


QUANTITATIVE METHODS

Summer 2008
01:830:200:H2
Instructor: Julie Phelan


CLASS OUTLINE – 7/07/08

- o Attendance and introductions
- o Syllabus & Course Policies
- o Basic Statistical Concepts/ Notation (Chapter 1)
- o In class assignment




CHAPTER 1: INTRO TO STATS

- o Why do we need to learn statistics?
 - Need a way to answer our questions
 - Need a way to communicate our findings to others




http://www.sisical.ac.in/~placement/Imago/statistics.jpg

- o **Statistics:** a set of mathematical procedures for organizing, summarizing, and interpreting information




SOME TERMS

- o **Population:** a set of all the individuals of interest in a particular study



- o **Sample:** a set of individuals selected from the population
 - Should be *representative*



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TERMS

- o **Variable:** characteristic or condition that changes or has different values across individuals
 - The things we measure
 - (height, intelligence, favorite color, etc.)
- o **Data:** actual measurements
 - FYI: data is *plural*
 - o "Look at all the data in that dataset!"
 - o "That datum is one person's test score."

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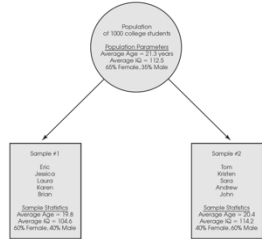
TERMS

- o Describing Data:
- o **Population Parameter:** numerical value that describes a population
 - Can be single measurements or derived from set of measurements
- o **Sample Statistic:** numerical value that describes a sample
 - Can be single measurements or derived from set of measurements

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TERMS

- o **Sampling Error:** the discrepancy, or amount of error, that exists between a sample statistic and a population parameter
 - Multiple samples can be drawn from same population
 - Each sample is slightly different



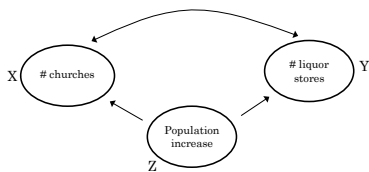
TERMS

- o **Descriptive Statistics:**
 - Summarize, organize, and simplify data
 - (average/ mean, sum, percentage)
- o **Inferential Statistics:**
 - Techniques that allow us to make generalizations from the sample to a population
 - *Inferring* from the sample data what the population might be like
 - (t-test, ANOVA, regression)



RESEARCH METHODS – TWO TYPES

- o **Correlational:** can demonstrate an association between variables
 - X is related to Y
 - correlation ≠ causation
 - Third variable effects



RESEARCH METHODS – TWO TYPES

- o **Experimental method:** can demonstrate a causal relationship between variables
 - X causes Y
 - Manipulate one variable, control all others
- *Independent variable (X)* = variable is manipulated
 - o Experimental and control condition
- *Dependent variable (Y)* = variable is observed or measured
 - o Outcome variable



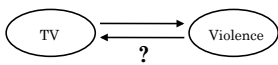
RESEARCH HYPOTHESIS

- o Children who watch violent TV programs are more aggressive than children who watch little violence on TV.
- o **If children watch violence** (*independent variable*), **then they will behave aggressively** (*dependent variable*).



HOW TO STUDY CORRELATIONALLY?

- o Observe children's TV viewing habits & violent behavior
- o Ask children how much violent TV and how much violent behavior
- o Ask parents, teachers, etc.
- Look for association between the two variables
- Problem: which direction?



HOW TO STUDY EXPERIMENTALLY?

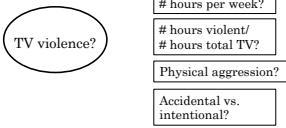
- o Lab: randomly assign kids so that:
 - ½ watch violent TV for an hour
 - ½ watch non-violent TV for an hour
 - Compare subsequent behavior
- o Summer Camp: control content (randomly assigned) so that:
 - ½ watch violent TV
 - ½ do not
 - Compare their subsequent behavior

- *But:* Is an hour of violent TV in the lab the same as at home? Does the effect carry over to other situations/places/times?



HOW DO WE MEASURE VARIABLES?

- o **Constructs:** variables that cannot be directly observed
 - Ex. intelligence, self-esteem
- o **Operational Definition:** defining a construct in terms of behaviors that can be observed
 - Ex. intelligence test score



DATA COLLECTION

- o **Discrete Variable:** separate indivisible categories; no value can exist between the categories
 - Whole numbers
 - Ex. # students in the classroom
- o **Continous Variable:** infinite number of possible values that fall between 2 values
 - Infinitely divisible
 - Ex. weight



SCALES OF MEASUREMENT

- o **Nominal scale:** set of categories that have different names but are not quantitatively different
 - Ex. gender
- o **Ordinal scale:** set of categories organized in an ordered sequence
 - Ranked
 - Ex. size – small, medium, large
 - Can make quantitative distinction, but cannot determine magnitude of difference

SCALES OF MEASUREMENT

- o **Interval Scale:** ordered series of categories, each with an equal interval between them. Zero point is arbitrary
 - Used a lot in psychological research
 - Ex. Likert scale

0 1 2 3 4 -2 -1 **0** 1 2
 Dislike Like Dislike Like

- o **Ratio Scale:** interval scale, but with absolute zero
 - Ex. Length

SCALES OF MEASUREMENT

Nominal	Ordinal	Interval	Ratio
People or objects with the same value are the same on some attribute.	People or objects with a higher scale value have more of some attribute.	Intervals between adjacent scale values are equal with respect to the attribute being measured.	There is a rationale zero point for the scale.
The values of the scale have no 'numeric' meaning.	The intervals between adjacent scale values are indeterminate (just "greater than" or "less than").	E.g., the difference between 8 and 9 is the same as the difference between 76 and 77.	Ratios are equivalent, e.g., the ratio of 2 to 1 is the same as the ratio of 8 to 4.

SCALES OF MEASUREMENT

Nominal	Ordinal	Interval	Ratio
Gender	Movie ratings (0, 1 or 2 thumbs up)	Degrees Fahrenheit	Degrees Kelvin
Ethnicity	Socioeconomic Status	Most personality measures	Annual income in dollars
Marital Status	U.S.D.A. quality of beef ratings (good, choice, prime) The rank order of anything	Golf scores (above and below par)	Length or distance in centimeters, inches, miles, etc

MATH REVIEW

- o Basic math skills are necessary to compute statistical tests.
- o Math review section in Appendix A of textbook
- o If you haven't taken a math course since high school, please look over the review before next class.

STATISTICAL NOTATION - BASICS

- o X = raw score (original, unchanged measurement)
- o **Set of scores on 2 variables**

$\frac{X}{5}$	$\frac{Y}{3}$	
7	8	
3	1	$n = 5$
1	4	
6	2	

- o N = number of scores in a population
- o n = number of scores in a sample

STATISTICAL NOTATION - BASICS

- Summation = Σ (sigma)
- ΣX = add all the scores for variable X

X	Y	XY
5	3	15
7	8	56
3	1	3
1	4	4
6	2	12
$\Sigma X = 22$	$\Sigma Y = 18$	$\Sigma(XY) = 90$

ORDER OF OPERATIONS

- Remember!
 - 1. Parentheses
 - 2. Exponents
 - 3. Multiplication & Division
 - 4. Summation using Σ
 - 5. Other Addition & Subtraction

Example: $5 + \Sigma(x-1)^2$

HOMEWORK

- Read Chapter 1 and 2 (and Math Review)
 - Skim chapter 1 if today's lecture was review (but it will be on exam!)
- Now:
 - Complete survey
- Bring any questions to class!
