Chapter 4 FRQ Practice

1. High blood pressure adds to the workload of the heart and arteries and may increase the risk of heart attacks. If not treated, this condition can also lead to heart failure, kidney failure, or stroke. We wish to test the effectiveness of Angiotensin-converting enzyme (ACE) inhibitors as a treatment for high blood pressure.

(a) It is well known that men and women may react differently to common cardiovascular drug treatments. What sort of experimental design would you choose for this study, and why?

Because the subjects include a mix of men and women, a completely randomized design would lead to variability in the response variable. Using a randomized block design and blocking by gender will make it easier to see a difference in the response variable if there is one.

(b) Explain why an experiment involving 600 men and 500 women is preferable to one involving 60 men and 50 women.

A larger number of subjects – greater replication – decreases the impact of random variation on experimental results, thereby increasing our ability to distinguish the effects of the treatment.

(c) Assume that 600 men and 500 women suffering from high blood pressure are available for the study. Create a diagram and describe a design for this experiment. Be sure to include a description of how you assign individuals to the treatment groups.

First create two blocks comprised of the 600 men and the 500 women. Then, within each block assign the men numbers from 001 to 600 and the women numbers from 001 to 500. Choose 3-digit numbers from the random number table, ignoring repeats and unassigned numbers, until you have selected 300 men. Then begin elsewhere in the table and follow the same procedure to randomly select 250 women. These subjects will be treated with ACE, and the remaining subjects will receive a placebo. Compare changes in blood pressure between the ACE group and the control group.
Question 2

Intent of Question

The primary goals of this question were to assess a student’s ability to: (1) distinguish between an observational study and an experiment; (2) explain the benefit of including a particular treatment group in an experiment; and (3) describe whether or not results from an experiment can reasonably be generalized to a larger population.

Solution

Part (a):

This is an experiment, because the participants were randomly assigned to treatment groups that drank different beverages.

Part (b):

The purpose of the “hot water” group is to investigate whether drinking tea is more effective than simply drinking hot water (essentially a placebo) for improving heart health. This group also allows for investigating whether drinking tea with milk is better than simply drinking hot water.

Part (C):

These 24 participants are volunteers, who may not be representative of a larger population with regard to the effect of tea/milk on heart health, so it is not necessarily reasonable to generalize the results of this study to a larger population.