Applied Statistical Analysis

EDUC 6050

Review Week

Finding clarity using data

Today

Connect the Methods

Selecting the Right Method

Selecting Method Based on Research Question

Does research question have to do with looking at **differences among groups** or **relationships** among continuous variables?

Z-tests compare our sample to known values

ANOVAs compare:
1) 3+ independent samples (groups)
2) 3+ repeated samples (time points)
3) Both groups and repeated samples at the same time

Z-tests
T-tests
ANOVAs
Chi Square
Regression

t-tests compare:
1) Our sample to known values
2) Two independent samples (groups)
3) Two paired-samples (time points)

Chi Squares compare:
1) 1 categorical variable to known values
2) 2 categorical variables

Regression compares:
1) 1+ categorical variable(s)
2) Controls for the effects of the covariates
3) Can also do a lot more...

All but Chi Square has a continuous outcome

Correlation tells us the direction and magnitude of a relationship between two continuous variables

Correlation
Regression

Regression tells us the direction and magnitude (in the units of the outcome) of a relationship between two continuous variables
(Can also have categorical variables in the model at the same time)

Continuous outcomes

Correlation tells us the direction and magnitude of a relationship between two continuous variables

Regression

Regression tells us the direction and magnitude (in the units of the outcome) of a relationship between two continuous variables

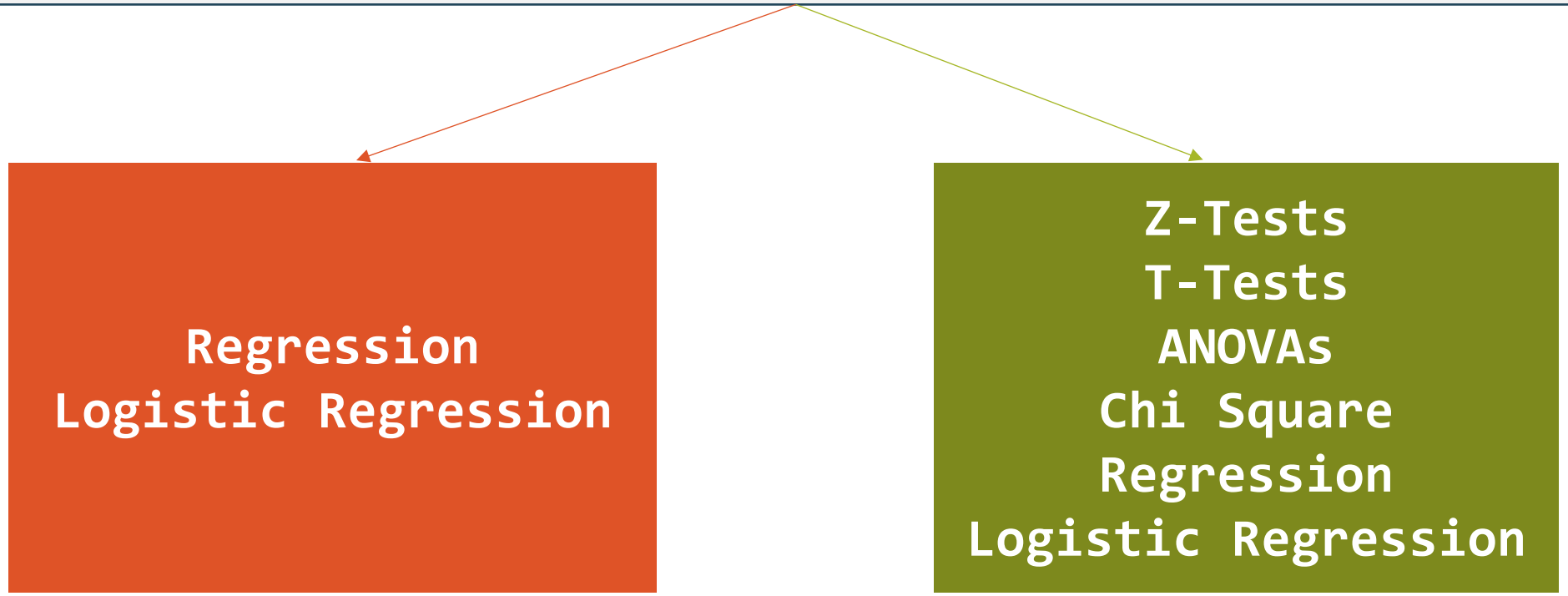
(Can also have categorical variables in the model at the same time)

Selecting Method Based on Available Data - Outcome

Is your outcome variable continuous (interval/ratio) or categorical (ordinal, nominal)?

Selecting Method Based on Available Data - IV

Is your independent variable(s) continuous (interval/ratio) or categorical (ordinal, nominal)?



Question 1

We hypothesize that test scores are caused by amount of time studying and note-taking style.

What approach could we use?

Question 2

We investigate the question of whether preferences for money/flying are different across degree types.

What approach could we use?

Question 3

We want to know the relationship between poverty level (continuous) and teen birth rate (continuous).

What approach could we use?

Question 4

We want to know if our intervention regarding adult mobility works. We have two groups (intervention and control) and test both groups at pretest and posttest.

What approach could we use?

Interpreting the Results

Common Threads Across Methods

1. Test Statistic
2. P-Value
3. Effect Size

One Sample T-Test

One Sample T-Test

		statistic	df	p	Cohen's d
prod1	Student's t	4.82	32.0	<.001	0.839

Note. H_a population mean ≠ 2

Independent Samples T-Test

Independent Samples T-Test

		statistic	df	p	Cohen's d
prod1	Student's t	−0.395	31.0	0.696	−0.137

Paired Samples T-Test

Paired Samples T-Test

			statistic	df	p	Cohen's d
prod2	prod1	Student's t	4.25	32.0	<.001	0.740

Common Threads Ac

1. Test Statistic
2. P-Value
3. Effect Size

ANOVA

ANOVA

	Sum of Squares	df	Mean Square	F	p	η^2
race	1.69	3	0.564	0.279	0.840	0.028
Residuals	58.55	29	2.019			

Repeated Measures ANOVA

Within Subjects Effects

	Sum of Squares	df	Mean Square	F	p	η^2
Mental Health	19.6	1	19.636	22.2	<.001	0.409
Residual	28.4	32	0.886			

Note. Type 3 Sums of Squares

Between Subjects Effects

	Sum of Squares	df	Mean Square	F	p	η^2
Residual	291	32	9.09			

Note. Type 3 Sums of Squares

ANCOVA

ANCOVA

	Sum of Squares	df	Mean Square	F	p	η^2
ment1	15.95	1	15.947	11.586	0.002	0.285
race	1.29	3	0.431	0.313	0.816	0.023
awkw1	1.51	1	1.513	1.100	0.304	0.027
Residuals	37.16	27	1.376			

Common Threads Acr

1. Test Statistic
2. P-Value
3. Effect Size

Correlation Matrix

Correlation Matrix

		prod1	ment1	depr1
prod1	Pearson's r	—	0.579	−0.229
	p-value	—	<.001	0.207
ment1	Pearson's r		—	−0.508
	p-value		—	0.003
depr1	Pearson's r			—
	p-value			—

Linear Regression

Model Fit Measures

Model	R	R^2
1	0.578	0.334

Model Coefficients

Predictor	Estimate	SE	t	p
Intercept	0.3702	1.3168	0.281	0.781
ment1	0.3835	0.1194	3.211	0.004
race:				
Indian – Black	−0.6952	1.1120	−0.625	0.537
Mexican American – Black	−0.6899	1.0953	−0.630	0.534
White – Black	0.0888	0.7437	0.119	0.906
depr1	0.0402	0.0623	0.646	0.524

Unique Things

The Estimate

Model Comparisons

Linear Regression

Model Fit Measures

Model	R	R^2
1	0.264	0.0699
2	0.578	0.3340

Model Comparisons

Comparison			ΔR^2	F	df1	df2	p
Model		Model					
1	-	2	0.264	10.3	1	26	0.004

Model Specific Results

Model 2

Model Coefficients

Predictor	Estimate	SE	t	p
Intercept	0.3702	1.3168	0.281	0.781
race:				
Indian – Black	–0.6952	1.1120	–0.625	0.537
Mexican American – Black	–0.6899	1.0953	–0.630	0.534
White – Black	0.0888	0.7437	0.119	0.906
depr1	0.0402	0.0623	0.646	0.524
ment1	0.3835	0.1194	3.211	0.004

Question 5

Interpret the following output

Paired Samples T-Test

Paired Samples T-Test

			statistic	df	p	Cohen's d
prod2	prod1	Student's t	4.25	32.0	<.001	0.740

Question 6

Interpret the following output

ANOVA

ANOVA

	Sum of Squares	df	Mean Square	F	p	η^2
race	1.69	3	0.564	0.279	0.840	0.028
Residuals	58.55	29	2.019			

Question 7.1

Interpret the following output

Linear Regression

Model Fit Measures

Model	R	R^2
1	0.749	0.561
2	0.818	0.670

Model Comparisons

Comparison							
Model		Model	ΔR^2	F	df1	df2	p
1	-	2	0.108	15.4	1	47	<.001

Model Specific Results

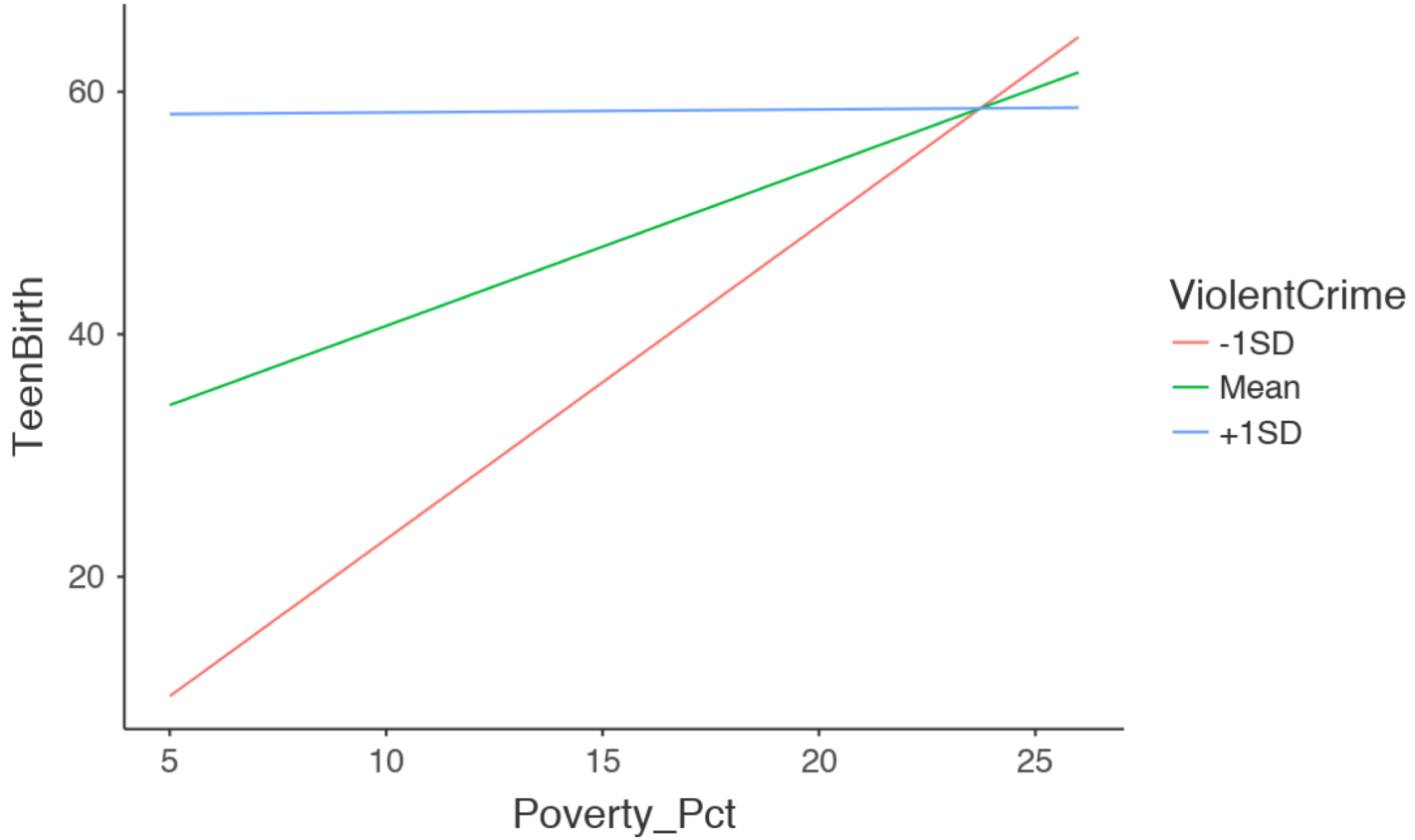
Model 2

Model Coefficients

Predictor	Estimate	SE	t	p
Intercept	0.821	5.4715	0.150	0.881
ViolentCrime	3.412	0.7770	4.391	<.001
Poverty_Pct	2.436	0.3419	7.126	<.001
ViolentCrime ✻ Poverty_Pct	−0.144	0.0366	−3.928	<.001

Question 7.2

Interpret the following output



Next week:

Final Exam :)