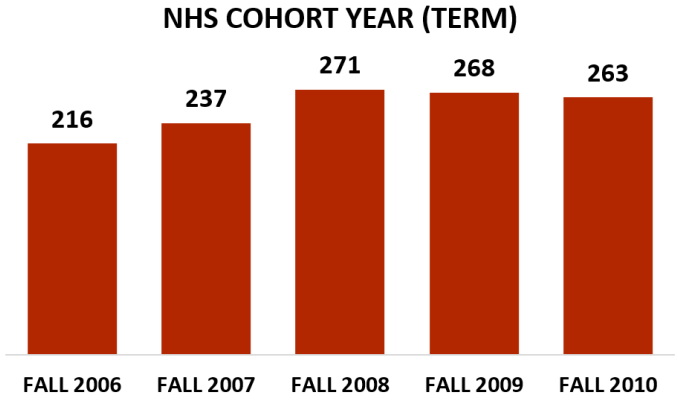
The University of Minnesota Crookston

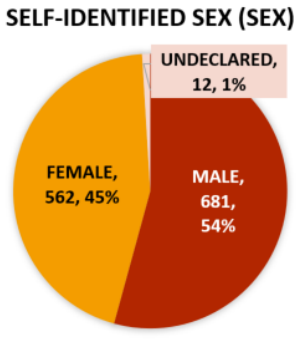
Success Model: Fall Retention and Graduation Rates

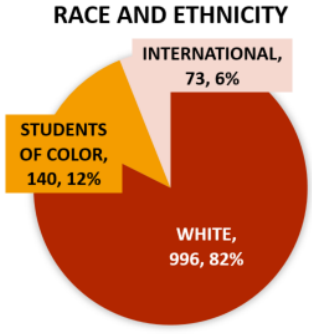
What are the predictors of success at UMC? For this model, success is defined by two factors: retention and graduation. New High School (NHS) Students from 2006-2010 were combined to determine cognitive predictors for their Fall Retention and if they graduate. External research has identified High School GPA (HSGPA), High School Rank, and ACT Composite Score (ACT) as cognitive predictors of a student's retention. On top of HSGPA and ACT, this success model will analyze the predictors sex, race/ethnicity (RACE), athlete status (ATHL), first generation status (FGEN), and total family income (FAMINC). To understand the predictors for success at UMC, each predictor will be analyzed individually and then together as a total model. There will be separate models for Fall Retention and Graduation.

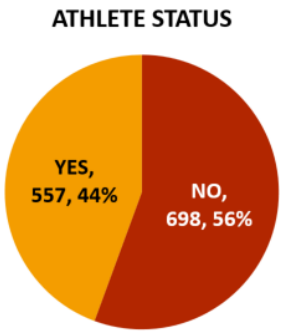
Sample Profile

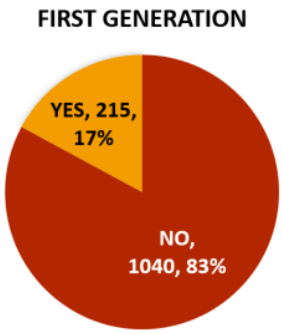


Five NHS cohorts were selected for this model. Each of these cohorts have had the opportunity to graduate in six years. The model looks at all of the cohorts together making a total sample of 1255. The largest cohort represented in this model is from 2008 with 271 students.







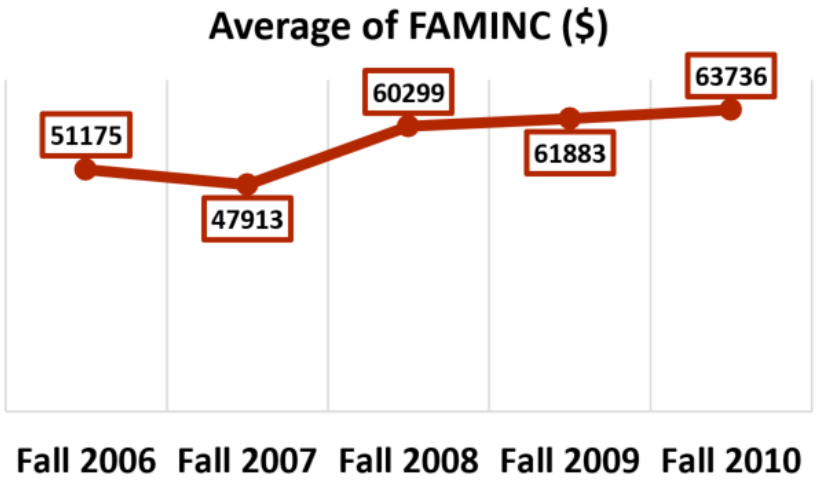


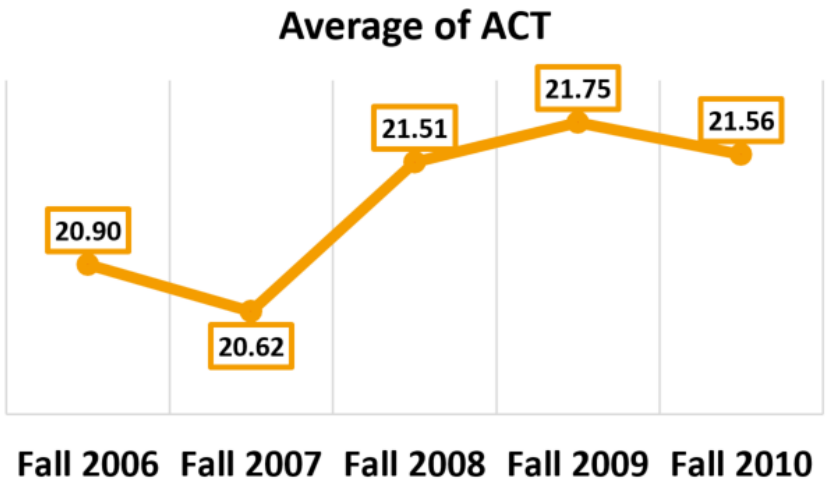
There are more male students represented in this sample than female students (coding: male=0, female=1, undeclared=2) . The majority of respondents are of white descent, with only 12% overall being students of color (coding: white=1, students of color=2, international=8/missing) . This 12% includes 140 students who identify as American Indian, Asian, Black, Hawaiian, or Hispanic. Less than half of the respondents are student athletes (557, 44%; coding: no=0, yes=1) and less than a quarter of the respondents are the first generation in their family to attend college (215, 17%), (coding: no=0, yes=1).

	TOTAL INCOME ($)	ACT COMPOSITE SCORE	HIGH SCHOOL GPA
Mean	68,797	21.29	3.07
Median	61,282	21	3.07
Mode	85,000	19	4.00
Minimum	70.00	13	1.23
Maximum	1,014,999	33	4.00
Valid	1048	1137	947
Missing	207	118	308

The average FAMINC is $68,797.17, with the most common FAMINC being $85,000.00. From 2006-2010 the average ACT score is 21.29, with a maximum score of 33 and a minimum score of 13. Students are entering UMC with an average HSGPA of 3.07.

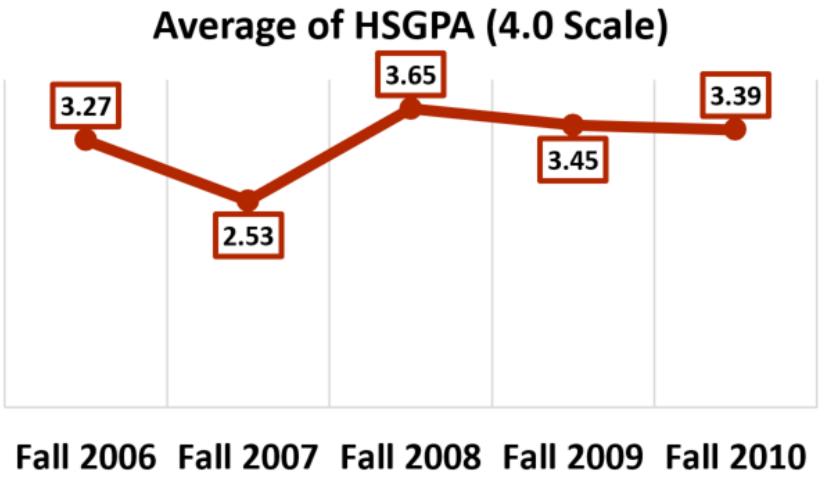
From 2006-2010, the average FAMINC has increased over $10,000. The lowest FAMINC was seen in 2007 with an average of $47,913 and the highest seen in 2010 with an average of $63,735.



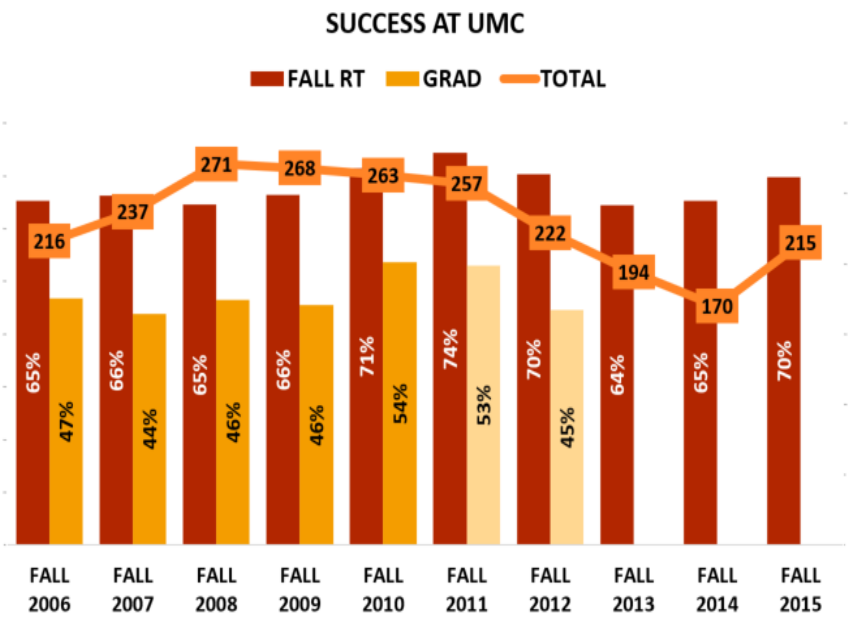


ACT scores increased over a point from 2006-2009. The highest average score of 21.75 was seen in 2009 with the lowest average score seen in 2007 (20.62).

Over the years, the average HSGPA from each cohort has remain constantly above 3.00, with the only exception in 2007 where it dropped to 2.53. The highest average HSGPA of 3.65 was seen in 2008.



What is Success at UMC?



To determine success at UMC, second year Fall Retention and Graduation of NHS students from 2006-2010 are looked at. The graph to the left portrays the trend of second year Fall Retention (red) and Graduation (dark yellow=6 years, light yellow=4 years) of NHS cohorts from 2006-2015. Second year Fall Retention is rebounding the decrease seen from 2011-2013, but it still is not at the Noel-Levis 2015 Retention Bench Mark of 74%. Overall Graduation rates have been below 50%. (Orange bar indicates the cohort size)

Fall Retention Model: Correlations

The chart to the right shows the correlations between each predictor. There are strong correlations found within the predictors (SEX, RACE, ATHL, FGEN, FAMINC, ACT, HSGPA). The predictors SEX, ACT, and HSGPA show to have a strong positive correlation with Fall Retention, meaning when Fall Retention goes up so does the other. FAMINC also has a positive correlation with Fall Retention just not as strong. RACE and FGEN show to have a negative correlation with Fall Retention, meaning when Fall Retention goes up the other goes down.

	SEX	RACE	ATHL	FGEN	FAMIN	ACT	HSGPA
SEX		--			--	++	++
RACE	--		++	++	--	--	--
ATHL		++		+	++	-	-
FGEN		++	+		--		
FAMN	--	--	++	--		++	
ACT	++	--	-		++		++
HSGPA	++	--	-			++	
FALLRT	++	-		-	+	++	++

+ positive correlation, ++ strong positive correlation, - negative correlation, -- strong negative correlation

	χ^2(t)	df	Sig.
SEX	10.121	2	.006**
RACE	17.851	2	.000***
ATHLETE	1.556	1	0.221
FGEN	4.106	1	.043*
FAMNC	(-2.118)	1046	.034*
ACT	(-4.300)	776	.000***
HSGPA	(7.809)	945	.000***

Sig. < 0.100 $^{+}$ (almost significant)
*Sig. < 0.05 * (significant)*
*Sig. < 0.01 ** (more significant)*
*Sig. < 0.001 *** (very significant)*

To confirm the above results, the table to the left indicates if there is a significant association between a predictor and Fall Retention. These results mirror those above with significant association between Fall Retention and six our of the seven predictors. ATHL is the only predictor that does not have a significant relationship with Fall Retention. Strong associations with Fall Retention are seen with RACE, ACT, AND HSGPA. Because ATHL showed no significant relationship with Fall Retention, it will be removed from one of the following regression models.

Sig. < 0.100 + (almost significant)
*Sig. < 0.05 * (significant)*
*Sig. < 0.01 ** (more significant)*
*Sig. < 0.001 *** (very significant)*

Fall Retention: Regression Models

MULTIPLE REGRESSION MODEL 1A

Coefficient	B Coefficient	Sig.
(Constant)	0.046	0.618
HIGH SCHOOL GPA	0.198	0.000***
SELF-IDENTIFIED SEX	0.049	0.074+
TOTAL FAMILY INCOME	5.25E-07	0.075+
FIRST GENERATION	-0.050	0.149
RACE AND ETHNICITY	-0.021	0.258
ACT COMPOSITE SCORE	-0.001	0.385
STUDENT ATHLETE	-0.027	0.581

To determine which predictors are important, all seven are compared together to understand their impact on Fall Retention. The table on the left represents the significance of each predictor when controlling for all others. From this model, it shows HSGPA has the strongest impact on Fall Retention ($p < 0.000$). By these numbers it can be said if HSGPA is high, the student has a better chance of returning. The overall model is significant ($p < 0.000$) and with an R value of 0.293 which means when the factors are combined in this model they have a moderate to strong effect on Fall Retention. This model can explain 8.6% of the change in Fall Retention for the sample. Two factors that are close to being significant are SEX ($p < 0.074$) and FAMINC ($p < 0.075$).

Because ATHL showed now significant relationship with Fall Retention is previous tests, in Model 1B it was left out. This model is not too different from the first. HSGPA is still the strongest predictor for Fall Retention ($p < 0.000$) followed by SEX ($p < 0.078$) and FAMINC (0.085). The significance of this model is still very strong ($p < 0.000$); with an R value still moderately strong and explaining 8.6% of the change in Fall Retention for the sample.

MULTIPLE REGRESSION MODEL 1B

Coefficient	B Coefficient	Sig.
(Constant)	-0.070	0.562
HIGH SCHOOL GPA	0.196	0.000***
SELF-IDENTIFIED SEX	0.058	0.078+
TOTAL FAMINC INCOME	4.51E-07	0.085+
FIRST GENERATION	-0.066	0.131
RACE AND ETHNICITY	-0.065	0.222
ACT COMPOSITE SCORE	-0.005	0.372

Fall Retention Success Model Overview

All but one predictor (ATHL) have a significant relationship with Fall Retention on their own, but when put into a controlled setting allowing each predictor to interact with each other, the only significant predictor of Fall Retention is HSGPA (as seen above); the higher a student's HSGPA is, the more likely they will return the following fall. This result is compatible with what other researchers have found. This could be suggesting since a student already succeeded in high school with a higher GPA, they will pursue college curriculum with the same manner. Unlike what other studies have found, this research indicates a student's ACT score to be a poor predictor for their success in returning the next fall. Two predictors to take a closer look at are SEX and FAMINC. They both showed significant relationships with Fall Retention on their own but are not significant when controlled with other predictors; they do however predict less than 10% that a student will NOT return the following fall (SEX = 7.8%, FAMINC = 8.5% - to be significant it would have to be less than 5%). Even though not statistically significant, it can be said female students are more likely to return the following fall over male students, and student's with higher total family incomes will more likely return the following fall than those with lower.

Graduation: Correlations

Unlike Fall Retention, only five predictors have significant correlations with Graduation Rates. SEX, ACT, and HSGPA all have strong positive correlations with Graduation Rates, meaning when Graduation Rates go up, so do they. RACE, and ATHL both have negative correlations with Graduation Rates (RACE stronger than ATHL), meaning with Graduation Rates go up, they go down. FGEN and FAMINC have no significant correlations with Graduation Rates.

	SEX	RACE	ATHL	FGEN	FAMIN	ACT	HSGPA
SEX		--			--	++	++
RACE	--		++	++	--	--	--
ATHL		++		+	++	-	-
FGEN		++	+		--		
FAMINC	--	--	++	--		++	
ACT	++	--	-		++		++
HSGPA	++	--	-			++	
GRAD	++	--	-			++	++

+ positive correlation, ++ strong positive correlation, - negative correlation, -- strong negative correlation

	χ^2(t)	df	Sig.
SEX	11.753	4	.019*
RACE	38.468	4	.000***
ATHLETE	7.210	2	.027*
FGEN	1.837	2	.399
FAMINC	(-1.880)	1082	.060^{+}
ACT	(-5.161)	1135	.000***
HSGPA	(-10.167)	645	.000***

Sig. < 0.100 $^{+}$ (almost significant)
*Sig. < 0.05 * (significant)*
*Sig. < 0.01 ** (more significant)*
*Sig. < 0.001 *** (very significant)*

The table on the left indicates how strong the association is between a predictor and Graduation Rates. Just like the correlations above, there are five predictors that have a significant association with Graduation Rates. The strongest associations are seen with RACE, ACT, and HSGPA. Because FGEN and FAMINC showed no significant relationship with Graduation Rates, they will be removed from one of the following regression models.

Sig. < 0.100 $^{+}$ (almost significant)
*Sig. < 0.05 * (significant)*
*Sig. < 0.01 ** (more significant)*
*Sig. < 0.001 *** (very significant)*

Graduation: Regression Models

MULTIPLE REGRESSION MODEL 2A

Coefficient	B Coefficient	Sig.
(Constant)	-0.425	.001
HIGH SCHOOL GPA	0.282	.000***
RACE AND ETHNICITY	-0.111	.051^{+}
STUDENT ATHLETE	-0.051	.143
SELF-IDENTIFIED SEX	0.042	.219
TOTAL INCOME	3.22E^{-07}	.246
FIRST GENERATION	-0.039	.403
ACT COMPOSITE SCORE	0.002	.718

To determine the key predictors for Graduation Rates, all predictors are analyzed in a controlled setting. The table to the left indicates that only one predictor is significant towards Graduation Rates. HSGPA shows to have a positive relationship with Graduation Rates, meaning when HSGPA increases the more likely that student will graduate. The overall model is significant ($p < 0.000$) and with an R value of 0.358 which means when analyzing all the predictors together they have a strong effect on Graduation Rates. This model can explain 12.8% of the change in Graduation Rates for the sample. One predictor that is close to being significant is RACE ($p < 0.051$).

Because FGEN and FAMINC showed now significant relationships with Graduation Rates is previous tests, in Model 2B they are left out. HSGPA is still the strongest predictor for Graduation Rates ($p < 0.000$). By removing FGEN and FAMINC, this allowed the model to show the significance of RACE. In Model 2B RACE became significant ($p < 0.007$). The table shows RACE to have a negative relationship with Graduation Rates, meaning that white students are more likely to graduate than students of color. The significance of this model is still very strong ($p < 0.000$); with an R value still showing a strong effect of Graduation Rates and explaining 12.1% of the change in Graduation Rates for the sample. One factor that is now close to being significant is ATHL ($p < 0.058$).

MULTIPLE REGRESSION MODEL 2B

Coefficient	B Coefficient	Sig.
(Constant)	-0.326	.007
HIGH SCHOOL GPA	0.281	.000***
RACE AND ETHNICITY	-0.143	.007**
STUDENT ATHLETE	-0.061	.058^{+}
SELF-IDENTIFIED SEX	0.024	.444
ACT COMPOSITE SCORE	-0.001	.880

Graduation Success Model Overview

All but two predictors (FGEN and FAMINC) have a significant relationship with Graduation Rates on their own, but when put into a controlled setting allowing each factor to interact with each other, HSGPA and RACE are the only significant predictors of Graduation Rates. From these results, it indicates students who identify as white and have a high HSGPA they are more likely to graduate than others. One predictor to look into further is ATHL. Although this predictor had no significance with Fall Retention, it has a strong relationship on its own with Graduation Rates but is a poor predictor overall. In Model 2B however, ATHL does predict less than 10% that a student will NOT graduate (ATHL $p < 0.058$, 5.8% - to be significant it would have to be less than 5%). Even though not statistically significant, it can be said that non-athletes are more likely to graduate from UMC than athletes.

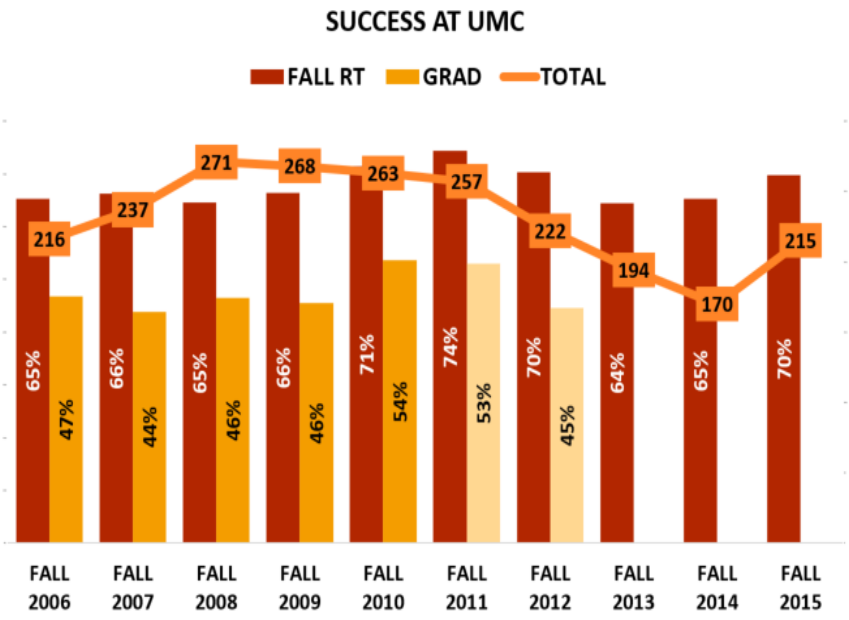
Conclusion

From these models of success (Fall Retention and Graduation Rates) several things can be said. There are many predictors individually that are associated with success. However, there are only a few that stand above the others. Both models showed that High School GPA is a key predictor in a students success at UMC. A student has a better chance of succeeding at UMC if they enter with a higher High School GPA. One interesting finding is indifference of a students athlete status. The models showed that a students athlete status does not impact their Fall Retention, but does show some significance in whether or not they graduate. This is saying that student athletes are being retained but are not completing their time at UMC. External studies indicated that a students ACT score as a key predictor of their success, however that is not true for these results. Although significant by itself, a student's ACT score turned out to be a poor predictor for their overall success at UMC. Some implementations from these results are during the admissions process a student's High School GPA could be looked at more closely or before their ACT when determining if they should be enrolled at UMC and programs could be developed to help graduate upper-classman athletes.

Fall Retention Continued—NHS Cohorts 2011-2016

Because the previous sample was from six plus years ago, the same success model is applied to the NHS cohorts from 2011-2016 to see if they have the same predictors for their success. This new sample is comprised of 1058 students. The largest cohort size was in 2011 with 257 students. There are more male students (545, 52%) than female students represented (500, 47%). Just as the previous sample, the respondents for this sample are dominantly white (825, 82%), with 12% identifying as American Indian, Asian, Black, Hawaiian, or Hispanic (171 students). Less than half of the respondents are student athletes (389, 37%), which is a smaller representation of student athletes from that in 2006-2010. There is a larger representation of first generation students in this sample than that in 2006-2010 (394, 37%). The average HSGPA, ACT and FAMINC ($) are all higher than what was recorded for 2006-2010: HSGPA = 3.09, ACT = 21.97, FAMINC = $80,540.10. To understand the predictors for success for this new cohort at UMC, each predictor will be analyzed individually and then together as a total model.

What is Success at UMC?



This graph was presented earlier, and looking closely you will notice Fall Retention (red) drops 10% during the years 2011-2013, which is over half of the sample from 2011-2015. Do the predictors for Fall Retention change because of this drop? Or do the remain consistent with what was found for the sample from 2006-2010? (HSGPA was the only predictor statistically significant for Fall Retention for 2006-2010)

Fall Retention 2011-2015 Model: Correlations

The chart to the right shows the correlations between each predictor. There are strong correlations found between predictors but only four predictors have significant correlations with Fall Retention. HSGPA, ACT, AND FAMINC show to have a strong positive correlation with Fall Retention, meaning when Fall Retention goes up so does the other. RACE is the only predictor to have a negative correlation with Fall Retention, meaning when Fall Retention goes up the other goes down.

	SEX	RACE	ATHL	FGEN	HSGPA	ACT	FAMINC
SEX		-	-		++		
RACE	-		++		--	--	--
ATHL	-	++			++		++
FGEN						-	--
HSGPA	++	--	--			++	++
ACT		--	--	-	++		++
FAMINC		--	--	--	++	++	
FALLRT		--			++	++	++

+ positive correlation, ++ strong positive correlation, - negative correlation, -- strong negative correlation

	χ^2(t)	df	Sig.
SEX	2.856	2	0.240
RACE	35.694	1	0.000***
ATHLETE	0.577	1	0.448
FGEN	0.299	1	0.584
HSGPA	(-7.166)	704	0.000***
ACT	(-4.565)	556.109	0.000***
FAMINC	(-4.514)	666.458	0.000***

Sig. < 0.100 $^{+}$ (almost significant)
*Sig. < 0.05 * (significant)*
*Sig. < 0.01 ** (more significant)*
*Sig. < 0.001 *** (very significant)*

To confirm the above results, the table to the left indicates if there is a significant association between a predictor and Fall Retention. These results mirror those above, where RACE, HSGPA, ACT, and FAMINC have significant associations with Fall Retention. The predictors that do not have any significant relationship with Fall Retention are SEX, ATHL, and FGEN. Because these three preditors have no significant relationship with Fall Retention, they will be removed from one of the following regression models.

Sig. < 0.100 $^{+}$ (almost significant)
*Sig. < 0.05 * (significant)*
*Sig. < 0.01 ** (more significant)*
*Sig. < 0.001 *** (very significant)*

MULTIPLE REGRESSION MODEL 3A		
Coefficient	**B Coefficient**	**Sig.**
(Constant)	0.123	0.358
SELF-IDENTIFIED SEX	-0.001	0.971
RACE AND ETHNICITY	-0.190	0.000***
STUDENT ATHLETE	-0.003	0.949
FIRST GENERATION	0.014	0.712
HIGH SCHOOL GPA	0.232	0.000***
ACT COMPOSITE SCORE	-0.008	0.219
TOTAL FAMILY INCOME	$5.540E^{-7}$	0.117

To determine key predictors during 2011-2015, all seven are compared together to understand their impact on Fall Retention. The table on the left represents the significance of each predictor when controlling for all others. From this model, it shows HSGPA and RACE have the strongest impact on Fall Retention (both having $p < 0.000$). By these numbers it can be said those most likely to return the following fall are white students with high HSGPA. The overall model is significant ($p < 0.000$) and with an R value of 0.316 which means when the factors are combined in this model they have a strong effect on Fall Retention. This model explains 10.0% of the change in Fall Retention for the sample.

Because three predictors have a poor relationship with Fall Retention is previous tests, in Model 3B they were left out. This model is not too different from the first. HSGPA and RACE are still the strongest predictors for Fall Retention (both having $p < 0.000$). The significance of this model is still very strong ($p < 0.000$); with an R value showing a strong effect and explaining 10.0% of the change in Fall Retention for the sample.

MULTIPLE REGRESSION MODEL 3B		
Coefficient	**B Coefficient**	**Sig.**
(Constant)	0.132	0.317
RACE AND ETHNICITY	-0.191	0.000***
HIGH SCHOOL GPA	0.231	0.000***
ACT COMPOSITE SCORE	-0.008	0.216
TOTAL FAMILY INCOME	$5.298E^{-7}$	0.122

Sig. < 0.100 $^{+}$ (almost significant)
*Sig. < 0.05 * (significant)*
*Sig. < 0.01 ** (more significant)*
*Sig. < 0.001 *** (very significant)*

Fall Retention 2011-2016 Success Model Overview

Only four predictors (RACE, HSGPA, ACT, FAMINC) have a significant relationships with Fall Retention for the NHS cohort 2011-2015 on their own. However, when in a controlled setting allowing them to interact with each other, the only significant predictors of Fall Retention is RACE and HSGPA (as seen above). From these results it can be said those who are white and have a higher High School GPA are more likely to return than those who are of color and have a lower GPA. When these results are compared to the cohort sample from 2006-2010, HSGPA is the only predictor that is the same. This could be suggesting a students High School GPA is a significant predictor of a student's success throughout the years, and is a predictor that can be reliable. On the other hand, RACE was not significant for the cohorts from 2006-2010 but very significant for those from 2011-2015. This could suggest that the diversity of UMC students is changing or RACE had a big impact in the 10% drop seen from 2011-2013.