Discussion Questions to Accompany Reading

Introduction  p1-16.


1. On page 2 the authors state: “Models consist of at least two parts: (1) a formula relating the response to all explanatory variables (e.g., effects), and (2) a description of the probability distribution assumed to characterize random variation affecting the observed response.”

In the context of a sample from a population with radon exposure in the “Review”, explain how (2) is applicable.

2. On page 2, the authors state: “The simplest model to describe how observations from this experiment were produced for drug A is \( Y_A = \mu_A + e \). That is, a blood pressure observation \( Y_A \) on a given subject treated with drug A is equal to the mean of drug A plus random variation ..”

Explain what the term “\( e \)” means in this model, and give an example.

3. On page 2, the authors state: “You can define the effect of drug A and \( \alpha_A \) such that \( \mu_A = \mu + \alpha_A \), where \( \mu \) is defined as the intercept.”

In the setting, suppose response for the population of \( N \) subjects could be potentially observed under each of five drugs. Define the intercept and the effect, making an assumption if required..

4. Page 3 (second paragraph). Interpret parameter that will result with 5 treatments if the SAS procedure is used that sets the mean of the last factor level equal to zero.

5. Page 3 (4th paragraph). “In general, \( Y_{ij} \) stands for the observation on the \( j^{th} \) subject treated with drug \( i \).”

Is the \( j^{th} \) subject referring to the \( j^{th} \) selection of a subject, or to the subject that was selected on the \( j^{th} \) selection?. Is the subject random, or fixed?

6. Page 4. Give an example of a linear and a non-linear model. What is the essential difference?
7. On page 4, the authors state: “An effect is called fixed if the levels in the study represent all possible levels of the factor, or at least all levels about which inference is to be made.”

Consider a simple random sample of dwelling units from a finite population. Using the author’s definition, are subject effects fixed effects? In the subsequent description of the blood pressure drug experiment, if there are 6 drugs, but only 5 are used, are drugs fixed effects? Can you improve on the author’s definition of fixed effect?

8. On page 5, the authors state: “The factor effects corresponding to the larger set of levels constitute a population with a probability distribution. The last statement bears repeating because it goes to the heart of a great deal of confusion about the difference between fixed and random effects: a factor is considered random if its levels plausibly represent a larger population with a probability distribution.”