

Policy Inquiry, Common Sense and the Elementary Forms of Statistical Reason

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We rely on crude statistical thinking at all times

- We “count” things all the time
- Only difference between how we talk and how statisticians “talk” is in how “carefully” we count
 - 76% of VT students favor faculty evaluations
 - Most of the students favor faculty evaluations
 - The students at VT favor faculty evaluations

Common Sense

- While people regularly dismiss statistical arguments, they regularly submit to “common sense”
- If we trust common sense, we should trust statistics more
- Why? Well, how do we create “common sense” – what methods do we use, and are they different from statistics?

We depend on typicality

- The most important method seems to be to arrange things in terms of how typical we think they are
 - We do this automatically, without thinking about it
 - We readily talk about *average* ability, *normal* intelligence, *typical* appearance, business as *usual*

Task

- Draw a “typical building”
 - Share
 - Could we program this?
-

Typification

- Typification is a necessary component of human communication
- It is a form of logic – or a “logical form”
- It appears in both ordinary discourse and statistical work

Assessing Typicality

- The way we do it in statistics is basically the same as how we do it every day
 - Actually, in everyday discourse, we often get much fancier
- Most prevalent method – look around and figure out what is predominant
 - New MPA class mostly male or female?
 - Describe the typical senator
 - What do statisticians call this kind of typicality?

Typicality cont.

- “We be black and they white. They got things and we ain’t. They do things and we can’t. It’s just like living in jail.”

Richard Wright, Native Son
- What is Richard Wright telling us? List the typicalities
- The point is that through literature Wright is making a statistical argument
 - he’s using a logical form – the idea of typicality
- Does this passage still apply today? How can we tell? Are things different? How much different?

Task

- Everybody standup and line up by height at the back of the room
- “least-tall” on left, “least-short” on right
- Who’s in the middle?
- What kind of typicality is this?
- Where do we see this type of “average” used the most? Why?

Task

- Measure your heads
- Measure you hands
- Add all together and divide by number of people in the room
- What type of average is this?
- When do we do this kind of averaging?
Why?
- Keep you measurements!

“Typical” Statistical Averages

- Mode
 - What is there the most of?
- Median
 - What's in the middle?
- Mean
 - If you put everything together and then equally distributed it, how much would everybody get?

- Other less “typical” (for us!)
 - <http://en.wikipedia.org/wiki/Average>

Task

- Write down description of a typical one-person band
 - The type of musician that performs on street corners and can play multiple instruments at the same time
- Where did you get this idea?
- If it were a short Ethiopian woman playing the viola and clarinet at the same time, would that alter your thinking of the typical one-person band?
- What do we call a conceptual average that is hard to break?

Why Typify?

- So, why do we typify?
- Consider you are about to meet someone for the first time and you know little about this person
- If you are wise, you will assume s/he is more or less a typical person – WHY?
- Answer: it minimizes total sum of errors
- What would happen if we decided that every new person we met was a jerk? How much re-evaluation would be necessary?

Folk Terms for Central Tendency

- Average, commonplace, consistent, humdrum, conventional, normal, ordinary, standard, stereotypical, popular, prevailing, regular, stock, typical, unexceptional, uniform, usual
- Any time you see one of these words used in spoken or written communication, a statistical argument is being made

Folk vs. Statistical

- While people often believe that “folk” ways of assessing things are “easier” than “statistical” ways, it is most often the opposite.
- Consider Richard Wright’s statement again and the complexities involved in what he is saying

The Atypical

- If we are interested in typicalities, we are automatically interested in differences
- We cannot “compare” without thinking about differences
- Even small differences can precipitate fights, depression, arrogance, humility, etc.
- In the 80s and 90s, a lot of consideration in organizations about the differences between Americans and the Japanese

Atypical cont.

- People are neurotically obsessed with differences
- People act on differences all the time
 - Actual or just believed
- How many of you are trying to eat less?
 - Why?
- If one neighborhood gets better trash service than another, does it matter? Why?
- **Concern with the atypical defines much of public administration**

Folk terms for Atypical

- Alien, antithesis, contrast, deviant, difference, discrepancy, disparity, dissimilar, distinct, divergent, diversity, heterogeneity, incomparable, individuality, mismatched, modified, originality, peculiar, special, unequal, unlike, variance, variation, unusual, strange, etc...

Difference for each average

- Mode
 - Why do we care about what characteristics the typical senator has?
 - Why do we care how many men vs. women are in graduate school?
- Median
 - Why do we care about median income?
- (Arithmetic) Mean
 - Why would we care about your head size?
 - What if IQ was involved?

Task

- How atypical are you?
- Calculate the difference of your head size from the arithmetic mean of the class
- Who are the ‘deviants’?
- Where do we set the bars?

All Research is Primarily about TWO things

- Averages
- And differences from the average

Counting

- Students generally think that stats is highly numerical (true)
- Students generally think that ordinary conversation is not usually numerical (false)
- Only difference is how conscientious we are about our counting

Careful Counting

- We all count, and we count nearly all the time
- The last bullet contains some counts
- Everyday conversation is loaded with hyperbole that results from not counting correctly (sometimes on purpose, sometimes not)
- “I never do anything right”
 - If you count the number of times I do things wrong, it will equal the number of times I have done anything at all
 - Obviously a bad count, and can have serious emotional consequences for the person who believes it

Hyperbole vs. Careful Counting in PA

- This will be one of the forms of statistical reasoning you will deal with the most
- Just about (a count) every complaint that you will receive will include an implicit count
- That count will usually (a count) not be a careful count
 - “That bridge construction project is taking forever! Or, too long!”
 - “We are under-serving our disadvantaged citizens!”
 - “Our recreation resources are terrible compared to other towns.”
- As a public administrator, you will have to deal with bad counting from both public AND your political bosses.

Folk Modifiers for Counting

- Many
 - Much
 - Some
 - Numerous
 - A little
 - Often
 - A lot
 - A few
 - Plenty
 - Commonly
 - Rarely
-

What do we count?

Categorization

- The scientist (social or otherwise) is concerned with categorization more than anything else
- It drives what gets counted and analyzed
- Statement 1: The estimated average density of the known universe is equal to one hydrogen atom per ten cubic meters
- Statement 2: The average classroom contains 20 students

Categorization, cont.

- First statement has well defined categories
 - Hydrogen atom – has a well defined and excepted definition – don't need to wonder whether it is big/small, rich/poor, sick/healthy, old/young, male/female
- Second statement is not well defined
 - Category student offers no clue as to what it is referring to – older students, special ed, graduate, grade school?
 - Category classroom is equally ambiguous – lecture hall at a college or elementary school classroom?

Task

- Define explicitly college student vs. town resident for a census count of Blacksburg
- Present and defend your categorization

Probability

- What is “probable” is what is “average”
- POLICY is passed based on a belief of averages!
 - Why should we try to minimize drug use in teens?
- Administrative decisions are made on a belief in averages!
 - Why would a locality send its police officers to training?

Task

- Let's draw a “frequency distribution”
- Across the bottom, let's divide head size into 5 categories (smallest to largest)
- One by one, read off your head measurements
- For each category, draw a box for each head that fits that category, stack them up as you get more than one for that category
- Calculate the “probability” of having a head size in the middle category

Probability cont.

- Probability is a measure of “how likely” we think it is that something is going to happen.
- We figure this out by comparing to the average
- How sure we are of our estimate depends on the “variability” of the data around the “average”
- What is we all had the same head size?

Relationships

- The human mind is not content with knowing averages and atypicalities
- It also wants to find patterns or relationships – knowing these relationships makes life much easier
- You buy your boyfriend/girlfriend a gift
 - Why? What relationship do you believe exists
- You entertain out of town friends by bringing them to an expensive restaurant you've never been to
 - Why? What relationships do you believe exist?
- You help pass legislation that makes any medicine containing oxycodone be sold behind the counter (you have to ask the pharmacist for it)
 - Why?

Relationship Defined

- Where you find X, you find Y
- Where you don't find X, you don't find Y
 - This is actually a “positive relationship”
 - What would a “negative relationship” be?
 - How about “curvilinear”

	Y Not Present	Y Present
X Present	-	+
X Not Present	+	-

Relationship Linguistics

- Expressed in many forms
 - “If we cut taxes, people will spend more money”
 - “If the road construction contractor finishes on time, he’ll get his bonus”
 - “Honor your mother and father.”
 - Moral arguments usually have an implicit statistical argument
 - “Eat your spinach!”

Task

- Read off your head measurement and hand-spread measurement for me to plot
- Do we see a correlation (a relationship)?
- Do we see causation (a relationship where A actual makes B happen)?

Folk Terms for Relationships

- Affiliation, affinity, agreement, association, belonging to, comparable, connection, contingency, dependence, effect, grouping, interdependence, interrelationship, pattern, linkage, proportionate, etc.

Sampling

- To find relationships, statisticians “infer” from samples of whatever they are looking at
- Tends to give stats a bad name – why? Example?

Sampling cont.

- Fact is, “All” human knowledge, in one way or another, is knowledge derived from a sampling of the world around us
- It would be very difficult to function otherwise
 - You’re preparing fettuccini alfredo for a group of friends and you sample it to see if it is seasoned properly
 - Anyone against sampling would have to eat the entire dish to make sure
 - Look out the side window. Is it raining?
 - Anyone against sampling would have to check a window on each side of the house to make that determination

Folk Sampling Gone Bad

- You're brought up in a middle-class, white, protestant home and you consider people like this as "normal." Others are not normal, and, possibly bad (you saw some bad African Americans on COPs).
- You go to a garage and they mess up. You say you will never return (a generalization about the quality of all their work)! Turns out its the best garage in town and only makes one error for every 10,000.
- What is wrong with these samples and generalizations? N!

Control (Standardization)

- By a show of hands, how many of you have ever attempted to grow a mustache or beard?
- What percentage of the class is that?
 - Divide the little number by the big number
- So, what is our conclusion about the popularity of facial hair among men at Virginia Tech?
- Is there a problem with this conclusion? What?

Control cont.

- We use control and standardization to simplify complex matters so that we can make comparisons.
 - Would you compare two runners with one running on a 400yd track and the other a 400m track?
- Anytime you hear “Yes, but...” or “Have you considered...” you are being asked a question about control and standardization

Control, cont.

- Can you come up with the “Yes, but...”
 - “They say if you eat less, you lose weight. I’m eating less, but I’m not losing weight.”
 - “If poor people would just get some ambition, they could have anything they want. America is a land of equal opportunity for all.”
 - “If we get better gas mileage from our cars, we will be going a long way toward improving the environment.”
 - “I figure I have a good lawyer in my case because he said he won every trial he was in.”
- Is X REALLY related to Y, or is there a third variable, Z, that might be influencing the results?

Folk Control Phrases

- “Yes, but have you considered...”
 - “You are leaving something out...”
 - “If you take so and so into account...”
 - “Yes, but that could also be caused by...”
-

Model

- When you put together all your supposed relationships with all necessary controls, you get a model

There are two “Types of Models”

- What are they?
 1. Physical – A smaller tangible thing you can mess with
 2. Symbolic - Use words, pictures, lines, equations, or computer programs to represent elements and illustrate relationships

Folk Terms for Symbolic Models

- Exemplar, archetype, ideal, map, paradigm, portrayal, presentation, stereotype, etc...

Task

- Write down three questions that you would put on a questionnaire if you were tasked with surveying CPAP MPA student opinions about the orientation program for incoming students.
- Task time: 5 minutes

Basic Model Construction

- What am I trying to figure out – what concepts am I trying to measure?
- What do I need to count to help me figure it out?
 - What variables could represent the concept?
- What relationship does this thing you're counting have with the concept you're trying figure out?
 - “If class requirements are clear the student will be happier”
- What controls might be needed?

Task

- Now, with the benefit of basic model building, split into three groups
 - Detail your model
 - What concepts are you trying to measure?
 - What are the relationships between your variables and the concept (positive or negative)?
 - Should any control variable be used?
 - Now, formulate, as a group, a question that could be asked to collect data for each variable
- Task time: 10 minutes
- Did your questions change? Why?
- One group will be called up to present their model and defend themselves to their colleagues.

Forms of Statistical Logic

- Average
- Deviation
- Careful Counting
- Probability
- Relationships
- Control
- Model
- Categorization

Assignment

- Write 1 paragraph describing, in your own words, each form of statistical logic
- For each form, find an example in a newspaper or news magazine, describe it and give your opinion of its veracity
 - What statistical argument are they making?
 - Is there any data/evidence to back up the argument or are they simple assertions?
 - Are there any “Yes, but...”s that should be considered?