

Undergraduate Research Experience and Pursuit of Graduate Study

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Undergraduate Research (UR)

- The experience of undergraduates to engage in research by working directly with research faculty, taking capstone courses, or doing theses
- Emphasis on inquiry-based, discovery-driven learning that seeks to enhance critical, synthetic thinking and learning
- Undergrad research 'accelerates learning,' enriches the students' education while increases their satisfaction with the institution

Undergraduate Research

- Concept has resonated on many university campuses, and have subsequently directed funding and/or efforts toward undergraduate research initiatives
- Several initiatives came together in 1999 to form the Center for Undergraduate Research Opportunities (CURO) at UGA

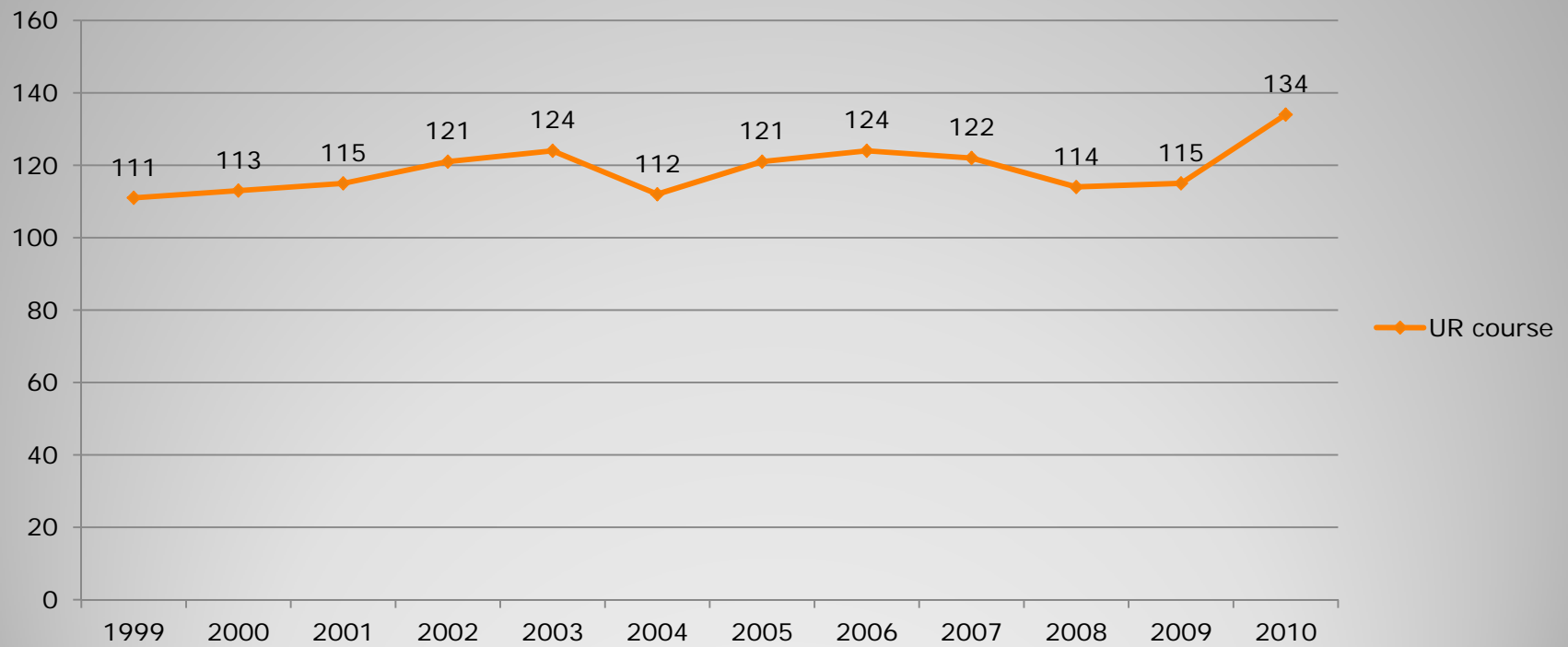
The study at hand

- Examining how the undergraduate research experience contribute to the students'
 - Academic achievement at UGA
 - Further pursuit of research interests at graduate level
- Background
 - The development of undergraduate research at UGA over the last 12 year period
 - Describing the students and the pattern they took undergraduate research courses

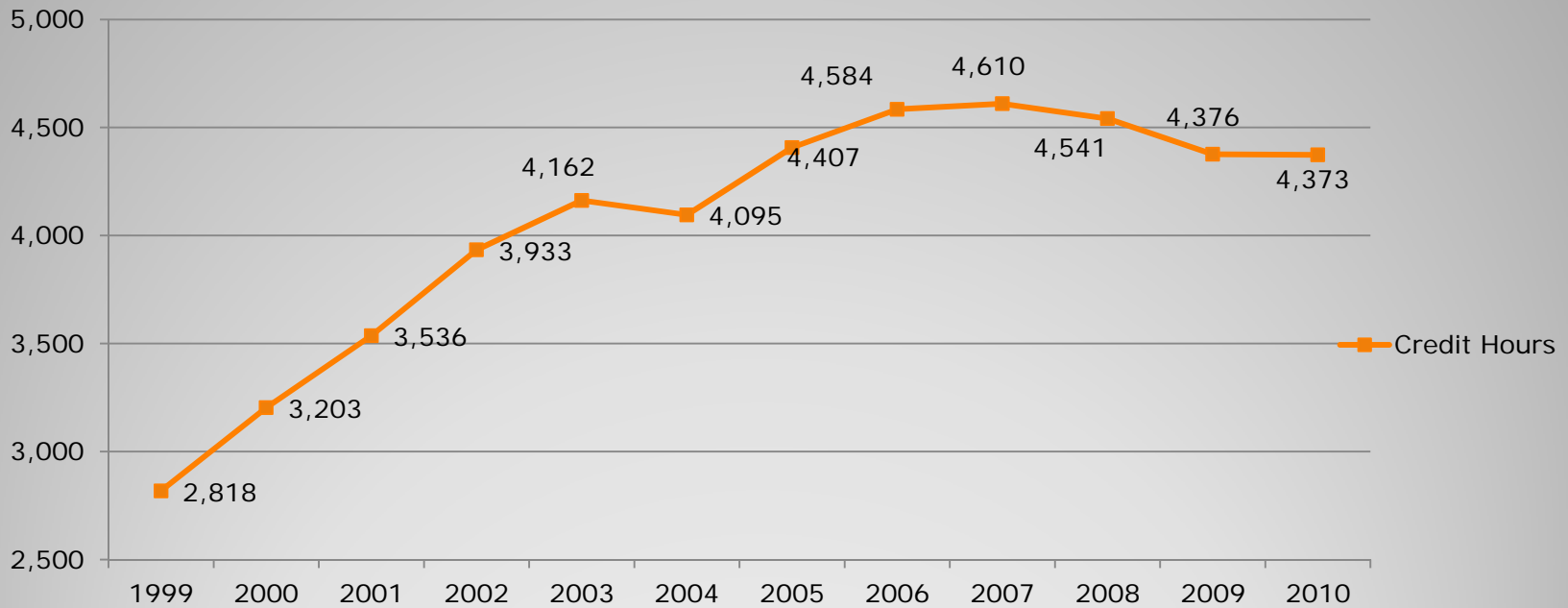
Twelve Years of UR at UGA

- Certain course numbers tied to Undergraduate Research courses
- The number of courses offered
- The total credit hours generated
- The number of students successfully finished the course

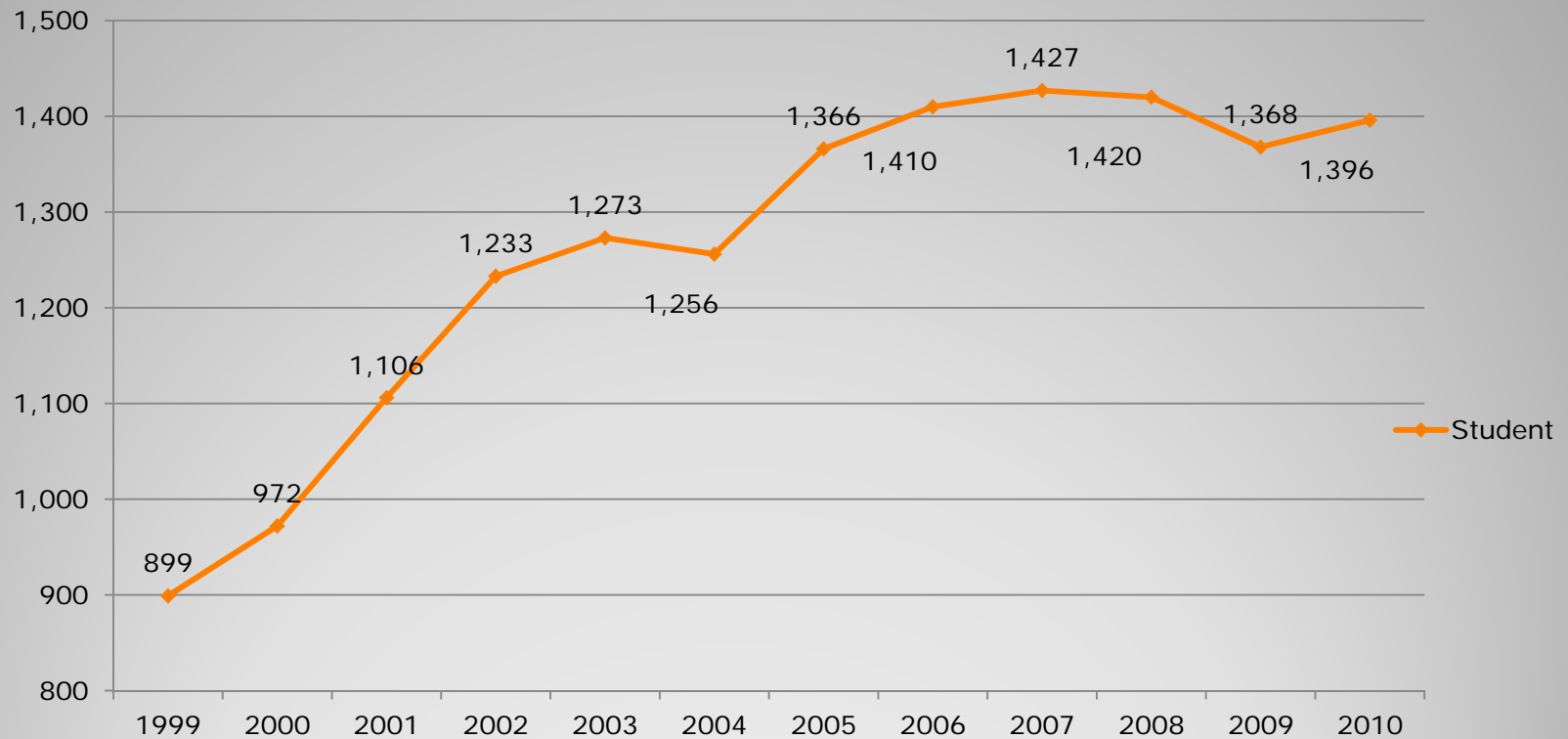
Number of UR Course Offered at UGA from 1999-2010



Credit Hours Generated by UR Courses at UGA From 1999 to 2010



Number of Students Taking UR Course from 1999 to 2010



Note: If a student took multiple UR courses, he/she is being counted multiple times

Students and Course Taking Pattern

- Students graduated with a Bachelor's degree from UGA during fiscal year 2001 to 2004 served as the sample for this study.
- Data from Student Database
- Data from Course History Database
- Data from National Clearing House

From 2001-2004

		Graduates	Taking URC		Graduate School		Earning Grad/Prof Degree	
FISCAL YEAR	2001	4267	479	11.2%	1398	32.8%	734	17.2%
	2002	4787	583	12.2%	1762	36.8%	887	18.5%
	2003	5029	600	11.9%	1748	34.8%	861	17.1%
	2004	4982	659	13.2%	1731	34.7%	788	15.8%
Total		19065	2321	12.2%	6639	34.8%	3270	17.2%

From 2001-2004

		Taking URC		Graduate School		Earning Graduate Degree	
FISCAL YEAR	2001	479	11.2%	170	35.5%	93	19.4%
	2002	583	12.2%	292	50.1%	122	20.9%
	2003	600	11.9%	298	49.7%	121	20.2%
	2004	659	13.2%	312	47.3%	113	17.1%
Total		2321	12.2%	1072	46.2%	449	19.3%

	Taking URC	Graduate School	Earning Graduate Degree
Female	11.4%	37.6%	20.0%
Male	13.1%	31.4%	13.7%
White	11.9%	34.5%	17.3%
Non_White	14.4%	37.3%	15.6%

	Frequency	Percentage	Of Those Took URC
No URC	16744	87.8	
One URC	1394	7.3	59.8
Two URCs	552	2.9	23.8
3 or More URCs	375	2.0	16.4
Total	19065	100.0	100.0
No URC	16744	87.8	
At Least One URC / No Thesis	1236	6.5	53.3
Only Thesis	661	3.5	28.7
Thesis and other URC(s)	424	2.2	18.0
Total	19065	100.0	100.0

Academic Achievement

- For the four graduating cohort, the average cumulative GPA of students who completed at least one undergraduate research courses was significantly ($p < 0.000$) higher (3.38) than students who did not (3.11).
- However, the former group also had significantly ($p < 0.000$) higher average SAT scores (1233 vs. 1138) and high school GPA (3.01 vs. 2.58).
- ANCOVA procedure was employed to compare GPA while controlling for SAT scores, high school GPA, gender and ethnicity.

- Dependent variable : CUM_GPA
- Factors: SEX ETHNICITY URC SEX*URC ETHNIC*URC
- Covariants : HS_AVG SAT_COMBINED

- The overall model $F(7, 15337) = 702.15$ ($p < 0.000$),
Adjusted $R^2 = .242$

- Completing UR courses did contribute to higher cumulative GPA ($p < 0.000$). The effect of taking such courses on cumulative GPA was consistent for both males and females, white and non-white.

3. URC

Dependent Variable: CUM_GPA

URC	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
.00	3.096 ^a	.006	3.084	3.108
1.00	3.298 ^a	.014	3.270	3.325

a. Covariates appearing in the model are evaluated at the following values: HS_AVG = 3.1023, SAT_COMBINED = 1150.69.

4. SEX * URC

Dependent Variable: CUM_GPA

SEX	URC	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
F	.00	3.204 ^a	.007	3.190	3.217
	1.00	3.371 ^a	.016	3.339	3.402
M	.00	2.989 ^a	.007	2.975	3.004
	1.00	3.225 ^a	.018	3.190	3.259

a. Covariates appearing in the model are evaluated at the following values: HS_AVG = 3.1023, SAT_COMBINED = 1150.69.

5. ETHNICITY * URC

Dependent Variable:CUM_GPA

ETHNICITY	URC	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
NON-WHITE	.00	3.034 ^a	.012	3.011	3.057
	1.00	3.292 ^a	.026	3.240	3.343
WHITE	.00	3.159 ^a	.004	3.151	3.166
	1.00	3.304 ^a	.010	3.284	3.324

a. Covariates appearing in the model are evaluated at the following values:
 HS_AVG = 3.1023, SAT_COMBINED = 1150.69.

- The greater the number of UR courses completed contributed to a higher cumulative GPA. This effect was consistent for males and females, white and non-white.
- The overall model $F(13, 15331) = 385.83$ ($p < 0.000$), Adjusted $R^2 = .246$

3. URC_NUM

Dependent Variable: CUM_GPA

URC_NUM	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
NO URC	3.096 ^a	.006	3.084	3.108
ONE URC	3.216 ^a	.021	3.174	3.258
TWO URC	3.347 ^a	.026	3.297	3.397
3 OR MORE URC	3.433 ^a	.028	3.378	3.489

a. Covariates appearing in the model are evaluated at the following values: HS_AVG = 3.1023, SAT_COMBINED = 1150.69.

4. SEX * URC_NUM

Dependent Variable: CUM_GPA

SEX	URC_NUM	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
F	NO URC	3.203 ^a	.007	3.189	3.216
	ONE URC	3.318 ^a	.024	3.272	3.365
	TWO URC	3.383 ^a	.029	3.326	3.440
	3 OR MORE URC	3.447 ^a	.034	3.379	3.514
M	NO URC	2.989 ^a	.007	2.974	3.003
	ONE URC	3.113 ^a	.025	3.064	3.163
	TWO URC	3.311 ^a	.034	3.244	3.378
	3 OR MORE URC	3.420 ^a	.038	3.346	3.495

a. Covariates appearing in the model are evaluated at the following values:
 HS_AVG = 3.1023, SAT_COMBINED = 1150.69.

5. ETHNICITY * URC_NUM

Dependent Variable: CUM_GPA

ETHNICITY	URC_NUM	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
NON-WHITE	NO URC	3.033 ^a	.012	3.010	3.055
	ONE URC	3.178 ^a	.041	3.097	3.258
	TWO URC	3.333 ^a	.046	3.242	3.424
	3 OR MORE URC	3.434 ^a	.051	3.335	3.533
WHITE	NO URC	3.159 ^a	.004	3.151	3.166
	ONE URC	3.254 ^a	.013	3.229	3.279
	TWO URC	3.360 ^a	.021	3.320	3.401
	3 OR MORE URC	3.433 ^a	.025	3.384	3.482

a. Covariates appearing in the model are evaluated at the following values: HS_AVG = 3.1023, SAT_COMBINED = 1150.69.

- Completion of thesis in combination with UR courses made most contribution to students' cumulative GPA, This effect was consistent for males and females.
- The overall model $F(13, 15331) = 390.20$ ($p < 0.000$), Adjusted $R^2 = .248$

3. URC_THESIS

Dependent Variable: CUM_GPA

URC_THESIS	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
NO URC	3.095 ^a	.006	3.084	3.107
AT LEAST ONE URC / NO THESIS	3.259 ^a	.018	3.224	3.294
ONLY THESIS	3.230 ^a	.039	3.154	3.306
THESIS AND OTHER URC	3.501 ^a	.029	3.444	3.559

a. Covariates appearing in the model are evaluated at the following values:
 HS_AVG = 3.1023, SAT_COMBINED = 1150.69.

4. SEX * URC_THESIS

Dependent Variable:CUM_GPA

SEX	URC_THESIS	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
F	NO URC	3.202 ^a	.007	3.189	3.216
	AT LEAST ONE URC / NO THESIS	3.331 ^a	.020	3.291	3.371
	ONLY THESIS	3.337 ^a	.042	3.255	3.419
	THESIS AND OTHER URC	3.517 ^a	.034	3.449	3.584
M	NO URC	2.989 ^a	.007	2.974	3.003
	AT LEAST ONE URC / NO THESIS	3.188 ^a	.023	3.142	3.234
	ONLY THESIS	3.124 ^a	.043	3.039	3.209
	THESIS AND OTHER URC	3.486 ^a	.037	3.413	3.560

a. Covariates appearing in the model are evaluated at the following values: HS_AVG = 3.1023, SAT_COMBINED = 1150.69.

5. ETHNICITY * URC_THESIS

Dependent Variable:CUM_GPA

ETHNICITY	URC_THESIS	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
NON-WHITE	NO URC	3.032 ^a	.012	3.010	3.055
	AT LEAST ONE URC / NO THESIS	3.216 ^a	.033	3.152	3.280
	ONLY THESIS	3.253 ^a	.075	3.105	3.401
	THESIS AND OTHER URC	3.524 ^a	.053	3.420	3.629
WHITE	NO URC	3.159 ^a	.004	3.151	3.166
	AT LEAST ONE URC / NO THESIS	3.303 ^a	.014	3.276	3.330
	ONLY THESIS	3.208 ^a	.018	3.172	3.244
	THESIS AND OTHER URC	3.478 ^a	.023	3.433	3.524

a. Covariates appearing in the model are evaluated at the following values: HS_AVG = 3.1023, SAT_COMBINED = 1150.69.

Pursuit of Graduate Study

- Binary Logistic Regression was run with the “Going to Grad School or not” as Dependent Variable.
- Students’ taking undergraduate research courses was tested with high school GPA, SAT score, cumulative GPA when graduating, gender, ethnicity controlled.
- Dependent variable (binary): GradSchool
Independent variables: CUM_GPA HS_AVG
SAT_COMBINED SEX ETHNICITY URC

- The odds of bachelor degree recipients to pursue graduate level study was increased by a factor of 1.391 when the students had undergraduate research experience, controlling for other variables in the model, while the strongest positive predictor is high graduating GPA.
- Goodness-of-fit Homster and Lemeshow test $p = .165$,
- Nagelkerke R Square is .039

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 ^a CUM_GPA	.482	.042	134.202	1	.000	1.620
HS_AVG	-.043	.017	6.276	1	.012	.958
SAT_COMBINED	.001	.000	38.904	1	.000	1.001
SEX(1)	.203	.036	31.825	1	.000	1.225
ETHNICITY(1)	.241	.056	18.397	1	.000	1.273
URC(1)	.330	.050	42.833	1	.000	1.391
Constant	-3.166	.164	373.128	1	.000	.042

a. Variable(s) entered on step 1: CUM_GPA, HS_AVG, SAT_COMBINED, SEX, ETHNICITY, URC.

- The odds of bachelor degree recipients to pursue graduate level study was further increased when more undergraduate research courses were taken by the students.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 ^a	CUM_GPA	.481	.042	132.837	1	.000	1.618
	HS_AVG	-.043	.017	6.274	1	.012	.958
	SAT_COMBINED	.001	.000	38.365	1	.000	1.001
	SEX(1)	.202	.036	31.812	1	.000	1.224
	ETHNICITY(1)	.239	.056	17.986	1	.000	1.270
	URC_NUM			43.066	3	.000	
	URC_NUM(1)	.311	.062	24.761	1	.000	1.365
	URC_NUM(2)	.354	.095	13.985	1	.000	1.425
	URC_NUM(3)	.364	.113	10.434	1	.001	1.439
	Constant	-3.156	.165	365.671	1	.000	.043

a. Variable(s) entered on step 1: CUM_GPA, HS_AVG, SAT_COMBINED, SEX, ETHNICITY, URC_NUM.

- The odds of bachelor degree recipients to pursue graduate level study was especially increased if the students did these.

Variables in the Equation		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1a	CUM_GPA	.484	.042	134.111	1	.000	1.623
	HS_AVG	-.042	.017	6.179	1	.013	.959
	SAT_COMBINED	.001	.000	39.155	1	.000	1.001
	SEX(1)	.203	.036	32.036	1	.000	1.225
	ETHNICITY(1)	.244	.056	18.774	1	.000	1.277
	NO URC			43.663	3	.000	
	AT LEAST ONE URC / NO THESE	.301	.066	21.123	1	.000	1.351
	ONLY THESE	.394	.089	19.550	1	.000	1.483
	THESE AND OTHER URC	.315	.107	8.718	1	.003	1.371
	Constant	-3.178	.165	369.184	1	.000	.042

- The odds of bachelor degree recipients to receive a professional or graduate degree was not significantly influenced by their undergraduate research experience, their GPA upon graduation and gender remained the strongest predictors.

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 ^a CUM_GPA	.614	.053	133.726	1	.000	1.849
HS_AVG	-.025	.021	1.440	1	.230	.975
SAT_COMBINED	.000	.000	.142	1	.706	1.000
SEX(1)	.373	.045	67.624	1	.000	1.452
ETHNICITY(1)	-.095	.073	1.698	1	.193	.909
URC(1)	-.024	.063	.143	1	.705	.977
Constant	-3.678	.206	318.766	1	.000	.025

a. Variable(s) entered on step 1: CUM_GPA, HS_AVG, SAT_COMBINED, SEX, ETHNICITY, URC.

- The odds of bachelor degree recipients to receive a professional or graduate degree might increase for those who took 3 or more undergraduate research courses, though not significant.

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 ^a						
CUM_GPA	.611	.053	131.785	1	.000	1.842
HS_AVG	-.025	.021	1.428	1	.232	.975
SAT_COMBINED	.000	.000	.093	1	.760	1.000
SEX(1)	.373	.045	67.647	1	.000	1.452
ETHNICITY(1)	-.101	.073	1.890	1	.169	.904
URC_NUM			1.311	3	.726	
URC_NUM(1)	-.068	.080	.723	1	.395	.934
URC_NUM(2)	-.004	.116	.001	1	.973	.996
URC_NUM(3)	.092	.132	.483	1	.487	1.096
Constant	-3.652	.207	310.238	1	.000	.026

a. Variable(s) entered on step 1: CUM_GPA, HS_AVG, SAT_COMBINED, SEX, ETHNICITY, URC_NUM.

- The odds of bachelor degree recipients to receive a professional or graduate degree might increase for those who did thesis. Their GPA upon graduation and gender remained the strongest predictors.

		Variables in the Equation					
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1a	CUM_GPA	.622	.053	136.222	1	.000	1.863
	HS_AVG	-.025	.021	1.380	1	.240	.976
	SAT_COMBINED	.000	.000	.252	1	.616	1.000
	SEX(1)	.374	.045	68.036	1	.000	1.454
	ETHNICITY(1)	-.086	.073	1.365	1	.243	.918
	NO URC			4.771	3	.189	
	AT LEAST ONE URC / NO THESE	-.071	.082	.741	1	.389	.932
	ONLY THESE	.163	.109	2.247	1	.134	1.177
	THESE AND OTHER URC	-.167	.132	1.590	1	.207	.846
	Constant	-3.732	.208	321.785	1	.000	.024

Conclusions

- In general, undergraduate students with completion of UR courses showed higher academic achievement in terms of graduating GPA.
- Undergraduate students with Undergraduate Research experience were more likely to go to graduate schools.
- Completing thesis appears to add even greater value towards higher academic achievement, going to graduate school and possibly earning a higher degree.

Limitations

- Better defining and tracking of Undergraduate Research activities
- More comprehensive data tracking students after graduation
- What is the most appropriate measurement of academic achievement
- Need to address qualitative aspects
- Other controlling variables in the model
- Looking at disciplines

- Questions?
- Thank you!