Multiple Choice 1

CHAPTER 2

In a study of 500 patients with coronary heart disease, 100 already had diabetes when the study started on 1 January 2014. Over the next year, 50 more developed diabetes. (Assume the diabetes is permanent and there are no losses or entries to the group of patients with heart disease.)

1. What is the prevalence of diabetes at the start of 2014?

A. 30%
B. 2%
C. 20%
D. 12.5%

Answer: **C**. 100 of 500 people had diabetes at the start of 2014 and 100 ÷ 500 = 0.2 or 20%. The prevalence of diabetes at the end of 2014 would be 30% (A) as it includes the new cases diagnosed during the study: (100 + 50) ÷ 500 = 150 ÷ 500 = 0.3 or 30%.

2. What is the incidence proportion of diabetes in the same study?

A. 30%
B. 12.5%
C. 20%
D. 12.5% over 1 year

Answer: **D.** 50 ÷ (500 – 100) = 0.125 or 12.5% **over 1 year.** Note that we must exclude the 100 people who already have diabetes from the denominator and the period over which the cases accumulate must be given.

3. At the beginning of 1999, 2.3% of the Australian population were estimated to be infected with Hepatitis C virus (HCV). During the year 1999, a further 16,000 individuals were found to have HCV. From this information we can conclude:

A. The incidence rate is 2.3%
B. The point prevalence is 2.3%
C. The incidence proportion is 2.3%
D. None of the above

Answer: **B**. The point prevalence is 2.3% *at the beginning of 1999.* We are told that 2.3% of the population were infected at the start of the year – as they are already infected this is a measure of prevalence. As we do not know the total population at risk of HCV infection we cannot calculate either an incidence rate (A) or incidence proportion (C).

Multiple Choice 1

4. What is the difference between the incidence proportion and the incidence rate?

A. The incidence proportion measures the proportion of people who develop disease during a specified period, whereas the incidence rate measures how quickly people are developing disease
B. The incidence proportion measures how quickly people are developing disease, whereas the incidence rate measures the proportion of people who develop disease during a specified period
C. The incidence proportion measures the number of people with disease in a population at a specific point in time, whereas the incidence rate measures the number of new cases of disease that occur in the population.
D. None of the above

Answer: **A.** The incidence proportion measures the proportion of people who develop disease during a specified period. It presents the number of new cases in a designated time period *(the numerator*) as a proportion of the total number of people at risk at the start of the period (*the denominator*) and has no units e.g. 1% (in six months). In contrast, the incidence rate measures how quickly people are developing disease over time and it has units of time e.g. 10 per 1000 *per year*.

5. A new treatment is developed that prevents death but does not produce recovery from a previously lethal disease. Which of the following will occur?

A. Prevalence will increase
B. Prevalence will decrease
C. Incidence will increase
D. Incidence will decrease

Answer: **A.** Prevalence is a function of incidence (the rate at which new cases of disease occur) and duration (how long an incident case continues to have the disease). If cases no longer die from the disease their duration of life with the disease present necessarily increases, hence prevalence increases. The new treatment will not, however, affect how quickly new cases occur so it will not affect the incidence of the disease.

6. A study aims to determine the incidence and prevalence of a particular disease within the local government area of Winchelsea. What factors would decrease the prevalence of the disease within this study catchment area?

A. Shorter duration of disease
B. Increasing case-fatality from the disease
C. In-migration of healthy people to the area
D. All of the above

Answer: **D**. All of the above. Prevalence is a function of incidence (the rate at which new cases of disease occur) and duration (how long an incident case continues to have the disease). A and B both reduce the time people have the disease, while an increase in the

denominator without a change in the numerator (C) necessarily reduces the size of the measure.

7. The following table shows data from an epidemiological study. What is the incidence rate among those who are exposed to the factor under study?

		Number of episodes	Person-years (py) at risk
Exposure	Present	700	1950
	Absent	300	2250
	Total	1000	4200

A. 35.9 per 100 py
B. 35.9 per 100,000 py
C. 35.9 per 1000 py
D. 13.3 per 100,000 py
E. 23.8 per 100 py
F. None of the above

Answer: **A**. The incidence rate in the exposed = 700 ÷ 1950 py = 0.359 = 35.9 per 100 py. It would be 359 per 1000 py (C) or 35,900 per 100,000 py (B).

8. According to the table below, which food is the most likely cause of the outbreak of food poisoning?

Food	Number of people who ate that food	Number who ate the food and got sick
Cold chicken	86	34
Potato salad	54	38
Egg sandwiches	76	40
Fruit pie and cream	32	12
Cheese	48	12

A. Cold chicken
B. Potato salad
C. Egg sandwiches
D. Fruit pie and cream
E. Cheese

Answer: **B**. The potato salad is the most likely culprit because it has the highest attack rate (38 ÷ 54 = 70.4%). This can't be definitive, given the challenges of recall and the fact that most people will eat a number of foods in addition to that causing the problem, but it (and to a lesser extent the egg sandwiches, attack rate = 40 ÷ 76 = 52.6%) stand out from the crowd, and both are known to be potential sources of food poisoning.

Food	Number of people who ate that food	Number who ate the food and got sick	*Attack Rate*

Cold chicken	86	34	*39.5%*
Potato salad	54	38	*70.4%*
Egg sandwiches	76	40	*52.6%*
Fruit pie and	32	12	*37.5%*
Cheese	48	12	*25.0%*

9. The following are all characteristics of the prevalence of a disease except one, which one?

A. It includes all of the existing cases of disease in a community
B. It depends on the duration of the disease process
C. It can be used to help determine the health care needs of a community
D. It depends on the incidence of disease
E. It is always measured over time

Answer: **E**. Prevalence is measured at a single point in time. (An exception is *period prevalence* which counts all cases that were present at some point during a given time window).

10. Community A and community B both have crude mortality rates for ischaemic heart disease (IHD) of 4 per 1000 population per year but the age-adjusted IHD mortality rate in community A is 5 per 1000 population compared to 3 per 1000 population in community B. Which of the following is correct?

A. Community A has a younger population than community B
B. Community A has an older population than community B
C. Diagnosis is more accurate in community A
D. Diagnosis is more accurate in community B

Answer: **A**. Mortality from IHD increases with age. If the age-adjusted rate is higher than the crude rate in population A then, on average, population A must be younger than the standard population. In contrast, the age-adjusted rate in population B is lower than the crude rate so this population must, on average, be older than the standard population. Community A therefore has a younger population than community B. The accuracy of diagnosis (C, D) is irrelevant.

11. A 50 year old Australian male is watching the news in 2014 and hears that the current life expectancy for males has risen to 80 years. Does this mean he can expect to live for another 30 years?

A. Yes. If life-expectancy at birth is 80 years and he has already lived for 50 years, he can expect to live for an additional 30 years (50 years + 30 years = 80 years)
B. No. If life-expectancy at birth is 80 years and he has already lived for 50 years, he can expect to live longer than 80 years, because the probability of dying differs over the life-course.
C. It is not possible to answer this question, because mortality rates in the population will change in the future.
D. None of the above.

Answer: **B**. No. If life-expectancy at birth is 80 years and he has already lived for 50 years, he can expect to live longer than 80 years, because the probability of dying differs over the life-course. This expectation can be calculated from the life table, and if he has reached 50 an Australian man can expect to live another 32 years and reach 82. The difference used to be much greater when there were many more deaths in early life. (And remember, this expectation is calculated on current death rates, so the true expectation is probably longer again, given continuing improvements in health care and prevention.)