

1. A medical researcher assigned 80,000 patients to receive either a new drug or an old drug randomly. Among the 40,123 patients who received the new drug, 24,007 were male. Among the 80,000 patients, the proportion of females is likely to be around \_\_\_\_.

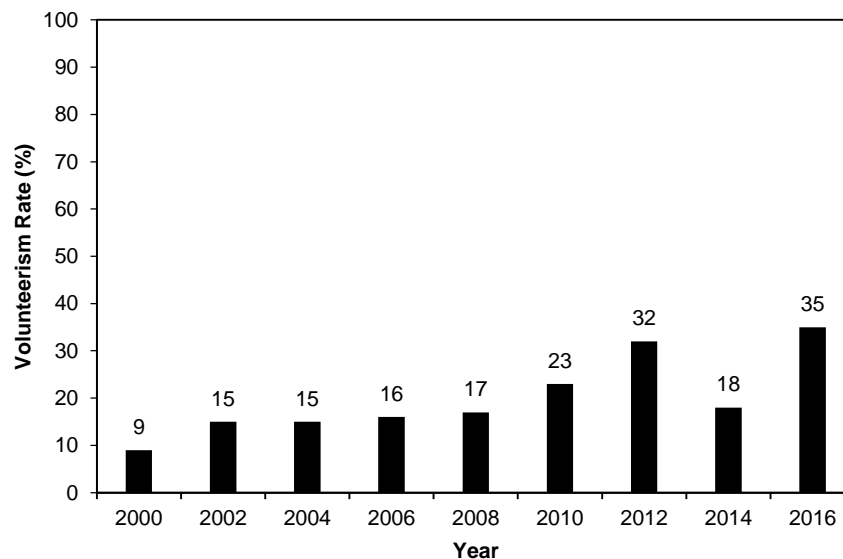
- A. 20%
- B. 30%
- C. 40%
- D. 50%

**Answer: C**

Random assignment of a large number of patients tends to produce groups which are similar in all respects (Chapter 1, Unit 4). This applies to the proportion of females here, since 80,000 is large.

Among the 40,123 patients who received the new drug, 16,116 (40%) were females. Based on the above reasoning, among 39,877 patients who received the old drug, 16017 (40%) should be female. Therefore, in the 80,000 patients, the number of females is likely 32,133 (40%).

2. The National Volunteer and Philanthropy Centre (NVPC) conducts an [Individual Giving Survey \(IGS\)](#) once every two years. In the figure, the horizontal axis indicates the year during which the IGS was conducted, and the vertical axis indicates the volunteerism rate for that particular year.



It is known that the Singapore Kindness Movement (SKM) kicked off its [media campaign](#) in the whole of Singapore during the March of 2016, before the IGS was conducted for that year.

Based on the information provided, what can we conclude about the effectiveness of the SKM media campaign in increasing the volunteerism rate in Singapore?

- A. The campaign was effective, and its effectiveness is equal to the increase in 17% since 2014.
- B. The campaign was effective, and its effectiveness is more than the increase in 17% since 2014.

- C. The campaign was effective, and its effectiveness is less than the increase in 17% since 2014.
- D. It is not possible to reach a definite conclusion about the effectiveness of the SKM media campaign in increasing the volunteerism rate in Singapore.

**Answer: D**

If a treatment was given to an entire population, it becomes difficult to conclude about its effectiveness (Chapter 1, Unit 2). This applies to the SKM media campaign, since it was kicked off in the whole of Singapore; the increase of 17% could have been due to something else other than the campaign itself (e.g., the passing of Mr. Lee Kuan Yew).

3. In football, the goal is literally to score goals, i.e., put the ball into the opponents' net. Frustrated with the performance of his hometown football club, Charles picks out his notebook and pencil to analyse the game more closely. He then notes the number of successful passes of a team in build-up plays, i.e., before there was either (a) a goal is scored, or (b) a goal is not scored (due to an unsuccessful attempt at goal, an infringement, or an interception by the opponents). What kind of study is this?
- A. A blinded controlled experiment.
  - B. A non-blinded controlled experiment.
  - C. An observational study.

**Answer: C.**

There was no attempt to modify the behaviour of the subjects being studied; hence this study is observational in nature.

4. (Continued from previous question.) He found that 80% of goals came from build-up plays involving fewer than four passes. Which of the following describes the given information?
- (I)  $\text{rate}(\text{goal} \mid \text{fewer than 4 passes}) = 80\%$ .
  - (II)  $\text{rate}(\text{fewer than 4 passes} \mid \text{goal}) = 80\%$ .
- A. (I) only.
  - B. (II) only.
  - C. Both (I) and (II).
  - D. Neither (I) nor (II).

**Answer: B.**

Among the goals, 80% involved fewer than four passes. So (II) is correct. Note that the flipped rate in (I) may or may not be equal to 80%.

5. (Continued from previous question.) The data also reveals that 60% of failed attacks (no goal) came from build-up plays involving fewer than four passes. Which of the following is/are true?

- (I) There is an association between scoring goals and having fewer than 4 passes in build-up play.
- (II) The data shows that teams should play fewer than 4 passes in build-up play, in order to score more goals.

- A. (I) only.
- B. (II) only.
- C. Both (I) and (II).
- D. Neither (I) nor (II).

**Answer: A.**

rate(fewer than 4 passes | goal) = 80% differs from rate(fewer than 4 passes | no goal) = 60%. Hence there is an association: (I) is true. Since this is an observational study, there might be confounders. So the data is weak evidence for teams to follow the advice. For instance, stronger teams may play more passes and score more goals.

6. Some scientists are studying the association of drinking coffee and students' ability to sleep (enough vs not enough sleep). Which of the following justify sex being a confounder?

- (I) Percentage of coffee drinkers among males is different from the percentage of coffee drinkers among females.
- (II) Percentage of coffee drinkers among students who have enough sleep is different from the percentage of coffee drinkers among students who do not have enough sleep.

- A. (I) only.
- B. (II) only.
- C. Both (I) and (II).
- D. Neither (I) nor (II).

**Answer: A.**

To be a confounder, sex must be associated with both drinking coffee and sleep. (I) says sex is associated with drinking coffee. (II) expresses an association between drinking coffee and sleep, which has nothing to do with sex.