SOC 3811
BASIC SOCIAL STATISTICS

Professor: David Knoke
Teaching Assistants: Kyungmin Baek, Yu-Ju Chien, Jasmine Harris

Department of Sociology
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Chapter 1
The Social Research Process

1.1 Ideas into Research Projects
1.2 Concepts in Propositions
1.3 Variables into Hypotheses
1.4 Observations into Records
1.5 Data into Numbers
1.6 Statistical Analysis
1.7 The General Linear Model
The Research Cycle

Variables into Hypotheses

Theoretical Ideas into Research Projects

Conclusions about Social Theory

Concepts into Propositions

Observations into Records

Statistical Analyses

Data into Numbers
**TYPES OF VARIABLES**

**Variable:** Any characteristic or attribute of persons, objects, or events that can take on different numerical values

To test a research hypothesis, choose a test statistic that is appropriate for a specific type of variable

<table>
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<th>A Typology of Variables</th>
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<td><strong>Nonorderable Variables</strong></td>
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<td><strong>Discrete</strong></td>
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<td>Polychotomous (many categories)</td>
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<td>Dichotomous (2 categories)</td>
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<td><strong>Continuous</strong></td>
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No nonorderable continuous variables!
Discrete Variables

**Discrete variable:** classifies persons, objects, or events according to the kind or quality of their attributes

Discrete variables may have many categories (polychotomous) or only two (dichotomous)

**Nonorderable discrete:** the sequence of categories cannot be meaningfully ordered

- **Eye color:** black, blue, brown, green, grey, purple, ...
- **Nationality:** Indonesian, Iraki, Iranian, Japanese, Kenyan, ...
- **Music:** blues, classical, country, hip hop, jazz, rap, rock, ...

**Orderable discrete:** the sequence of categories can be meaningfully ordered (numbers show low-high sequence)

- **Life-stage:** infant, toddler, child, adolescent, young adult, ...
- **Social class:** lower, working, middle, upper
- **Company size:** small, medium, large, very large
- **Attitude:** strongly disagree, disagree, agree, strongly agree
Dichotomous variable: a discrete measure with two categories that may or may not be ordered.

Which of these dichotomies are ordered? Why?

- Gender: Female/Male
- Wealth: Poor/Rich
- Vote: McCain/Obama
- Age: Young/Old
- Height: Small/Large
- Mascot: Gopher/Hawkeye
- Education: Noncollege/College
Continuous variable: a variable that, in theory, can take on all possible numerical values in a given interval

Ideally, precise intervals (distances) should be measured, as in the natural sciences. In practice, social variables usually allow only a limited number of values on a underlying continuous scale.

How many total categories for each continuous variable?

Education: 0, 1, 2, 3, …. 20 years of schooling
Age: 1, 2, 3, 4, 5, 6, …. 125 years old
Annual Income: <$500; $501-999; $1,000-1,999; $2,000-2,999, ...
Pres. Obama’s job rating: Poor, good, fair, excellent
Attitude: Strongly disagree, Disagree, Agree, Strongly agree

Reasonable people may disagree on whether the last two examples are discrete orderable or continuous variables. How about you?

We should feel comfortable in treating a variable as continuous only if a statistical test we apply is robust: it’s insensitive to small departures from assumptions on which it depends; e.g., continuous measurement
Identify These Variables’ Types

Classify the following. Keep in mind that a variable’s type may be ambiguous, reflecting imprecision of social measurements:

Class Role: (Instructor, TA, Student)
Desserts Eaten: (None, One, Two, ....)
Social Class: (Lower, Working, Middle, Upper)
Textbook Price: (dollars and cents)
Religion: (Christian, Nonchristian)
Marital Status: (Single, Married, Widowed)
Residential Area: (ZIP code)
Population growth: (Down, Unchanged, Up)
Workplace Accidents: (Number of injuries)
Industrialization: (Pre-industrial, Industrial)
Descriptive vs. Inferential Stats

The field of statistics breaks down into two broad categories – descriptive and inferential statistics.

Descriptive statistics are concerned with summarizing the properties of a sample of observations.

The Gallup Poll’s final survey of 2010 found that 48% of the 1,500 respondents said they approved how Pres. Obama was doing his job, with a “margin of sampling error” = ±3 per cent.

The percentage of respondents choosing a response is a descriptive sample statistic. But, why should we care about the opinions of those 1,500 unknown people, from an adult population of more than 240 million persons?
Inferential statistics apply the mathematical theory of probability to make decisions about the likely properties of populations based on the sample evidence.

The Gallup Poll stated that the “margin of error is ±3%” (plus or minus three percent) around the respondents’ responses to the item. What does this phrase mean?

The t-test, an inferential statistic that you will learn, allows us to infer (make conclusions or generalize) about the probable value of the population parameter.

The American public had a 95% “confidence interval,” from 45% to 51%, in approving Pres. Obama’s job.
Statistical Significance

A statistical significance test allows us to make a statement about the probability that a population with a hypothesized parameter value could have produced the observed value of a sample statistic.

When random sampling assures us of a sample that highly represents the population, then we can make inferences about likely population parameters with a high level of confidence (but not with complete certainty).
During this course, you will learn how to combine descriptive and inferential statistics to test the truth-value of research hypotheses about population parameters, using statistics based on sample data.

We’ll learn why an apparently small Gallup sample allows us to be very confident that Obama’s true rating in 2009 was probably closer to 50% or to 52%, than it was to 47% or 55%. (And also that the most probable parameter value was the Gallup Poll’s point-estimate sample statistic: 51%)
The General Linear Model

General linear model: assumes the relationships among independent and dependent measures basically vary according to straight line patterns

The regression line in the figure on next slide shows that, as respondents’ years of formal education increase, expected occupational prestige scores increase in a linear pattern.

We’ll learn how to program the computer to calculate and graph the “best-fitting line” through a scatterplot showing the relationship between two variables.
General Social Surveys annual/biennial samples of U.S. adults interviewed since 1972 on diverse social, economic, political topics. An online codebook with question wordings & response categories is available at:

http://www.norc.org/GSS+Website/

Many examples in this course come from statistical analyses of the 2008 GSS and earlier GSS surveys.

SPSS is a computer software package for calculating descriptive and inferential statistics. We’ll use it to analyze GSS data files whose variables have mnemonic names.