DISEASE DETECTIVES QUIZ

1. VOCABULARY: For this section, match the definition on the left with the word that it may link to on the right. You may use terms once, more than once, or not at all.

- The systematic collection, analysis, and interpretation of data. (**R**)

- A tsetse fly is a _____ for trypanosoma. (**S**)

- an aggregation of cases over a particular period of time. (**C**)

- the rate of incidence of a disease. (**J**)

- Surveillance _____ is an example of this. (**B**)

- Lactobacillus is an example of this. (**A**)

- the time that lapses between infection and the first appearances of the symptoms of the disease. (**G**)
- the measure of the frequency of death. (**I**)

- severity of disease in a host. (**T**)

- the study of patterns, causes, effects, and disease conditions in a population. (**D**)

- the capacity to cause infection in a host. (**H**)

- an organism that depends on another organism. (**M**)

- the probability that one will become infected by an illness or injury within a specific period of time. (**Q**)

- ~~large amount of people affected over a wide geographical swath.~~ (**Epidemic- not counted b/c of mess-up**)

- capacity of a host to cause disease (**N**)

A. Agent

B. Bias

C. Cluster

D. Epidemiology

E. Fomite

F. Incidence

G. Incubation period

H. Infectivity

I. Mortality

J. Morbidity

K. Outbreak

L. Pandemic

M. Parasite

N. Pathogenicity

O. Prevalence

P. Reservoir

Q. Risk

R. Surveillance

S. Vector

T. Virulence

U. Zoonosis

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- occurrence of a phenomenon over several countries and geographic locale with a large population affected. (**L**)

- proportion of the host population infected at a given time. (**O**)

- capacity to cause disease in a host. (**N**)

- the rate at which new cases of infection arise in a population. (**F**)

- more cases of a particular disease than expected in a given area, at a given time. (**K**)

- Rabies in an example of this. (**U**)

- A hairbrush carrying lice would be an example of this. (**E**)

- Soil is an example of this. (**P**)

2. SHORT ANSWER: Answer well

- List the steps an epidemiologist would take to carry out an investigation of an outbreak.

10 STEPS TO OUTBREAK INVESTIGATION
1. Prepare for Field Work: Research, supplies, arrangements. Research the situation. Follow protocol; make official administrative arrangements. Contact all parties
2. Est. Existence of Outbreak: expected # of cases for area; Use health records, other factors like better reporting, seasonal fluctuations, population changes
3. Verify the Diagnosis: Verify procedures used to diagnose. Check that there is no lab error (experimental error). Interview several people (aka commonality)
4. Define and ID Cases: Case Definition includes:
Clinical Information, about the disease or condition; Characteristics of People (Age, Sex, etc), Location or Place (specific), and Time Sequence. 3 types of ID: Confirmed (diagnosis, case def, + lab verification), Probable (many factors point to diagnosis, no lab verification), Possible (some factors point to diagnosis).
5. Describe in terms of Time, Place, Person - Time: an epicurve to show course of disease. Place: geographic extent and a spot map. Person: identify by characteristics
6. Develop Hypothesis - Use EHA. Testable and current. Based on current knowledge
7 Evaluate Hypothesis - Use the studies. Must lab verify.
8. Refine Hypothesis - More studies may be needed. Might need to be more specific
9. Implement Control and Preventive Measures: break chain of transmission of EHA; Immunization, education, legal issues. See Criteria for conclusions
10. Communicate Findings - Oral or written report

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- What are the three components of the epidemiological triad?

Environment, Host, Agent or **Time, Person, Place**

- Provide two examples of the following agents: (ANSWERS MAY VARY)

Biological - **Bacteria, viruses**
Chemical - **Poison, alcohol**
Physical - **Radiation, trauma**
Nutritional - **Lack of nutrition, Excess of nutrition (obesity)**

Unbeknownst to most, the CDC really loves greek yogurt, but is having some doubt regarding its health effects. Recently, they found differences in the amount of beneficial probiotic e. coli present in different brands of Greek yogurt. The CDC is hoping to gather a group of individuals in order to demonstrate a potential link between loss of e. coli in the gut and its link to colitis. They have gathered a group of 140 men who only ate Chobani without e. coli and 180 men who only ingest Fage with e. coli. Over the next twenty years, they monitored the subjects' health and obtained the following results: 92 of the Chobani men had developed colitis, while 8 of the Fage men workers had colitis.

a.)Create a two by two contingency table for this information.

	Colitis—Yes	Colitis—No	Total
Chobani Men	92	48	140
Fage Men	8	172	180
Totals	100	220	160

b.) What kind of study is this?

Cohort

c.*) Tiebreaker: What is colitis? It it actually caused by what I said it was caused by?

Inflammation of the colon; NAAAAH.

d.) Name two advantages and disadvantages to this type of study.

Advantages:
      Relative risk/attack rate is easily measured
      Good for relatively rare exposures
      Allows for multiple disease outcomes
   **Less subject to bias than case-control studies**

Disadvantages:
      Expensive
      Hard to follow exposed and unexposed persons over time
      Difficult to examine multiple-exposure cases
      Needs a large population size

e.) Would you use odds ratio or relative risk to analyze this data? Calculate the value you used and round to the nearest hundredths. Write a sentence to analyze this result.
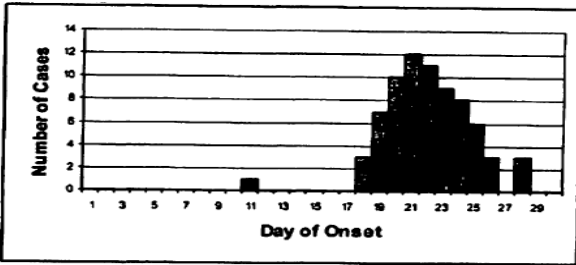
RELATIVE RISK

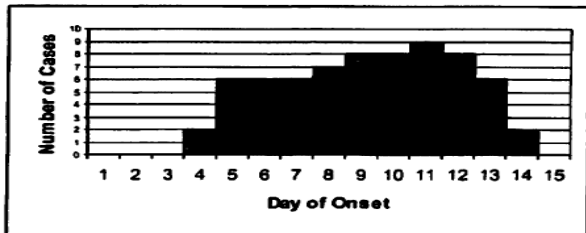What do epidemiologists call a graph like the one below?
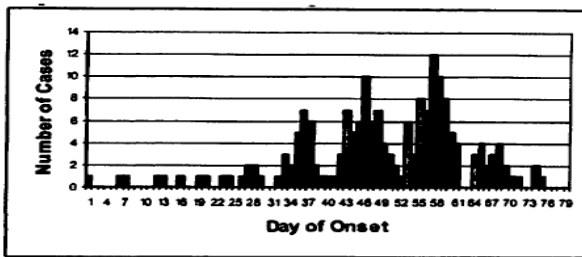
Epi Curve
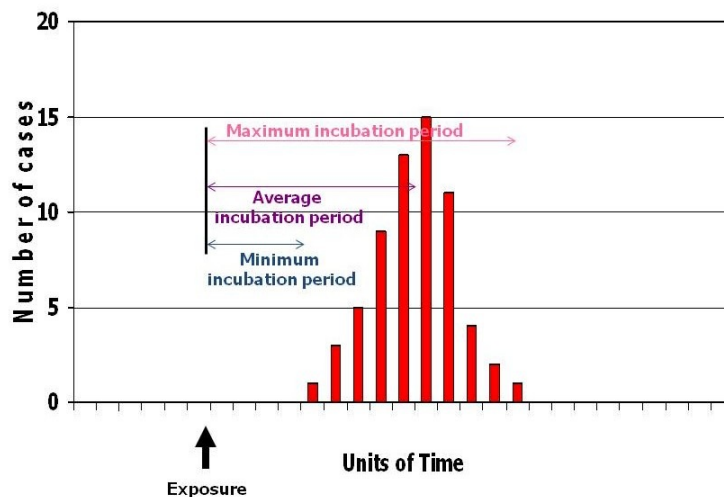
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Name the three types of this graph that one can potentially visualize. Write them next to the graphs below.

ı. **Point**

ı. **Common Continuous**

c. **Propagated**

An epidemiologist decides to investigate the effects of a severe heat wave that occurred at Chicago from July 10, 2011 to July 20, 2011, during which temperatures often exceeded 40°C. To do this, he visits 10 public and private high schools located in Chicago and 20 others scattered around the state of Illinois. Each student fills out a survey asking them about their living conditions and experiences during those 10 days, any preexisting health conditions, and any changes in health during or following the heat wave.

a.) Define bias

Systematic deviation of results or inferences

b.) What is one type of bias identified in this study?

Surveillance, Selection

c.) How can this study be altered to change its bias?

Widen the study base by contacting people at other locations, including (but not limited to) hospitals, preschools, elementary schools, and middle schools, various businesses and workplaces, and senior homes.

Define all of Hill's Criteria of Causation and briefly explain what the purpose of Hill's Criteria of Causation is.

<u>HILL'S CRITERIA FOR CAUSATION</u>
<u>Strength of Association</u> - relationship is clear, risk is high
<u>Consistency</u> - observation of association must be repeatable in different populations at different times.
<u>Specificity</u> - a single cause produces a specific effect
<u>Alternative Explanations</u> - consideration of many hyp's.
<u>Temporality</u> - cause/exposure must precede effect/outcome
<u>Dose-Response Relationship</u> - ^ exposure, ^ risk
<u>Biological Plausibility</u> - association agrees with biology
<u>Experimental Evidence</u> - condition can be altered, either prevented or accelerated, by an appropriate experiment
<u>Coherence</u> - association should work with existing theory

Regale me by presenting me with the Chain of Infection.

agent, reservoir, portal of exit, mode of transmission, portal of entry, susceptible host.

Syosset High School is having lots of health problems after many students went to the Syosset Chipotle. Many are complaining of muscle weakness, suicidal thoughts, loss of coordination, and impaired vision. Oddly enough, everyone at Syosset High School loves sour cream (<3). Tests of the sour cream have indicated the presence of lots of mercury, a sure impetus for these symptoms.

Syosset High School's Brothers Advocating for Epidemiological Studies (affectionately referred to as the BAES) organization asked all students to go to the nurse's office to get tested for mercury poisoning. 156 students had symptoms and got sour cream on their burritos. 28 didn't get sour cream and had symptoms. 88 got sour cream and didn't have symptoms.

a.) Provide the null and alternative hypotheses for a Chi-Square test.

Ho: There is no association between sour cream from the Chip-ottle and experiencing the mercury poisoning-like symptoms
Ha: There is an association between sour cream from the Chipotle and experiencing mercury poisoning-like symptoms

b.) Provide a two by two contingency table for this data.

	Sour Cream-Yes	Sour Cream-No	Total
Symptoms	156	28	184
No Symptoms	88	44 Everyone else	
Total	244		

c.) If a Chi-Square test were to be used, how many degrees of freedom would be needed?

1 degree of freedom

d.) On the assumption that there is no association between exposure to sour cream and symptoms, what would be the expected counts? Create a table with this information.

	Sour Cream-Yes	Sour Cream-No	Total
Symptoms	184*(244/Z) = **A**	184*(X/Z)= **C**	184
No Symptoms	Y*(244/Z) = **B**	Y*(X/Z) = **D**	244+X-184 = **Y**
Total	244	**X**	244+X=**Z**

e.) Calculate the Chi-Square statistic for this test. Show all work for full credit.

= (156-A)²/A + (28-C)²/C + (88-B)²/B + (Everyone Else-D)²/D

Understanding the biological underpinnings of diseases is important. Determine whether the following diseases are bacterial, viral, fungal, or parasitic in origin. Write the origin next to each disease.

•Influenza: **VIRAL**

•Aspergillus: **FUNGAL**

•Gonorrhea: **BACTERIAL**

•Ascaris: **PARASITIC**

•Tuberculosis: **BACTERIAL**

•Toxic Shock Syndrome: **BACTERIAL**

•Genital Warts: **VIRAL**

•Strongyloides: **PARASITIC**

•Chagas disease: **PARASITIC**

•Cholera: **BACTERIAL**

Define primary, secondary, and tertiary disease prevention.
Primary: early intervention to avoid initial exposure to agent of disease preventing process from starting.

Secondary: during the latent stage (when the disease has just begun), process of screening and instituting treatment may prevent progression to symptomatic disease

Tertiary Prevention: during the symptomatic states (when patient shows symptoms), intervention may arrest, slow, or reverse the progression of disease.

In 2009, a community survery of people who went on the Zipper at the Syosset Carnival for blood pressure was conducted in which residents were asked how many times they had their blood pressure tested in the past year. The answers from the first 20 participants are listed below. In 2014, they did the same thing.

2009: 0, 2, 0, 0, 24, 1, 2, 0, 2, 2, 1, 1, 0, 0, 5, 1, 360, 10, 2, 3
2014: 2, 1, 0, 0, 2, 1, 4, 3, 2, 1, 0, 4, 2, 52, 1, 9, 2, 7, 4, 5

Organize the data into a table of frequency distribution. Find the mean, median, and mode of the data set. You must set the columns for the distribution yourself.

Frequency Distribution

Times blood pressure measured	2009	2014
0	6	3
1	4	4
2	5	5
3	1	1
4	0	3
5	1	1
6	0	0
7	0	1
8	0	0
9	0	1
10	1	0
24	1	0
52	0	1
360	1	0

In 2009
mean is 20.8 previous measurements,
the median is 1.5 previous measurements,
mode is 0 blood pressure measurements.

In 2014
Mean is 5.1
The median is 1.5
Mode is 2