

Explaining Statistics to Nonstatisticians

Consider using the ADEPT model for explaining statistical ideas to non-statisticians.

A: Analogy:

- Connect the statistical idea to an idea that the client likely already understands.
- Confirm with the client.

D: Diagram:

- Pictures can more easily demonstrate the idea.
- Make sure the diagram is thoughtfully created.

E: Example:

- Select a simple example, in a context that is relevant to the client's field.
- Then, build upon it.

P: Plain Language:

- Avoid statistical jargon and words with double meanings in statistics and outside statistics.
- Use language relevant to the client's field.
- Be concise, don't ramble.
- Explain at the level that meets the client's needs (not above and not below).
(Note: This means that you need to know the client's needs and the statistical background of the client. You will need to specifically determine both of these items.)

T: Technical Definition:

- Only if such a definition will serve the client's needs should it be provided.
- Ensure that you understand how the client will be using the technical definition.
- Use statistical notation carefully.

You may not use all components in every situation, or even in this order.

Homework 10: (due Mon Apr 10) Find a friend who is not a statistician and has no or minimal statistical training or experience. Choose a concept to explain to them and use an analogy to do so. When you're done, ask them if they understood and what feedback they have for you. Write me a paragraph reflecting on the experience. Include 1) Who was your friend, and what's their background? 2) What concept and analogy did you choose? 3) How did you think it went? (At least three sentences.) Give one specific thing you think you could improve on. 4) How did your friend think it went? Ask them to be as specific as they can.

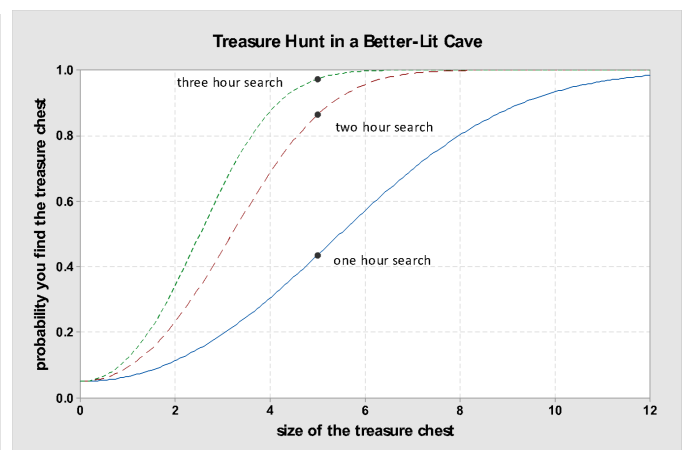
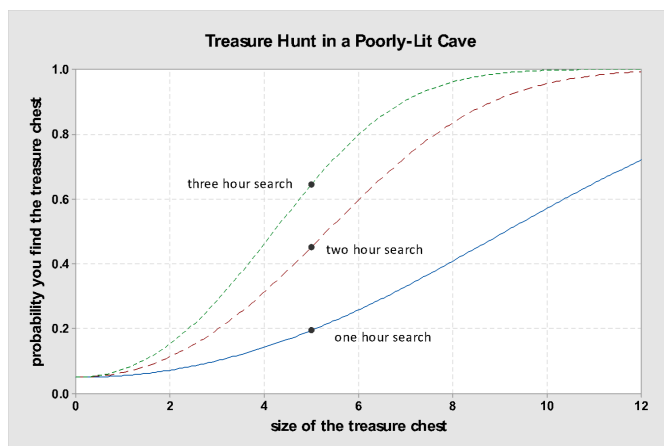
ANALOGY/DIAGRAM: Consider using the idea of a Treasure Hunt as an analogy for power.

- Suppose there are four caves, within each a treasure chest is hidden.
- Two caves contain a small chest and two caves contain a large chest.
- Two of the caves are poorly lit and two caves are well lit.
- You have a certain amount of time to search the cave.

In this analogy, the probability of finding the treasure is the power. What do the treasure, the size of the chest, the lighting, and the time to search represent?

Which chests are easier to find? What idea does this represent?

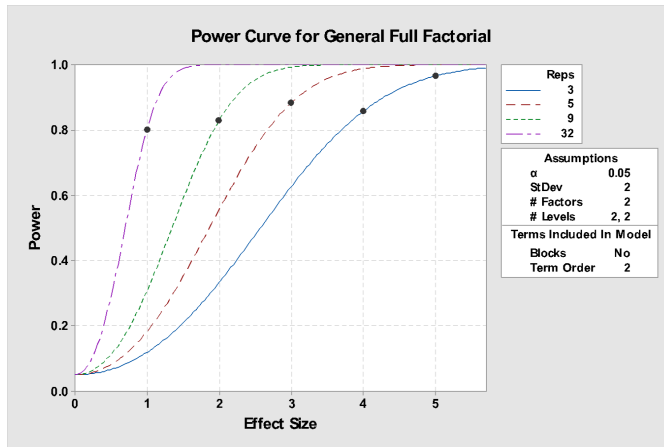
Is it worth searching the poorly lit cave with the small chest at all? What idea does this represent?



How would you explain these diagrams?

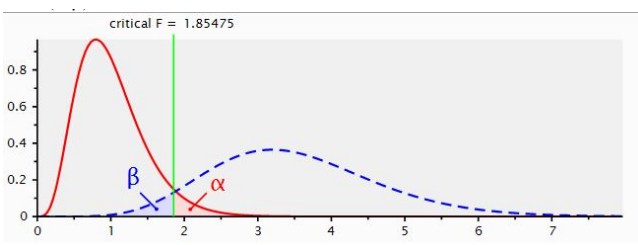
PLAIN LANGUAGE: Finding the treasure is an analogy for the power of a study. Power is the chance you will successfully find a statistically significant effect is one is really there.

EXAMPLE/DIAGRAM: You are a statistician working with a bacteriologist, who is designing a two factor, two level factorial experiment. She is interested in the effects of two different culture media (A, B) and two different culture times (12 hours and 18 hours) on the growth of a particular bacteria. She comes to you and asks how many culture samples she should use for each of her four experimental treatments. (She is asking you, “How long should I look for the treasure?”)



Here is a diagram of a power curve for this study. Can you relate it back to the treasure analogy? Can you describe it in the context of this study?

TECHNICAL LANGUAGE: Given the number of replicates specified and given the amount of experimental error you are expecting in your experiment, power is the probability that your experiment can detect a difference in average bacterial growth between two experimental treatments, of the size specified by the effect size, if, in fact such a difference truly does exist. It is computed as $(1 - \beta)$.



Examples of Analogies

From Smith/Vance:

- Type I error: Convicting an innocent person in a jury trial
- Type II error: Letting a guilty man go free in a jury trial
- Power: Treasure chest
- Confidence interval: Catching a butterfly (or fish) in a net
- P-value: How far does a high jumper clear the high jump bar?
- Sampling: Tasting soup for saltiness, or Taking a blood sample at your health check-up
- Probability model: Animals in the zoo and the footprints that they leave.
- Statistical inference: Animal footprints in the wild, what type of animal may have made them?
- Interaction: Money can't buy happiness
- Residuals: Reading tea leaves at the bottom of your tea cup

Twenty-Five Analogies for Explaining Statistical Concepts,
by Roberto Behar, Pere Grima & Lluís Marco-Almagro (2013)
The American Statistician, 67:1, 44-48,
DOI: <http://dx.doi.org/10.1080/00031305.2012.752408>

Read and discuss the analogies assigned to your group, and choose one to share with the class.

Name: _____

What's your current favorite statistical analogy?

Name: _____

What's your current favorite statistical analogy?
