Spring 2017 Tuesdays 1- 4 PAIS Building, Room 361

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<u>Content</u>: In this course we will examine multiple regression analysis and the general linear model as a comprehensive statistical analytic framework. We will begin with some useful graphical statistical methods and basic statistical concepts, and then explore simple and multiple regression, hypothesis testing and effect size, model adequacy and regression diagnostics, models containing additive, interactive, curvilinear, and indirect effects, and the relation of regression to ANOVA. We will also examine analyses of categorical dependent variables via logistic and poisson regression.

The primary goals for the course are to furnish students with an adequate conceptual and working understanding of multiple regression analysis and related techniques such that they will be competent users of these techniques in their own research and effective critics of the application of these techniques in others' research.

The course will provide a mix of theoretical, conceptual, and "hands-on" approaches to regression analysis. Students will be responsible for demonstrating knowledge of relevant theoretical and conceptual aspects of these techniques, as well as competence at conducting statistical analyses. Teaching methods will combine lecture and computer demonstrations of graphical and regression analyses. Part of the class will be devoted to students gaining familiarity with the statistical package SPSS. Students are expected not only to complete assignments in a timely fashion, but also to contribute to class discussion.

<u>Assignments</u>: There will be four assignments and two in-class tests spread throughout the semester. Each assignment will involve integration of the class and reading materials with some computer data analysis and/or graphing. Statistical analyses will be done either on Psychology Dept. or home PCs using the SPSS data analysis and graphing package.

Assignments will be due 2 weeks after they are distributed. There will be no exceptions to this and no extensions given; students will be penalized one full grade for every week that their assignment is late. Assignments must be done electronically and submitted on Canvas.

Files must be prepared as Word documents and have the following format:

Student'sNameAssgt#_Date. For example, my first assignment would be entitled "WaldmanAssgt1_2-3-17 .doc". Assignments will be scored in a categorical fashion as follows: 5=Excellent; 4=Very good; 3=Good; 2=Satisfactory; 1=Marginal. Each of the four assignments will count 20% and each of the tests 10% toward the final grade. <u>Grading will be as follows:</u>

- A: Average grade on assignments close to 5.
- B+: Average grade on assignments close to 3.5.
- A-: Average grade on assignments close to 4.
- B: Average grade on assignments close to 3.

B-: Average grade on assignments ≤ 2.5 .

Please note that attendance is mandatory and each absence will result in loss of half a grade.

Course Outline

<u>Texts</u> :	 Cohen, J., C Correlatio (Designate Abelson, R Journal arti 	Cohen, P., West, S.G., & Aiken, L.S. (2003). Applied Multiple Regression / n Analysis for the behavioral Sciences, 3 rd edition. Hillsdale, NJ: Erlbaum. ed C&C below). .P. (1995). <u>Statistics as Principled Argument</u> (SPA). Hillsdale, NJ: Erlbaum. cles and chapters will also be assigned and email'ed as pdf's.
<u>Tentat</u> 1/10	<u>ive Dates</u> : Week 1	Organizational meeting
1/17	Week 2	Graphical methods for describing data Reading: C&C , Ch. 4. Data visualization, exploration (pp. 101-116). Lane, D.M. & Sandor, A. (2009). Designing Better Graphs by Including Distributional Information and Integrating Words, Numbers, and Images. <u>Psychological Methods</u> , <u>14</u> , 239-257. Wainer, H. (1984). How to display data badly. <u>American Statistician</u> , <u>38</u> , 137-147.
Suppl	ementary:	 Wainer, H. & Thissen, D. (1993). Graphical data analysis. In Keren, G. & Lewis, C. (Eds.), <u>A handbook for statistical analysis in the sociobehavioral sciences: Statistical issues</u>. Hillsdale, NJ: Erlbaum Wainer, H. & Velleman, P.F. (2001). Statistical Graphics: Mapping the pathways of science. <u>Annual Review of Psychology</u>, <u>52</u>, 305-335.
1/04	We als 2	Assignment #1 distributed.
1/24	Week 5	 <u>Advanced Graphing / Basic Stat Concepts (e.g., mean, std. deviation, variance, covariance) / Learning the basics of graphing and analyzing data using SPSS</u> Reading: C&C, Preface and Ch. 1. Introduction. Abelson, SPA, Preface, Abelson's Laws, Ch.1 Making claims with statistics,
1/31	Week 4	Simple linear regression and correlation Reading: C&C Ch. 2. Bivariate correlation and regression. Abelson, SPA, Ch. 2 Elementary arguments and the role of chance.
		Assignment #1 due, Assignment #2 distributed.
2/7	Week 5	 Hypothesis testing, effect size, and statistical power (continue next week if need be) Reading: Abelson, SPA, Ch. 3 Magnitude of effects. Cohen, J. (1992). A power primer. <u>Psychological Bulletin, 112, 155-159.</u> Cumming, G. (2014). The new statistics: Why and how. <u>Psychological Science, 25, 7-29.</u> Rosnow, R.L. & Rosenthal, R. (1989). Statistical procedures and the justification of knowledge in psychological science. <u>American Psychologist, 44, 1276-1281(top paragraph)</u>. [Just read first part and final paragraph]] Simmons, J.P., Nelson, L.D., & Simonsohn, U. (2011). False-Positive Psychology: Undisclosed flexibility in data collection and analysis allows

Supplementary:		 presenting anything as significant. <u>Psychological Science</u>, <u>22</u>, 1359-1366. Tversky, A. & Kahneman, D. (1971). Belief in the law of small numbers. <u>Psychological Bulletin</u>, <u>76</u>, 105-110. Abelson, R.P. (1985). A variance explanation paradox: When a little is a lot. <u>Psychological Bulletin</u>, <u>97</u>, 129-133. Maxwell, S. E. (2000). Sample size and multiple regression analysis. <u>Psychological Methods</u>, <u>5</u>, 434-458. Rosnow, R.L. & Rosenthal, R. (1989). Statistical procedures and the justification of knowledge in psychological science. <u>American</u> <u>Psychologist</u>, <u>44</u>, 1276-1284. [rest of paper]
2/14	Week 6	Multiple regression (including hierarchical and stepwise methods)(continue next week if need be)
		Reading: C&C Ch. 3. Multiple regression/correlation with two or more independent variables, and 5. Data-analytic strategies using multiple regression/correlation Abelson, SPA , Ch. 4 Styles of Rhetoric.
		Assignment #2 due, Assignment #3 distributed.
2/21	Week 7	Multiple regression (continued)/Catch up and Review of Material
2/28	Week 8	First exam, begin Assignment 3
3/7		Spring break (Work on Assignment 3, read for next week)
3/14	Week 9	Assumptions of the linear regression model, model adequacy, and regression diagnostics Reading: C&C Ch. 4. Data visualization, exploration, and assumption checking: Diagnosing and solving regression problems I (pp. 117-150), Ch. 10. Outliers and multicollinearity: Diagnosing and solving regression problems II Abelson, SPA , Ch. 5 On suspecting fishiness.
3/21	Week 10	 Interactive and curvilinear effects (moderation) Reading: C&C Ch. 6. Quantitative scales, curvilinear reltionships, and transformations and 7. Interactions among continuous variables. Baron, R.M. & Kenny, D.A. (1986). The moderator-mediator distinction in social psychological research: Conceptual, strategic, and statistical considerations. Journal of Personality and Social Psychology, 51, 1173-1182. McClelland, G.H. & Judd, C.M. (1993). Statistical difficulties of detecting interactions and moderator effects. Psychological Bulletin, 114, 376-390. Wahlsten, D. (1991). Sample size to detect a planned contrast and a one degree-of-freedom interaction effect. Psychological Bulletin, 110, 587-595.

Supplementary :Cronbach, L.J. (1991). Emerging views on methodology. In T.D. Wachs
& R. Plomin (Eds.), Conceptualization and measurement of organism-
environment interaction. Washington, D.C.: American Psychological Assn.

Assignment #3 due; Assignment #4 distributed.

- 3/28 Week 11 The relation of regression analysis to ANOVA Reading: C&C Ch. 8. Categorical or nominal independent variables, and 9. Interactions with categorical independent variables (start reading). Abelson, R, SPA, Ch. 6 Articulation of results: Ticks and buts. Cohen, J. (1983). The cost of dichotomization. <u>Applied Psychological</u> <u>Measurement, 7</u>, 249-253. MacCallum, R.C., Zhang, S., Preacher, K.J., & Rucker, D.D. (2002). On the practice of dichotomization of quantitative variables. *Psychological Methods*, 7, 19-40.
- 4/4 Week 12 <u>No class</u>
- 4/11 Week 13 <u>ANCOVA, partialling / statistical control, and indirect effects (Mediation)</u> Reading: C&C Ch. 8. Categorical or nominal independent variables,
 9. Interactions with categorical variables (finish reading), and
 12. Multiple regression/correlation and causal models (pp.452-467). MacKinnon, D.P. & Fairchild, A.J. (2009). Current Directions in Mediation Analysis. *Current Directions in Psychological Science, 18*, 16-20. Meehl, P.E. (1973). High school yearbooks: A reply to Schwarz. In <u>Psychodiagnosis: Selected Papers</u>, 174-181. Abelson, SPA, Ch. 7 Generality of results & Ch. 8 Interestingness of argument.

 Supplementary: Miller, G.A. & Chapman, J.P. (2001). Misunderstanding Analysis Of Covariance. Journal of Abnormal Psychology, 110, 40-48.
 Shrout, P.E. & Bolger, N. (2002). Mediation in Experimental and Nonexperimental Studies: New Procedures and Recommendations. <u>Psychological Methods</u>, 7, 422-445.
 Waldman, I. (1995). Do hostile perceptual and response biases mediate the relation between childhood aggression and inattention and impulsivity? Poster presented at the biennial convention of the SRCD, Indianapolis, IN.

4/18 Week 14 Logistic Regression analysis of a categorical criterion variable / Robust regression and graphical displays
Reading: C&C Ch. 11. Missing data, and 13. Alternative regression models: Logistic and poisson regression and the generalized linear model. Abelson, SPA, Ch. 9 Credibility of argument. Efron, B. & Tibshirani, R. (1991). Statistical data analysis in the computer age. Science, 253, 390-395. Maxwell, S. E. (2004). The persistence of underpowered studies in psychological research: Causes, consequences, and remedies. <u>Psychological</u> Methods, 9, 147-163.

	Wilcox, R.R. (1998). How many discoveries have been lost by ignoring modern statistical methods? American Psychologist, 53, 300-314.
Supplementary:	Widaman, K.F. (2006). Missing Data: What to do with or without them.
	In Monographs of the Society for Research in Child Development, 71, 42-64.
	[Summarized in the lecture slides]
	Norusis, MJ (1992). Ch. 1 Logistic regression analysis (pp.1-30).
	In SPSS for Windows Advanced Statistics, Release 5. SPSS, Inc.: Chicago, IL.
	Gardner, W., Mulvey, E.P., & Shaw, E.C. (1995). Regression analyses of counts
	and rates: Poisson, overdispersed poisson, and negative binomial models.
	Psychological Bulletin, 118, 392-404.
	Schafer, J. L. & Graham, J. W. (2002). Missing Data: Our View of the State
	of the Art. Psychological Methods, 7, 147-177.
	Assignment #4 due.

4/25 Week 15 Second exam