When are you graduating?

A. This spring — 78%

B. This fall — 17%

C. Next spring — 0%

D. Later — 6%

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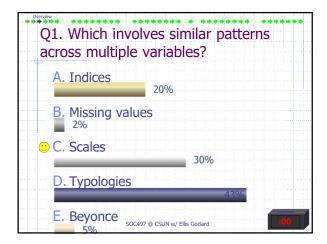

SUCCESS

what people think it looks like

what it really looks like

Reminders: ToDon'ts…

- wait to draft your survey questions
- wait until the night b4 midterm due to start
  - It *closes* March 13th, & there will be *no* extensions
- forget to ID a secretary on labs with 3 or more students
- use the "measure" column for level of measyrement
- use all measure of central tendency or dispersion for the same variable & sample
  - That *never* makes sense, and is a red flag that says "I'm lost"
- say "prove" about anything scientific, or in this class
- say any output, ever, is "normal" – it isn't!
- call me "Godard" ☺

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SOC497/L: SOCIOLOGY RESEARCH METHODS

Beyond Valid Values:

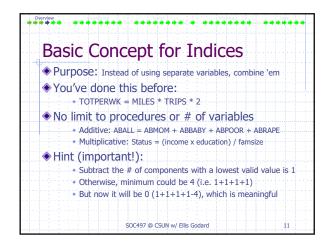### Indices & Scales (& Typologies)

Ellis Godard

Overview

Slides with these, you've seen before

Outline for Today

Continuing on theme of data cleaning…

- **Complex Variables**
  - Indices – concepts, steps, examples
  - Scales
    - Meaning, Types, vs. Indices
  - Typologies
- **Missing Values**
  - 2 kinds, What's "Missing"?, 7 Solutions
- **SPSS Demo & Lab**

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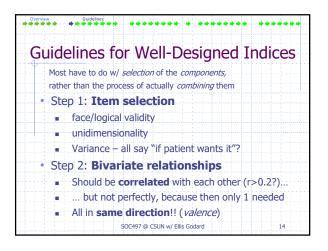
Slide 1

Overview

Intro to Complex Variables

- ◆ Needing multiple measures
  - Concepts have varied meanings
  - Meanings have multiple operationalizations
  - May need more than 1 measure to assess
- ◆ That's a challenge!
  - Manipulating many variables simultaneously may be tricky, difficult, inappropriate, or impossible
- ◆ 3 tools to resolve these problems (B says 2?)
  - **Indices:** <u>accumulate</u> scores (compute, count, IF)
  - **Scales:** score <u>patterns</u> or intensity structures
  - **Typologies:** <u>label</u> specific intersections of variables

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Slide 2

Overview

Advantages of Indices

1. More efficient
   - simplify/ease summary/analysis of data
2. More descriptive
   - more variation (12 dichotomies -> one 0-8)
3. More valid
   - "Better" measurement if difficult underlying concept
     - SES via measures of wealth?
     - Status via measures of prestige?
   - *Best* if concept has multiple inseparable dimensions
     - Love
     - Status
   - *But* assumes dimensions distributed in same places

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Slide 3

Overview

Q1. Which involves similar patterns across multiple variables?

A. Indices — 20%

B. Missing values — 2%

☺ C. Scales — 30%

D. Typologies — 43%

E. Beyonce — 5%

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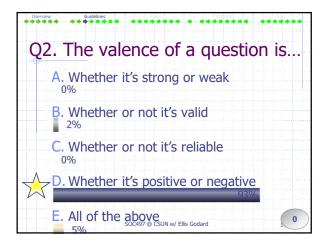
Slide 4

Overview

Indicators of a <u>Common Factor</u>

- ◆ Index components should be related
  - Conceptually, not just statistically
  - Components each indicate a *factor* common to all
  - Aggregation of components measures *intensity* or *diversity* of that factor
- ◆ Example: whether someone is a good student
  - ask whether respondents agree or disagree w/ these statements:
    - 1. I attend every class
    - 2. I study every night
  - A good student should agree with both statements.
    - Both indicators reflect a good student.
    - Doing either is a good student; doing both is even "better" – more intense, more diverse, thank just doing one

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Slide 5

Overview

Basic Concept for Indices

- ◆ Purpose: Instead of using separate variables, combine 'em
- ◆ You've done this before:
  - TOTPERWK = MILES * TRIPS * 2
- ◆ No limit to procedures or # of variables
  - Additive: ABALL = ABMOM + ABBABY + ABPOOR + ABRAPE
  - Multiplicative: Status = (income x education) / famsize
- ◆ Hint (important!):
  - Subtract the # of components with a lowest valid value is 1
  - Otherwise, minimum could be 4 (i.e. 1+1+1+1)
  - But now it will be 0 (1+1+1+1-4), which is meaningful

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Slide 6

Overview   Guidelines

Guidelines for Well-Designed Indices

Most have to do w/ *selection* of the *components*, rather than the process of actually *combining* them

- Step 1: **Item selection**
  - face/logical validity
  - unidimensionality
  - Variance – all say "if patient wants it"?
- Step 2: **Bivariate relationships**
  - Should be **correlated** with each other (r>0.2?)…
  - … but not perfectly, because then only 1 needed
  - All in **same direction**!! (*valence*)

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Example w/ Valence Issue

◆ For all five questions please answer strongly agree, agree, disagree, or strongly disagree.
- Q1: President Bush should not go to war.
- Q2: Congress should authorize a war against Iraq.
- Q3: I am against killing of other humans.
- Q4: If American troops are sent into battle, it will be a just cause.
- Q5: Most of my friends do not support a war against Iraq.
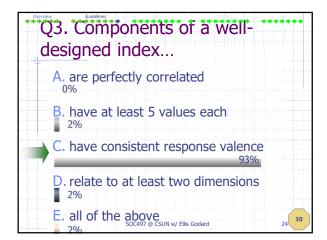
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Step 4: Scoring

A. Assign a numerical value to each indicator.
- Agree = 1 Disagree = 0
- SA = 5, A = 4, N = 3, D = 2, SD = 1

B. Assess how missing values will be handled
- 7 strategies – later this lecture
- If any case is missing a component value, can't calculate index value!

C. Determine what range is desired
- Prefer 2-4 per component (if more, extremes get sparse), 3-9 overall
- Otherwise, extremes get sparse
- Hint: if addings 1s and 2s, subtract the # of measures

D. Determine how the components should be weighted
- Equal unless compelling reason to do otherwise

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Q2. The valence of a question is…

A. Whether it's strong or weak
0%

B. Whether or not it's valid
2%

C. Whether or not it's reliable
0%

⭐ D. Whether it's positive or negative
93%

E. All of the above
5%

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0

Step 5: Validation

Four options…
A. Inspect sample cases
- Look across some rows - make sense? Combine correctly?

B. Conduct item analysis
- Statistically measure extent to which composite measure is related to or associated with the included items
  - Pearson's correlation coefficient (0.2 or higher)
  - Cronbach's alpha of reliability (?)

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Step 3: Multivariate Relationships

◆ Babbie shows a good trivariate example
- Review it – uses crosstabs!

◆ We'll use Cronbach's alpha of reliability
- Technical Definition
  - "squared correlation between the score a person obtains on a particular scale and the score the person would have obtained on a scale of all the possible items in that scale's universe"
- In SPSS: Analyze – Scales – Reliability Analysis
  - Just pick variables and get alpha; don't need to select any other options or stats
- Approximate interpretation:
  - Higher the value, more reliabe the index is
  - % of the time the components correspond to each other

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Step 5: Validation, cont'd

C. Seek external validation
- Use other items in dataset
  - ~ construct validity
  - euthanasia index correspond w/ abortion? Death penalty?
- If not mesh, possibilities:
  - Either the index or included items don't measure the concept
  - Sampling problem (next lecture)
- Re-examine index first
  - become more explicit about the concept – compassion? Fear of death?

D. Shortcut: use established measures!

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Q3. Components of a well-designed index…

A. are perfectly correlated
   0%

B. have at least 5 values each
   2%

C. have consistent response valence
   93%

D. relate to at least two dimensions
   2%

E. all of the above
   2%

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Scales: A Special Case

◆ What level of measurement are they?
  - Textbooks often say interval
  - Seem ordinal to me (differences not equal)
  - Unsettled debate – see the "schemapiric view"
    ♦ S Stevens, Science 30, Aug 1968, V 161, No 3844, p849-856, "Measurement Stats and the Schemapiric view"

◆ When in doubt, treat as both
  - E.g. consider the mean *and* median
  - Each procedure has assumptions; compare results
  - Like triangulation – alt perspective = deeper inquiry

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Introducing "Scales"

◆ Texts
  - Scales as *levels of measurement*

◆ SPSS
  - Scale as *interval or ratio* measures

◆ Technical
  - Scale as an *intensity structure*
  - Ranks cases on a continuum
  - Combines related ordinal measures
    ♦ Like a specific kind of index…

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Likert: The Holy Grail of Scales

◆ Informally
  - any measure with 4 to 7 categories

◆ Technically
  - an index of things w/ 5 or so categories
  - Series of measures w/ different criteria

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Indices vs. Scales

◆ What they have in common
  - both can be composite measures of variables (built by combining 2 or more measurements)

◆ How are they different
  - Indexes accumulate different kinds of scores; e.g. miles & trips
    Scales assess patterns across similar measures e.g. varied abortion attitudes
  - Scales involve ordinal *components*;
    Indices combine anything

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Intensity Scaling

◆ Bogardus Social Distance Scale
  - Measures willingness to participate in social relations
  - ethanize stranger > spouse (distance)

◆ Guttman Scaling
  - Hard vs. easy indicators of the same concept
    ♦ cold, HIV, coma, full-blown AIDS, severed head
  - Some items may prove more extreme indicators
    ♦ Support life in prison for causing death while DUI
    ♦ Support life for 2nd degree murder
    ♦ Support life for 1st degree murder
      ▪ Scoring would be 3, 2, 1, top to bottom

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Slide 30

Low/High Precision Scaling

◆ Semantic Differential
  ▪ Choosing between two opposite positions
    ◆ Emotional........................Rational
    ◆ Sensitive.................Competitive
    ◆ Relaxed .... Active

◆ Thurstone Scales
  ▪ Attempt to define intervals on an ordinal scale
  ▪ Uses a panel of experts to judge items and score them
  ▪ They evaluate based on their own criteria

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Slide 33

Introducing Typologies

◆ Labeling the intersections of 2 or more variables
◆ Usually nominal composites
  ▪ Conceptual Example: three types of terrorists (Based on historical time connection, typical tactics used during attacks, motivation, and willingness to commit mass victimization.)
    ◆ Early anarchists.
    ◆ New terrorists.
    ◆ Post-modern terrorists
◆ Could be ordinal…
  ▪ Cellular Example: six types of students

	A	B / C	D / F
More able	Achievers	Underachievers	Failures
Less able	Overachievers	Average students	Challenged

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Slide 31

Tips about Scales (heh)

◆ Useful in explanatory work

◆ Require careful checks of validity & reliability
  ▪ those checks are interesting themselves
  ▪ can write article just on methodology
  ▪ could do in paper
    ◆ E.g. 2 measures of income consistent? (check w/ educ)
    ◆ or two ways of asking polit Qs – in gss modules

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Slide (Reminders)

Reminders: Valid Percent

Here, 50% of cases have "system missing" values (that is, no value – literally missing!).

Unless you want to treat not answering as a category, you should focus on valid percents

Which one of the following was the cause of the latest problem in your relationship?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Time for the relationship	8	13.8	27.6	27.6
	Different values	8	13.8	27.6	55.2
	Lack of commitment	1	1.7	3.4	58.6
	Honesty	2	3.4	6.9	65.5
	Jealousy	1	1.7	3.4	69.0
	Communication	5	8.6	17.2	86.2
	Other problems	3	5.2	10.3	96.6
	No problems	1	1.7	3.4	100.0
	Total	29	50.0	100.0	
Missing	System	29	50.0		
Total		58	100.0		

Slide 32

When to use which?

◆ Scales are generally superior to indexes
◆ But often difficult (even impossible) to construct from available or achievable data
  ▪ Scales require planning in advance
  ▪ Indices are usually constructed post hoc
◆ Indexes are more frequently used
  ▪ But their construction is *not* obvious or straightforward
  ▪ Must be explicitly explained & defended

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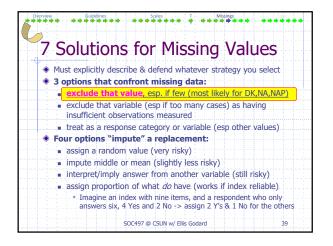
Slide 35

Kinds of Missing Values

◆ System missing
  ▪ no data on that variable for that case
  ▪ Indicated in SPSS w/ a period instead of a #
◆ User-defined missing
  ▪ Values typically excluded from computations
    ◆ DK, NA, NAP
  ▪ Values not used in a particular comparison
    ◆ E.g. if focus on 2 categories of a nominal variable
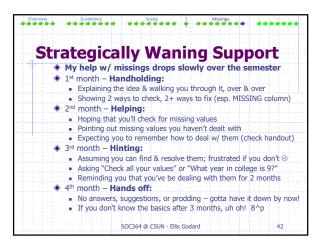
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Slide 37

What is "Missing"?

◆ **Missing Cases?**
- Have values that are already declared as missing
- Listed in 1 or more rows of freq table labeled "Missing", *below* the section labeled "Valid"
- Use valid percent!
  - Should differ from percent column
- Note in discussions of sample size, possible biases, etc.
  - Next lecture…

◆ **Missing Variables?**
- Doesn't mean anything
- A variable that's not in the dataset??

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Slide 40

Questions to Ask Yourself (& see FAQ!)

- In the "Values" column in Variable View, are there any non-valid values (DK, NA, RF, NAP, etc.)?
  - If so, are in "Missing" column?
- In the frequency table(s), are there separate groupings for "Valid" and "Missing" values?
  - There might not *be* any missing cases
- In the frequency table(s), are there any values listed under "Valid" that should be listed in the "Missing" group?
  - If so, you didn't add them in the "Missing" column
- Do NOT recode w/o a good, clear reason
  - Including strategy for old and new values
  - Almost certainly NOT what you should be doing for missing values

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Slide 38

What is "Missing"?

◆ **Missing Values?**
- Various abbreviations
  - DK (don't know), NA (No answer), NAP (Did not apply), RF (Refusal), et al
- Should be in "missing" column of variable view
  - Click cell then elipses ("…" in a grey box
  - List single value, up to 3, range, or range plus 1
  - Tells SPSS to exclude cases w/ those values from any statistical analysis or data displays
- But ignoring values is not the only option…

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Slide 41

Q4. Which do you *not* need to do?

A. Be aware of the number of missing cases
   2%

B. Ensure missing values are in Missing col.
   0%

C. Check for invalid values in "Valid" section
   2%

D. Report the number of missing variables
   20%

E. Ignore the "measure" column
   76%

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Slide 39

7 Solutions for Missing Values

◆ Must explicitly describe & defend whatever strategy you select
◆ **3 options that confront missing data:**
- **exclude that value**, esp. if few (most likely for DK,NA,NAP)
- exclude that variable (esp if too many cases) as having insufficient observations measured
- treat as a response category or variable (esp other values)
◆ **Four options "impute" a replacement:**
- assign a random value (very risky)
- impute middle or mean (slightly less risky)
- interpret/imply answer from another variable (still risky)
- assign proportion of what *do* have (works if index reliable)
  - Imagine an index with nine items, and a respondent who only answers six, 4 Yes and 2 No -> assign 2 Y's & 1 No for the others

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Slide 42

Strategically Waning Support

◆ **My help w/ missings drops slowly over the semester**
◆ 1st month – **Handholding:**
- Explaining the idea & walking you through it, over & over
- Showing 2 ways to check, 2+ ways to fix (esp. MISSING column)
◆ 2nd month – **Helping:**
- Hoping that you'll check for missing values
- Pointing out missing values you haven't dealt with
- Expecting you to remember how to deal w/ them (check handout)
◆ 3rd month – **Hinting:**
- Assuming you can find & resolve them; frustrated if you don't ☹
- Asking "Check all your values" or "What year in college is 9?"
- Reminding you that you've be dealing with them for 2 months
◆ 4th month – **Hands off:**
- No answers, suggestions, or prodding – gotta have it down by now!
- If you don't know the basics after 3 months, uh oh! 8^p

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Slide 43

Overview Guidelines Scales T Missings Labs

Lab Assignment Continuity…

- Last lab: Grouping hero types
  - Family members?
  - Entertainment figure?
  - Historical persons?
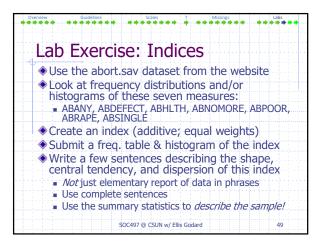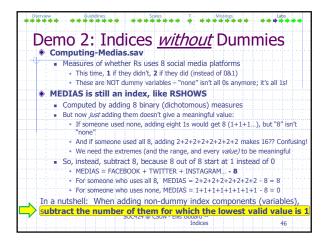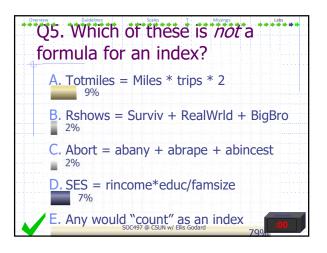- This lab: Combining abortion attitudes
  - First, combine variables (compute)
  - Second, analyze attributes (elem stats)
  - Must go beyond last data lab –
    - tell story, summarize the data, describe the sample!

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Slide 47

Overview Guidelines Scales T Missings Labs

Demo 3: Declaring Missing Values

- Computing-rshows.sav again
- **Look at frequency distributions for YRBORN and PCTYPE**
- **Both have a value of 99 for "not answered"**
- **Must declare that "missing"**
  - We don't have a "real" value – not a *valid* value
  - We want SPSS to ignore that value, and that case

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Indices   47

Slide 45

Overview Guidelines Scales T Missings Labs

Demo 1: Indices *with* Dummies

- **Computing-Rshows.sav**
  - Measures of whether Rs watched 8 reality shows
    - Each is a "dummy variable" – a binary toggle, 0 or 1
    - 0 if they didn't watch it, and 1 if they did, for each of 8
- **RSHOWS is an index, of all 8**
  - Computed by adding those binary (dichotomous) measures
    - RSHOWS = SURVIVOR + BIGBRTHR + REALWRLD…
    - What will the total be for someone who watched none of them?
      - RSHOWS = 0+0+0+0+0+0+0+0 = 0
    - What will the total be for someone who watched all 8?
      - RSHOWS = 1+1+1+1+1+1+1+1 = 8

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Indices   45

Slide 49

Overview Guidelines Scales T Missings Labs

Lab Exercise: Indices

- Use the abort.sav dataset from the website
- Look at frequency distributions and/or histograms of these seven measures:
  - ABANY, ABDEFECT, ABHLTH, ABNOMORE, ABPOOR, ABRAPE, ABSINGLE
- Create an index (additive; equal weights)
- Submit a freq. table & histogram of the index
- Write a few sentences describing the shape, central tendency, and dispersion of this index
  - *Not* just elementary report of data in phrases
  - Use complete sentences
  - Use the summary statistics to *describe the sample!*

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Slide 46

Overview Guidelines Scales T Missings Labs

Demo 2: Indices *without* Dummies

- **Computing-Medias.sav**
  - Measures of whether Rs uses 8 social media platforms
    - This time, **1** if they didn't, **2** if they did (instead of 0&1)
    - These are NOT dummy variables – "none" isn't all 0s anymore; it's all 1s!
- **MEDIAS is still an index, like RSHOWS**
  - Computed by adding 8 binary (dichotomous) measures
  - But now *just* adding them doesn't give a meaningful value:
    - If someone used none, adding eight 1s would get 8 (1+1+1…), but "8" isn't "none"
    - And if someone used all 8, adding 2+2+2+2+2+2+2+2 makes 16?? Confusing!
    - We need the extremes (and the range, and every *value*) to be meaningful
  - So, instead, subtract 8, because 8 out of 8 start at 1 instead of 0
    - MEDIAS = FACEBOOK + TWITTER + INSTAGRAM… **- 8**
    - For someone who uses all 8, MEDIAS = 2+2+2+2+2+2+2+2 - 8 = 8
    - For someone who uses none, MEDIAS = 1+1+1+1+1+1+1+1 - 8 = 0

In a nutshell: When adding non-dummy index components (variables),
➡ **subtract the number of them for which the lowest valid value is 1**

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Indices   46

Slide (Q5)

Overview Guidelines Scales T Missings Labs

Q5. Which of these is *not* a formula for an index?

A. Totmiles = Miles * trips * 2
   9%

B. Rshows = Surviv + RealWrld + BigBro
   2%

C. Abort = abany + abrape + abincest
   2%

D. SES = rincome*educ/famsize
   7%

✓ E. Any would "count" as an index
   79%

:00

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Overview   Guidelines   Scales   T   Missings   Labs

Team Scores

Points	Team	Points	Team
3.5	Later		
3.3	This fall		
3.18	This spring		