TEST YOURSELF: Multiple Choice 1
ANSWERS TO QUESTIONS

1. In the investigation of an epidemic the most appropriate measure to describe the frequency of occurrence of illness is the:

   Ans *= D. The **attack rate** is a measure of cumulative incidence; it measures the proportion of people that develop an outcome of interest and is particularly useful for short time periods. (See Chapter 1 pg 4; Ch 2 pg 39; Ch 12 pg 298).*

   *A. **Prevalence**: measures the proportion of the population who have disease at a point in time; it tells us nothing about who is newly affected.*
   *B. **Incidence rate**: tells us how quickly cases are developing in a population, usually per year. It is less useful when short-term measures are required such as during an outbreak.*
   *C. **Case-fatality rate**: the proportion of people with a disease who die from it.*
   *E. **Mortality rate**: measures the rate at which people in the population are dying.*

2. In practice the existence of an epidemic is most often determined by:

   Ans *= D. An incidence of disease that is clearly in excess of that expected (See Chap 12, pg 278).*

3. According to the table below, which food is the most likely cause of an outbreak of food poisoning:

Food	Number of people who ate that food	Number of people 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 cream	32	12	*37.5%*
Cheese	48	12	*25.0%*

   Ans *= B. Potato salad, because it has the highest attack rate (See final column in Table above).*

4. What was the attack rate among those who ate the egg sandwiches?

   Ans *= D. 53% (40 ÷ 76 × 100).*

5. Which of the following is not something that you might consider when assessing whether an association could be causal:

   Ans *= D. Whether it is possible to intervene to prevent people from becoming exposed to prevent the outcome from occurring.*

6. Which of the following factors is most important when considering the validity of the results of a clinical trial?

   Ans *= D. Random allocation of participants to the intervention and control groups: this is important to ensure that any difference between the groups is not due to confounding by other factors that may have differed between the groups at the start of the study (See Chapter 4 pg 114).*

   A. There are equal numbers of people in the intervention and control groups: this is commonly the case, but is not essential - although it is unusual to have more than two or three times as many people in one group than the others.

B. A relatively high incidence of the outcome of interest in the study population: this is desirable because if the outcome is very rare it is harder to be sure that any differences have not arisen by chance, but it is not the most important thing .

C. Inclusion of people of all ages: this is only relevant if it is important to be able to generalise the results to people of all ages.

E. 100% compliance with the intervention: this would be nice but is almost impossible to ensure in practice and it is better to have some non-compliance but random allocation than the other way around.

7. An orthopaedic surgeon was interested in the best way to manage patients with hip fractures. He read a paper that presented the following data from a series of 204 patients:

Number of:	Surgical treatment	Conservative management	Total
Patients	139	65	204
Survivors	103	34	137
Deaths	36	31	67
Percent mortality	26.5%	47.7%	32.9%

A statistical test comparing the mortality rates in the two groups gave p < 0.01. Which of the following statements is/are true and why?

Ans *= A, C and E.*

A. The mortality rate was significantly lower in the group treated with surgery. ***TRUE:*** *the p-value < 0.01 suggests that the mortality rate of 26.5% in the surgery group was significantly lower than that of 47.7% seen in the conservative management group. (See Chapter 6 pg 158-160).*

B. The much larger number of patients in the group treated with surgery distorts the results. ***FALSE:*** *it does not matter that the groups are different sizes.*

C. We cannot draw any conclusions from these data because it was not a randomised trial. ***TRUE:*** *we do not know how it was determined whether patients would receive surgery or conservative management. The two groups could have been very different e.g. those treated conservatively could have been too unwell to undergo surgery*

D. We cannot draw any conclusions from these data because there was no control group. ***FALSE:*** *it does not matter that there was not an untreated group – it would probably be unethical anyway; in this case the conservative management group serves as a control for the surgery group.*

E. Patients managed conservatively may be older and sicker than those selected for surgery. ***TRUE:*** *see C.*

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

Ans *= E. Prevalence is measured at a single point in time (See Chapter 2 pg 34-6).*

9. A case-control study of oestrogen use and uterine (endometrial) cancer showed an attributable fraction of 60%. Assuming the relation between oestrogen use and uterine cancer is causal this suggests that:

   Ans = *C.* *60% of uterine cancers in oestrogen users could potentially have been prevented if they had not used oestrogen. This is the* ***attributable fraction****; it tells us the proportion of disease in the exposed group that is potentially attributable to the exposure (See Chapter 5 pg 135-6).*

10. 1000 adults who presented to their local emergency department with a possible heart attack had a blood sample collected for laboratory tests. It was later found that 300 of these people had not had a heart attack and the levels of triglycerides in the blood of this group were compared with the levels among the 700 who had had a heart attack giving the following results:

	Heart attack	No heart attack
High triglycerides	600	100
Low triglycerides	100	200
Total	700	300

The odds ratio for the association between high triglycerides and heart attack is:

Ans = *B.* *6.0* *Odds ratio =* $\frac{600 \times 200}{100 \times 100}$ *(See Chapter 5 pg 144)*

11. The association in Q10 above was statistically significant and persisted after adjusting for age, sex, gender and blood cholesterol levels so the investigators concluded that people with high triglyceride levels were at higher risk of having a heart attack. This conclusion is:

    Ans = *E.* *Not justified because having a heart attack might lead to increased triglyceride levels. The blood samples were collected after the people had their possible heart attack; it is possible that the high levels in those with a heart attack could be a consequence and not a cause of the heart attack. This is a common problem in case-control studies when exposure is measured after the onset of disease (ad is sometimes described as 'reverse causality' because the condition causes the exposure (high triglyceride levels in this case) and not the other way around. (See Chapter 4 pg 98).*

    A. The fact the association did not change when the investigators adjusted for possible confounders just suggests that these factors were not actually confounders
    B. Just because the association was statistically significant does not mean that it is real – it could be due to bias (see above).
    C. The fact that it was not a population-based sample is not the main concern given the possible bias (above).
    E. Although the groups were not matched for potential confounders the investigators did adjust for confounders so again this is not the major concern.

12. Which is the best way to prevent confounding from occurring in a study?

    Ans = *A.* ***Randomisation****: as this will maximise the chances that all confounders (known and unknown) are balanced across the study groups. (See Chapter 8 pg 208-9).*

    B. ***Restriction*** *and* ***matching*** *will also help ensure that known confounders are*
    D. balanced but they cannot deal with unknown confounders.

C. *__Stratification__ and __multivariable analysis__ are methods that can be used to control*
E. *for confounding at the stage of data analysis but will not prevent confounding from occurring.*

13. Which of the following measures is most useful for assessing the potential benefits of a preventive programme:

__Ans__ = D. *__Population attributable fraction__: the PAF estimates the proportion of cases in a population that can be attributed to a particular risk factor; it therefore represents the maximum percentage reduction in the burden of disease that might be expected if we could remove the exposure completely. (See Chapter 14 pg 336).*

A. *The __relative risk__ or __odds ratio__ only tell us about the strength of the association;*
B. *even a very strong association may not have a big impact on disease rates if the exposure is very rare.*
C. *The __attributable fraction__ only tells us about the amount of disease that is attributable to the exposure __among the exposed group__. Again, if the exposure is rare, removing it may not have a big impact on overall disease rates.*
E. *The __case fatality rate__ tells us what proportion of cases die from their disease.*

14. Which of the following is true of a case-control study?

__Ans__ = D. *A, B and C are all true. Case-control studies are good for studying rare diseases and, because they can usually be done more quickly and only a relatively small number of disease-free people are studied, they are generally less expensive than cohort studies. Their main drawback is that they are, by necessity, retrospective in nature because the cases have already developed disease by the time they are recruited.*

15. If an ecological study shows a strong positive correlation between per capita alcohol consumption and breast cancer incidence rates in European countries we can draw the following conclusion:

__Ans__ = B. *Breast cancer rates are higher in countries with higher alcohol consumption. This ecological study compared the prevalence of breast cancer and alcohol consumption between different European countries; it did not relate alcohol consumption to breast cancer in individual women. It is impossible to determine whether the two factors are truly associated, and thus also impossible to determine causality from an ecological study because there may be other explanations for the observed association. (See Chapter 3 pg 90-1)*

16. Over the last 15 years PSA screening to detect asymptomatic prostate cancer has become more widespread. As a result, survival, measured by the time from diagnosis to death among men with prostate cancer, has increased. Using only this information, which of the following statements is correct?

__Ans__ = C. *Survival from time of diagnosis to death might have increased without any decrease in mortality. If screening detects cases earlier but does not have any effect on the point at which a patient dies, then survival will appear to have increased (because the time from diagnosis to death will now be longer), but mortality rates will be unchanged.*

A. *Screening may well increase the numbers of cancers detected but from the*
B. *information given we have no way of knowing if it has actually reduced mortality.*

17. In a series of 1000 women with breast cancer, 32 were pregnant. From this we can conclude:

    Ans *= C. In this particular series of women with breast cancer, 3.2% were pregnant.*

    A. *As we do not know anything about the rate of pregnancy among comparable*
    B. *women without breast cancer we cannot draw any conclusions about the relation between pregnancy and breast cancer.*

18. In a study to determine whether tonsillectomy is associated with subsequent development of Hodgkin's disease, the adjusted relative risk of Hodgkin's disease for those with prior tonsillectomy compared to those who had not had a tonsillectomy was found to be 1.9. From this we can conclude:

    Ans *= B. the incidence of Hodgkin's disease is higher among those who have had a prior tonsillectomy than among those who have not had a tonsillectomy.*

    A. *We cannot make any claims about the case fatality rate from this information.*

    C. *As the relative risk is greater than 1.0 for those who have had tonsillectomy it does not appear that tonsillectomy protects against Hodgkin's disease, if anything the opposite appears to be true.*

    D. *We would want much more information before concluding that tonsillectomy was causally related to Hodgkin's disease. Furthermore, even if the relation were causal, we would still need to balance the potentially large benefits of tonsillectomy against the possible small increase in risk of a rare disease before deciding whether the procedure should be performed.*

19. To determine attack rates for a respiratory disease of unknown origin among people attending a conference, random samples of guests staying at four hotels were surveyed for subsequent illness. Because it was not feasible to survey all guests, random sampling provided the best information because:

    Ans *= B. It would avoid selection bias. By sampling guests at random we are most likely to get a group that is truly representative of the whole population.*

    A. *If we did not survey everyone at the hotels it is very unlikely that we would identify all those who developed the disease*

    C. *It would not affect measurement.*

    D. *Random sampling cannot eliminate sampling error, although the larger the sample we take, the less error we will have.*

    E. *If, for example, we want to see if the attack rate differed between the different hotels, then confounding may be an issue and it will not be addressed by random sampling. Note the important distinction between **random sampling** of people from a population where we do not control who is and who is not exposed to the factor of interest, and **randomisation** where we select people (possibly at random) and then randomly assign them to the exposure of interest or the control group. It is the process of randomly assigning people to the exposure groups that controls for confounding.*

20. A double-blind study of a vaccine is one in which:

    <u>Ans</u> *= B. Neither the participants nor the observers know who received the vaccine and who received the placebo.*

21. Controls are needed in a case-control study because:

    <u>Ans</u> *= C. They provide a comparable estimate of the frequency of exposure in the absence of disease.*