Crimes of Statistics

Experimental Unit vs. Sampling Unit Part II

What is the Difference? Should we be concerned?

Tuesday, October 3, 2017

Quick Review

- Experimental Unit
- Observational / Sampling Unit
- Examples?

Pen 1
Diet A

Pen 2
Diet B

Response is the Weight of each Animal

Experimental Unit ?

Sampling Unit?

Sources of Variation in this Design?

- Individual Animal
- Pen Effect
- Treatment or Diet Effect
- Pen x Treatment Effect

Are there weight differences between the diets?

- Can we answer this question?
- Why or why not?

Sources of Variation

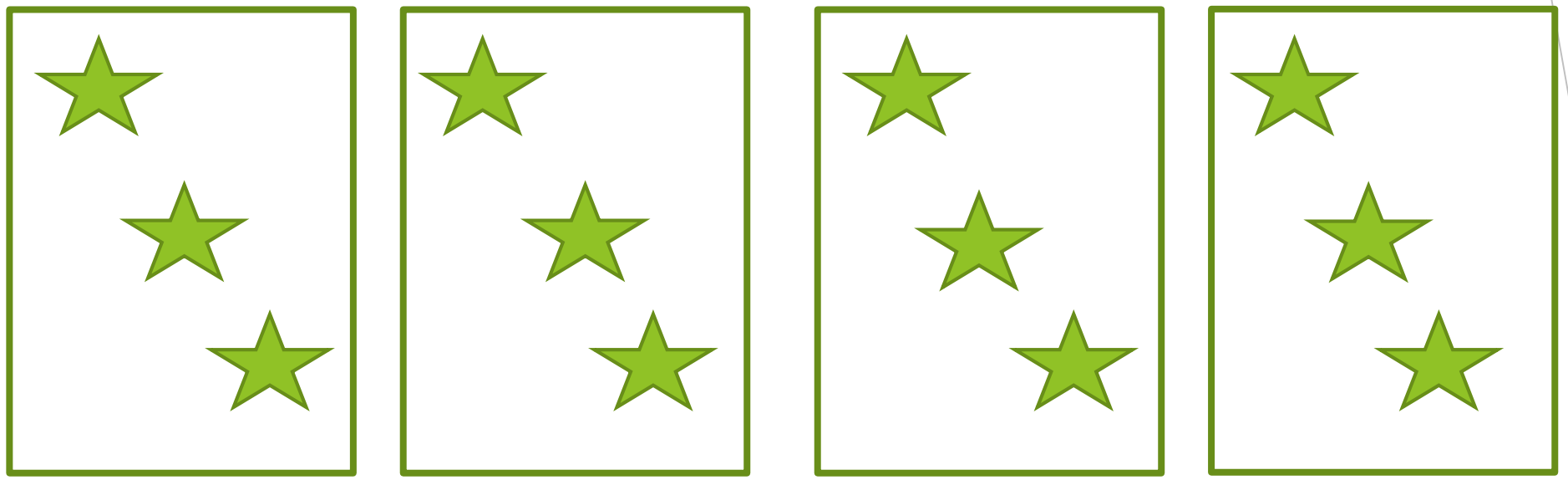
- Among the animals within the pen
- What is the experimental unit?
- We have only 1 observation / treatment
- NO – we cannot assess whether there are differences between the diets

Pen 1
Diet A

Pen 2
Diet A

Pen 3
Diet B

Pen 4
Diet B



Experimental Unit ? How many are there?

Sampling Unit?

Are there weight differences between the diets?

Can we answer this question now?

Two levels of Variation

1. The variation among the observational units within the experimental units

2. Variation between the experimental units

Which one do we need to determine if there are any treatment differences??

Estimate of the Experimental Error

- Experimental Error is a measure of variation that exists among observations taken on the experimental units that are treated alike

- What is this in this case?

From last time…..

- Our statistical analyses need to calculate an estimate of the variance of the experimental error
  - Remember: this is the variation between our experimental units – if we want to test treatment differences this is what we need!!
  - Variation of observations within an experimental unit will not give us treatment differences!

True Replicates

To answer a hypothesis testing the difference between treatments, you need TRUE replicates

Which of the two scenarios presented – have TRUE replicates?

Pseudoreplicates

"Pseudoreplication is defined as the use of inferential statistics to test for treatment effects with data from experiments where either the treatments are not replicated (although the samples may be) or replicates are not statistically independent."

Hurlbert (1984)

True or Pseudo - replicates

- Responses measured on:
  - 25 animals OR
  - 25 measurements taken on the same animal
  - 4 plots in a field OR
  - 10 samples in one plot of that same field
- Other examples?

Next Crimes of Statistics will be held on Thursday, November 2 OAC Boardroom at 10am