UFSO

SCIENCE OLYMPIAD
AT THE
UNIVERSITY OF FLORIDA

Northern Regional: January 19th, 2019

Disease Detectives B Test

Name(s): _____

Team Name: _____

School Name: _____

Team Number: _____

Rank: _____

Score: _____

Disease Detectives Division B Test

WARNING: *Do **NOT WRITE ON THE TEST** itself, only on your answer sheet! Points may be deducted. Also, please do not forget to **WRITE YOUR TEAM NUMBER ON THE ANSWER SHEET**.*

TIEBREAKERS: *Questions **(26, 35, and 62)** will be tiebreakers and **WILL** count toward your overall score. In the event of a tie, the team who has obtained the most points from tiebreaker questions will win.*

POINTS*: This test has a total of 101 points, split between three sections. Please manage your time wisely.*

Part 1: 34 points
Part 2: 43 points
Part 3: 24 points

Part 1: Background and Surveillance 34 pts

1. (1pt) A patient was admitted into the ER complaining about severe abdominal pain. Upon running tests, the patient was discovered to have appendicitis and underwent surgery. Which of the following terms best describes the approach to the problem that the doctors used?

a. Scientific method
b. Clinical approach
c. Public health approach
d. Observation

2. (1pt) The World Health Organization conference in Copenhagen discussed the problem of infertility and looked for possible solutions. When evaluating *in vitro* fertilization, they evaluated the effectiveness, safety, and benefit in order to determine whether it should become a standard treatment. What approach was used?

a. Clinical approach
b. Scientific method
c. Experimental method
d. Public health approach

3. (1pt) What are some barriers to effective public health policy?

I. There are more clinical professions than public health professions
II. Public health relies on limited government funding instead of insurance
III. There is no forum for addressing worldwide public health issues
IV. Public health effects are less discernable than clinical
V. Clinicians do not support public health efforts

a. I, II, and III
b. I and III
c. II, III, and V
d. II and IV
e. I, II, and IV

4. (1pt) What is epidemiology?

a. A branch of medical science that focuses specifically on control of disease and risk factors in developing countries
b. The study of the outer layer of the skin
c. A branch of medical science that deals with the incidence, distribution, and control of disease in a population
d. Two of the above
e. None of the above

5. *Part A*. (1 pt) An epidemiologist is analyzing the incidences of heart disease among African Americans in the United States as compared to Caucasian populations. They note a higher amount of risk factors, such as limited access to fresh food or healthcare, associated with African American patients. What type of epidemiology is being modeled?

a. Analytic epidemiology
b. Descriptive epidemiology
c. Occupational epidemiology
d. Racial epidemiology

Part B. (1 pt) The epidemiologist notes a higher amount of risk factors, such as limited access to fresh food or healthcare, associated with African American patients. This is an example of what type of epidemiology?

a. Risk perception
b. Occupational epidemiology
c. Descriptive epidemiology
d. Analytic epidemiology

6. (Short answer, 4 pts) The CDC has identified a new outbreak of the swine flu. What are the 4 steps that the CDC should take to dealing with and solving this health problem? Write your answer with each step being labeled in numerical order. Complete sentences are not required.

7. (1 pt) What is the difference between an incubation period and a latency period?
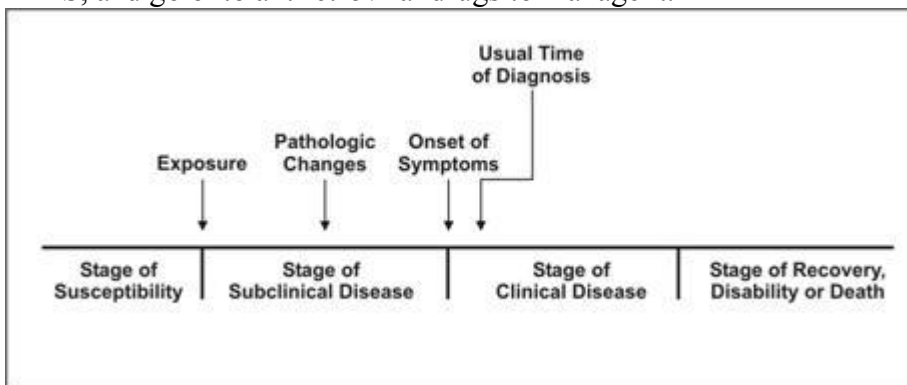
a. They are the same thing.
b. An incubation period is the time between exposure to a disease and the onset of disease symptoms, while the latency period is the time in between flare-ups of a chronic disease.
c. Both describe the time between exposure to a disease and the onset of disease, but the term incubation period is used for infectious disease and the term latency period for chronic diseases.
d. None of the above

For Questions 8-9, use the following information:

A patient is infected with the HIV virus and experiences no symptoms for six years. They get infected with a severe case of pneumonia and immediately after, they also contract norovirus. They go to the doctor and find out that their immune system is dangerously suppressed, a characteristic of AIDS, and go onto antiretroviral drugs to manage it.

Source: Centers for Disease Control and Prevention. Principles of epidemiology, 2nd ed. Atlanta: U.S. Department of Health and Human Services;1992.

8. (1 pt) What stage of disease did the patient have after infection while they did not experience any clinical symptoms?

a. Stage of susceptibility
b. Stage of subclinical disease
c. Stage of clinical disease
d. Stage of recovery, disability, or death

9. (1 pt) What stage of disease did the patient have after they began their antiretroviral treatment?

a. Stage of susceptibility
b. Stage of subclinical disease
c. Stage of clinical disease
d. Stage of recovery, disability, or death

For Questions 10-19, use the following word bank to match key terms with their definitions.

Endemic	Outbreak	Epidemic	Pandemic	Cluster
Risk	Surveillance	Vector	Fomite	Sporadic

10. (1 pt) A large number of people over a wide geographic area are affected.
11. (1 pt) The systematic, ongoing collection, analysis, interpretation, and dissemination of health data.
12. (1 pt) An aggregation of cases over a particular period, especially relating to cancer and birth defects closely grouped in time and space regardless of whether the number of cases is more than the expected number.
13. (1 pt) A disease or condition present among a population at all times.
14. (1 pt) A disease that occurs infrequently and irregularly.
15. (1 pt) An animate intermediary in the indirect transmission of an agent that carries the agent from a reservoir to a susceptible host.
16. (1 pt) A large number of people over a very wide area (several countries or continents) wherein a large proportion of the population is affected.
17. (1 pt) More cases of a particular disease than expected in a given area or among a specialized group of people over a particular period of time.
18. (1 pt) The probability that an individual will be affected by, or die from, an illness or injury within a stated time or age span.
19. (1 pt) A physical object that serves to transmit an infectious agent from person to person.

For Questions 20-24 (mark whether the following are part of the Chain of Infection.
(*Important: Write out TRUE or FALSE in their entirety. Answers written as abbreviations T/F or in lowercase will not be scored.*)

20. (1 pt) Reservoirs
21. (1 pt) Infectious Agents
22. (1 pt) Vaccines
23. (1 pt) Susceptible Hosts
24. (1 pt) Diagnosis

25. (1 pt) Which of the following are the main objectives of surveillance?

I. To provide the government with the means to spy upon the general populace
II. To provide information about changing trends in the health status of a population
III. To provide timely warning of public health disasters
IV. To provide feedback to help modify policy and redefine objectives

a. I only
b. I and II
c. I, II, and III
d. II, III, IV
e. I, II, III, and IV

26. (2 pts) Put the following steps of the surveillance process into the correct order from start to finish. (*Important: Do not forget to number the steps from 1 to 5. Answers without numbered steps will not be scored.*)

Data Dissemination, Data Analysis, Data Interpretation, Action, Data Collection

27. (1 pt) St. Clary's Medical Center has received seven cases of measles in the past two days. The healthcare professionals employed there report the measles cases to the correct health agency. This is an example of:

a. Passive surveillance
b. Helicopter surveillance
c. Syndromic Surveillance
d. Active Surveillance

28. (1 pt) The WHO is interested in monitoring a particular strain of meningococcal bacteria. What are some of the benefits of using Sentinel Surveillance?

I. Higher quality data can be obtained.
II. A larger amount of data can be collected than through other surveillance methods.
III. Recruited reporting units have a high probability of seeing the disease in question.
IV. Allows a focus on monitoring the prevalence of specific symptoms that are characteristic of a disease that would otherwise not be noted.
V. Health agencies would be able to contact health providers to obtain more information than they would receive otherwise.

a. I only
b. II and V
c. I and III
d. IV only
e. I, II, and III

29. (1 pt) True or False: Healthcare providers and health institutions commonly report disease cases directly to their State Health Department. (*Important: Write out TRUE or FALSE in their entirety. Answers written as abbreviations T/F or in lowercase will not be scored.*)

Part 2: Outbreak Investigation 43 pts

All of the questions in Part 2 (Questions 30-56) will refer to the following case study:

On September 17, 2018, the Maryland Department of Agriculture (MDA) was notified by officials of ill swine at an agricultural fair two hours away that was held from September 14-17. September 18, the MDA is notified that fair exhibitors were also ill and that two other agricultural fairs (September 13-17 and September 15-23) also had signs of influenza. Local officials suspect that this might be an outbreak. You are assigned the case.

30. (1 pts) What is the first step of an outbreak investigation?

31. (2 pts) Name two things that you must do to begin conducting the investigation.

You arrive at the location.

32. (4 pts) What must you do to establish whether the cluster of cases is an outbreak?

33. (3 pts) List three things you can do to verify the diagnosis.

34. (4 pts) What are the four components/standard criteria for determining a case definition (which is the standard criteria for determining who has the disease or condition in the outbreak)?
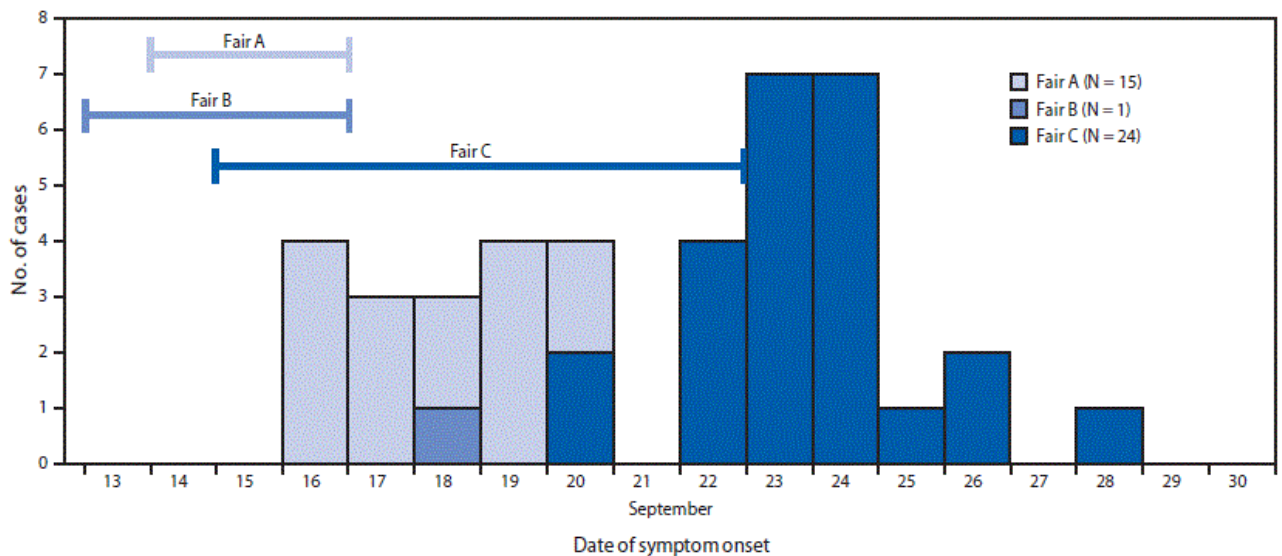
35. (3 points) You must locate cases systematically and record information. What information do you collect?

For Questions 36-42, use the following table to assign the appropriate case definition classification (confirmed, probable, possible, or not a case).

Question Number	Patient Initials	Age	Fever/chills	Sore Throat	Cough	Date of Onset	Lab Verification of Influenza A
36. (1 pt)	AD	12	Yes	Yes	Yes	Sept 14	Yes
37. (1 pt)	SS	8	No	Yes	No	Nov 1	Not done
38. (1 pt)	PG	4	Yes	Yes	Yes	Sept 20	Pending
39. (1 pt)	OK	47	Yes	Yes	Yes	Sept 18	Yes
40. (1 pt)	JN	82	Yes	No	No	Sept 23	Pending
41. (1 pt)	CF	50	Yes	Yes	Yes	Sept 16	Yes
42. (1 pt)	EZ	23	No	No	Yes	Oct 31	Not done

43. (1 point) What is the name of the type of table provided for questions 36-42?

For Questions 44-46, use the following chart:

Source: Duwell MM, Blythe D, Radebaugh MW, et al. Influenza A(H3N2) Variant Virus Outbreak at Three Fairs — Maryland, 2017. MMWR Morb Mortal Wkly Rep 2018;67:1169–1173.

44. (1 point) What is the name of this chart?
45. (1 point) Does this curve show any significant outliers?
46. (1 point) Does this chart better indicate a continuous common source or a propagated outbreak? (The incubation period of influenza A is typically around 2 days).

47. (3 points) What are three elements are vital for developing a hypothesis behind the outbreak?

For Questions 48 - 52, use the following information:

You find out that the fair has noticed signs of respiratory illness in the swine exhibited. You hypothesize that exposure to the swine was the cause behind the outbreak. You decide to do a retrospective survey of attendees of the fair.

	Positive for Influenza A	Negative for Influenza A
Exposed (visited swine exhibit)	36	40
Not exposed (did not visit swine)	4	120

48. (1 pt) What is the name of the exposure study you performed?

49. (1 pt) What is the attack rate for the exposed?

50. (1 pt) What is the attack rate for the unexposed?

51. (1 pt) What is the relative risk?

52. (1 pt) Based upon your calculations, does the relative risk indicate that exposure to swine is a likely cause of the outbreak?

53. (4 pts) Name some of the Bradford Hill criteria for verifying the cause of a health problem.

54. (1 pt) While your analysis looks promising, you cannot yet validate your hypothesis. What is the final step?

You find out that 75 percent of the infected had more than one characteristic putting them at high risk for serious influenza complications. 60 percent of the infected were children under the age of five. 65 percent of all patients reported direct contact with swine or the swine enclosure, while only 13 percent reported indirect contact.

55. (1 pt) What are some preventative measures to ensure that such an outbreak will not reoccur?

56. (1 pt) What is the last step of the outbreak investigation?

Part 3: Patterns, Control, and Prevention 24 pts

For Questions 57- 58, use the following graph.

Folic Acid Fortification at Time of Conception

Source: Centers for Disease Control and Prevention. Trends in Neural Tube Defects (Anencephaly and Spina Bifida) Among All Births, 45 States and District of Columbia, 1990–1999.

57. (1 pt) Does the graph show an increase or decrease in neural tube defects?
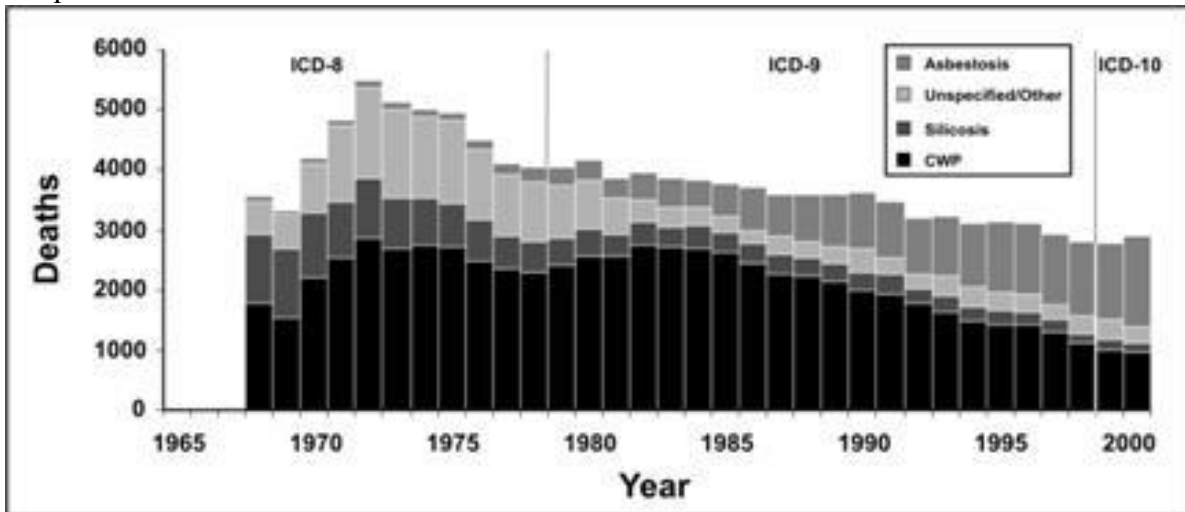
a. Increase
b. Decrease
c. Stays about the same

58. (1 pt) What is the main point demonstrated by the graph?

a. Folic acid fortification is a pre-natal vitamin.
b. Folic acid fortification has little to no effects on the prevalence of neural tube defects.
c. As folic acid fortification became mandatory, the prevalence of neural tube defects increased.
d. As folic acid fortification became mandatory, the prevalence of neural tube defects decreased.
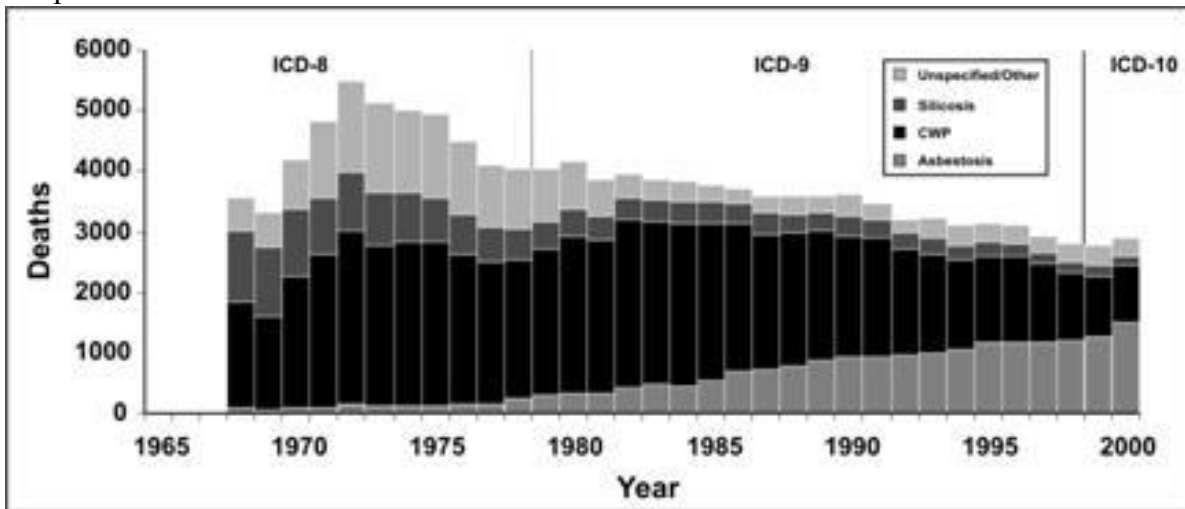
59. (2 pts) Which of these graphs is most effective at showing the increase in deaths from asbestos over time?

Graph A:

Data Source: Centers for Disease Control and Prevention. Changing patterns of pneumoconiosis mortality–United States, 1968-2000. MMWR 2004;53:627–31.

Graph B:

Data Source: Centers for Disease Control and Prevention. Changing patterns of pneumoconiosis mortality–United States, 1968-2000. MMWR 2004;53:627–31.

a. Neither are very good graphs
b. Graph A
c. Graph B

60. (1 pt) Disease control describes ongoing operations aimed at reducing:

I. The incidence of disease
II. The duration of disease and consequently the risk of transmission
III. The effects of infection
IV. The financial burden to the community
V. The amount of insurance providers

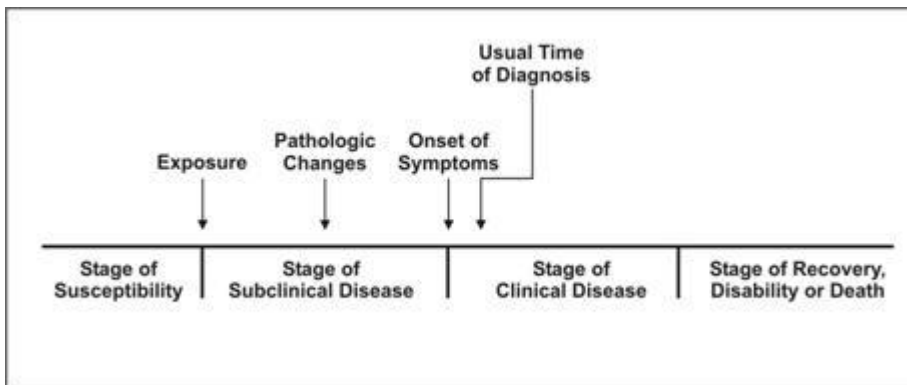a. I and II
b. I, II, and III
c. II, III, and IV
d. I, II, III, and IV
e. I, II, III, IV, V

61. (4 pts) What is the disease control process? List the four main steps.

62. (5 pts) Name five preventable causes (factors) of disease.

63. (2 pts) Explain the difference between morbidity and mortality.

64. (1 pt) During which stage of disease would one implement secondary prevention?

a. Stage of Subclinical Disease
b. Stage of Susceptibility
c. Stage of Recovery, Disability, or Death
d. Stage of Clinical Disease

65. (1 pt) What is primordial prevention?

a. Primary care advice as part of routine consultation
b. Primary care risk factor reduction for those at risk
c. Rehabilitation to prevent deterioration
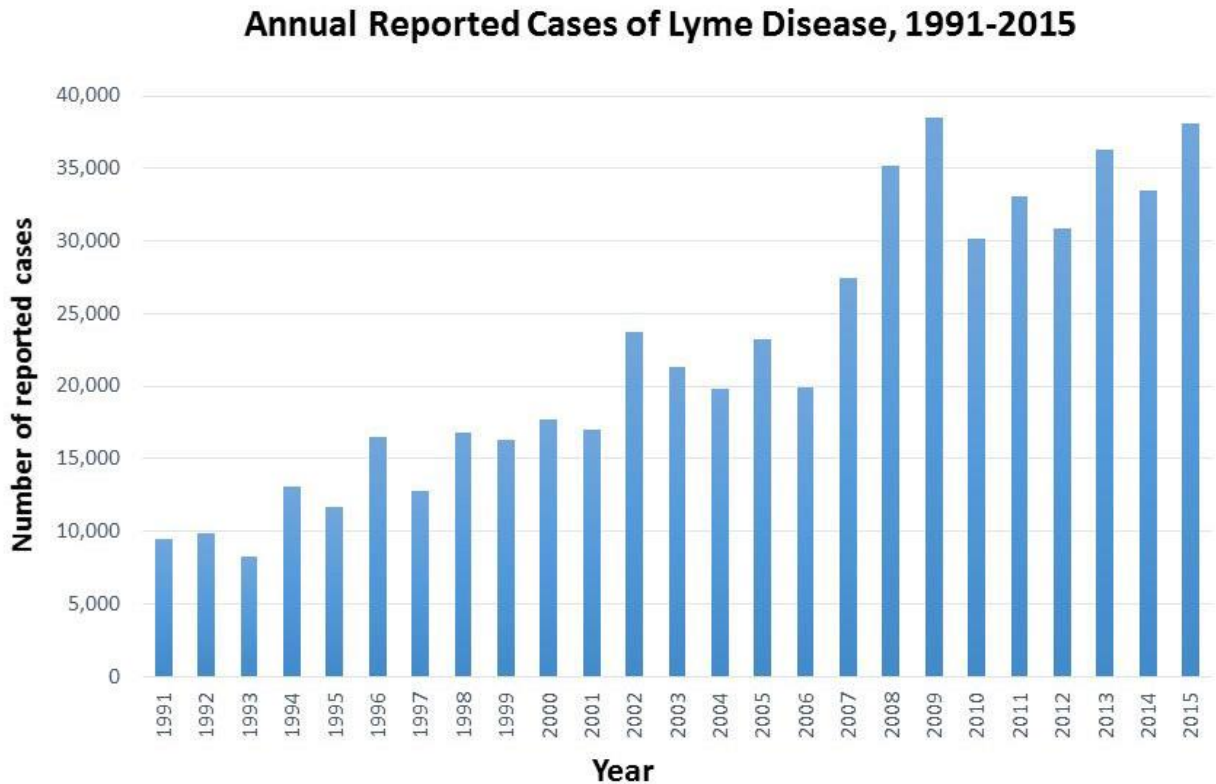d. Advocacy for social change through public health policy

66. (1 pt) What characterizes the high-risk approach to prevention?

I. Target groups of individuals at high risk
II. Strive for strong risk factor control
III. Often requires clinical action
IV. Must be relatively inexpensive and non-invasive

a. I and II
b. II and III
c. III and IV
d. I, II, and III

THIS IS NOT THE END OF THE TEST!

For Questions 67- 68, use the following graph.

Annual Reported Cases of Lyme Disease, 1991-2015

Source: Centers for Disease Control and Prevention. Why is CDC concerned about Lyme disease?

67. (1 pt) Lyme disease is an infection spread via the bites of ticks. It is the most commonly occurring vector-borne disease in the United States. Explain the slope of the graph.

a. The slope of the graph shows an approximately linear increase in annual reported cases of Lyme disease
b. The slope of the graph shows an approximately exponential increase in annual reported cases of Lyme disease
c. The slope of the graph shows a gradual increase in annual reported cases of Lyme disease
d. The slope of the graph shows a positive correlation between the number of reported cases and annual cases of Lyme disease.

68. (1 pt) How many reported cases of Lyme disease were there in the year 2006?

a. 15,000
b. 20,000
c. 25,000
d. 30,000

69. (1 pt) How many reported cases of Lyme disease were there between the years 1991 and 1994?

a. 20,000
b. 30,000
c. 40,000
d. 50,000

70. (2 pts) A study follows 437 men and women with pancreatic cancer for five years. Of these 437 patients, 398 of them died by the end of the time period. Calculate the incidence proportion (risk) of death of pancreatic cancer.