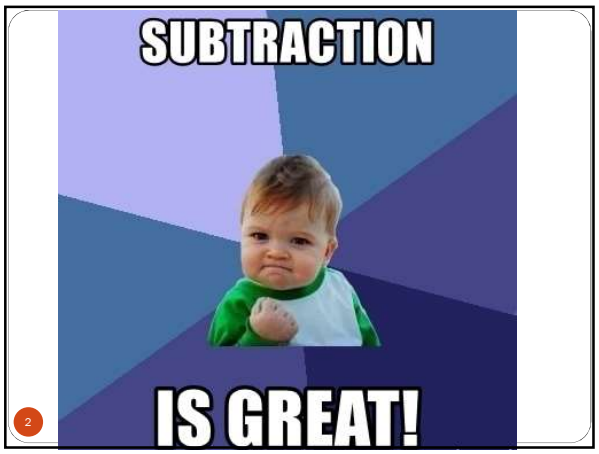
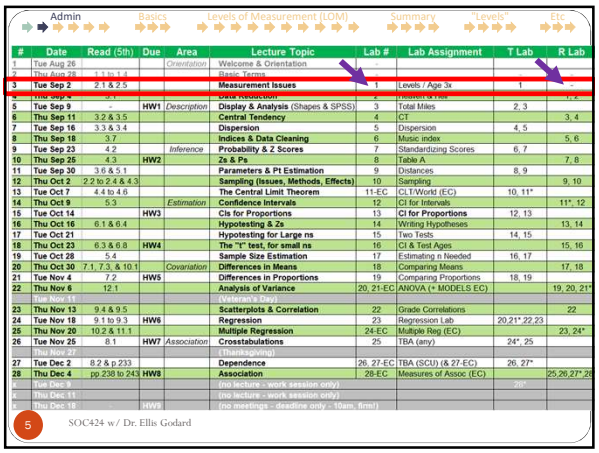
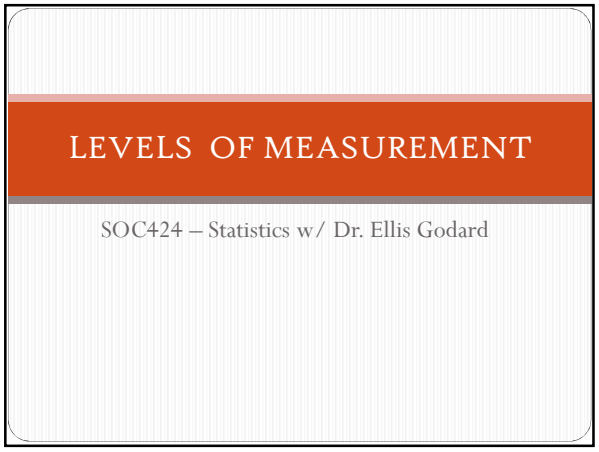
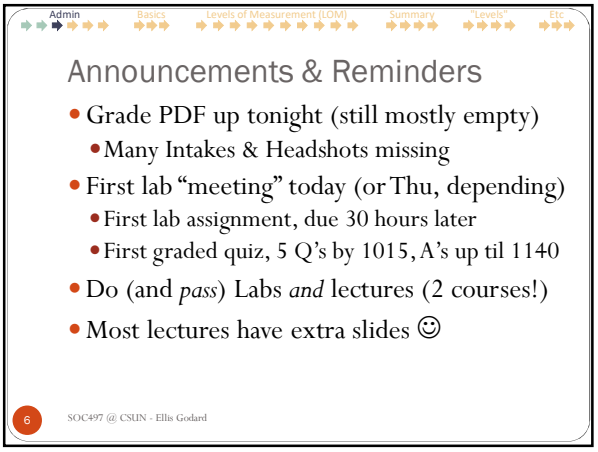
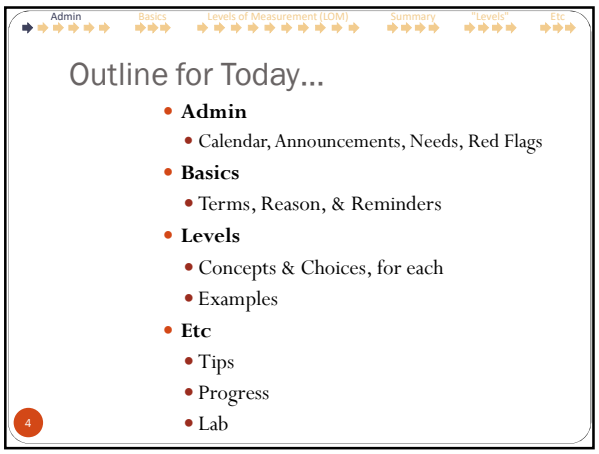


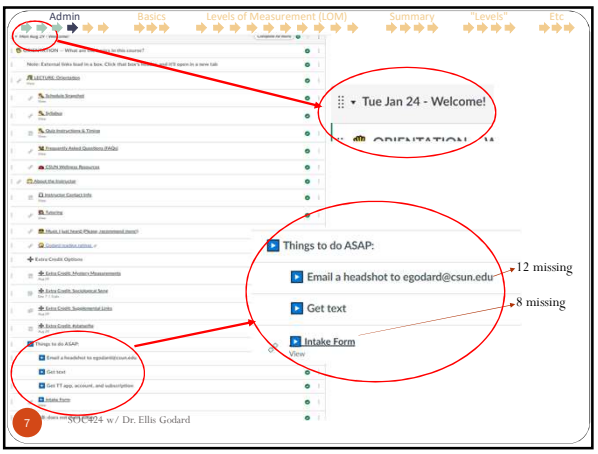


#	Date	Read (5th)	Due	Area	Lecture Topic	Lab #	Lab Assignment	T Lab	R Lab
1	Tue Aug 26			Orientation	Welcome & Orientation	--			
2	Thu Aug 28	1.1 to 1.4			Basic Terms	--			
3	Tue Sep 2	2.1 & 2.5			Measurement Issues	1	Levels / Age 3x	1	-
4	Thu Sep 4	3.1			Data Reduction	2	Means & Me		1, 2
5	Tue Sep 9	-	HW1	Description	Display & Analysis (Shapes & SPSS)	3	Total Miles	2, 3	
6	Thu Sep 11	3.2 & 3.5			Central Tendency	4	CT		3, 4
7	Tue Sep 16	3.3 & 3.4			Dispersion	5	Dispersion	4, 5	
8	Thu Sep 18	3.7			Indices & Data Cleaning	6	Music index		5, 6
9	Tue Sep 23	4.2		Inference	Probability & Z Scores	7	Standardizing Scores	6, 7	
10	Thu Sep 25	4.3	HW2		Zs & Ps	8	Table A		7, 8
11	Tue Sep 30	3.6 & 5.1			Parameters & Pt Estimation	9	Distances	8, 9	
12	Thu Oct 2	2.2 to 2.4 & 4.3			Sampling (Issues, Methods, Effects)	10	Sampling		9, 10
13	Tue Oct 7	4.4 to 4.6			The Central Limit Theorem	11-EC	CLT/World (EC)	10, 11*	
14	Thu Oct 9	5.3		Estimation	Confidence Intervals	12	CI for Intervals		11*, 12
15	Tue Oct 14		HW3		CIs for Proportions	13	CI for Proportions	12, 13	
16	Thu Oct 16	6.1 & 6.4			Hypotesting & Zs	14	Writing Hypotheses		13, 14
17	Tue Oct 21				Hypotesting for Large ns	15	Two Tests	14, 15	
18	Thu Oct 23	6.3 & 6.8	HW4		The "t" test, for small ns	16	CI & Test Ages		15, 16
19	Tue Oct 28	5.4			Sample Size Estimation	17	Estimating n Needed	16, 17	
20	Thu Oct 30	7.1, 7.3, & 10.1		Covariation	Differences in Means	18	Comparing Means		17, 18
21	Tue Nov 4	7.2	HW5		Differences in Proportions	19	Comparing Proportions	18, 19	
22	Thu Nov 6	12.1			Analysis of Variance	20, 21-EC	ANOVA (+ MODELS EC)		19, 20, 21*
	Tue Nov 11				(Veterans Day)				
23	Thu Nov 13	9.4 & 9.5			Scatterplots & Correlation	22	Grade Correlations		22
24	Tue Nov 18	9.1 to 9.3	HW6		Regression	23	Regression Lab	20,21*,22,23	
25	Thu Nov 20	10.2 & 11.1			Multiple Regression	24-EC	Multiple Reg (EC)		23, 24*
26	Tue Nov 25	8.1	HW7	Association	Crosstabulations	25	TBA (any)	24*, 25	
	Thu Nov 27				(Thanksgiving)				
27	Tue Dec 2	8.2 & p.233			Dependence	26, 27-EC	TBA (SCU) (& 27-EC)	26, 27*	
28	Thu Dec 4	pp 238 to 243	HW8		Association	28-EC	Measures of Assoc (EC)		25,26,27*,28
	Tue Dec 9	-			(no lecture - work session only)			28*	
	Thu Dec 11				(no lecture - work session only)				
	Thu Dec 18	-	HW9		(no meetings - deadline only - 10am, finn!)				









Early Red Flags RE Directions…

- 3 (Nickname). What would you like me to call you, if something other than your first name on record? (PLEASE leave blank if you just want me to use what's in the CSUN system. Please. Don't write the same name you just wrote, or "i don't have one", or "just use my name", lol… only enter a nickname, if you have one.)
  - **But some of you gave me your legal name or wrote "just use my first name"**
- 4 (Codename). I need a "codename" for you - something under which to post your grades in the PDF grading report, if you want your row shown in the PDF grading report. This cannot be, or include, your name, initials, address, phone number, email address, Social Security number (or even part of it), student ID number (or even part of it), or anything else personally identifying. Think code, something no one but you and I will know. ;-)
  - **But some of you gave your initials, a nickname, or simpy your first name**
- 6 (Email). At what email address, if something other than your CSUN address, would you like to receive class notices, updates, and warnings? (PLEASE leave blank if you just want me to use your CSUN address.)
  - **But several of you gave your CSUN address**
- I worry – these were easy questions w/explicit all-caps cautions
  - *Please* slow down and read carefully ☺

Levels of Measurement

- **Nominal**
  - Values represent unorderable categories
- **Ordinal**
  - Each value is more or less of something
- **Interval**
  - Equal differences btwn consecutive levels
- Ratio
  - Zero is meaningful
  - *Not important for our work*

This one is not a correct answer to ANYTHING in this class. NOTHING. If you give it as an answer, it's wrong. It's unimportant. A distraction. Forget it.

In case you thought I was kidding…

Winners of the Fall 2017 Golden Quiz Bananas

https://www.instagram.com/p/BcSzAMgBGwL/ http://bit.ly/2GgOxGR (at Facebook)

Mandatory Minimums

- **Equivalence**
  - Comparable values
    - vs. "female, catholic, or tall"
- **Exhaustive**
  - All cases in a category (inc. DK, NA, NAP)
    - {black, white} vs. **{black, white, other}**
- **Mutually Exclusive**
  - Each case is only 1 value of the variable
  - Each case falls in 1 (and *only* 1) category
    - {white, Hispanic} vs. **{non-Hispanic white, Hispanic}**

Why Do Levels Matter?

- Assoc. w/ Different Statistics, 2 ways…
- Each level is described differently
  - Each requires different *univariate* procedures
    - Can't compute "average religion"
    - *Can* compute *most frequent* (modal) religion
  - Combinations require different *bivariate* procedures
- Stat. techniques requires (min.) level
  - Each has a set of assumptions about data
  - Inc. mathematical manipulation of the values
    - Addition, subtraction, multiplication, division
    - Require at least interval level of measurement

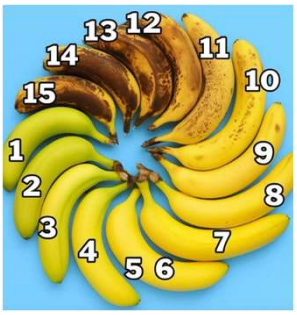
Nominal Measurements

- ***Only* those 3**
  - incomparable cases – distinguish by name only
  - attributes differ in quality only, not magnitude
    - e.g. sex, race, religion, region; political party (?)
- **They simply classify individuals into groups**
  - The groups could be in any order
  - You can't subtract the group names
    - Male – Female? Banana – Orange?
  - Any numbers have no inherent meaning
    - *not* quantitative; just happened to be numbered
    - Phone #, car licenses, social security #s
  - Oft use for identification purposes only

Nominal Choices

- **Only limited set of techniques can be used**
  - Because only a limited amount of info is captured
    - Can only report counts and % in each
  - Would prefer to capture more info
    - not only to use more techniques but bc more informative
- **How many categories?**
  - Depends on the purpose of the study
  - Note/Hint: 2 categories can be treated as nominal
    - You can't get two values out of order
    - So, dichotomies (anything defined as binary) is nominal, statistically

Ordinal values are not subtractable



- 3 is greener than 4, but you can't subtract those greennesses
- "4 - 3" isn't relevant; those are just the placeholders
- The difference between 3 & 4 is not the same as the difference between 9 and 10 or 13 and 14
- Values with subtractable differences are *interval*

https://www.threads.com/@sharbearog/post/DMpBMttuaET

Ordinal Measurements

- **Those 3 Criteria AND the values have some order**
  - Magnitude difference between values
    - e.g. social class, agreement scale, health scale
    - Note: if only 2 values, treat as nominal
  - Attributes are ordered or rankable
  - Represent relatively more or less of the variable
  - Conveys transitivity (A>B, B>C, A>C)
- ***But* the differences are inexact & inconsistent**
  - e.g. letter grades
  - Assess *relative* locations or amounts
  - Difference between values almost meaningless
    - Can't say 4 = twice as interested as 2, or twice as rich

Interval Measurements

- **Meaningful standard intervals**
  - An interval is the space BETWEEN values
    - NOT a range, array, set, spectrum, or group of values
  - Usually *known*, Always meaningful
  - *Absolute* (not just relative) – *we can subtract!*
- **Value increments are uniform, equal**
  - Distance between successive values is uniform
  - Corresponding intervals have same meaning
  - Meaningful spectrum of values
    - Distance between *any* two values can be *calculated*
    - Difference between any two cases can be *calculated*

Ordinal Choices

- **How many values?**
  - Scale of Satisfaction – 1-5? 1-10? 1-100?
  - SES – lower/middle/upper? 2? 8?
  - Education – Elem/HS/BA? More?
- **Valence: Increasing or decreasing?**
  - Higher # may not mean higher value
    - e.g. more violence, more attendance
    - 1: high, 2: medium, 3: low
  - Think carefully about meaning of what's measured
    - e.g. ranking of defects per 100 cars

Beware Value Groupings!

- Sets of Values aren't Interval!
  - 0, 1-2, 3-4, 5-6, 7+ ….That's Ordinal!
  - "$20-$50,000" is *not* an interval value
    - That's a range of values – and a *big* one!
  - For an interval variable, you can subtract values from each other
  - Difference btwn "$20-50K" and "$51-100K"?
    - Is it $1,000 (50K to 51K) or $80,000 (20 to 100)?
    - It's neither. ***You cannot subtract ranges from each other.***
- Some common measures are in sets
  - Income groupings ("RINCOME") – ordinal!
  - FAMSIZE top value "7+" – treat as interval?

Interval Choices

- Treat as "Continuous" (esp. if 7 or more)
  - More distinctions, more specific locations
  - Can compute medians (middle value) etc.
  - Key = *treat* the distances between the units as equal – might not be, but not sure if any really are
- Not always true of constructed measures
  - E.g. psychological tests such as IQ scores
  - Treat jump from 100 and 101 same as 130/131
  - But difficult to show how or why those are equal – or even what equality means there
- Arguably clearer in physical sciences –
  - E.g. for Centigrade, measure amount of heat
  - Different degrees differ by known amount of heat

Levels of Measurement

- Nominal variables:
  - Only exhaustive & mutually exclusive
  - Values cannot be ordered, ranked
    - Just names, for differences in kind (not amount)
    - "It's apples and oranges" (and kiwi and apricot and…)
  - Examples: gender, race, religion, department
- Ordinal variables:
  - Also rank-ordered – more/less, higher/lower
  - Ranks are relative, not absolute
    - Difference between 2 values or cases is unclear
    - Range covered by each value *may* be unclear too
  - Examples: short/medium/tall; <HS/HS/BA/+

Ratio Measurements ("the R Word")

- Key 3, *and* rank-ordered *and* equidistant, *and*… meaningful zero point
  - e.g. money in pocket, income, # of childs or sibs, age, yrs educ, weeks jobless in calendar yr
- Intervals have no "true zero"
  - Need to be careful about comparing
    - Jill has twice as much as Joe
- Not always listed (e.g. this text)
  - Rarely require separate analysis
    - e.g. can treat differently in models and combinations)
  - Often behave the same as interval,
    So won't distinguish much from here on

Distinguishing Levels

- *Can* the values be *out* of order?
  - If not, it's nominal.
  - If so…
- Can the values be subtracted from each other?
  - If so, it's interval.
  - If not, it's ordinal.

Ratio Choices (but not in this class)

- 1 thing intervals don't have: true zero point
  - 0°C only marks temp where water freezes
  - does not indicate absence of heat (which is understood as the movement of atoms)
  - Vs. IQ – arbitrary scale not bound to a 'real' 0
- Kelvin scale, however, is a ratio measure –
  - At 0 Kelvin (-273°C), all atomic activity stops
    - Allows ratios: 20°K is twice the atomic activity of 10°K
  - Can't do that with a non-ratio scale
    - 100°C is not twice as hot as 50°C
    - 100°Fahrenheit is not twice as hot as 50°F
- No other differences for our purposes
  - just use NOI
  - RATIO IS *NEVER* THE CORRECT ANSWER IN THIS CLASS ☹

Example: Grade Measures

- Nominal: Homework, Exam, or Quiz?
- Ordinal: Check, Plus, Minus
- Interval: Curved to 100pt scale, @85
- Ratio: Number of missed pts, % of missed points

Not correct as an answer to *anything* in this class.
If you give it as an answer, it will be a *wrong* answer.
Seriously. *Only* the other three matter in this class.
Please don't try and teach yourself this class. ☹

Example: Highway Exits

- California – labeled nominally
  - For the most part, *no* exit numbers
  - E.g. Collins, Madera, Yosemite off the 118
- Georgia – numbered ordinally
  - Exits are simply numbered in order, regardless of distance between them
- Pennsylvania – numbered intervally
  - Exit number tells # of miles between them

"Levels" vs. "Scales"

- Some call these (NOI) "*Scales* of Measurement"
- Scales mean something else
  - SPSS "Measures" column *(don't use it!!)* – NOS?!?
  - Scales are a sequence (probably Ordinal)
    - e.g. personality or agreement
  - Special Types
    - Likert Scale – typically, set of 5-point agreement scales
    - Semantic Differential Scale – set of binary choices
    - Thurstone Scale – attempt @ equal intervals thru experts
    - Bargodus Social Distance Scale

Why "Levels"?

- Levels reflects higher/lower precision
  - Interval = "higher" LOM
    - More precise distinction among/between cases
  - Nominal = "lower" LOM
    - Less powerful; merely incomparable groups
- Hierarchy of Levels

  Interval – *most amount of info (e.g. # years education)*

  Ordinal – *not quite as specific (elementary, HS, college)*

  Nominal – *values distinguished but unranked (PhD/not)*

Changing Levels

- Can recode ("collapse") to a lower level
  - e.g. years of schooling: 0, 1, 2, … 16+
    - 0-8, 9-11, 12, 13-15, 16, > 16 (ordinal)
    - "dropout;" "high school grad" (nominal bc 2)
- Can go "down" but not "up"
  - I > O, or O > N
  - Can't get *more* variation than a variable contains
    - Knowing you're in high school doesn't tell me what year
    - Knowing you passed doesn't tell me your actual grade

Levels are a *Choice*

- Behavior – e.g. class enrollment
  - Full-time/part-time
  - 0, 1-2, 3-4, 5+
  - {specific number of classes or units}
- Characteristics – e.g. gender
  - Male / Female
  - Masculine, Mixed, Feminine
  - Of 100 binary aspects (lips? Jawline?), # male
- Orientations – e.g. sexual
  - Straight / Gay (Heteronormative / Non-normative?)
  - Heterosexual, Bisexual, Homosexual
  - Kinsey Scale (10 point)

SPSS Tips

Note for later!!!

- If the variable is ordinal or nominal, there will need to be a legend in the "Values" column that tells you what each number means.
- **Interval variable don't have labels for valid values**
  - The value is its own label – 2 for MAEDUC is 2 years of education, 3 is 3, etc.
  - Might have values for missing values – e.g 97 for DK, 98 for NA, 99 for NAP
- **Ergo, helpful guidelines:**
  - If a variable has NOTHING in the values column, it's probably interval,
  - If it *only* has value labels for missing values, it's probably interval.

Progress of Analysis Procedures

1. **Univariate** (including inference to a pop.)
2. Univariate analysis for **subsamples**
3. Bivariate analysis **from univariate** data (diff. of means or proportions)

	NOMINAL IV	ORDINAL IV	INTERVAL DV
NOMINAL DV	***5.* Crosstabs** Size: % diff by column Test: chi-square PRE: lambda, tau	*Equal differences?* *← No* *Yes →*	***8.* Special Regression** (discriminant or logistic)
ORDINAL DV	*If nothing multivariate, use crosstabs or anova; otherwise, use ordinal regression*	**6. Linear association** Nonparametric tests Gamma, tau b, Somer's d	*Equal increments & uniform distribution?* *← No* *Yes*
INTERVAL DV	***4.* ANOVA** Diff. in means More than 2 groups F test Eta squared	*Equal differences?* *← No* *Yes →*	***7.* Regression** Slope b T or F Correlation, R^2

For Your First Lab…

One of two solo labs

1. **Which level of measurement (Nominal, Ordinal, or Interval) would be most appropriate for each of these, when measured as indicated in parentheses…**
   a) Major (Sociology, Accounting, Biology, etc.)
   b) Your social network (as a number of friends)
   c) Preferred network (Instagram, Discord, Snapchat, etc.)
   d) Religion (Catholic, Baptist, Muslim, FSM, etc.)
   e) Relationship Status (in a relationship vs. not in one)
   f) Expected graduation (Sp 23, Fa 23, Sp 24, etc.)
2. **Describe 3 different ways you could measure age**
   - One at each LOM: Interval, ordinal, and nominal
   - Give at least some values to show you "get" the differences

- Note: This lab has two (2!) parts. Some of you will ignore that.
- **I can't give credit if you only do half a lab**.