Outcomes of Course
Econ 29000
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Students will be able to apply mathematically rigorous analysis to topics such as analyzing data tables, hypothesis testing, and regression analysis.

Students can expect to learn topics in four basic areas:

1. creating and interpreting basic statistics on large datasets
    - mean
    - median
    - measures of spread
2. creating and interpreting data tabulations including
    - crosstabs of counts and fractions
    - marginal and conditional probabilities
    - conditional means
3. conducting hypothesis tests for equality of two means and regression t-tests including
    - calculating areas under t and normal distributions; calculating t-value
    - getting critical values
    - creating confidence intervals
    - determining p-values
    - explaining significance test results including Type I/Type II error
4. determining regression coefficients using statistical software such as SPSS
    - explaining the coefficient estimates as slope values
    - testing statistical significance of these estimates
    - with datasets with thousands of observations

Examples:

Topic Area 2
Using ATUS data from 2003-2009, we look at the crosstabs of race and ethnicity; this gives the number of each group:

	Native American Indian / Inuit / Hawaiian	Asian	African-American	White	Total
Non-Hispanic	1440	2834	12385	69721	86380
Hispanic	325	77	337	11659	12398
Total	1765	2911	12722	81380	98778

The fractions of each demographic category are:

	Native American Indian / Inuit / Hawaiian	Asian	African-American	White	Total

Non-Hispanic	0.014578145	0.0286906	0.1253822	0.7058353	0.8744862
Hispanic	0.003290206	0.0007795	0.0034117	0.1180324	0.1255138
Total	0.017868351	0.0294701	0.1287939	0.8238677	

Conditional by row:

	Native American Indian / Inuit / Hawaiian	Asian	African-American	White
Non-Hispanic	0.016670526	0.0328085	0.1433781	0.8071429
Hispanic	0.026213905	0.0062107	0.0271818	0.9403936

So 14% of non-Hispanics are African-American while just 2.7% of Hispanics are African-American.

Conditional by column:

	Native American Indian / Inuit / Hawaiian	Asian	African-American	White
Non-Hispanic	0.815864023	0.9735486	0.9735105	0.8567338
Hispanic	0.184135977	0.0264514	0.0264895	0.1432662

Alternately, 97% of African-Americans are not Hispanic while just 86% of whites are not Hispanic. Native Americans are the most Hispanic ethnic group.

Topic Areas 1 & 4

Using 2010 CPS data, restrict to only fulltime workers with a non-zero wage. Regression will have earnings (annual wage and salary) as the dependent variable.

The first set of basic explanatory variables is hypothesized to be factors such as age, sex, education, race/ethnicity, marital status, veteran status, and if a union member.

Average values of regression variables, for this subset, are:

Wage/Salary (annual)	$	49,773.79
Age		41.88
Female		44.5%
White		79.7%
African-American		11.8%
Asian-American		5.8%
Native American/ Indian/ Alaskan/ Inuit/ Hawaiian		2.8%
Hispanic		16.1%
Mexican		9.8%
Puerto Rican		1.4%
Cuban		0.6%
Immigrant		17.5%
1 or more Parents were immigrants		23.8%

Education: no high school	8.6%
Education: High School Diploma	28.9%
Education: Some College (incl no degree or Assoc degree)	27.9%
Education: Some College but no degree	17.5%
Education: Associate in vocational	5.0%
Education: Associate in academic	5.4%
Education: 4-yr degree	22.5%
Education: Advanced Degree	12.1%
Married	62.0%
Divorced or Widowed or Separated	14.8%
Unmarried	23.2%
Union member	2.2%
Veteran (any)	7.4%

The regression estimates are made with three basic specifications: Spec 1 has just the listed variables; Spec 2 included dummies for industry, occupation, and state of residence; Spec 3 has dummy interactions for female*age, African-American*age, female*African-American*age, Hispanic*age, female*Hispanic*age, and female*education. An asterisk indicates statistical significance.

	Spec 1 Coefficient *std. error*		**Spec 2** Coefficient *std. error*		**Spec 3** Coefficient *std. error*	
intercept	-$28,685.56	*	$13,744.52	*	-$10,978.43	*
	1954.106		*3025.180*		*3685.959*	
Age	$2,517.92	*	$2,012.04	*	$3,052.09	*
	93.814		*88.514*		*133.158*	
Age-squared	-$23.60	*	-$18.55	*	-$29.40	*
	1.055		*.994*		*1.504*	
Female	-$17,380.74	*	-$14,587.20	*	$26,912.27	*
	360.019		*393.294*		*4202.955*	
African American	-$6,136.77	*	-$5,315.62	*	$17,924.27	*
	552.138		*545.564*		*7559.610*	
Asian	-$783.89		-$3,140.09	*	-$3,196.33	*
	861.879		*851.007*		*849.324*	
Native American Indian or Alaskan or Hawaiian	-$4,615.72	*	-$3,077.92	*	-$3,030.05	*
	1054.697		*1025.422*		*1022.749*	
Hispanic	-$5,176.56	*	-$4,433.05	*	$32,492.36	*
	596.068		*588.188*		*5715.141*	
Immigrant	-$7,377.88	*	-$4,669.63	*	-$4,080.20	*
	776.395		*731.493*		*733.482*	
1 or more parents were immigrants	$4,513.48	*	$1,231.87		$892.78	

	718.087	*677.532*	*677.771*
Education: High School Diploma	$7,658.27 *	$3,819.68 *	$4,208.53 *
	701.918	*667.305*	*826.691*
Education: Some College but no degree	$15,430.94 *	$7,791.73 *	$9,434.14 *
	756.430	*734.022*	*900.898*
Education: Associate in vocational	$15,719.42 *	$8,376.06 *	$9,873.19 *
	1003.190	*966.454*	*1098.448*
Education: Associate in academic	$19,907.99 *	$9,660.31 *	$11,310.63 *
	978.304	*948.764*	*1091.644*
Education: 4-yr degree	$35,565.50 *	$20,756.84 *	$24,651.87 *
	738.325	*761.377*	*949.760*
Education: Advanced Degree	$63,729.94 *	$40,911.95 *	$46,708.57 *
	815.818	*896.308*	*1109.431*
Married	$8,100.77 *	$7,074.38 *	$6,912.90 *
	486.083	*459.856*	*459.565*
Divorced or Widowed or Separated	$1,646.98 *	$1,893.12 *	$1,881.97 *
	633.993	*595.046*	*594.911*
Union member	-$3,992.75 *	$2,282.96 *	$2,372.64 *
	1169.615	*1108.181*	*1105.552*
Veteran (any)	-$1,186.63	-$884.41	-$905.22
	687.786	*648.453*	*659.002*
R-squared	0.213	0.315	0.319

Sample age-wage profiles are shown below, for a white male with just a high-school diploma, unmarried, neither immigrant, veteran nor union member. The estimated peak earning year is 53 in Specification 1, 54 in Specification 2, and 52 in Specification 3.