- a) Wear gloves only when handling raw meat
 - b) Never wear gloves
 - c) Use good personal hygiene during food preparations, where gloves whenever possible**
 - d) Use the same cutting board and knife for raw meats and vegetables
 - e) Thaw raw meat on the counter at room temperature

- 14) Describe the difference between Type I and Type II error.

In statistical hypothesis testing, a type I error is the incorrect rejection of a true null hypothesis (a "false positive"), while a type II error is incorrectly retaining a false null hypothesis (a "false negative"). (Wikipedia!).

15) Which statement is true?

- a) You can calculate the incidence rate for a case-control study.
- b) Case-control studies are based on exposure status, whereas cohort studies are based on whether or not certain people have a disease.
- c) Cohort studies are ideal for well-defined populations.**
- d) Case-control studies can be prospective.
- e) Cohort studies can be problematic because of recall bias.

16) Classify the following as bacterial, viral, fungal, prion, or protozoan. (1pt each)

Listeriosis: **Bacteria** Cyclosporiasis: **Protozoan** Diphtheria: **Bacteria**
Coccidioidomycosis: **Fungal** Cryptosporidiosis: **Protozoan** Brucellosis: **Bacteria**
Creutzfeldt-Jakob Disease: **Prion** Rocky Mountain Spotted Fever: **Bacterial** Influenza: **Viral**

17) What are the two types of epidemiological determinants?

Causes, risk factors

18) Does odds ratio or relative risk carry a stronger implication for causation? Why? (1pt for correct ID, 2pt for explanation)

Relative Risk, displays temporality more than odds which is strictly association.

Part II: Fill in the blank (3 pts each)

Write in the correct term in the blank space. Not all of the terms in the word bank will be used.

sensitivity	vector	bacteraemia	virulence	latency period	morbidity
odds ratio	relative risk	confounding variable	observer bias	mortality	endemic
specificity	pandemic	pathogenicity	septicemic	nosocomial	recall bias

- 1) **VIRULENCE** is a *quantitative measure* of a pathogen's ability to cause severe harm or death.
- 2) To show the correlation between two variables in a case-control study, one can calculate the **ODDS RATIO**.
- 3) **SPECIFICITY** measures the proportion of negatives that are correctly identified as such (e.g. the percentage of healthy people who are correctly identified as not having the condition).
- 4) Surgical wounds, hepatitis B, *Clostridium difficile*, and urinary tract infections are examples of **NOSOCOMIAL** infections.
- 5) Macario conducts a study and finds that there is a statistical association between attending Paly football games and the number of movies Nicholas Cage has starred in. However, this was a very poorly designed study, because there is a(n) **CONFOUNDING VARIABLE** that he did not take into account: cheese consumption per capita.

- 6) Bacterial infections can cause **SEPTICEMIA**, which causes the body's immune system to trigger inflammation across the entire body.

Part III: Short answer

For calculations, please show your work. Round to the third decimal place.

- 1) Paula Tishin has conducted a study and has concluded that smoking is good for general health measured by the health unit, which increased with greater health. The following lines came from her report:
- a) "A reported 100% of test subjects had increased health units after a week of smoking"
 - b) "In addition to cigarettes, subjects were given perfect diets, exercise, and daily yoga"
 - c) "The more smokes the subjects had, the higher their health units"
 - d) "No other hypotheses were considered cuz this one was just too gr9"

Assuming everything Paula said was true, give three violations of Hill's Criteria for Causation in her report from the lines she said. (7pts)

Strength of association measured with tests (a just reports 100% increased health units)

Plausibility: LOL

Consideration of Alternate Explanations: d and b, confounding potentially present BUT not considered

Coherence: association should not contradict existing theory

Answers will vary.

- 2) The CDC investigated the an outbreak of jinitis in the city of Palo Alto. They surveyed part of the population and found that 54 of 85 ill people drank lactose-free llama milk as compared to 469 of 976 well people.

- a) Create a 2x2 table (2 pts)

	Has Jinitis	No Jinitis	Totals
Drank Lactose-Free Milk	54	469	523
Didn't drink milk	31	507	538
Total	85	976	1,061

- b) Calculate the relative risk OR odds ratio (whichever one is appropriate for this situation). Write a sentence analyzing the result. (3 pts)

Case-control; odds-ratio: $ad/bc = 27,378/14,539 = 1.883$. For those who consumed lactose-free milk, the estimated odds of getting jinitis was 1.883 times the estimated odds of those who didn't.

PLEASE DO NOTE: I received a lot of answers when administering the test that said this was cohort. I gave partial credit because the error compounded but also researched a lot to support why it was case-control (mainly with the phrasing of the question). If did make a mistake, sorry :) please forgive me.

- c) What type of epidemiological study is this? Describe 2 advantages of using this type of study. (3 pts)

Case-control: good for examining multiple exposures from a single outcome, less expensive and easier to conduct

- 3) Dr. Anderson is administering a trial for a new drug to treat hypertension. He gives the drug to half of the patients and to the other half, he gives a placebo. If Dr. Anderson knows who received the actual treatment and who received a placebo, this may influence his blood pressure measurements. He may underestimate the blood pressure in those who have been treated, and overestimate it for those in the control group. Explain one way to minimize this bias. (1 pt)

Double-blind that shiz

- 4) Fill in the chart below with the 5 main modes of transmission (follow the APHA and CDC scheme). Give an example of a disease that is spread by each mode of transmission. (1 pt for each correct response, 10 pts total)

Direct Transmission	Direct Contact	Ex: STDs
	Droplet Spread	Ex: Common cold, TB
Indirect Transmission	Airborne	Ex: Chicken pox, hantavirus
	Vehicleborne	Ex: Tetanus
	Vectorborne (mechanical or biological)	Ex: Zika, Ebola, all that jazz Examples will vary.

Extra credit: What is vertical transmission? (2 pts)

Mother to child

- 5) List all five steps in the chain of transmission. (1 point for each correct response, 5pts total)

Infectious Agent, Reservoir, Portal of exit, mode of transmission, portal of entry, susceptible host

- 6) Horatio is investigating an outbreak of a mysterious diseases in a rural region of New Mexico. He identifies 87 people in the region who have contracted the disease. To identify the causative agent of the disease, Horatio visits the homes of the sick individuals. In the homes of 79 of those 87 sick people, he detects the presence of mouse droppings. Horatio also finds a control group of 98 healthy people. Of those healthy people, he determines that 5 have been exposed to mouse droppings.

- a) Create a 2x2 table to represent this data. (2 pts)

	Has Hantavirus	No Hantavirus	Totals
Mouse Droppings	79	5	84
No Mouse Droppings	8	93	101
Total	87	98	185

b) Find the odds ratio. Explain the significance of this number. (3 pts)
 $7347/40 = 183.67$. For households with mouse droppings, the estimated odds of getting hantavirus was 183.67 times the estimated odds of those who didn't. (WOWIZOWIEE there must have been something going on.)

c) Taking into account the way this disease is most likely transmitted, what is one thing local residents can do to decrease their chance of contracting the disease? (2 pts)
Mousetraps, clean their houses, kill the mice

d) In the United States, the disease is endemic to the Four Corners region (Colorado, New Mexico, Arizona, and Utah). Symptoms include fatigue, fever, muscle aches, coughing, shortness of breath and in severe cases, pulmonary edema. What is the pathogen that causes the disease? (3 pts)

Hantavirus

Part IV: General Knowledge

1. What was the cause of a kuru outbreak in Papua New Guinea? (1pt)
Cannibalism, brains, prions

2. Describe the difference between association and correlation. (2pts)
Correlation is a linear relationship, potentially causation, association does not imply correlation or causation

3. What is the difference between active immunity and passive immunity? (2pts)
Active Immunity: occurs when the person is exposed to a live pathogen, develops the disease, and becomes immune as a result of the primary immune response.
Passive Immunity: short-term immunization by the injection of antibodies, such as gamma globulin, that are not produced by the recipient's cells. Naturally acquired passive immunity occurs during pregnancy, in which certain antibodies are passed from the maternal into the fetal bloodstream.

4. What is only disease that we have eradicated globally? (1pt)
Smallpox

5. Describe the difference between a retrospective cohort and prospective cohort study in detail. (2pts)
Retrospective: exposures and outcomes have already occurred in the past. Prospective: exposures have occurred but you follow them into the future to see if they develop the disease in question.

6. Why would an epidemiologist include probable cases in a case count/record of number of cases during an epidemic or outbreak? (2pts)
Too expensive to get lab confirmation if a large-scale epidemic.

7. A large Thanksgiving feast was held at your house. Of the 78 attendees, 17 become ill from listeriosis. All 78 were interviewed about the food they ate. The interviews show that 8 of the 17 people who are ill and 25 of the 78 who are healthy ate tofurkey.

a. Calculate the attack rate. (2pts)

$$\text{ill/ill + well} = 17 / 78 = 0.2179$$

b. What does attack rate mean? Provide a sentence that also explains the value in the context of the problem. (3pts)

It is the risk of getting the disease during a specified period, such as the duration of an outbreak. A variety of attack rates can be calculated.

c. Calculate relative risk and risk-difference. (4pts)

$$1.212, 0.2424 - 0.2 = 0.0424$$

8. What is the most significant bias associated with case-control studies and why is it problematic? (3pts)

Recall, if you can't remember your exposures how am I supposed to compare them??

9. What is the difference between descriptive and analytical epidemiology? (4pts)

Descriptive has to do with the spread of risk factors that leads to disease in a population

Analytical compares groups to determine risk factors for a disease

Descriptive: looks at characterizing cases by time, place, and person

10. Name 3 types of observational studies. (3pts)

Case-control, cohort, cross sectional

11. What is the *Listeria* Initiative? (4pts)

The Listeria Initiative is a national surveillance system that collects information on laboratory-confirmed cases of listeriosis in the United States.

12. List the 4 functions or critical characteristics of public health surveillance.

- Timeliness**, to implement effective control measures;
- Representation**, to provide an accurate picture of the temporal trend of the disease;
- Sensitivity**, to allow identification of individual persons with disease to facilitate treatment; quarantine, or other appropriate control measures; and
- Specificity**, to exclude persons not having disease. (2 points each, 8 points)

13. Zika Virus and Ebola Hemorrhagic Fever are two of the most notable epidemics within the past few years. Compare and contrast Zika Virus and Ebola Hemorrhagic Fever in terms of determinants, their analytic and descriptive epidemiology, chain of transmission, vectors, epidemiological triad, and more. (no credit for mentioning they are both viral diseases)

Answers will vary. If they mention at least 3 different components correctly then give full credit. (10pts)

1. Describe proper techniques for prevention of foodborne illness at each of the following stages:
(10 points total)

Clean: wash hands/food contact surfaces and utensils often and whenever contaminated, use high heat and chemical

- Warm water/soap 20 seconds, paper towel
- Alcohol based hand sanitizer ineffective
- Wash everything
- For sanitizing:
 - Bleach and water
 - Microwave damp sponges and replace them

Separate: prevent cross contamination

- When grocery shopping
- Use reusable bags for specific
- Prevent when in the refrigerator
- Clean serving plates for meat

Cook:

- View food specific temperatures for cooking
- Check with a food thermometer

Chill: 41°F fridge temp or lower, do not overfill the fridge, freezers at 0°F or below

- Perishable foods should not sit at room temp for more than 2 hours, one hour when temp > 90°F
- Thaw food:
 - Fridge
 - Cold water
 - Microwave
 - If thawed in cold water or microwave, cook immediately
- Submerge food in cold water

1. Match the following. (6pt)

- | | |
|-------------------------------|--|
| 1. Endemic g | a) period between exposure and clinical onset of disease |
| 2. Incubatory period a | b) a condition that is the consequence of a previous disease or injury |
| 3. Enzootic d | c) carries or transmits pathogens to another living animal |
| 4. Sequelae e | d) endemic occurring in an animal population |
| 5. Vector c | e) a sequence of exposures leading to the onset of a disease |
| 6. Epizootic h | f) epidemic occurring in an animal population |
| | g) disease occurs with predictable regularity, clustered in space not time |
| | h) outbreak of disease in animal population |