

PRE-ACADEMIC & ACADEMIC PROFILES OF FIRST-YEAR FRESHMAN COHORTS AND THE RELATIONSHIP TO RETENTION

This Research Brief provides information regarding retention rates among UNCG's first-time freshman cohorts from Fall 2015 through Fall 2017. Retention rates for both the first Spring term and second Fall term were examined. A comprehensive set of academic ability, demographic, and socioeconomic status variables was employed in this analysis. A logistic regression was performed to explore the impacts of these variables on first Spring and second Fall attrition. Additionally, majors with the highest attrition rates of first year students over the past three years are provided.

RESEARCH QUESTIONS

This Research Brief compares the pre-academic and academic profiles of first-year students who retain into their first Spring and second Fall with those who do not. There are three main research questions (RQ) addressed in this brief.

- RQ1.** *What are the high school academic, demographic, socioeconomic, and academic profiles of first year UNCG students who do not return for their first spring or second fall?*
- RQ2.** *What majors have the highest attrition rates of first-year students?*
- RQ3.** *What relationship exists between variables in the student profiles and attrition?*

MAJOR FINDINGS

- The retention rates of freshmen into the first Spring and second Fall have been consistent over the past three cohorts.
- On average 92.4 % of freshmen retained into the first Spring.
- Retention into the second Fall dropped to 76.6% on average, indicating an annual loss of close to 25% of the freshman class.

RQ1

- High school GPA was lower for students who did not retain. The difference was most pronounced by second Fall; high school GPA was 3.58 for those who dropped out compared to 3.82 for those retained.
- SAT scores followed a similar trend. Second Fall retained students had an average 1,046 SAT while non-retaining students had a 1,033.
- Retention rates into first Spring are slightly higher for women (93.1% compared to 91.0%), and much higher by the end of the first year (78.8% of women come back for their second year compared to 72.2% of men).

RQ2

- The top ten majors with the highest attrition rates in first Spring are Philosophy, Music (Pre-Major), Classical Studies, Special Education (Pre-Major), Biochemistry, Physics, Women's and Gender Studies, Art, Pre-Health Studies, and Mathematics.
- The top ten majors with the highest attrition rates in second Fall are French, German, Physics, Pre-Interior Architecture, Music (Pre-Major), Entrepreneurship, Classical Studies, Arts Administration, Computer Science, and Chemistry.

- Classical Studies, Physics, and Music majors had high rates of attrition in both first Spring and second Fall.

RQ3

- Four logistic regressions were performed to explore the impacts of the pre-academic, demographic, socioeconomic, and academic variables on first Spring and second Fall attrition.
- Spring Model 1 included pre-academic, demographic, and socioeconomic variables, and the total number of credit hours the student registered for in their first Fall term.
 - High school GPA was statistically significant in Spring Model 1. Once Fall term GPA was added in Spring Model 2, high school GPA was no longer significant, indicating that Fall term GPA was a better predictor of attrition into Spring. However, the purpose of running Spring Model 1 without Fall term GPA initially was to see if any insight could be gained from statistically significant factors that might help with early intervention to retain these students.
 - Variables in Spring Model 1 which significantly increased odds of attrition were being male, white, rural, or first-generation.
 - Males were over 20% more likely to drop out before Spring than women.
 - Whites were close to 50% more likely to drop out than non-whites.
 - Rural students were close to 43% more likely to drop out than non-rural students.
 - First-generation students were 46% more likely to drop out than non-first-generation students.
 - For each additional credit hour a student enrolled in for their first Fall, their odds of dropping out before Spring decreased.
- Spring Model 2 included the additional variable first Fall term GPA.
 - Being African American or being low-income significantly lowered the odds of attrition.
 - Odds of attrition for African Americans are just 60% that of other races.
 - Odds of attrition for low-income students are 72.9% that of non-low-income students.

- As in Spring Model 1, being first-generation remained significant with a likelihood of attrition 35% higher than non-first-generation students.
- Likewise, increased credit hour enrollment in the first Fall is negatively related to odds of attrition.
- Fall Model 1 included pre-academic, demographic, and socioeconomic variables, the total number of credit hours the student registered for in their first Fall term, and first Fall term GPA.
 - Being African American, low-income, or having a higher high school GPA significantly lowered the odds of dropping out before the second Fall.
 - First-generation students had significantly higher odds of dropping out before the second Fall.
 - The more credit hours a student enrolled in their first Fall, and the better their first Fall term GPA, the less likely they were to drop out before second Fall.
- Fall Model 2 included first year cumulative GPA instead of first Fall term GPA.
 - After controlling for students' academic outcome at the end of their first year, being African American or low-income still significantly lowered the odds of dropping out before the second Fall.
 - As students' cumulative first year GPA increased, their odds of dropping out before the second Fall decreased.

METHODOLOGY

For RQ1, a high school academic ability profile was compiled including high school GPA and admissions test scores from the SAT and ACT. The demographic variables included were gender, race and ethnicity, and under-represented minority status. The socioeconomic profile included low income, rural, and first-generation status. Lastly, the academic profile of first year students included Fall and Spring term GPAs as well as first year cumulative GPA.

Majors were ranked by highest attrition rates for Spring and Fall to answer RQ2.

To address RQ3, four logistic regressions were performed. The logistic regressions estimated the effects

of high school GPA, admissions test scores, gender, race and ethnicity, low income, rural, and first-generation status, and term and cumulative GPA on Spring and Fall attrition.

DATA

The population for this research was UNCG’s first-time freshman cohorts from Fall 2015, Fall 2016, and Fall 2017. First-time freshman cohorts consist of degree-seeking undergraduate students who are entering college for the first time.

In considering SAT and ACT scores, the highest scores over all administrations of a students’ test were used. SAT and ACT scores were included wherever this data was available and were not restricted to just instances where the score was used in the admissions decision.

FINDINGS

Retention rates were calculated for the first Spring and second Fall semesters for the new freshman cohorts of Fall 2015, Fall 2016, and Fall 2017 (**Figure 1**). On average 92.4 % of freshmen retain into the first Spring. This rate has been consistent over the past three cohorts. Retention into the second Fall drops to 76.6% on average, indicating a loss of close to 25% of the freshman class. This too has remained stable over the past three cohort years.

Figure 2 presents the high school academic ability profile of new freshmen. The academic potential of

incoming freshman students was examined in order to identify which new freshmen may be at risk of dropping out sometime during their first year. These metrics were compared for students who did and did not retain into their first Spring as well for students who did and did not retain into their second Fall. Students who did not retain into their first Spring on average had a 3.61 high school GPA compared to 3.77 for those who continued. For second Fall the difference was more pronounced; high school GPA was 3.58 for those who dropped out compared to 3.82 for those retained. A similar trend can

FIGURE 1. FIRST SPRING AND SECOND FALL RETENTION RATES FOR NEW FRESHMEN

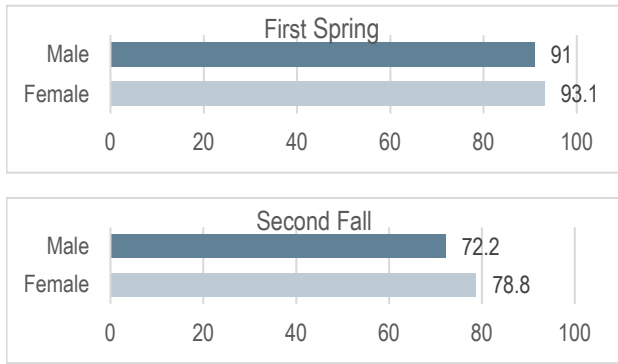
Cohort Starting Term	New Freshman Cohort N	Retained to First Spring		Retained to Second Fall	
		n	%	n	%
Fall 2015	2,773	2,549	91.9	2,113	76.2
Fall 2016	2,850	2,648	92.9	2,205	77.4
Fall 2017	2,791	2,574	92.2	2,127	76.2
Three Year Trend	8,414	7,771	92.4	6,445	76.6

FIGURE 2. ACADEMIC ABILITY PROFILE OF NEW FRESHMEN

First Spring and Second Fall Retention Rates

Average	Cohort Starting Term	Overall Freshman Cohort	Retained to First Spring		Retained to Second Fall	
			No	Yes	No	Yes
High School GPA	Fall 2015	3.62	3.54	3.63	3.50	3.66
	Fall 2016	3.82	3.67	3.83	3.60	3.89
	Fall 2017	3.84	3.62	3.86	3.65	3.90
	Three Year Trend	3.76	3.61	3.77	3.58	3.82
SAT Total	Fall 2015	1,020	1,010	1,021	1,006	1,025
	Fall 2016	1,026	1,027	1,026	1,015	1,029
	Fall 2017	1,088	1,075	1,089	1,083	1,090
	Three Year Trend	1,043	1,035	1,044	1,033	1,046
SAT Math	Fall 2015	509	505	509	502	511
	Fall 2016	510	506	510	504	512
	Fall 2017	537	533	537	535	538
	Three Year Trend	518	514	518	513	520
SAT Critical Reading	Fall 2015	511	504	512	504	514
	Fall 2016	516	521	516	511	517
	Fall 2017	554	547	555	551	555
	Three Year Trend	526	522	527	521	528
ACT Composite	Fall 2015	22	22	22	21	22
	Fall 2016	22	22	22	22	22
	Fall 2017	22	22	22	22	22
	Three Year Trend	22	22	22	22	22

FIGURE 3A. RETENTION RATES BY GENDER

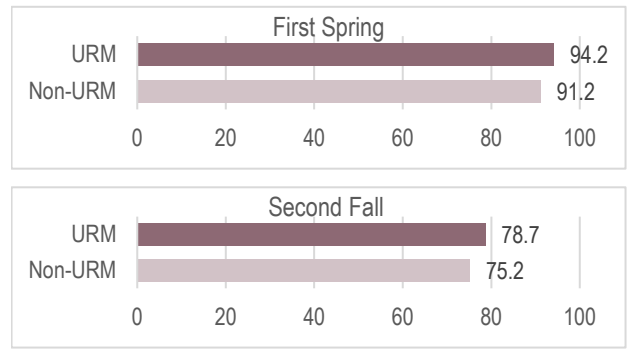


be seen for SAT scores. Total SAT for those retained into Spring was 1,044 compared to 1,035 for those leaving. Second Fall retained students had on average a 1,046 SAT while those students who did not retain had a 1,033.

Figure 3 (see Appendix) provides the complete demographic profile of new freshman cohorts. Students were classified by gender, race, and ethnicity. Also identified was the subpopulation of under-represented minorities (URM) defined as students who are neither Asian nor White.

UNCG’s freshman cohorts are typically two-thirds female and one-third male. Retention rates on average differ by gender. Although retention rates into first Spring are slightly higher for women (93.1% compared to 91.0 for men), the difference is more pronounced by the end of the first year as 78.8% of women come back for

FIGURE 3B. RETENTION RATES BY URM STATUS

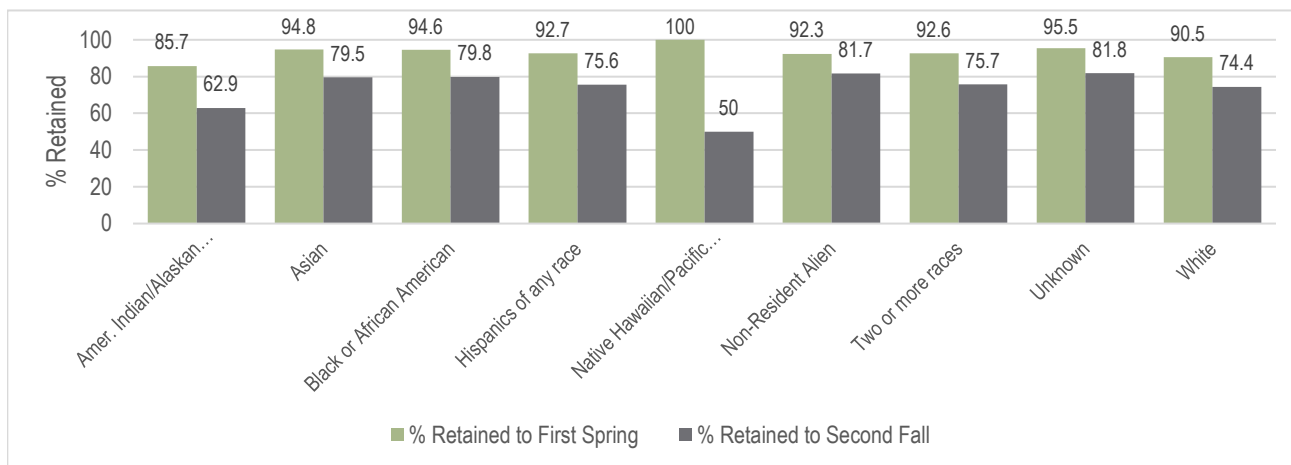


their second year while only 72.2% of men persist (**Figure 3A**).

Figure 3B illustrates that under-represented minorities have higher retention rates than non-under-represented minorities in both first Spring and second Fall semesters across cohort terms. The difference in retention between under-represented minorities and non-under-represented minorities is within 3-4%. As stated above the non-under-represented minorities are White and Asian students. The white student retention rate is 74.4% in second fall and the Asian rate is 79.5% (see Figure 3 in Appendix). It appears as if more white students do not return and since they are a larger proportion of the non-URM group their departure is lowering the non-URM retention rate.

Figure 3C shows average retention rates by race and ethnicity across cohort terms. By the end of the first year,

FIGURE 3C. RETENTION RATES BY RACE/ETHNICITY



the highest retention rates are seen among Asian, African American, and Non-Resident Alien students. Those with the lowest retention rates are Whites and those of two or more races.

Recognizing that students’ socioeconomic status can impact performance and retention, **Figure 4** provides data on low-income, rural, and first-generation students. Students were categorized as ‘low-income’ if they received a Federal Pell Grant. The data show that retention rates for low-income students are about the same on average as for non-low-income students in the first Spring term (92%) and in the second Fall term (76-77%).

Over 93% of UNCG’s new freshmen are in-state students and typically about 18% come from Guilford county, where UNCG is located. Many of North Carolina’s counties are rural and economically distressed. Consequently, an examination of students from rural counties provided additional insight into their socioeconomic status. Students were identified as ‘rural’ if they came from a rural North Carolina county as designated by the NC Department of Commerce, which takes into account each county’s average unemployment rate, median household income, percentage growth in population, and adjusted property tax base per capita. About the same proportion of students retained into the

FIGURE 4. SOCIOECONOMIC PROFILE OF NEW FRESHMEN
First Spring and Second Fall Retention Rates

Demographic	Cohort Starting Term	Overall Freshman Cohort		Retained to First Spring				Retained to Second Fall			
				No		Yes		No		Yes	
		N	%	n	%	n	%	n	%	n	%
LOW INCOME											
Yes	Fall 2015	1,412	50.9	120	8.5	1,292	91.5	352	24.9	1,060	75.1
	Fall 2016	1,399	49.1	100	7.1	1,299	92.9	316	22.6	1,083	77.4
	Fall 2017	1,510	54.1	111	7.4	1,399	92.6	366	24.2	1,144	75.8
	Three Year Trend	4,321	51.4	331	7.7	3,990	92.3	1,034	23.9	3,287	76.1
No	Fall 2015	1,361	49.1	104	7.6	1,257	92.4	308	22.6	1,053	77.4
	Fall 2016	1,451	50.9	102	7.0	1,349	93.0	329	22.7	1,122	77.3
	Fall 2017	1,281	45.9	106	8.3	1,175	91.7	298	23.3	983	76.7
	Three Year Trend	4,093	48.6	312	7.6	3,781	92.4	935	22.8	3,158	77.2
RURAL											
Yes	Fall 2015	931	33.6	94	10.1	837	89.9	236	25.3	695	74.7
	Fall 2016	905	31.8	73	8.1	832	91.9	194	21.4	711	78.6
	Fall 2017	911	32.6	79	8.7	832	91.3	222	24.4	689	75.6
	Three Year Trend	2,747	32.6	246	9.0	2,501	91.0	652	23.7	2,095	76.3
No	Fall 2015	1,842	66.4	130	7.1	1,712	92.9	424	23.0	1,418	77.0
	Fall 2016	1,945	68.2	129	6.6	1,816	93.4	451	23.2	1,494	76.8
	Fall 2017	1,880	67.4	138	7.3	1,742	92.7	442	23.5	1,438	76.5
	Three Year Trend	5,667	67.4	397	7.0	5,270	93.0	1,317	23.2	4,350	76.8
FIRST GENERATION											
Yes	Fall 2015	1,158	41.8	106	9.2	1,052	90.8	304	26.3	854	73.7
	Fall 2016	936	32.8	77	8.2	859	91.8	224	23.9	712	76.1
	Fall 2017	1,004	36.0	97	9.7	907	90.3	269	26.8	735	73.2
	Three Year Trend	3,098	36.8	280	9.0	2,818	91.0	797	25.7	2,301	74.3
No	Fall 2015	1,228	44.3	89	7.2	1,139	92.8	265	21.6	963	78.4
	Fall 2016	1,213	42.6	68	5.6	1,145	94.4	248	20.4	965	79.6
	Fall 2017	1,143	41.0	74	6.5	1,069	93.5	241	21.1	902	78.9
	Three Year Trend	3,584	42.6	231	6.4	3,353	93.6	754	21.0	2,830	79.0
Unknown	Fall 2015	387	14.0	29	7.5	358	92.5	91	23.5	296	76.5
	Fall 2016	701	24.6	57	8.1	644	91.9	173	24.7	528	75.3
	Fall 2017	644	23.1	46	7.1	598	92.9	154	23.9	490	76.1
	Three Year Trend	1,732	20.6	132	7.6	1,600	92.4	418	24.1	1,314	75.9

FIGURE 5. FIRST YEAR GPA FOR NEW FRESHMEN

First Spring and Second Fall Retention Rates

Average	Cohort Starting Term	Overall Freshman Cohort	Retained to First Spring		Retained to Second Fall	
			No	Yes	No	Yes
First Fall Term GPA	Fall 2015	2.79	1.68	2.87	2.00	3.03
	Fall 2016	2.81	1.68	2.89	1.92	3.06
	Fall 2017	2.77	1.64	2.85	1.87	3.03
	Three Year Trend	2.79	1.67	2.87	1.93	3.04
First Spring Term GPA	Fall 2015	2.82	2.06	2.83	1.97	3.01
	Fall 2016	2.82	1.83	2.82	1.79	3.03
	Fall 2017	2.79	3.12	2.79	1.77	3.00
	Three Year Trend	2.81	2.13	2.81	1.84	3.01
First Year Cumulative GPA	Fall 2015	2.76	1.69	2.85	1.94	3.01
	Fall 2016	2.77	1.68	2.85	1.84	3.04
	Fall 2017	2.73	1.64	2.81	1.78	3.01
	Three Year Trend	2.75	1.67	2.83	1.85	3.02

first Spring whether they were from a rural (91%) or non-rural population (93%). Retention rates were also very similar for rural and non-rural populations going into the second Fall (76.3% and 76.8%, respectively).

Where data were available, the first-generation college criterion was considered. This is a self-reported metric, based on students' disclosure of their parents' or guardians' highest attained level of education. A first-generation student is a student whose parents or guardians have not earned at least a bachelor's degree. First-generation college students are especially at risk during their first year of enrollment because they face additional challenges that can impact their performance and retention; they typically have less financial and social support and are less prepared for college than their inter-generational peers. Within the new freshman cohorts, first-generation students had lower retention rates than students whose parents had obtained at least a bachelor's degree. First Spring retention rates for first-generation students were 91% compared to 93.6% for non-first-generation students, and second Fall retention rates were 74.3% compared to 79.0%, respectively.

Data in **Figure 5** depict academic outcomes of new freshman students after their first year. Not surprisingly, GPA was lower for students who did not retain to the first Spring term and the second Fall term compared to students who did retain. On average, the first Fall term

GPA for students who retained to their first Spring was 2.87, compared to 1.67 for students who did not return in Spring. The first Spring term GPA for students who retained to their second Fall was 3.01 on average, while the first Spring term GPA for students who did not return the next Fall was 1.84. The average first year cumulative GPA for students who returned for their second Fall was 3.02, while for students who completed their first year but did not return for the second Fall had a 1.85 cumulative GPA.

Finally, majors were ranked by highest attrition of freshman students in the first Spring as well as the second Fall. The top ten majors with the highest attrition rates in Spring and Fall are provided in **Figures 6** and **7**.

FIGURE 6. MAJORS WITH HIGHEST ATTRITION IN FIRST SPRING

Major	Starting Cohort Enrollment	Retained to First Spring	% Attrition
Philosophy	25	19	24.0%
Music (Pre-Major)	64	49	23.4%
Classical Studies	14	12	14.3%
Special Education (Pre Major)	37	32	13.5%
Biochemistry	100	87	13.0%
Physics	56	49	12.5%
Women's and Gender Studies	8	7	12.5%
Art	180	158	12.2%
Pre-Health Studies/Sciences	562	500	11.0%
Mathematics	55	49	10.9%

FIGURE 7. MAJORS WITH HIGHEST ATTRITION IN SECOND FALL

Major	Starting Cohort Enrollment	Retained to Second Fall	% Attrition
French	1	0	100.0%
German	1	0	100.0%
Physics	56	30	46.4%
Pre Interior Architecture	7	4	42.9%
Music (Pre-Major)	64	39	39.1%
Entrepreneurship	52	33	36.5%
Classical Studies	14	9	35.7%
Arts Administration	15	10	33.3%
Computer Science	362	251	30.7%
Chemistry	137	96	29.9%

Classical Studies, Physics, and Music majors appeared on both lists.

ANALYSIS

RQ3 requires an analytic approach to explore factors that may impact attrition. Four logistic regressions were performed to explore the impacts of the pre-academic, demographic, socioeconomic, and academic variables on first Spring and second Fall attrition. Logistic regression was chosen because the dependent variable of interest, attrition, is binary; students either drop out or return. In

all four models, the likelihood of attrition (rather than retention) was modelled.

A comprehensive list of all the variables used in the models is provided in **Figure 8**. The equations for the four logistic regression models are provided in **Figure 9**.

The left-hand side of the logistic regression equation represents the log odds of attrition, where p is the probability of attrition. This means that the coefficients must be interpreted in terms of their log odds. The sign of the coefficient estimate, i.e. whether it is positive or negative, describes the relationship between the independent variable and the odds of the dependent variable. A positive coefficient estimate indicates a positive relationship between the independent and dependent variable outcome being modeled, while a negative coefficient estimate indicates an inverse relationship. For example, a positive coefficient estimate for the independent variable male would indicate that being male is associated with greater odds of attrition, while a negative coefficient estimate would indicate that being male is associated with lower odds of attrition. To understand the effect of each variable on the odds of attrition in practical terms, each coefficient is exponentiated to calculate the odds ratio.

FIGURE 8. VARIABLES USED IN LOGISTIC REGRESSION MODELS

Variable	Description	Type	Use
ATTRIT_SPRING	1 if attrition in first Spring, 0 if otherwise	Discrete	Dependent
ATTRIT_FALL	1 if attrition in first Fall, 0 if otherwise	Discrete	Dependent
HS_GPA	High School GPA	Continuous	Independent
SATT	SAT Total Score	Continuous	Independent
MALE	1 if male, 0 otherwise	Discrete	Independent
ASIAN	1 if Asian, 0 otherwise	Discrete	Independent
BLACK	1 if Black, 0 otherwise	Discrete	Independent
HISPANIC	1 if Hispanic, 0 otherwise	Discrete	Independent
OTHER_RACE	1 if other race/ethnicity, 0 otherwise	Discrete	Independent
WHITE	1 if White, 0 otherwise	Discrete	Independent
LOWINC	1 if Low Income, 0 otherwise	Discrete	Independent
RURAL	1 if Rural, 0 otherwise	Discrete	Independent
FIRST_GENERATION	1 if First Generation College Student, 0 otherwise	Discrete	Independent
TOT_HRS	Total credit hours the student registered for in Fall term	Continuous	Independent
TERM_GPA_FALL	Fall Term GPA	Continuous	Independent
CUMGPA_SPR1	Cumulative first year GPA	Continuous	Independent

Odds ratios quantify the strength of the association between two variables, or the odds that an outcome (attrition) will occur given a particular condition (being a first-generation student) compared to the odds of the outcome occurring in the absence of that condition (not being a first-generation student). When an odds ratio is greater than 1, it describes a positive relationship between the two variables. Conversely, an odds ratio less than 1 describes a

FIGURE 9. LOGISTIC REGRESSION MODEL EQUATIONS

Spring Attrition Model 1.

$$\ln\left(\frac{p}{(1-p)}\right) = \beta_0 + \beta_1\text{HS_GPA} + \beta_2\text{SATT} + \beta_3\text{MALE} + \beta_4\text{ASIAN} + \beta_5\text{BLACK} + \beta_6\text{HISPANIC} + \beta_7\text{WHITE} \\ + \beta_8\text{OTHER_RACE} + \beta_9\text{LOWINC} + \beta_{10}\text{RURAL} + \beta_{11}\text{FIRST_GENERATION} + \beta_{12}\text{TOT_HRS}$$

where p is the probability of attrition in the first Spring term

Spring Attrition Model 2.

$$\ln\left(\frac{p}{(1-p)}\right) = \beta_0 + \beta_1\text{HS_GPA} + \beta_2\text{SATT} + \beta_3\text{MALE} + \beta_4\text{ASIAN} + \beta_5\text{BLACK} + \beta_6\text{HISPANIC} + \beta_7\text{WHITE} \\ + \beta_8\text{OTHER_RACE} + \beta_9\text{LOWINC} + \beta_{10}\text{RURAL} + \beta_{11}\text{FIRST_GENERATION} + \beta_{12}\text{TOT_HRS} + \beta_{13}\text{TERM_GPA_FALL}$$

where p is the probability of attrition in the first Spring term

Fall Attrition Model 1.

$$\ln\left(\frac{p}{(1-p)}\right) = \beta_0 + \beta_1\text{HS_GPA} + \beta_2\text{SATT} + \beta_3\text{MALE} + \beta_4\text{ASIAN} + \beta_5\text{BLACK} + \beta_6\text{HISPANIC} + \beta_7\text{WHITE} \\ + \beta_8\text{OTHER_RACE} + \beta_9\text{LOWINC} + \beta_{10}\text{RURAL} + \beta_{11}\text{FIRST_GENERATION} + \beta_{12}\text{TOT_HRS} + \beta_{13}\text{TERM_GPA_FALL}$$

where p is the probability of attrition in the second Fall term

Fall Attrition Model 2.

$$\ln\left(\frac{p}{(1-p)}\right) = \beta_0 + \beta_1\text{HS_GPA} + \beta_2\text{SATT} + \beta_3\text{MALE} + \beta_4\text{ASIAN} + \beta_5\text{BLACK} + \beta_6\text{HISPANIC} + \beta_7\text{WHITE} \\ + \beta_8\text{OTHER_RACE} + \beta_9\text{LOWINC} + \beta_{10}\text{RURAL} + \beta_{11}\text{FIRST_GENERATION} + \beta_{12}\text{TOT_HRS} + \beta_{13}\text{CUMGPA_SPR1}$$

where p is the probability of attrition in the second Fall term

negative relationship. If an odds ratio equals exactly 1, there is no relationship between the variables. The reciprocal, or inverse, odds ratio is calculated by 1 divided by the odds ratio, and provides the odds that an outcome occurs given the absence of a condition compared to the presence of a condition. The reciprocal is especially useful for interpreting odds ratios less than 1. As usual, when interpreting regression coefficients, it is assumed that all other variables in the model are held constant.

First Spring Attrition Models

Two models were developed to estimate first Spring attrition. The first model included pre-academic, demographic, and socioeconomic variables, as well as the total number of credit hours the student registered for in their first Fall term. The first model was intended to provide insight into student characteristics that may suggest which subpopulations of the freshman cohort could benefit from interventions during their first Fall semester to improve attrition into the first Spring.

The second model included the additional variable `TERM_GPA_FALL` to control for students' academic outcome at the end of their first semester. The addition

of the first Fall term GPA variable changed the statistical significance of some independent variables in the model, suggesting some degree of multicollinearity. However, a student's GPA at the end of their first Fall semester will naturally be an important factor in whether or not they continue into their first Spring, and its inclusion in this model allowed for the identification of student characteristics that still significantly impacted Spring retention after accounting for academic performance during the first Fall semester.

Results from Spring Models

1 and 2 are discussed in detail below.

Conducting these two models provided a comprehensive, multidimensional perspective of how various student characteristics impact attrition in the first Spring semester. Results of both models are displayed in **Figure 10**, including the logistic regression coefficients, odds ratios, standard errors, and p-values for each predictor in the models.

In Spring Model 1, high school GPA was a statistically significant strong predictor of attrition in the first Spring. The odds ratio of 0.447 means that, holding everything else constant, for each one unit increase in high school GPA, the odds of attrition in the first Spring dropped by more than half. In other words, freshmen with a high school GPA of 3.00 were over half as likely to drop out as freshmen with a high school GPA of 2.00. Inversely stated, freshmen with a high school GPA of 2.00 were 2.24 times more likely to drop out before Spring than freshmen with a high school GPA of 3.00 (reciprocal odds ratio is $(1/0.447)=2.237$).

In terms of demographics, gender and being White were also statistically significant. Interpreting the odds ratios

FIGURE 10. SPRING ATTRITION LOGISTIC REGRESSION RESULTS

Variable	Model 1				Model 2			
	Coefficient	Odds Ratio	Standard Error	p-value	Coefficient	Odds Ratio	Standard Error	p-value
Constant	3.2844	26.693	0.7207	<.0001	0.9881	2.686	0.8402	0.2396
Pre-Academic								
HS_GPA	-0.8059	0.447	0.1077	***<.0001	0.1935	1.213	0.1352	0.1524
SATT	0.000183	1.000	0.000421	0.6633	0.000207	1.000	0.000484	0.6689
Demographic								
MALE	0.2028	1.225	0.1004	*0.0434	-0.1183	0.888	0.1161	0.3081
ASIAN	-0.0443	0.957	0.2251	0.8438	-0.1901	0.827	0.2540	0.4543
BLACK	-0.3194	0.727	0.1737	0.0659	-0.4873	0.614	0.1985	*0.0141
HISPANIC	-0.0207	0.979	0.1638	0.8992	-0.0187	0.981	0.1821	0.9180
WHITE	0.4002	1.492	0.1680	*0.0172	0.3708	1.449	0.1906	0.0518
OTHER_RACE	0.0435	1.044	0.2552	0.8646	-0.2836	0.753	0.3013	0.3465
Socioeconomic								
LOWINC	-0.0239	0.976	0.1067	0.8225	-0.3157	0.729	0.1206	**0.0089
RURAL	0.3634	1.438	0.1019	***0.0004	0.1822	1.200	0.1148	0.1126
FIRST_GENERATION	0.3768	1.458	0.1037	***0.0003	0.2967	1.345	0.1163	**0.0107
Academic								
TOT_HRS	-0.242	0.785	0.0342	***<.0001	-0.1379	0.871	0.0392	***0.0004
TERM_GPA_FALL					-1.0981	0.334	0.0534	***<.0001

*p<.05, **p<.01, ***p<.001, α=.05

	Model 1	Model 2
Model Information		
Response Variable	attrit_spring	attrit_spring
Probability Modeled	attrit_spring=1	attrit_spring=1
Frequency attrit_spring=1	509	450
Frequency attrit_spring=0	6,151	6,122
Number of Observations	6,660	6,572

	Model 1	Model 2
Association of Predicted Probabilities & Observed Responses		
Percent Concordant	67.2	78.4
Percent Discordant	32.8	21.6
Somers' D	0.343	0.568
Gamma	0.343	0.568
Tau-a	0.048	0.072
C	0.672	0.784
Hosmer and Lemeshow Goodness-of-Fit Test		
Chi-Square	11.4344	27.1168
p-value	0.1783	0.0007

reveals that, holding other variables constant, males were 22.5% more likely to drop out after their first Fall term than females, and White students were nearly 50% more likely to drop out after their first Fall term than all other races.

The socioeconomic variables identifying rural and first-generation students were both statistically significant strong predictors of attrition in the first Spring. Students from rural counties were 43.8% more likely to drop out before Spring than students from urban areas, and first-generation students were nearly 50% more likely to drop out before Spring than students whose parents hold at least a bachelor's degree.

Finally, the total number of credit hours a student registered for in their first Fall was a highly statistically significant strong predictor of attrition in the first Spring. The odds ratio of 0.785 means that for each additional credit hour a student enrolls in for their first Fall semester, the odds of attrition in their first Spring was just 78.5% that of students taking one fewer credit hour. In practical terms, this means that a freshman taking 16 credit hours in the Fall was only about three-quarters as likely to drop out before Spring as a freshman taking 15 credit hours. Inversely, a freshman taking 15 credit hours in the Fall was 1.3 times more likely to drop out before Spring than a freshman who took 16 credit hours. This is an interesting finding. Perhaps students taking on a greater

courseload their first semester are better academically prepared than students who enroll in fewer credit hours, reflecting the negative relationship between total enrolled credit hours in the first Fall and attrition to the first Spring. Students who enroll in fewer hours their first semester may be less confident in their academic abilities.

Spring Model 2 included the addition of the students' first Fall term GPA. In Spring Model 2, controlling for all other variables including GPA at the end of the first Fall term, being an African American student was the only statistically significant demographic variable. The odds of attrition in the first Spring for African American students were just 60% the odds of all other races; this is consistent with the higher first Spring retention rates seen among African American students (Figure 3, Appendix).

In Spring Model 2, the socioeconomic variables identifying low income and first-generation students were significant. The odds of a low-income student dropping out before Spring were 72.9% that of non-low-income students; controlling for all other variables including GPA at the end of the first Fall term, low-income students were less likely to drop out before Spring. The odds of dropping out before Spring were over one-third greater for first-generation students than for students whose parents hold at least a bachelor's degree.

For academic variables, both the total number of credit hours a student registered for in their first Fall and their GPA after their first Fall were significant. Interpreting the odds ratio of 0.871 means that for each additional credit hour a student enrolled in their first Fall semester, the odds of attrition in their first Spring was 87.1% that of students taking one fewer credit hour. In other words, a freshman taking 16 credit hours their first Fall is only about 87% as likely to drop out before Spring compared to a student taking just 15 credit hours. Inversely, a student taking 15 credit hours their first Fall is 1.15 times more likely to drop out before Spring than a freshman who took 16 credit hours. The odds ratio for first Fall term GPA was 0.334, meaning students with a GPA of 3.00 after their first Fall are one-third as likely to drop out before Spring than students with a GPA of 2.00, and inversely, students with a GPA of 2.00 are three times

more likely to drop out before Spring than students with a 3.00 GPA.

Second Fall Attrition Models

Two similar models were developed to estimate second Fall attrition. Fall Model 1 included pre-academic, demographic, and socioeconomic variables, as well as the total number of credit hours the student registered for in their first Fall term and their GPA at the end of Fall. Fall Model 1 was intended to provide insight into student characteristics that may suggest which subpopulations of the freshman cohort could benefit from interventions during their first Spring semester to improve attrition into the second Fall. Fall Model 2 switched the Fall term GPA variable to the student's cumulative first year GPA. Results of both Fall attrition models are displayed in **Figure 11** and discussed in detail below.

Similar to the Spring models, in Fall Model 1 high school GPA was statistically significant. The odds ratio of 0.797 means that students with a 3.00 high school GPA were only 80% as likely to drop out after their first year than students with a high school GPA of 2.00. Freshmen students entering UNCG with higher GPAs had better odds of retaining into their second year.

In Fall Model 1, being an African American student was a highly statistically significant predictor of attrition in the second Fall term. The odds of attrition in the second Fall for African American students were just 60% that of all other races.

Unexpectedly, low-income students had lower odds of attrition after the first year. The odds of a low-income student dropping out after Spring term were only 84.2% that of non-low-income students. Not surprisingly, being a first-generation student significantly increased the risk of attrition after the first year. The odds of dropping out before second Fall were 20% greater for first-generation students than for students whose parents hold at least a bachelor's degree.

Academic variables also had a significant impact on the likelihood of attrition to the second Fall in Fall Model 1. The number of credit hours a student enrolled in during their first Fall moderately decreased the odds of attrition

FIGURE 11. FALL ATTRITION LOGISTIC REGRESSION RESULTS

Variable	Model 1				Model 2			
	Coefficient	Odds Ratio	Standard Error	p-value	Coefficient	Odds Ratio	Standard Error	p-value
Constant	3.1371	23.036	0.5446	<.0001	3.4439	31.308	0.5593	<.0001
Pre-Academic								
HS_GPA	-0.2263	0.797	0.0851	**0.0078	-0.0644	0.938	0.0878	0.4633
SATT	0.000576	1.001	0.000314	0.0666	0.000375	1	0.000324	0.2476
Demographic								
MALE	-0.0225	0.978	0.0747	0.7636	-0.1063	0.899	0.0769	0.167
ASIAN	-0.1907	0.826	0.1613	0.2373	-0.1531	0.858	0.1663	0.357
BLACK	-0.5272	0.590	0.1257	***<.0001	-0.5592	0.572	0.1302	***<.0001
HISPANIC	-0.0683	0.934	0.1196	0.5682	-0.1192	0.888	0.1252	0.3409
WHITE	0.1756	1.192	0.1208	0.1460	0.1201	1.128	0.1250	0.3366
OTHER_RACE	0.1038	1.109	0.1827	0.5699	0.00507	1.005	0.1885	0.9786
Socioeconomic								
LOWINC	-0.1720	0.842	0.0782	*0.0277	-0.1900	0.827	0.0804	**0.0181
RURAL	0.0103	1.010	0.0761	0.8925	-0.0108	0.989	0.0785	0.8903
FIRST_GENERATION	0.1843	1.202	0.0750	*0.0141	0.1265	1.135	0.0772	0.1012
Academic								
TOT_HRS	-0.0553	0.946	0.0265	*0.0369	-0.051	0.950	0.0273	0.0619
TERM_GPA_FALL	-1.2519	0.286	0.0424	***<.0001				
CUMGPA_spr1					-1.5196	0.219	0.0481	***<.0001

*p<.05, **p<.01, ***p<.001, α=.05

	Model 1	Model 2
Model Information		
Response Variable	attrit_fall	attrit_fall
Probability Modeled	attrit_fall=1	attrit_fall=1
Frequency attrit_fall=1	1,486	1,494
Frequency attrit_fall=0	5,086	5,105
Number of Observations	6,572	6,599

	Model 1	Model 2
Association of Predicted Probabilities & Observed Responses		
Percent Concordant	78.6	80.1
Percent Discordant	21.4	19.9
Somers' D	0.572	0.602
Gamma	0.572	0.602
Tau-a	0.200	0.211
C	0.786	0.801
Hosmer and Lemeshow Goodness-of-Fit Test		
Chi-Square	56.3993	168.4358
p-value	<.0001	<.0001

to the second Fall; for each additional credit hour a student enrolled in during their first Fall semester, their odds of dropping out before second Fall were 95% of those not taking an additional hour. And for each one unit increase in first Fall term GPA (i.e. 2.50 to 3.50), the odds of attrition (for the 3.50 students) are one-third that of those without the one unit increase in GPA (the 2.50 students). Again, this indicates that students who take more credit hours and students with higher first Fall term GPAs tend to retain better than academically weaker students.

The second Fall Model introduced cumulative first year GPA instead of first Fall term GPA. This changed the

model to account for overall first year academic performance, which naturally is a major determinant of retention.

In Fall Model 2, being African American was still highly statistically significant. Controlling for academic performance and holding everything else constant, the odds of attrition after the first year were still just about 60% that of all other races.

Low-income students were also shown to still have lower odds of attrition into the second year. The odds of a low-income student dropping out before second Fall were just 82.7% that of non-low-income students. This is an

interesting finding and suggests that being low-income is not necessarily a barrier to persistence.

Finally, as expected, a student's first year cumulative GPA was a highly statistically significant predictor of attrition after the first year. For each one unit increase in cumulative GPA at the end of the first year at UNCG, the odds of attrition were nearly one-fifth that of those without a one-point lower GPA. For example, this means that students with a GPA of 2.00 after their first year were four-and-a-half times ($1/.219=4.566$) more likely to drop out before second Fall than students with a GPA of 3.00. Clearly, academic performance is extremely important for retention after freshman year.

LIMITATIONS

Given the multitude of factors that may impact attrition, it is emphasized that the models presented here are a starting point for studying these questions and are by no means exhaustive or definitive. This study was limited by both time and data constraints. Additional variables that may be considered for future research include how many hours the student spent working outside of school, the distance a student must commute to UNCG, or the

number of courses a freshman enrolls in that have historically high Drop-Fail-Withdrawal (DFW) rates.

It would also be advantageous to incorporate survey data such as the National Survey of Student Engagement (NSSE) to examine student perspectives on connectedness and their relationship to attrition.

Although the results of the logistic regressions provide valuable insight into some significant variables related to attrition, it would also be beneficial to explore attrition rates among various combinations of demographic and socioeconomic variables, for example attrition rates among female Asian students from urban areas compared to female Asian students from rural areas. A Tableau visualization is in the process of being built by OIR to examine these interactions.

Despite these limitations, this Research Brief contributes a strong foundation for exploring the relationships between a variety of student variables and first year attrition.

FIGURE 3. DEMOGRAPHIC PROFILE OF NEW FRESHMEN
 First Spring and Second Fall Retention Rates

Demographic	Cohort Starting Term	Overall Freshman Cohort		Retained to First Spring				Retained to Second Fall			
		N	%	No		Yes		No		Yes	
				n	%	n	%	n	%	n	%
GENDER											
Female	Fall 2015	1,862	67.1	141	7.6	1,721	92.4	403	21.6	1,459	78.4
	Fall 2016	1,899	66.6	119	6.3	1,780	93.7	378	19.9	1,521	80.1
	Fall 2017	1,846	66.1	129	7.0	1,717	93.0	408	22.1	1,438	77.9
	Three Year Trend	5,607	66.6	389	6.9	5,218	93.1	1,189	21.2	4,418	78.8
Male	Fall 2015	911	32.9	83	9.1	828	90.9	257	28.2	654	71.8
	Fall 2016	951	33.4	83	8.7	868	91.3	267	28.1	684	71.9
	Fall 2017	945	33.9	88	9.3	857	90.7	256	27.1	689	72.9
	Three Year Trend	2,807	33.4	254	9.0	2,553	91.0	780	27.8	2,027	72.2
ETHNICITY											
American Indian or Alaskan Native	Fall 2015	9	0.3	2	22.2	7	77.8	3	33.3	6	66.7
	Fall 2016	13	0.5	-	-	13	100.0	3	23.1	10	76.9
	Fall 2017	13	0.5	3	23.1	10	76.9	7	53.8	6	46.2
	Three Year Trend	35	0.4	5	14.3	30	85.7	13	37.1	22	62.9
Asian	Fall 2015	148	5.3	8	5.4	140	94.6	27	18.2	121	81.8
	Fall 2016	165	5.8	10	6.1	155	93.9	34	20.6	131	79.4
	Fall 2017	146	5.2	6	4.1	140	95.9	33	22.6	113	77.4
	Three Year Trend	459	5.5	24	5.2	435	94.8	94	20.5	365	79.5
Black or African American	Fall 2015	866	31.2	44	5.1	822	94.9	181	20.9	685	79.1
	Fall 2016	786	27.6	32	4.1	754	95.9	146	18.6	640	81.4
	Fall 2017	898	32.2	62	6.9	836	93.1	187	20.8	711	79.2
	Three Year Trend	2,550	30.3	138	5.4	2,412	94.6	514	20.2	2,036	79.8
Hispanics of any race	Fall 2015	274	9.9	22	8.0	252	92.0	70	25.5	204	74.5
	Fall 2016	287	10.1	18	6.3	269	93.7	64	22.3	223	77.7
	Fall 2017	346	12.4	26	7.5	320	92.5	87	25.1	259	74.9
	Three Year Trend	907	10.8	66	7.3	841	92.7	221	24.4	686	75.6
Native Hawaiian or Other Pacific Islander	Fall 2015	2	0.1	-	-	2	100.0	1	50.0	1	50.0
	Fall 2016	3	0.1	-	-	3	100.0	1	33.3	2	66.7
	Fall 2017	1	0	-	-	1	100.0	1	100.0	-	-
	Three Year Trend	6	0.1	-	-	6	100.0	3	50.0	3	50.0
Non-Resident Alien	Fall 2015	45	1.6	3	6.7	42	93.3	7	15.6	38	84.4
	Fall 2016	27	0.9	3	11.1	24	88.9	8	29.6	19	70.4
	Fall 2017	32	1.1	2	6.3	30	93.8	4	12.5	28	87.5
	Three Year Trend	104	1.2	8	7.7	96	92.3	19	18.3	85	81.7
Two or more races	Fall 2015	147	5.3	16	10.9	131	89.1	38	25.9	109	74.1
	Fall 2016	159	5.6	11	6.9	148	93.1	43	27.0	116	73.0
	Fall 2017	197	7.1	10	5.1	187	94.9	41	20.8	156	79.2
	Three Year Trend	503	6	37	7.4	466	92.6	122	24.3	381	75.7
Unknown	Fall 2015	8	0.3	1	12.5	7	87.5	2	25.0	6	75.0
	Fall 2016	7	0.2	-	-	7	100.0	1	14.3	6	85.7
	Fall 2017	7	0.3	-	-	7	100.0	1	14.3	6	85.7
	Three Year Trend	22	0.3	1	4.5	21	95.5	4	18.2	18	81.8
White	Fall 2015	1,274	45.9	128	10.0	1,146	90.0	331	26.0	943	74.0
	Fall 2016	1,403	49.2	128	9.1	1,275	90.9	345	24.6	1,058	75.4
	Fall 2017	1,151	41.2	108	9.4	1,043	90.6	303	26.3	848	73.7
	Three Year Trend	3,828	45.5	364	9.5	3,464	90.5	979	25.6	2,849	74.4
UNDER-REPRESENTED MINORITIES											
Yes	Fall 2015	1,052	37.9	60	5.7	992	94.3	234	22.2	818	77.8
	Fall 2016	974	34.2	42	4.3	932	95.7	190	19.5	784	80.5
	Fall 2017	1,120	40.1	80	7.1	1,040	92.9	245	21.9	875	78.1
	Three Year Trend	3,146	37.4	182	5.8	2,964	94.2	669	21.3	2,477	78.7
No	Fall 2015	1,668	60.2	160	9.6	1,508	90.4	417	25.0	1,251	75.0
	Fall 2016	1,842	64.6	157	8.5	1,685	91.5	446	24.2	1,396	75.8
	Fall 2017	1,632	58.5	135	8.3	1,497	91.7	414	25.4	1,218	74.6
	Three Year Trend	5,142	61.1	452	8.8	4,690	91.2	1,277	24.8	3,865	75.2
Unknown	Fall 2015	53	1.9	4	7.5	49	92.5	9	17.0	44	83.0
	Fall 2016	34	1.2	3	8.8	31	91.2	9	26.5	25	73.5
	Fall 2017	39	1.4	2	5.1	37	94.9	5	12.8	34	87.2
	Three Year Trend	126	1.5	9	7.1	117	92.9	23	18.3	103	81.7

UNCG OFFICE OF INSTITUTIONAL RESEARCH

The mission of the Office of Institutional Research (OIR) is to aggregate, analyze, and disseminate representative and timely information in support of institutional planning, policy formulation, and decision-making for internal and external constituencies.

The OIR staff develop and support a wide variety of institutional data files, surveys, and reports. In addition, staff members provide consultation, recommendations, and service on institutional committees and work groups to support and advance the mission of the institution.

PRIMARY RESEARCHERS

Karen Blackwell
Assistant Director

Samantha Bradley
IT Analyst / Programmer II

CONTACT

840 Neal Street, Suite 112
PO Box 26170
Greensboro, NC 27402
336-334-3736
oir@uncg.edu