1. Suppose a new drug is discovered which is highly effective in the treatment of a form of cancer, which previously had been very fatal. Which of the following rates will be _least_ affected by the widespread use of the drug? (Check _as many as may be true_)

_____ a. Five year survival rate for this type of cancer.

_____ b. Prevalence rate for this type of cancer.

_____ c. Incidence rate for this type of cancer.

_____ d. Mortality rate for this type of cancer.

2. For Statements A, B, C, D, fill in the letter of the *one epidemiologic concept* best exemplified by each of the descriptive statements below.

    a. "Selection" as a cause of spurious association.

    b. Attributable risk.

    c. Relative Risk.

    d. Bias of measurement as a cause of spurious association.

    e. Case fatality rate.

    f. Inappropriate comparisons because only numerator data were used.

    g. Ecological fallacy.

    h. Sensitivity.

    i. Specificity.

    _____ A. The age standardized diabetes prevalence rates in men in high paying jobs are reported to be higher than in low paying jobs. And men in high paying jobs receive more complete medical examinations than men in low paying jobs.

    _____ B. 80% of people on "hard" drugs have previously tried marijuana. Therefore marijuana usage leads to taking hard drugs.

    _____ C. For every 100,000 births in each country, over 400 more babies die in the U.S.A. than die in Japan.

    _____ D. Cities with high levels of calcium in their water supplies have lower age-race specific death rates from coronary heart disease than do cities with low levels of calcium. Therefore calcium protects individuals from dying from heart disease.

3,   In a study concerned with the possible effects of air pollution on the development of chronic bronchitis the following data were obtained.

A population of 9000 white men aged 45 years were examined in January, 1960. Of these, 6000 were exposed to air pollution and 3000 were not. At this examination, 90 cases of chronic bronchitis were discovered, 60 among those exposed to air pollution.

All the men initially examined were available for subsequent repeated examinations over the next five years. These revealed 268 new cases of chronic bronchitis in the total groups, including 30 among those not exposed to air pollution.

The prevalence rates of chronic bronchitis in January, 1960, were (*in each case show the numerator and denominator*):

_____ X 1000   a.   Rate among those exposed to air pollution.

_____ X 1000   b.   Rate among those not exposed to air pollution.

The incidence rates of chronic bronchitis over the five years were:

_____ X 1000   c.   In those exposed to air pollution.

_____ X 1000   d.   In those not exposed to air pollution.

_____ X 1000   e.   In the total sample.

Which of the following conclusions can be drawn from the prevalence data? (*Please check*)

_____ f.   Air pollution is associated with chronic bronchitis.

_____ g.   Air pollution is not associated with chronic bronchitis.

Which of the following conclusions can be drawn from the incidence data? (*Please check*)

_____ h.   Air pollution is associated with chronic bronchitis.

_____ i.   Air pollution is not associated with chronic bronchitis.

(Question No. 3 Continued from Page 3)

In order to determine whether air pollution is or is not causally related to chronic bronchitis, the possibility that the conclusions, drawn from either the prevalence or the incidence data, may be spurious has to be considered.

Three of the more common sources of spurious conclusions are:

> selective survival
> selective migration
> secondary association

For each source of spurious conclusion, indicate whether it is more likely to apply to the prevalence data, the incidence data or to apply equally to both sets of data (Check the *one best* answer for each)

Selective survival is:

_____ j. More likely to have influenced the conclusions drawn from the prevalence data than the incidence data.

_____ k. More likely to have influenced the conclusions drawn from the incidence data than the prevalence data.

_____ l. Equally likely to have influenced the conclusions drawn from the prevalence or the incidence data.

Selective migration is:

_____ m. More likely to have influenced the conclusions drawn from the prevalence data than the incidence data.

_____ n. More likely to have influenced the conclusions drawn from the incidence data than the prevalence data.

_____ o. Equally likely to have influenced the conclusions drawn from the prevalence or the incidence data.

Secondary associations are:

_____ p. More likely to have influenced the conclusions drawn from the prevalence data than the incidence data.

_____ q. More likely to have influenced the conclusions drawn from the incidence data than the prevalence data.

_____ r. Equally likely to have influenced the conclusions drawn from the prevalence or the incidence data.

4. Death rates from all causes are reported to be lower in professional and managerial occupations than in unskilled occupations. You would suspect that this association between occupational status and death was secondary if you knew the following facts. *(Check as many as would make you suspect a secondary association)*

_____ a. People in unskilled occupations are older than those in professional and managerial occupations.

_____ b. People in professional and managerial occupations are older than those in unskilled occupations.

_____ c. Professional and managerial occupations contain a greater proportion of women than do unskilled occupations.

_____ d. There are more people in unskilled occupations than there are in professional and managerial occupations.

5. To determine whether a newly-invented birth control pill increased the risk of stroke, a cohort study was started. A random sample of women in the child-bearing age was selected and examined to make sure that none had any evidence of stroke; 9920 individuals were thus identified as being eligible for study; of these, 1000 were taking the birth control pill regularly and the remainder were not taking it at all. The entire sample was followed for 10 years with the following results:

	Number of New Cases of Stroke Over 10 Years	Number Free of Stroke Over 10 Years	Total
Women Taking Pill	10	990	1000
Women Not Taking Pill	10	8910	8920
TOTAL	20	9900	9920

From these data, which of the following conclusions can be drawn? (Check the one best answer)

_____ a. Taking the pill does increase the risk of stroke and the degree of this risk is shown by the fact that 10/1000 (1%) of those taking the pill developed a stroke, whereas only 10/8920 (0.1%) of those not taking the pill developed a stroke.

_____ b. Taking the pill does not increase the risk of stroke because 50% (10/20) of stroke cases were taking the pill and 50% (10/20) of stroke cases were not taking the pill.

_____ c. Taking the pill does not increase the risk of stroke because while 10/1000 (1%) of those taking the pill did develop a stroke, 990/1000 (99%) of those also taking the pill did not develop a stroke.

_____ d. Taking the pill does increase the risk of stroke and the degree of this risk is shown by the fact that 10/20 (50%) of the stroke cases were taking the pill, whereas only 990/9900 (10%) of those free of stroke were taking the pill.

6. In order to determine whether exposure to various industrial pollutants increased the risk of lung cancer, the average annual death rates for lung cancer over a 10 year period was analyzed for male employees in five different sorts of industries. These industries are labelled in the table below: Industry A, B, C, etc. (Because lung cancer is almost invariably fatal, and there is a short interval between diagnosis and death, death rates are good approximation of incidence)

Table 1: Average Annual Death Rate for
Lung Cancer for Male Employees
by Industry (1960-1969)

Industry	Annual Death Rate per 100,000 Male Employees
A	72
B	71
C	50
D	49
E	49

The death rates in industries A and B were different from those in C, D, and E. The differences were statistically significant.

It was known however that both the age distribution and cigarette smoking patterns differed in those different industries. Because both age and cigarette smoking increase the risk of lung cancer it was necessary to control for these before concluding that same factor in industries A and B was responsible for an increased risk of lung cancer. To control for them an age and cigarette smoking standardized mortality ratio (S.M.R.) was computed. The results were as follows:

Table 2: Standardized Mortality Ratio for Lung Cancer
by Industry (Male Employees)

Industry	S.M.R.
A	180.6
B	101.1
C	210.2
D	98.9
E	101.3

(Question No. 6 Continued from Page 7)

From these data (page 7) which of the following conclusions can be drawn?
(Check *as many as may be true*)

_____ a.   Some factors in Industries A and C were probably increasing
             the risk of lung cancer.

_____ b.   These data show that neither cigarette smoking nor age was
             related to lung cancer in Industries B, D, and E.

_____ c.   Industry B must have had either more cigarette smokers and/or
             older employees than Industry C.

7. For each of the circumstances listed below, check whether you would recommend a case history or a cohort study.

   A. A study which attempted to determine whether knowledge about disease led to higher utilization of medical care or whether higher utilization of medical care led to more knowledge about disease.

      _____ a. Case History

      _____ b. Cohort

   B. A study concerned with a rare disease.

      _____ a. Case History

      _____ b. Cohort

   C. A study in which it was important to quantify precisely the attributable risk of a characteristic.

      _____ a. Case History

      _____ b. Cohort

   D. A study in which selective survival could seriously bias the results.

      _____ a. Case History

      _____ b. Cohort

8. For a disease which is spread by contaminated water and food, the following data were available for a particular county:

New

Year	Population of County	Number of Cases Reported In that Year
1950	50,000	100
1955	75,000	150
1960	80,000	160
1965	100,000	200

In each of those same years, the health department had conducted a community-wide survey to determine the total number of known cases. Their results were as follows:

Year	Number of Cases Found In Survey
1950	200
1955	225
1960	232
1965	230

The number of deaths due to this disease were as follows:

Year	Number of Deaths
1950	3
1955	2
1960	4
1965	3

Assuming that both the reporting of new cases and the survey results were accurate and complete, would you regard these data as evidence (check the one best answer):

_____ a. Of a successful environmental health program--that is, improvement in the sanitary quality of food and water.

_____ b. Of improvement in treatment of the disease.

_____ c. Of a successful environmental health program and improvement in treatment.

_____ d. That neither the environmental health program had been successful nor had there been any improvement in treatment.

9. A health agency was concerned with two problems: the high rate of recurrence of rheumatic heart disease in children with rheumatic fever, and the high rate of complications occuring in children with diabetes. The consequences (in terms of subsequent disability and death) of rheumatic fever recurrences and diabetic complications are equally serious. Furthermore, the prevalences of diabetes and rheumatic heart disease were the same in the population for which the agency was responsible. The high rate of recurrence of rheumatic heart disease was due to the failure of many children with rheumatic fever to take their penicillin regularly. The high rate of diabetic complications was due to failure of diabetic children to take insulin regularly. To reduce these problems they wished to try two approaches; The first was sending a postcard each month to the families to remind them that the patient must have his penicillin or insulin regularly. The second was a regular home visit by a nurse. For this purpose they drew a random sample of their rheumatic fever patients and a similar sample of their juvenile diabetic patients. One third of each sample received no intervention, one third of each sample received a regular postcard and one third a home visit. As can be seen from the following tables which were compiled one (1) year after the trials started, sending a postcard had little effect, but home visits were highly effective for both rheumatic fever and diabetes.

Table 1: Recurrences of Rheumatic Heart Disease in Children with Rheumatic Fever

Method of Intervention	Recurrences of Rheumatic Heart Disease/1000
No Intervention	15.7
Regular Postcard	15.5
Home Visits	5.0

Table 2: Occurrences of Diabetic Complications in Diabetic Children

Method of Intervention	Diabetic Complications/1000
No Intervention	4.5
Regular Postcard	4.2
Home Visits	0.5

As a result of this information it was decided to make home visiting a routine program of the agency. Due to personnel shortage however such home visits could only be made to all rheumatic fever patients or to all diabetic patients (but not to both)

(Question No. 9 Continued from Page 11)

On the basis of the data presented above which condition should receive
the home visits?

_____ a.   Rheumatic Fever Children

_____ b.   Diabetic Children

Show the data from which you drew your conclusion.

10. A study was undertaken to evaluate the effectiveness of a prenatal program. An objective of this program was to reduce the perinatal mortality rate.

The populations studied were:

All primipara (first pregnancy) aged 21-24 who attended the clinic for prenatal care during a particular year.

A representative sample of primipara from the community served by the clinic who were pregnant during this same period and who had received no prenatal care. This sample was of the same age and ethnic group and parity as the attenders.

The results were as follows:

Table 1: Perinatal Mortality Rates in Women Receiving and Not Receiving Prenatal Care

Prenatal Care at Clinic	No. of Women	No. ofPeri- natal Deaths	Perinatal Mortality Rate/1000
Receiving Pre- natal Care	200	5	25.0
No Prenatal Care	150	10	66.6
ALL Women	350	15	42.9

Table 2: Perinatal Mortality Rates by Educational Level

Education	No. of Women	No. of Peri- natal Deaths	Perinatal Mortality Rate/1000
High School Graduates	190	6	31.6
Non-High School Graduates	160	9	56.3
ALL Women	350	15	42.9

(Question No. 10 Continued From Page 13)

If you knew that 110 of the women who were receiving prenatal care
were high school graduates and that two of them had had a perinatal
death, (and assuming that all the results are statistically significant)
Would you conclude from these data:

_____ a. That the prenatal program had been effective for
             primipara aged 21-24 in that it had reduced their
             perinatal mortality rate.

_____ b. That the prenatal program had not been effective.
             The reduction in perinatal mortality rate was not
             due to the program but due to the higher educational
             level of the women using the program.

Present the complete table from which you drew your conclusions.

Questions 11 - 12.

In a study to determine the relationship between physical activity and coronary heart disease, men of similar age and of the same ethnic group in three different occupations were compared. The occupations were classified as physically active, intermediate activity and sedentary. The findings were as follows:

Table 1: Relation of Occupation to Coronary Heart Disease

Occupational Type	No. of Men	No. of Cases of Coronary Heart Disease	Rate per 1000 Men
Active	6000	20	3.3
Intermediate	3000	30	10.0
Sedentary	1000	20	20.0
ALL Occupations	10,000	70	7.0

Questions 11 and 12 are True-False questions all relating to these data. If you do not know the answer to these questions *DO NOT GUESS* as points will be subtracted for incorrect answers.

11. If the data shown in Table 1 were from a *cross-sectional study* (i.e., prevalence data) and the differences were statistically significant, indicate whether each of the following statements is true or false.

True _____ a. The associations shown in Table 1 could have occurred
False _____   if physical activity was protective against coronary
               heart disease.

True _____ b. The associations shown in Table 1 could be entirely a
               result of men with coronary disease changing occupations
False _____   from active to more sedentary jobs.

True _____ c. The associations shown in Table 1 could be entirely a
               result of a higher case fatality in the active men than
False _____   in the sedentary.

True _____ d. The associations shown in Table 1 could have occurred
               if there had been a higher case fatality in the
False _____   sedentary men than the active.

12. If the data shown in Table I (page 15) were from a *cohort study* (i.e., incidence data) and the differences were statistically significant, indicate whether each of the following statements is True or False.

    True _____ a. The associations shown in Table I could have occurred if physical activity was protective against coronary heart disease.
    False _____

    True _____ b. The associations shown in Table I could be entirely a result of men with coronary disease changing occupations from active to more sedentary jobs.
    False _____

    True _____ c. The associations shown in Table I could be entirely a result of a higher case fatality in the active men than in the sedentary.
    False _____

    True _____ d. The associations shown in Table I could have occurred if there had been a higher case fatality in the sedentary men than the active.
    False _____

13. In a study to determine the relationship between cigarette smoking and chronic bronchitis, patients with chronic bronchitis were matched (by age, sex, race, and social class) with suitable controls and cigarette smoking histories obtained. The analyses were performed separately for 2 age groups as shown in Tables 1 and 2.

Table 1: Cigarette Smoking in Cases
and Controls, Age 35-44

	Cases	Controls	Totals
Smokers	31	12	43
Non Smokers	19	38	57
TOTAL	50	50	100

Table 2: Cigarette Smoking in Cases
and Controls, Age 45-54

	Cases	Controls	Totals
Smokers	30	40	70
Non Smokers	70	160	230
TOTAL	100	200	300

On the basis of these tables, the investigators drew the following conclusions:

Statement 1: "For the younger group there is an association between cigarette smoking and chronic bronchitis because the majority of the patients with chronic bronchitis were smokers."

Statement 2: "In the older group, however, the opposite association exists because the majority of the patients with chronic bronchitis were non smokers."

(Question No. 13 Continued from Page 17)

Check the one totally correct answer.

A. As far as the conclusions concerning the younger group (Statement 1)
    are concerned, and using only the data in Table 1, would you:

    _____ a. Disagree with the investigators' conclusions <u>even though</u>
               they <u>did</u> make the appropriate comparisons.

    _____ b. Agree with the investigators' conclusions <u>even though</u> they
               <u>did not</u> make the appropriate comparisons.

    _____ c. Disagree with the investigators' conclusions <u>because</u> they
               <u>did not</u> make the appropriate comparisons.

    _____ d. Agree with the investigators' conclusions <u>because</u> they <u>did</u>
               make the appropriate comparisons.

B. Give the numerators and denominators of the rates or proportions you used
    to arrive at your answer.

C. As far as the conclusions concerning the **older** group (Statement 2)
    are concerned, and using only the data in Table 2, would you:

    _____ a. Disagree with the investigators' conclusions <u>even though</u>
               they <u>did</u> make the appropriate comparisons.

    _____ b. Agree with the investigators' conclusions <u>even though</u> they
               <u>did not</u> make the appropriate comparisons.

    _____ c. Disagree with the investigators' conclusions <u>because</u> they
               <u>did not</u> make the appropriate comparisons.

    _____ d. Agree with the investigators' conclusions <u>because</u> they <u>did</u>
               make the appropriate comparisons.

D. Give the numerators and denominators of the rates or proportions you
    used to arrive at your answer.