Disease Detectives C - Disease C FINAL - UT Invitational 2020 - Division C - 11-08-2020

You will need a scientific calculator, and you may need scratch paper.

Pay attention to questions that specify to mark all correct answers.

Pay attention to the specified format of fill-in-the-blank questions.

Good luck!

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1. (4.00 pts) Which of the following statements are true regarding descriptive and analytic epidemiology?

(Mark **ALL** correct answers)

- [x] A) Descriptive epidemiology generates hypotheses while analytic epidemiology tests hypotheses
- [x] B) Analytic epidemiology involves a comparison group
- [x] C) Descriptive epidemiology analyzes data on person, place, and time
- [ ] D) Descriptive epidemiology is population-based while analytic epidemiology is individual-based

2. (1.00 pts) **For Questions #2-7, indicate whether observed prevalence of a disease would increase, decrease, or have no change as a result of:**

Decrease in new cases

- ○ A) Increase
- ◉ B) Decrease
- ○ C) No change

3. (1.00 pts) **For Questions #2-7, indicate whether observed prevalence of a disease would increase, decrease, or have no change as a result of:**

Increase in reporting

- ◉ A) Increase
- ○ B) Decrease
- ○ C) No change

4. (1.00 pts) **For Questions #2-7, indicate whether observed prevalence of a disease would increase, decrease, or have no change as a result of:**

In-migration of healthy people

- ○ A) Increase
- ◉ B) Decrease
- ○ C) No change

5. (1.00 pts) **For Questions #2-7, indicate whether observed prevalence of a disease would increase, decrease, or have no change as a result of:**

Increase in recovery

- ○ A) Increase
- ◉ B) Decrease
- ○ C) No change

6. (1.00 pts) **For Questions #2-7, indicate whether observed prevalence of a disease would increase, decrease, or have no change as a result of:**

Increase in case fatality

- ○ A) Increase
- ◉ B) Decrease
- ○ C) No change

7. (1.00 pts) **For Questions #2-7, indicate whether observed prevalence of a disease would increase, decrease, or have no change as a result of:**

Increase in incidence of a different disease

- ○ A) Increase
- ○ B) Decrease
- ◉ C) No change

8. (4.00 pts) What are possible reasons to use a standardized death rate to measure the death rate of a particular disease in a population?

(Mark **ALL** correct answers)

- ☑ A) Compare between two populations while minimizing possible confounding factors
- ☐ B) Measure the population's death rate in comparison to the ideal standard of health
- ☑ C) Adjust for differences in mortality rates between different age groups
- ☐ D) Adjust for differences in incidence rates of different diseases

9. (2.00 pts) Which of the following types of studies has the strongest ability to establish causality?

- ○ A) Case-control study
- ○ B) Cohort study
- ◉ C) Randomized controlled trial
- ○ D) Ecological study

10. (2.00 pts) Which of the following types of studies has the weakest ability to establish causality?

- ○ A) Case-control study
- ○ B) Cohort study
- ○ C) Randomized controlled trial
- ◉ D) Ecological study

11. (1.00 pts) **For Questions #11-14, indicate the level of prevention in the scenario:**

Students must be immunized before starting school

- ○ A) Primordial
- ◉ B) Primary
- ○ C) Secondary
- ○ D) Tertiary

12. (1.00 pts) **For Questions #11-14, indicate the level of prevention in the scenario:**

Everyone wears a mask to prevent the spread of COVID-19

- ○ A) Primordial
- ◉ B) Primary
- ○ C) Secondary
- ○ D) Tertiary

13. (1.00 pts) **For Questions #11-14, indicate the level of prevention in the scenario:**

Construction workers are regularly tested for hearing loss

- A) Primordial
- B) Primary
- C) Secondary
- D) Tertiary

14. (1.00 pts) **For Questions #11-14, indicate the level of prevention in the scenario:**

National programs teach children the importance of nutrition and exercise

- A) Primordial
- B) Primary
- C) Secondary
- D) Tertiary

15. (2.00 pts) Which of the following are possible sources of surveillance data?

(Mark **ALL** correct answers)

- A) Hospital records
- B) School absence records
- C) Laboratory specimen
- D) Public surveys

16. (3.00 pts) Label the type of surveillance in each scenario (one word for each blank):

1. A network of hospitals is chosen to report cases of Hepatitis A in the region
2. Public health officials are notified of a spike in sales of over-the-counter medication.
3. Public health officials contact local clinics for possible additional cases after an initial case report is received

sentinel | syndromic | active

17. (4.00 pts) Which of the following are examples of direct transmission?

(Mark **ALL** correct answers)

- A) Blood transfusion
- B) Contaminated water
- C) Touching
- D) Sneezing
- E) Dust particles
- F) Mosquitos

18. (5.00 pts) Which of the following principles is **NOT** part of Hill's Criteria for Causation?

(Mark **ALL** correct answers)

- A) Experimental evidence demonstrates a causal association
- B) Changes in exposure amount result in changes in outcome
- C) Multiple studies with different conditions have similar findings
- D) There is no known mechanism of a confounding variable present
- E) Strength of association increases with a larger sample size

19. (3.00 pts) What are the advantages of using a cohort study design compared to a case-control study design?

(Mark **ALL** correct answers)

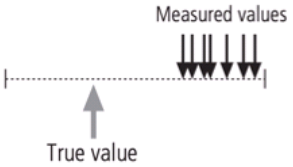
- [ ] A) Can establish causality between exposure and disease
- [x] B) Can study different effects of one cause
- [ ] C) Can study diseases with long latency periods
- [ ] D) Less expensive
- [x] E) Less prone to selection bias
- [x] F) Can directly calculate incidence

20. (3.00 pts) What are possible methods to control confounding variables in the study design?

(Mark **ALL** correct answers)

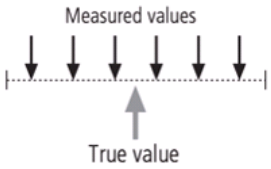
- [x] A) Select study participants from the population randomly
- [ ] B) Create different study groups that have distinct differences from each other
- [x] C) Limit the population being studied to certain characteristics

21. (2.00 pts) Validity and reliability are important measures to consider when designing a study. Based on the figure presented, indicate the scenario at play.



- ( ) A) High validity, high reliability
- ( ) B) High validity, low reliability
- (•) C) Low validity, high reliability
- ( ) D) Low validity, low reliability

22. (2.00 pts) Validity and reliability are important measures to consider when designing a study. Based on the figure presented, indicate the scenario at play.



- ( ) A) High validity, high reliability
- (•) B) High validity, low reliability
- ( ) C) Low validity, high reliability
- ( ) D) Low validity, low reliability

23. (3.00 pts) _____ validity indicates the degree of confidence for the relationship observed between the independent and dependent variables

_____ validity indicates the ability to generalize findings to a population outside the study

Confounding variables affect the _____ validity of a study

internal	external	internal

24. (4.00 pts) Which of the following statements are true regarding relative risk (RR) and odds ratio (OR)?

(Mark **ALL** correct answers)

- [x] A) RR is used in cohort studies while OR is used in case-cohort studies

- [x] B) In studies where absolute risk cannot be estimated, OR must be used
- [ ] C) RR and OR are approximately equal when the disease is common
- [ ] D) RR = 1 indicates that the risk of disease is higher in the exposed group than the unexposed group

For Questions #25-30, refer to Passage A below:

Washing hands often, especially during times when one is likely to acquire and spread pathogens, is one important measure to help prevent the spread of SARS-CoV-2, the virus that causes coronavirus disease 2019 (COVID-19), as well as other pathogens spread by respiratory or fecal-oral transmission. Studies have reported moderate to high levels of self-reported handwashing among adults worldwide during the COVID-19 pandemic; however, little is known about how handwashing behavior among U.S. adults has changed since the start of the pandemic.

For this study, data from ConsumerStyles fall and summer surveys conducted by Porter Novelli Public Services in October 2019 (prepandemic) and June 2020 (during pandemic) were compared. These data are collected by Porter Novelli Public Services through Ipsos' Knowledge Panel, an online market research panel. This panel is designed to be representative of the noninstitutionalized U.S. population, and panel members are recruited randomly by mail through probability, address-based sampling. Respondents receive points for participating in the panel, which can be used to redeem cash and prizes. The samples from each year were weighted to match the U.S. population across eight characteristics: sex, age, annual household income, race/ethnicity, household size, education, U.S. Census division, and residence in a metropolitan area. Sampling weights were applied to all analyses.

The fall 2019 ConsumerStyles survey was completed by 3,624 participants during October 8–22, 2019, (77.5% response rate); the summer 2020 ConsumerStyles survey was completed by 4,053 participants during June 10–25, 2020, (62.7% response rate). The same handwashing question was asked in both surveys: "In which of these situations/settings are you most likely to remember to wash your hands?" with the following response options provided in a randomized order to each participant: 1) after using the bathroom at home; 2) after using the bathroom in public; 3) after coughing, sneezing, or blowing one's nose; 4) before eating at home; 5) before eating at a restaurant; and 6) before preparing food at home. Participants were asked to select all options for which they would be likely to remember to wash their hands and could choose as many of the six response options as were applicable. In addition to handwashing, collected data included information about demographic characteristics, household size, annual household income, employment status, and perceived health status. Multivariable logistic regression was used to estimate odds ratios (ORs) for the association between remembering to wash hands and year, adjusting for sex, age group, race/ethnicity, health status, U.S. Census division, annual household income, work status, education, metro status, household size, and marital status.

25. (2.00 pts) **For Questions #25-30, refer to Passage A.**
What type of study design is described in the article?

- ○ A) Case report
- ○ B) Case-control
- ○ C) Cohort
- ◉ D) Cross-sectional

26. (2.00 pts) **For Questions #25-30, refer to Passage A.**

This study uses self-reported data. This type of data is most subject to which TWO of the following biases?

(Mark **ALL** correct answers)
- [x] A) Recall bias
- [ ] B) Selection bias
- [ ] C) Attrition bias
- [x] D) Social desirability bias

27. (4.00 pts) **For Questions #25-30, refer to Passage A.**

Which of the following characteristics of the study design as explained in the article help to reduce bias?

(Mark **ALL** correct answers)
- [ ] A) Survey was conducted by Ipsos' Knowledge Panel, which is a trustable research panel
- [ ] B) Respondents can redeem cash and prizes for participating
- [x] C) Participants were recruited through probability, address-based sampling
- [x] D) Calculated odds ratios were adjusted based on factors such as sex, age group, and race/ethnicity

28. (3.00 pts) **For Questions #25-30, refer to Passage A.**

Using the information provided in the below table, which situations had statistically significant differences in percentages of washing hands from 2019 to 2020?

Table. Percentage of respondents who reported remembering to wash their hands for different situations. Values in parentheses indicate 95% confidence interval.

	2019	2020
Before eating at home	62.8 (60.9-64.6)	74.4 72.7-76.1)
Before eating at a restaurant	55.2 (53.5-57.1)	70.6 (68.9-72.4)
Before preparing food at home	86.5 (85.2-87.8)	85.7 (84.3-87.1)
After using the bathroom at home	85.9 (84.6-87.2)	89.6 (88.5-90.8)
After using the bathroom in public	95.5 (94.6-96.3)	94.8 (93.8-95.8)
After coughing, sneezing, or blowing nose	53.3 (51.4-55.2)	71.2 (69.5-72.9)

(Mark **ALL** correct answers)

- [x] A) Before eating at home
- [x] B) Before eating at a restaurant
- [ ] C) Before preparing food at home
- [x] D) After using the bathroom at home
- [ ] E) After using the bathroom at public
- [x] F) After coughing, sneezing, or blowing nose

29. (3.00 pts) **For Questions #25-30, refer to Passage A.**

Which of the following conclusions can be reached based on the information provided in the passage and table?

(Mark **ALL** correct answers)

- [x] A) Out of the scenarios surveyed, "after experiencing respiratory symptoms" had the greatest increase in the percentage of people washing hands from 2019 to 2020
- [ ] B) The percentage of people who wash their hands after using the bathroom in public decreased from 2019 to 2020
- [ ] C) COVID-19 caused more people to wash their hands before eating in a restaurant

30. (4.00 pts) **For Questions #25-30, refer to Passage A.**

What are two (2) possible methods that public health officials can implement to increase handwashing behavior?

Expected Answer: 2 of the following: Increased availability of handwashing supplies; Increased signage promoting handwashing in areas where it is most encouraged, such as public restrooms, restaurants; Increased education on the importance of handwashing

For Questions #31-38, refer to Passage B below:

Preventing transmission of SARS-CoV-2, the virus that causes coronavirus disease 2019 (COVID-19), in institutes of higher education presents a unique set of challenges because of the presence of congregate living settings and difficulty limiting socialization and group gatherings. On August 3, 2020, university A in North Carolina broadly opened campus for the first time since transitioning to primarily remote learning in March.

University A students returned to residence halls during August 3–9, 2020, and in-person classes began on August 10. Mitigation steps taken to prevent the spread of SARS-CoV-2 on campus included scheduling move-in appointments across a 1-week period, decreasing classroom density to facilitate physical distancing, and reducing maximum dining hall capacity and increasing takeout options. Students were required to sign an acknowledgment of community standards and university guidelines recommending daily symptom checks, use of masks in all indoor common spaces and classrooms, physical distancing of greater than 6 feet in indoor and outdoor settings, and limitations on group gatherings consistent with local guidelines (groups of no more than 10 persons indoors and 25 outdoors). Approximately 95% of students signed the acknowledgment; however, data on adherence to these important mitigation strategies were not available. Reentry testing for COVID-19 and quarantine before or after arrival on campus were not used. Undergraduate enrollment in university A for the fall semester was 19,690 students. Approximately 5,800 (29%) of these undergraduate students resided on campus as of August 10.

By August 25, 670 laboratory-confirmed cases of COVID-19 with a specimen collection date for SARS-CoV-2 testing of August 3 or later had been identified among students, faculty, and staff members at university A. Cases were identified by the student health clinic (by self-report or through testing at the student health clinic or the university hospital testing center) or linked to a university cluster by the local health department. Initial information was collected by the university at the time of testing; the university also implemented contact tracing, isolation, and quarantine. Additional investigation of cases was conducted by the local health department for students who were tested off campus. Cases were classified according to the Council of State and Territorial Epidemiologists COVID-19 2020 Interim Case Definition. An additional 120 potential cases identified by the student health clinic had insufficient information to meet criteria for confirmed or probable COVID-19 and were not included in the analysis. Information on cases reported only to the university employee occupational health clinic, which is separate from the student health clinic, was not available for review at the time of analysis.

Among 670 confirmed cases with specimen collection dates during August 3–25 for SARS-CoV-2 testing, median patient age was 19 years (range = 17–50 years), and 293 (47%) cases occurred in males (information on gender was missing for 47 [7%] patients). Information on school affiliation (e.g., undergraduate versus graduate/professional student, faculty,

or staff member) was not consistently recorded; however, considering patient age <22 years as an indicator of undergraduate status, 643 (96%) cases were estimated to have occurred in undergraduate students; among these students, 230 (36%) resided on campus, and at least 51 (8%) were members of a fraternity or sorority and 51 (8%) were student athletes. For the remainder, place of residence, including if living at home or in shared apartments, was not readily available. As of August 25, no COVID-19 patients were hospitalized or had died, and no cases of multisystem inflammatory syndrome in children or adults were reported. One student was kept for extended observation in a hospital emergency department. Information on other clinical manifestations, such as myocarditis, was not available.

On August 19, when 334 (50%) university A-associated cases had been reported to the local health department, all university A classes transitioned to online, and efforts to reduce the density of on-campus housing commenced. Testing for SARS-CoV-2 was recommended for all persons living in residence halls with case clusters and was offered to all students at the student health clinic and the university hospital testing center. Students living in on-campus residence halls were required to return home unless they applied for and received a hardship waiver indicating they could remain on campus. All students returning home were instructed to self-quarantine for 14 days following departure from campus. Off-campus testing sites were set up both to meet community needs and target off-campus student housing complexes with multiple cases.

31. (3.00 pts) **For Questions #31-38, refer to Passage B.**
The passage outlines several control methods implemented by University A upon first opening campus. Which aspects of the chain of infection were targeted?

(Mark **ALL** correct answers)

- [ ] A) Infectious agent
- [ ] B) Reservoir
- [x] C) Portal of exist
- [x] D) Mode of transmission
- [x] E) Portal of entry
- [ ] F) Susceptible host

32. (2.00 pts) **For Questions #31-38, refer to Passage B.**

What is the attack rate of COVID-19 in undergraduate students at University A? Write your answer as a percentage and round to the nearest tenth of a percent.

3.3%

33. (1.00 pts) **For Questions #31-38, refer to Passage B.**

What is the relative risk of COVID-19 of undergraduate students who lived on campus compared to those who lived off campus? Round to the nearest tenth.

1.3

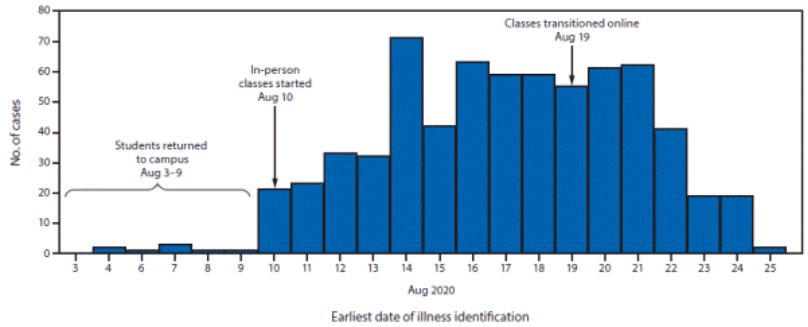
34. (3.00 pts) **For Questions #31-38, refer to Passage B.**

Based on your answer to the previous question, which statement is correct?

- (●) A) Undergraduate students who live on campus are more likely to be infected with COVID-19 compared to those who live off campus
- ( ) B) There is no evidence for an association between living on campus and being infected with COVID-19
- ( ) C) Undergraduate students who live on campus are less likely to be infected with COVID-19 compared to those who live off campus
- ( ) D) None of the above

35. (2.00 pts) **For Questions #31-38, refer to Passage B.**

What is the common name of the below figure?



- ( ) A) Outbreak curve
- ( ) B) Epidemiology graph

- [x] C) Epidemic curve
- [ ] D) Bar graph

36. (2.00 pts) **For Questions #31-38, refer to Passage B.**

Based on the figure, what mode of spread is present at University A?

- [ ] A) Point source
- [x] B) Continous source
- [ ] C) Propagated source
- [ ] D) Intermittent source

37. (3.00 pts) **For Questions #31-38, refer to Passage B.**

What distinguishes a confirmed case from a probable case?

(Mark **ALL** correct answers)

- [x] A) Confirmed case has positive laboratory evidence
- [ ] B) Confirmed case meets clinical criteria
- [ ] C) Probable case does not have epidemiologic linkage

38. (3.00 pts) **For Questions #31-38, refer to Passage B.**

What factors may cause the observed prevalence to be lower than the true prevalence of COVID-19 at University A?

(Mark **ALL** correct answers)

- [x] A) Lack of testing among all students
- [x] B) Lack of reporting to the student health clinic
- [ ] C) False positive test result

For questions 39-41, choose whether the scenario describes the use of a Clinical Approach or the Public Health approach to healthcare. Choose the BEST answer.

39. (1.00 pts)

An agency has noticed that there has been a 25% increase in increased cholesterol mentioned in questionnaires and research studies within the Austin area. To try to combat this, the agency wants to provide individual counseling and workshops geared towards healthy eating as well as education on bloodwork and cholesterol levels.

- [ ] A) Public Health Approach
- [x] B) Clinical Approach
- [ ] C) Neither

40. (1.00 pts)

A hospital has noticed there is a sudden influx of hepatitis cases in the University area for the past two weeks. The hospital has sent scientists to examine those specific individuals, and determine the mass spread of these cases and how treatment should be administered towards this group of individuals.

- [x] A) Public Health Approach
- [ ] B) Clinical Approach
- [ ] C) Neither

41. (1.00 pts)

Flu season has come around, and there is an increase in homeless patients that have contracted the flu. To combat this, non-profits have decided to set up “Flu Mobiles” around homeless campsites to help administer the flu shot to each person.

- [ ] A) Public Health Approach
- [x] B) Clinical Approach

C) Neither

42. (2.00 pts) What is the difference between incubation period and latency period during the subclinical disease stage?

A) The latent period is usually between exposure and infection, whereas the incubation period is between exposure and recovery.
B) The latent period is for infectious diseases, whereas the incubation period is for chronic diseases.
C) The latent period is for chronic diseases, whereas the incubation period is for infectious diseases.
D) The latent period is usually between exposure and onset of symptoms, whereas the incubation period is between exposure and infection.
E) There is no difference, they are the same.

43. (2.00 pts) What are the two main factors of Data Dissemination in Public Surveillance?

A) Data Collection, Data Analysis
B) Data Analysis, Target Audience
C) Method of distribution, Target Audience
D) Method of distribution, Data interpretation
E) Individual identification, Target Audience

For questions 44-47, determine whether the scenario is depicting passive, active, sentinel or syndromic surveillance. Choose the BEST answer.

44. (2.00 pts)
The pharmacies in the Texas area are seeing a massive unusual increase in the sale of Loratadine, an over-the-counter allergy drug. Public health professionals start actively monitoring these sale records and try to determine if there is an issue.

A) Passive Surveillance
B) Sentinel Surveillance
C) Active Surveillance
D) Syndromic Surveillance

45. (2.00 pts)
A need for high quality data on a new invasive fungal disease is present in Texas. Seton healthcare hospitals(a huge branch of hospitals) is tasked with the mass collection of data on the patients associated with this disease and any other research present on it.

A) Passive Surveillance
B) Sentinel Surveillance
C) Active Surveillance
D) Syndromic Surveillance

46. (2.00 pts)
An increase in cases of COVID-19 has been reported on University campuses. To determine why there is a sudden spike, contact tracing efforts have been put into place to track down the root case or future cases of COVID-19.

A) Passive Surveillance
B) Sentinel Surveillance
C) Active Surveillance
D) Syndromic Surveillance

47. (2.00 pts) A patient comes to the hospital with a case of Botulism. The physician tending to this patient completes and turns in a case report to the local health department.

A) Passive Surveillance
B) Sentinel Surveillance

C) Active Surveillance

D) Syndromic Surveillance

Read the following hypothetical scenario for question 48:

An indigenous population on the border of New Mexico reported a sudden increase in Shigellosis(an infectious disease that leads to diarrhea, fever and stomach cramps). The first case was reported on November 4th 2019, and an increase in cases continued for two weeks.

48. (2.00 pts) This scenario can be described as what type of epidemiology?

A) Analytic Epidemiology

B) Descriptive Epidemiology

C) Analytic and Descriptive Epidemiology

49. (2.00 pts) What are the two main variables in the rate % formula (when determining disease frequency) ?

A) Number of cases; population at risk

B) Number of cases; general population

C) Population at risk; number of deaths

D) General population; population at risk

50. (2.00 pts) Which answer choice is NOT a part of the chain of infection?

A) Portal of Exit

B) Reservoir

C) Period of Communicability

D) Modes of Transmission

E) Infectious Agents

Read the following hypothetical scenario for question 51:

A middle school hosts a camping trip for 25 students over the weekend. After a week, 5 students start presenting symptoms of fever, sore throat, fatigue, and enlarged lymph nodes. After two weeks, over 75% of the students from that camping trip appear symptomatic. It is later discovered that the students have contracted mononucleosis, and appeared to have shared multiple toothbrushes over the camping weekend.

51. (2.00 pts) According to the mechanism of disease, what kind of element is the toothbrush?

A) Fomite

B) Vector

C) Portal of Entry

D) Infectious Agent

E) Vulnerable Agent

Read the following hypothetical scenario for question 52:

This specific strain of Cholera originated in Russia where it killed over 900,000 people. It then spread to the Middle East, South Africa, India, and East Asia. This disease caused outbreaks across the world, especially in passengers that were traveling(steamships, boats, etc). It caused a massive quarantine and travel restrictions in every country.

52. (2.00 pts) What is the correct term for what is happening in this scenario?

A) Endemic

B) Pandemic

C) Epidemic

D) Sporadic Disease

E) Localized Outbreak

53. (2.00 pts) Choose the answer that is NOT a characteristic of a cross-sectional study.

A) It is a type of observational study.

B) The participant for this study is selected based on outcome status.

C) This study is used for population-based surveys.

D) This study is not commonly used when deriving causal relationships.

E) Prevalence of disease can be estimated from a cross-sectional study.

54. (2.00 pts) Choose the answer that is NOT a characteristic of a Quasi-Experimental Study.

A) They are non-randomized.

B) It is used to evaluate the effectiveness of interventions.

C) One of the strengths of this type of study is that it can determine causality.

D) This type of study is done when there are ethical considerations that need to be taken.

E) All are CORRECT.

55. (2.00 pts) Select the BEST reason why screening programs would disrupt the natural history of a disease.

A) There are variations in screening policies across different populations.

B) They become more sensitive over time and move the detectable period earlier.

C) They reduce lead-time bias.

D) They shorten the time between disease initiation and diagnosis.

E) All of these are equally as important.

56. (2.00 pts) A clinic notices a surge in Hepatitis B cases in the local area. Select the answer(s) that would help this clinic break the chain of infection.

(Mark **ALL** correct answers)

A) Good hand hygiene/using Gloves

B) Maintaining proper ventilation

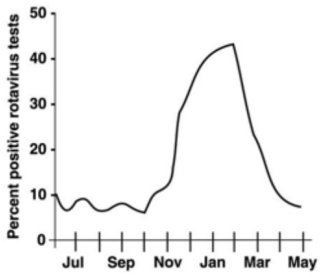
C) Disposing of wound dressings properly

D) Protecting the eyes, nose, and face

E) Carefully handling food

F) Carefully handling sharps

57. (2.00 pts) Use the following diagram to answer question 57:



From the months of June to October, the rotavirus is considered an _____. From October onwards, the rotavirus is considered an _____.

A) Epidemic; Pandemic

B) Epidemic; Endemic

- C) Endemic; Epidemic
- D) Pandemic; Endemic
- E) Endemic; Pandemic

58. (2.00 pts) What type of bias is most typically associated with population-based cohort studies? Select the BEST answer.

- A) Medical Surveillance Bias
- B) Observation Bias
- C) Confirmation Bias
- D) Publishing Bias
- E) Cohort studies are never affected by bias!

Read the following hypothetical scenario and answer questions 59-61:

The local elementary school serves milk for lunch everyday to most of its students. A couple of weeks into the school year, the school switches its milk supplier, and young students start falling ill. The milk turns out to be unpasteurized, and students are being diagnosed with Brucellosis, an infectious bacterial disease caused by infected animal products.

59. (2.00 pts)
After investigation, scientists have concluded that Brucellosis symptoms have shown up in students that drank at least two cartons of milk a day. What is this number called? What type of disease would Brucellosis be considered? **Answer in order.**

- A) Period of Communicability; Zoonotic
- B) Infectious Dose; Zoonotic
- C) Vector Dose; Anthroponotic
- D) Vector Communicability; Zoonotic
- E) None of the above

60. (2.00 pts)
Strains of Brucella (B. melitensis, B. abortus, B. suis) have been heavily experimented within plants. Brucella has a large genome size, that allows it to use metabolic functions from plants for long periods of time as well as persist in the soil. Even though the effects of Brucella have not been seen in plants, Brucella in animals causes death. We see a _____ relationship between Brucella and plants. We see a _____ relationship between Brucella and animals. **Answer in order.**

- A) Commensalism; Parasitism
- B) Mutualism; Commensalism
- C) Parasitism; Parasitism
- D) Neutralism; Mutualism
- E) Competition; Parasitism

61. (2.00 pts)
Brucellosis is also a high occupational risk. Farmers and anybody working directly with livestock are at high risk of exposure to the disease. If we were to create a study for an endemic region (such as Greece) and a specific high risk population, what kind of study would we steer towards?

- A) Cross-sectional Study
- B) Case Report Study
- C) Quasi-experimental Field Trial
- D) Follow-Up Study
- E) Ecological Study

Directions: for 62-77, match each question stem to a word bank term. **Word bank terms may be used once, more than once, or not at all.**

Every question will have two blanks. Put only ONE word in each blank. If the term is only one word long, put "X" in the second blank. Be sure to include hyphens when necessary.

Airborne transmission	Attack rate	Biological transmission	Case-control study	Correlation
Cross-sectional study	Dose-response relationship	Droplet transmission	Endemic	False positive
Fomite	Health indicator	Herd immunity	Iatrogenic	Incubation period
Index case	Infectivity	Isolation	Latency period	Nosocomial
Pandemic	Passive immunity	Pathogenicity	Point source outbreak	Primary case
Propagated outbreak	Quarantine	Risk factor	Vector	Virulence

62. (1.00 pts) A cough or sneeze may cause infection to passers-by in the area hours afterward via:

airborne | transmission

63. (1.00 pts) A cough or sneeze may cause infection from over 6 feet away via:

airborne | transmission

64. (1.00 pts) As the number of pack-years increases for a given smoker, their likelihood of developing lung cancer increases. This best demonstrates:

dose-response | relationship

65. (1.00 pts) The period between exposure and infection:

latency | period

66. (1.00 pts) Having an immunodeficiency disorder is an example of a(n) _____ for severe infections:

risk | factor

67. (1.00 pts) A mortality rate is an example of a:

health | indicator

68. (1.00 pts) A mosquito bite causing an infection by a pathogen it served as a maturing host for is an example of:

biological | transmission

69. (1.00 pts) The percentage of people infected by a **particular infectious agent** who eventually go on to experience disease symptoms is a measure of:

pathogenicity | x

70. (1.00 pts) The resistance of a disease that is caused by a substantial amount of immune people:

herd | immunity

71. (1.00 pts) A practice in which the exposures and outcomes of a sample population are recorded simultaneously:

cross-sectional | study

72. (1.00 pts) A practice in which observes an infected group and a healthy group and compares their exposure, behaviors and other notable characteristics:

case-control | study

73. (1.00 pts) An exposure spread from person to person rather than from a common event:

propagated | outbreak

74. (1.00 pts) The first occurrence of an infection recorded by health authorities:

index | case

75. (1.00 pts) A new infection picked up in a hospital shortly after admission is known as:

nosocomial | x

76. (1.00 pts) Given that the common cold is highly prevalent in all areas of the world, it is considered a(n) _____ disease:

endemic | x

77. (1.00 pts) The separation of sick individuals from healthy individuals in order to slow the spread of disease is known as:

isolation | x

Use the following scenario for questions 78-81:

An outbreak occurs at a party and due to the nature of the outbreak, it is suspected that the agent behind the outbreak is a foodborne illness. Below lies all the food present at the party and the number of sick and healthy individuals that ate or did not eat the food.

	Healthy		Sick	
Food	**Ate**	**Didn't Eat**	**Ate**	**Didn't Eat**
Ice Cream	30	4	59	7
Poultry	3	31	6	60
Spaghetti	22	12	45	21
Soda	27	7	54	12
Salmon	18	16	34	32
Eggs	8	26	50	16
Pastry	32	3	57	9

78. (1.00 pts) Given the outbreak was a foodborne illness, what type of epi-curve would one expect to see?

- (●) A) Point source
- ( ) B) Continuous common source
- ( ) C) Propagated
- ( ) D) Negative predictive source
- ( ) E) Two of the above
- ( ) F) None of the above

79. (2.00 pts) What type of statistic should you use in order to identify the food that most likely was the cause of this outbreak?

- A) Relative risk
- B) Odds ratio
- C) Attack rate
- D) Chi-squared
- E) None of the above

80. (3.00 pts) For the correct risk statistic, what is the risk statistic for ice cream? **Round to the nearest tenth.**

1.1

81. (3.00 pts) What food listed below through the correct risk statistic has the highest likelihood of being the cause of the outbreak?

- A) Eggs
- B) Pastry
- C) Ice Cream
- D) Poultry
- E) Soda
- F) None of the above

Use the following scenario for questions 82-88:

You develop a test for a certain disease and the results you obtain following clinical trials are in the chart below.

	Disease Present	Disease Not Present
Test Positive	145	6
Test Negative	35	60

82. (1.00 pts) What term could be said to be the true negativity rate?

- A) Sensitivity
- B) Specificity
- C) Positive predictive rate
- D) Negative predictive rate
- E) Both A and C
- F) None of the above

83. (2.00 pts) What is the false positive in your tests? **Enter only a numerical value.**

6

84. (3.00 pts) What is the sensitivity of your tests? **Round to 2 decimal places and enter the decimal digits only (ex. enter 0.32 as "32")**

81

85. (2.00 pts) If the disease were to be dangerous, what would you maximize?

- A) Sensitivity
- B) Specificity
- C) False positives

D) Negative predictive rate

E) A and B

F) None of the above

86. (1.00 pts) What does a confirmed case have that a possible and probable case does not?

A) Symptoms

B) Case Definition

C) Exposure

D) Lab verification

E) None of the above

87. (3.00 pts) If one travels from a location with a low prevalence of a disease to a place with a higher prevalence of a disease, which of these would increase?

(Mark **ALL** correct answers)

A) Sensitivity

B) Specificity

C) Positive predictive rate

D) Negative predictive rate

E) None of the above

88. (3.00 pts) If one travels from a location with a low prevalence of a disease to a place with a higher prevalence of a disease, which of these would stay the same?

(Mark **ALL** correct answers)

A) Sensitivity

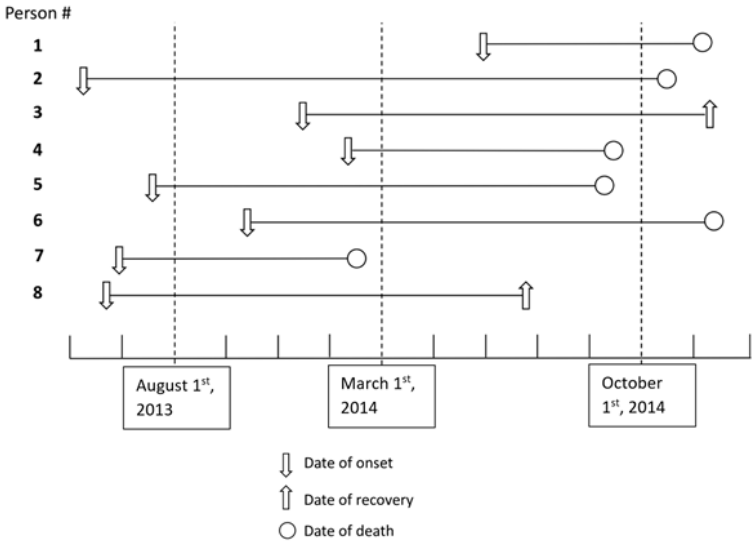
B) Specificity

C) Positive predictive rate

D) Negative predictive rate

E) None of the above

Use the following graph for questions 89-91. This graph below shows the progress of an outbreak over 14 months in a population of 30 people. Each horizontal line represents one person. The down arrow indicates the date of onset of illness. The solid line represents the duration of illness. The up arrow and the circle represent the date of recovery and date of death, respectively.



89. (4.00 pts)

Calculate the incidence rate from August 1st, 2013, to October 1st, 2014 as the denominator. Express the rate per 100 population and round up (Hint: use midpoint population)

Example answer format: for 21 per 100, enter "21".

14

90. (4.00 pts)
Calculate the point prevalence on March 1, 2014. Express your answer as a percentage rounded to one decimal place. **Example answer: 78.4% is entered as "78.4"**

20.7

91. (4.00 pts)
Calculate the period prevalence from August 1st, 2013, to October 1st, 2014. Express your answer as a percentage rounded to one decimal place. **Example answer format: 78.4% is entered as "78.4"**

26.7

Read the passages and figures below and answer the questions that follow (92-99).

Credit: CDC

Scientists recently analyzed the 2018 Behavioral Risk Factor Surveillance System (BRFSS) data to compare the occurrence of frequent mental distress between adults with and without disabilities. BRFSS is an annual, landline and cellular telephone–based self-reported survey of noninstitutionalized U.S. adults aged ≥18 years. In 2018, the BRFSS unweighted sample size was 430,949. The combined (landline and cellular telephone) median response rate among the 50 states and the District of Columbia in 2018 was 49.9% (range = 38.8%–67.2%).§ Adults were considered to have a disability if they reported having one or more of six disability types: hearing, vision, cognition, mobility, self-care, or independent living. Mutually exclusive disability categories were created for each disability type and for adults reporting more than one disability. The latter were further categorized into four groups, based on cognition or mobility, two of the most prevalent disability types: cognition-only, mobility-only, both, or neither. Adults were considered to have frequent mental distress if they reported 14 or more days in response to the question “Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?”

Nearly one third of adults with disabilities (32.9%) reported experiencing frequent mental distress, compared with 7.2% of adults without disabilities. Frequent mental distress was reported by 55.6% of those with disability in both mobility and cognition, 8.8 times that reported among those without disabilities. Mental distress was more commonly reported among females and persons who were unmarried; unemployed; identified as lesbian or gay, bisexual, or something else; and lived in lower-income households compared with males and those who were married, employed, identified as straight or not gay, and lived in higher-income households. Persons identifying as non-Hispanic Asian, Hispanic, and middle-aged or older reported mental distress less often than did those who identified as non-Hispanic white, and who were younger. Among adults without disabilities, both veterans and retirees were 20% less likely to report mental distress than were nonveterans and adults who were employed; no differences were found by veteran and employment status for adults with disabilities. Among adults with disabilities, those who reported adverse health-related behaviors or conditions (i.e., cigarette smoking, insufficient sleep, physical inactivity, obesity, and diagnosed depressive disorder) or an unmet health care need because of cost more often had frequent mental distress than did those without these characteristics. For all comparisons, statistical significance at a level of α = 0.05 was determined using a two-sided t-test in SAS-callable SUDAAN (version 11.0.1; RTI International).

92. (2.00 pts) The ratio reported in this study is an example of a(n):

- A) Relative risk
- B) Prevalence ratio
- C) Relative attack rate
- D) Incidence rate

93. (3.00 pts) Based on the study, frequent mental distress was associated with which of the following?

(Mark **ALL** correct answers)
- [x] A) Having a disability
- [x] B) Having an unaddressed medical condition
- [x] C) Identifying as LGBTQ+
- [ ] D) Being a veteran

94. (2.00 pts) Given that the SAS-callable SUDAAN hypothesis test was run as a two-sided test, what could the results of each hypothesis test tell us, as used in this study?

(Mark **ALL** correct answers)
- [x] A) Whether or not two groups have significantly different occurrences of frequent mental distress
- [ ] B) Whether or not one group has a significantly greater occurrence of frequent mental distress relative to a known population mean
- [ ] C) The goodness-of-fit between the sample data and the population

D) To what statistical extent membership in a particular group causes frequent mental distress

95. (3.00 pts) What was the probability of the SUDAAN test giving a false positive result; that is, identifying an association that doesn't actually exist?

A) 95%
B) 5%
C) 97.5%
D) 2.5%

96. (3.00 pts)
The study also found that one in six adults with disabilities who did not have a diagnosed depressive disorder reported frequent mental distress. Which of the following is an implication of this finding?

A) There may be a high prevalence of undiagnosed mental health disorders among adults with disabilities
B) The strength of correlation of disability status and frequent mental distress as observed in this study may be an underestimate
C) Some healthcare providers caring for patients with physical disabilities may be under-identifying the mental health outcomes of the conditions
D) All of the above

97. (3.00 pts) Which of the following does NOT limit the findings of this study?

A) Causality cannot be inferred because disability and mental distress may have reciprocal effects
B) Excluding institutionalized American adults could have resulted in an overestimate of correlation magnitudes
C) Mental health symptoms may have been underreported due to the social desirability effect of self-reported phone surveys
D) The disability categories used were broad and did not reveal the primary disabling condition

98. (2.00 pts)
A follow up study could examine how the identities interrogated in this study, such as gender identity, race, and sexuality, may be associated with frequent mental distress in combination with each other (such as, is the prevalence of frequent mental distress different in Non-hispanic Asian females relative to females overall). In doing so, this follow up study would employ principles of:

A) Demographic transition theory
B) Epidemiological transition theory
C) Medical anthropology
D) Intersectionality theory

99. (3.00 pts)
While this study used a survey to collect data on mental health, public health surveillance is another way to quantify the occurrence of particular conditions in the public. Is it ever justifiable to collect names or identifiable data during epidemiological surveillance on mental health conditions?

A) Yes, to avoid double-counting records and facilitate longitudinal surveillance
B) Yes, but only if there is explicit, informed patient consent
C) No, because health officials are obligated to respect patient privacy
D) No, because there is often a stigma associated with mental health conditions

Read the study summary below and answer the questions that follow (100-104).

Certification of global eradication of indigenous wild poliovirus type 2 occurred in 2015 and of type 3 in 2019. Since the launch of the Global Polio Eradication Initiative (GPEI) in 1988 and broad use of live, attenuated oral poliovirus vaccine (OPV), the number of wild poliovirus cases has declined >99.99%. Genetically divergent vaccine-derived poliovirus (VDPV) strains can emerge during vaccine use and spread in underimmunized populations, becoming circulating VDPV (cVDPV) strains, and resulting in outbreaks of paralytic poliomyelitis. In April 2016, all oral polio vaccination switched from trivalent OPV (tOPV; containing vaccine virus types 1, 2, and 3) to bivalent OPV (bOPV; containing types 1 and 3). Monovalent type 2 OPV (mOPV2) is used in response campaigns to control type 2 cVDPV (cVDPV2) outbreaks. This report presents data on cVDPV outbreaks detected during January 2018–June 2019 (as of September 30, 2019). Compared with January 2017–June 2018, the number of reported cVDPV outbreaks more than tripled, from nine to 29; 25 (86%) of the outbreaks were caused by cVDPV2. The increase in the number of outbreaks in 2019 resulted from VDPV2 both inside and outside of mOPV2 response areas. GPEI is planning future use of a novel type 2 OPV, stabilized to decrease the likelihood of reversion to neurovirulence. However, all countries must maintain high population immunity to decrease the risk for cVDPV emergence. Cessation of all OPV use after certification of polio eradication will eliminate the risk for VDPV emergence.

100. (3.00 pts) Which of the following is true based on the study?

- A) The vaccine for polio can cause wild poliovirus in some recipients
- B) The vaccine for polio can cause novel strains of poliovirus to begin circulating
- C) cVDPVs are more likely in areas with high rates of polio vaccination
- D) cVDPVs are less likely in underdeveloped countries

101. (2.00 pts) Which of the following is a criterion for the eradication of a disease?

- A) Reduction of a the prevalence in a regional population to zero
- B) Reduction of the global prevalence to a negligible amount
- C) Reduction of the prevalence in the global host population to zero
- D) Undetectable amounts of the virus in its non-human reservoir over a period of 5 years of rigorous testing

102. (3.00 pts) Which of the following are criteria for a disease to be selected for global eradication efforts?

- A) The basic reproduction number must be below 1
- B) The infectious agent cannot have a non-human reservoir or amplify in the environment
- C) An accurate diagnostic tool for the disease with high specificity and sensitivity should exist
- D) The infectious agent cannot be self-mutating
- E) Two of the above
- F) Three of the above

103. (2.00 pts) Inactivated poliovirus vaccine (IPV) is another type of polio vaccine that is highly effective. Which of the following is most accurate regarding IPVs?

- A) VDPVs are unlikely to result from IPVs because they do not contain any live virus
- B) IPV-derived poliovirus may result from mutation in underimmunized populations
- C) IPVs are more likely to cause an adverse reaction than OPVs
- D) IPVs better protect people from wild poliovirus compared to OPVs

104. (1.00 pts) The decades-long decrease in US poliovirus cases as a result of vaccination programs is best described as a:

- A) Longitudinal study
- B) Cohort effect
- C) Period effect
- D) Sequela
- E) Secular trend