

POLS201 Spring 2019

Introduction to Measurement

February 11

Reminders

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- Complete Quiz 2
- Submit a Theory and Hypothesis by tomorrow
- Finish the RStudio assignment from Friday

Today's Topic: Measurement

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- The leap from conceptual to operational definitions
- Systematic vs. Random errors

Conceptual Definitions

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- A conceptual definition of a variable states precisely what you mean when you use a particular term.
- It is an explanation of a concept in the abstract.

Conceptual Definitions

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- For tricky concepts:
 - Make sure your definition is not circular
 - Look at how other scholars have defined a term, and go with the consensus unless there is a good reason to deviate.
 - Consider your particular theory and hypothesis.

Operational Definitions

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- An operational definition of a variable is a complete recipe for going out into the world and measuring a variable.
- It helps us make the leap from our subjective impressions to an objective measure.

Example: Democracy

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- Conceptual Definition?
- Operational Definition?

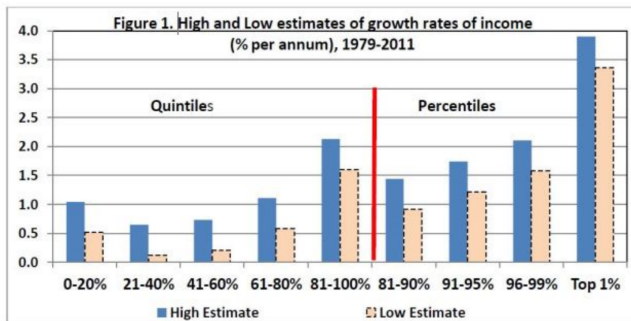
Example: Consider this hypothesis

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- *Rich people are more likely to favor the Citizen's United ruling.*
 - What is the concept of the IV that the researcher is likely trying to pin-point?
 - How can this be operationalized?

How do you measure income?

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How do you measure Income?

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- Conceptual Definition?
 - Is income the same as wealth?
 - Should income be measured at an individual or household level? Does number of children matter?
- Operational Definition?
 - What constitutes income?
 - Include Government benefits? Exclude taxes?

Two Types of Measurement Error

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- Random Error (reduces *reliability*)
 - Reliability: The extent to which a measure yields the same values on repeated trials.
 - So how do you test reliability

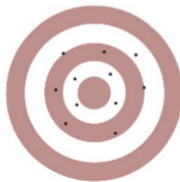
Two Types of Measurement Error

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- Systematic Error (reduces *validity* and increases *bias*)
 - Validity: The systematic precision an estimate.
 - A measure may be reliable (consistent) but biased.
 - A measure may be unbiased but inconsistent

Which depicts. . .

- Systematic error? Random error? Both? Neither?



Strength of linear correlation

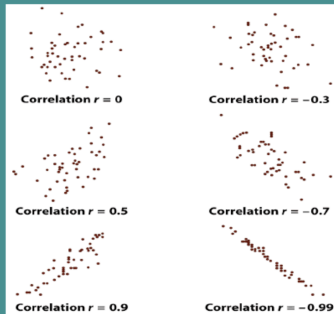
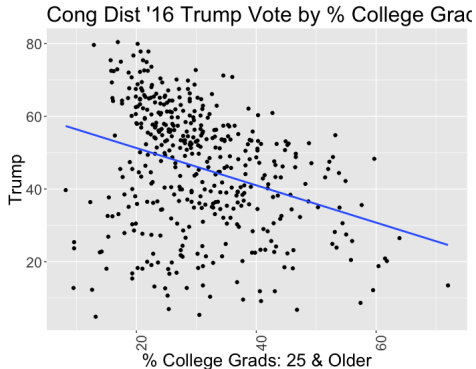


Figure 14-6
Statistics: Concepts and Controversies, Sixth Edition
© 2006 W. H. Freeman and Company

Does % of college educated (25+) predict '16 Vote?

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- By cong. district, we see a modest relationship: Correlation is $-.31$



This is a weak model, but it implies something like:

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- $\text{Trump Vote} = 61.5 - .512 \times \text{College Grade Pct} + \text{Random Error}$
- If the error is entirely random, it will average out over many observations. . .
 - . . . even if many individual predictions are wildly missed
- But guess what? There's systematic error too., Can you see it?

Suppose we add systematic error: We add 5% error to each observation

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- Meaning: The model college \rightarrow Trump is off by an additional 25% for every district
- Reliability is unchanged. The correlation remains $-.31$

Suppose we add *random* error:

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- We add $\pm 10\%$ from a random distribution
- The correlation would drop significantly.
 - Does this increase risk of a
 - false negative or
 - false positive
 - Hint: Think of the Wolfers article

The Wolfers Article argues

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- A study published a null finding about parent time and child outcomes
- Wolfers says the study is bogus. Why?
- Essentially: a false (positive/negative) hid the real relationship
 - Which?
 - False **negative**
- Something about the data increased *random* error

Is a Trump % - College Grad % Link Real?

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- You bet it is.
- Our little toy model doesn't capture it well,
- But our job is "keep digging"
 - Say more. Look at the contingencies. Maybe add more data.
- Not: "we thought the link existed but whoa!"

Random Measurement Error increases risk of false negative

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- There might be a relationship that is hidden
- Most random measurement error tends to increase risk of a false negative

Systematic Error Example: The Bradley Effect

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- L.A. Mayor Tom Bradley lost a governor's race in CA despite being ahead in the polls.
- The discrepancy between the poll and election results for minority candidates has been called the "Bradley Effect"
- False negative or false positive?
 - False positive.

Parting Advice

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- First, when a measure is chosen, its inherent biases have to be made clear.
- Second, the choice of measure has to be justified in relation to what is actually being examined.
 - One more thing: Freedom House creates a popular metric of democracy.
 - It should not be used to evaluate democracy's relationship with corruption or economic equality because. . .
 - these are already built into the measure itself.
 - It's a perfect example of endogeneity.

For Wednesday: External Validity

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