Utilizing Predictive Analytics in the Search for Stronger Student Retention Strategies

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Overview - Objectives

Context

- 5 year retention
- Trends

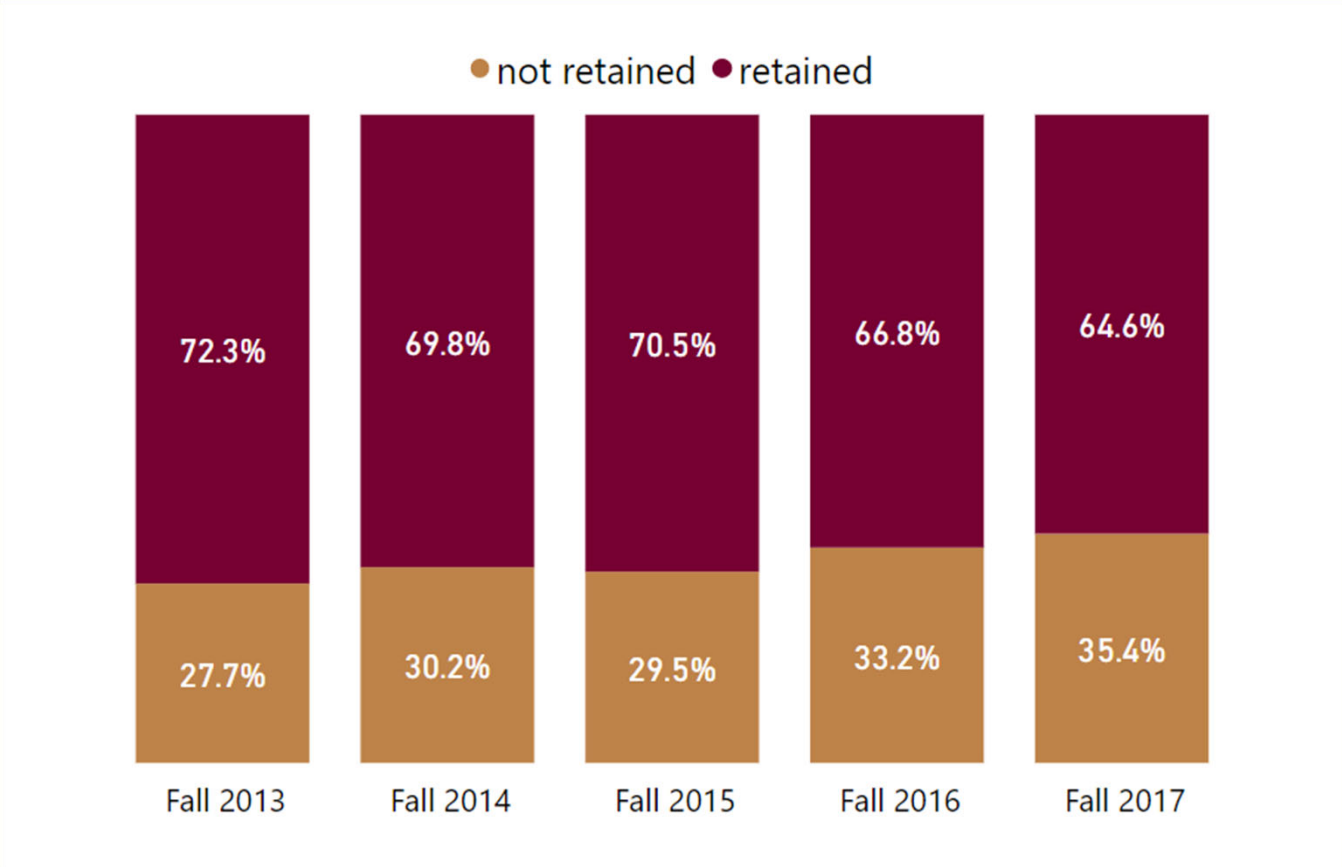
Logistic Regression

- Review
- Model development

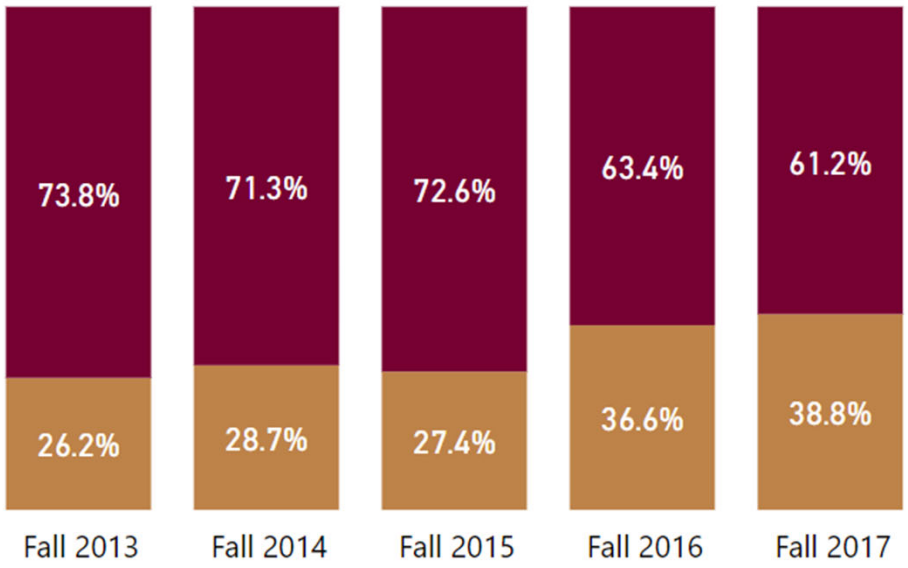
Focus Group

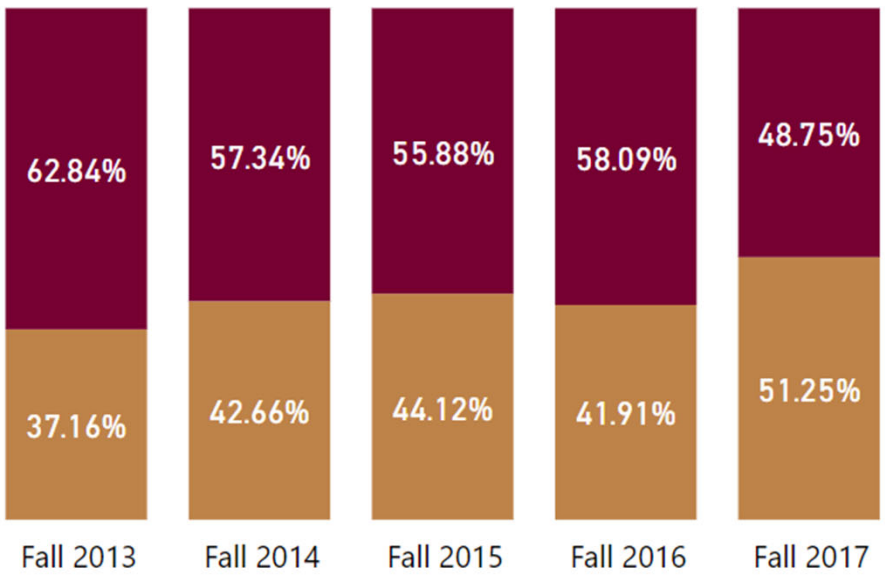
- Student Success
- Opportunities

MSU 5 Year First Time Full Time Entering Cohort Retention Rates



Retention for 25%-75% of HS Rank





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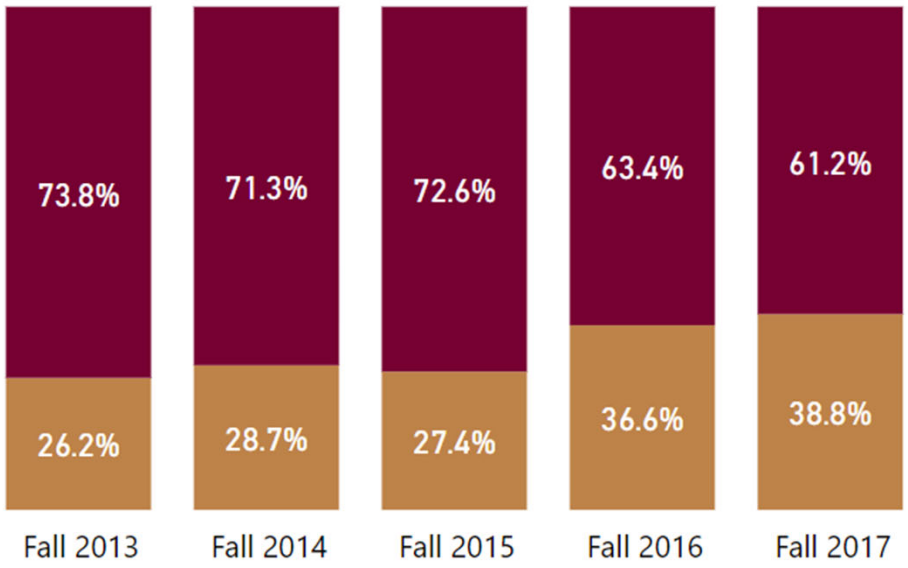
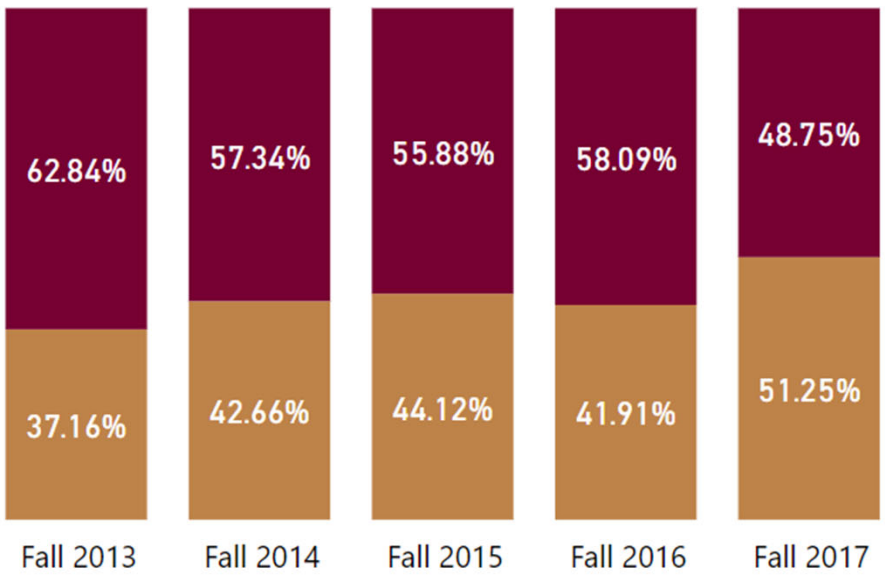
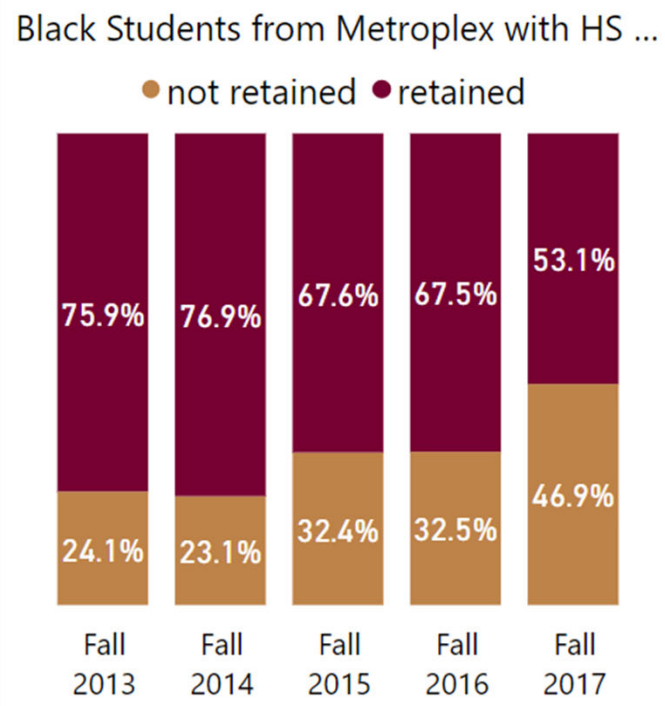
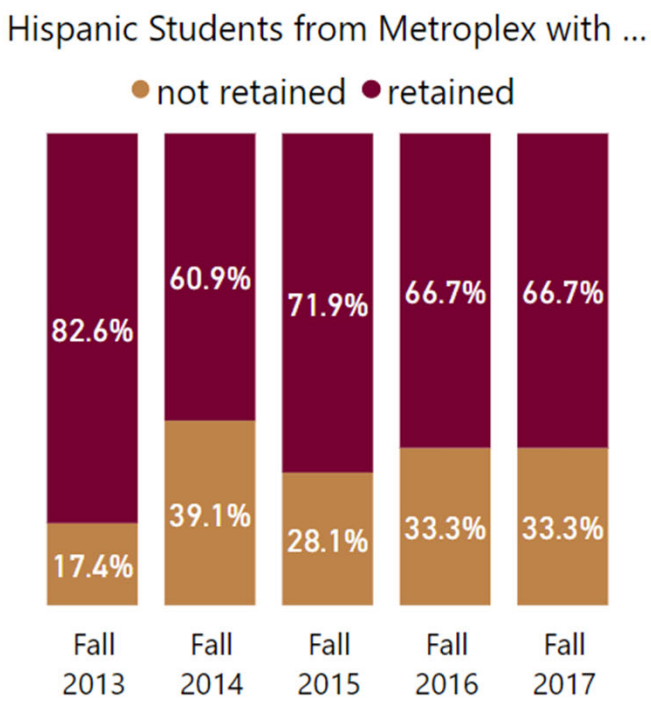
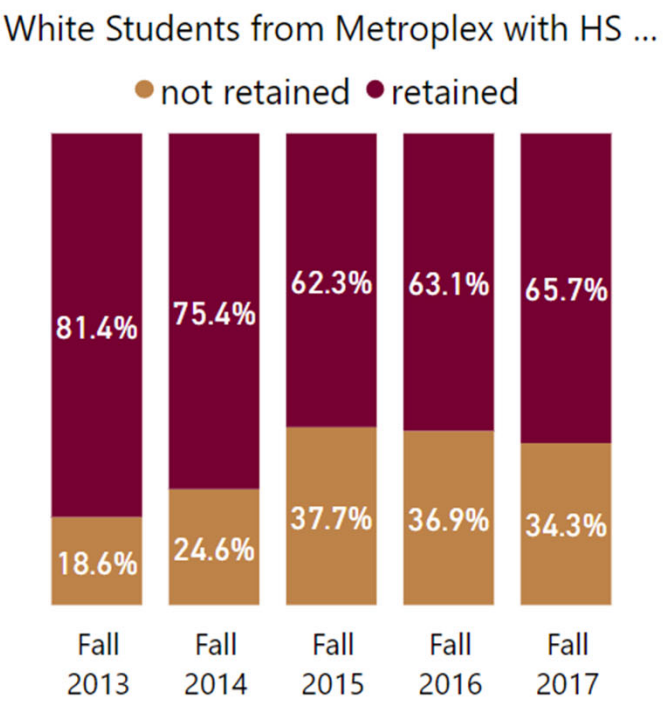




Increasingly from the Metroplex





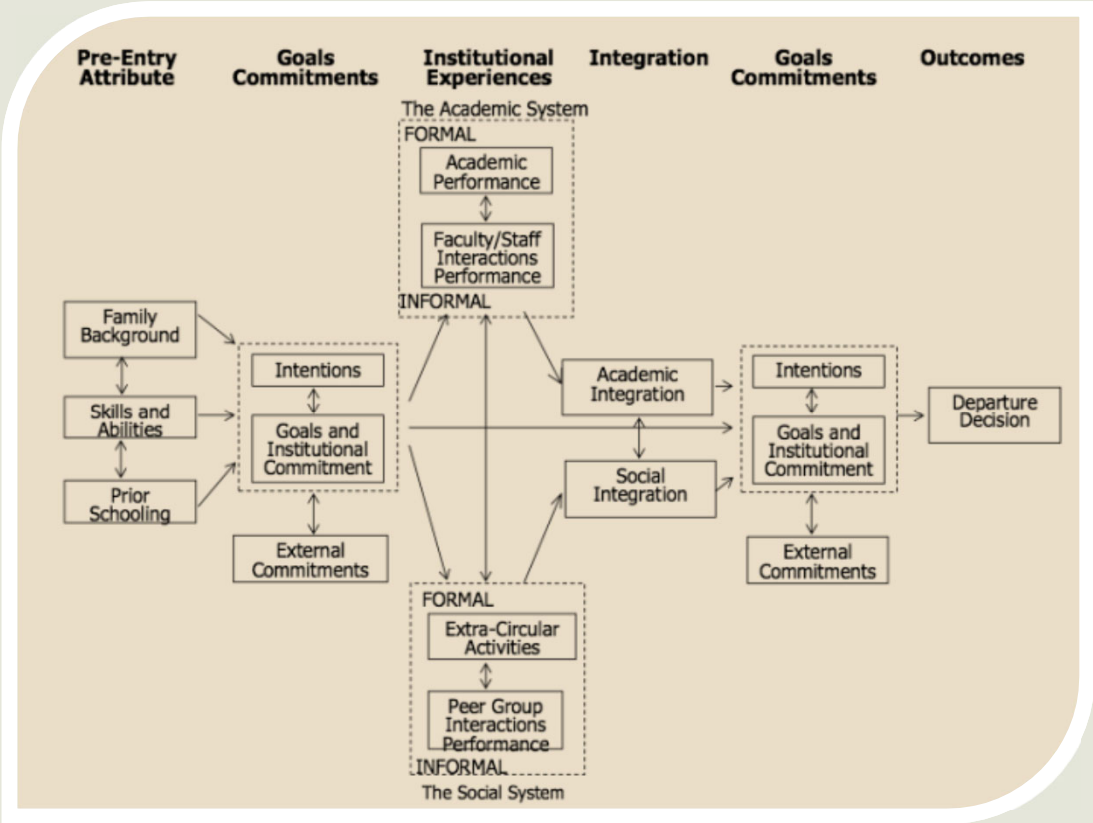


Tinto's Conceptual Schema for Dropping out of College

A General View for Persistence

- Academic Integration
- Social Integration
- Integration with the Community

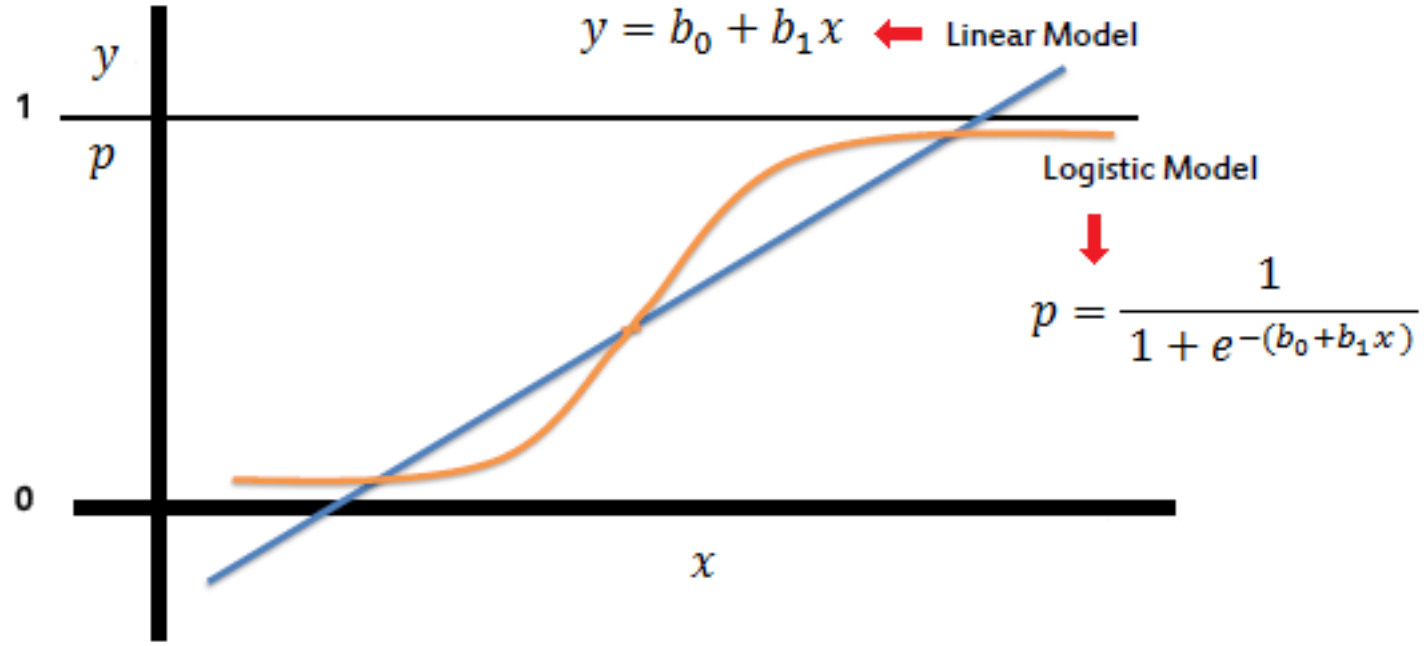
Tinto, 1993



Review of Binary Logistic Regression

- Predict classification into 2 categories (retained or not)
  - Dummy coded as 0 or 1
- Linear Regression Problems
  - e is not normally distributed because Y can only be 2 values
  - The predicted probabilities can be greater than 1 or less than 0
- Logistic Regression
  - Handles outliers in the data
  - Keep prediction bounded between 0 to 1.

Review of Binary Logistic Regression



Developing Our Model

- Goal was to find factors that could identify at risk students
  - Prior to entering, prior to midterm grades, early intervention
- Develop coefficients for fall to fall dropout risk
  - Logistic regression model of historical data
- Convert into a retention estimate for incoming students
  - Transform logit(p) into probability scores

Data Description

- Utilized data that we had on hand
  - Fall 2016 and 2017 FTFT
- Data elements
  - Academic prep (HS rank, test score – converted to ACT)
  - Financial aid unmet need
  - Student demographics (race, gender, first gen, distance)
  - University elements (athlete, on-campus housing, 1st term GPA)

Running the Numbers

- Binary logistic regression
  - Standard entry method
  - Including first semester GPA
- Saved the output probabilities to classify into deciles
- Reviewed how they were classified

First Run Results – Fall - Fall Binary Logistic

	Predicted Retained		
Actual Retained	0 no	1 yes	Percentage Correct
0 no	250	267	48.4
1 yes	83	902	91.6
Overall %			76.7

a. The cut value is .500; HL sig = .179; Nagelkerke R sq = .336
b. Base Rate 65.6%

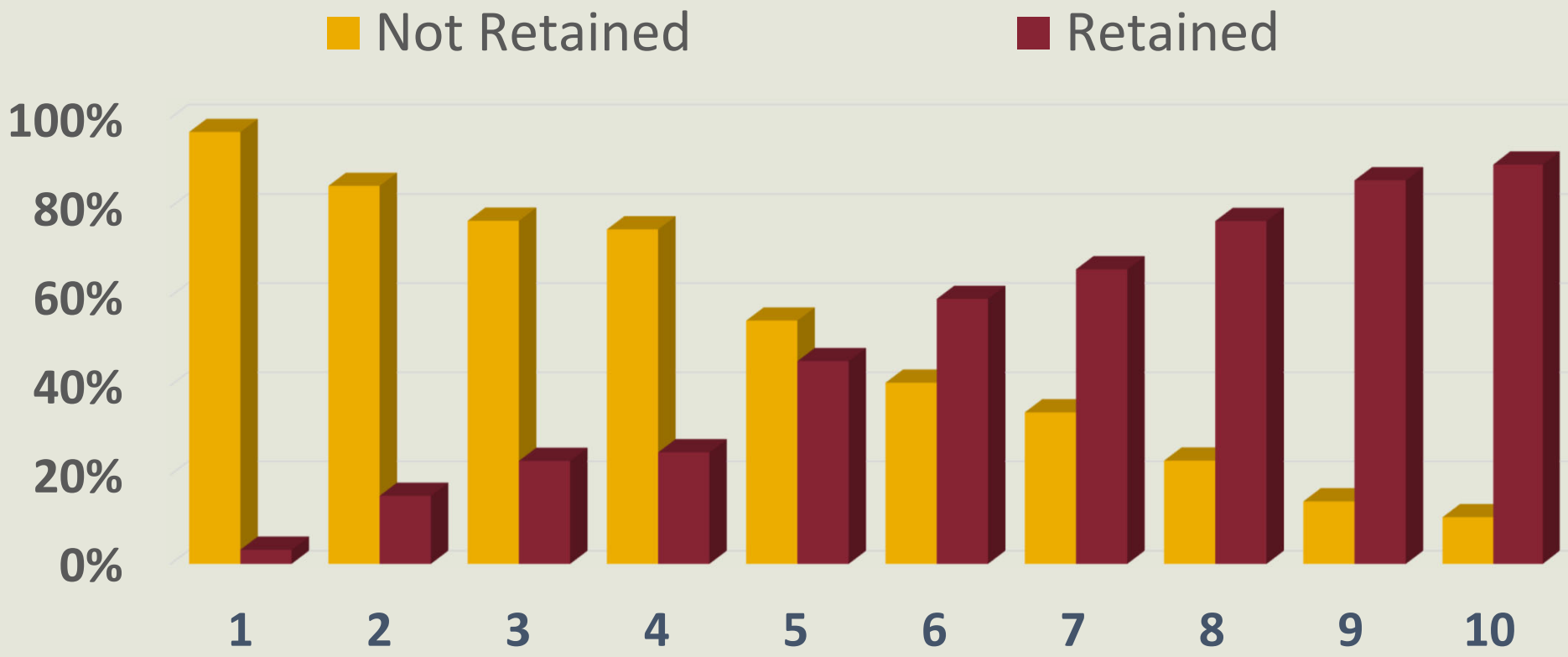
Student Success is the Best Predictor

Predictors	B	S.E.	Wald	df	Sig.	Exp(B)
termgpa	**1.254**	**0.089**	**198.75**	**1**	**0.00**	**3.50**
unmet100	**-0.007**	**0.002**	**18.45**	**1**	**0.00**	**0.99**
white(1)	**0.348**	**0.136**	**6.51**	**1**	**0.01**	**1.42**
campushousing(1)	0.267	0.159	2.80	1	0.09	1.31
distance	-0.001	0.001	2.59	1	0.11	0.99
woman(1)	-0.186	0.133	1.95	1	0.16	0.83
entranceexam	0.028	0.020	1.87	1	0.17	1.03
high school % rank	0.000	0.003	0.00	1	0.98	1.00
Constant	**-2.867**	**0.513**	**31.28**	**1**	**0.00**	**0.06**

Convert to Probability

- log odds = -2.867+(1.54*GPA)+ (1.007* unmetneed100) +……. Similar to a regression line for linear regression
- odds = exp(log odds) = base of the natural logarithm (2.71828) raised to the power of the log odds
- Probability = odds / (1+odds) = .754
  - This is the probability of retention

Predicted Retention Decile



Focus on the Middle

- Students with a 40% to 70% probability of retention
  - Most likely to have an influence
- 450 students in this range in sample
- About 225 in fall class
- 9 student retained = 1% point
- Long term effects revenue, graduation rates

Classification Rate Before Fall

	Predicted Retained		
Actual Retained	0 no	1 yes	Percentage Correct
0 no	139	378	26.9
1 yes	83	902	91.6
Overall %			69.3

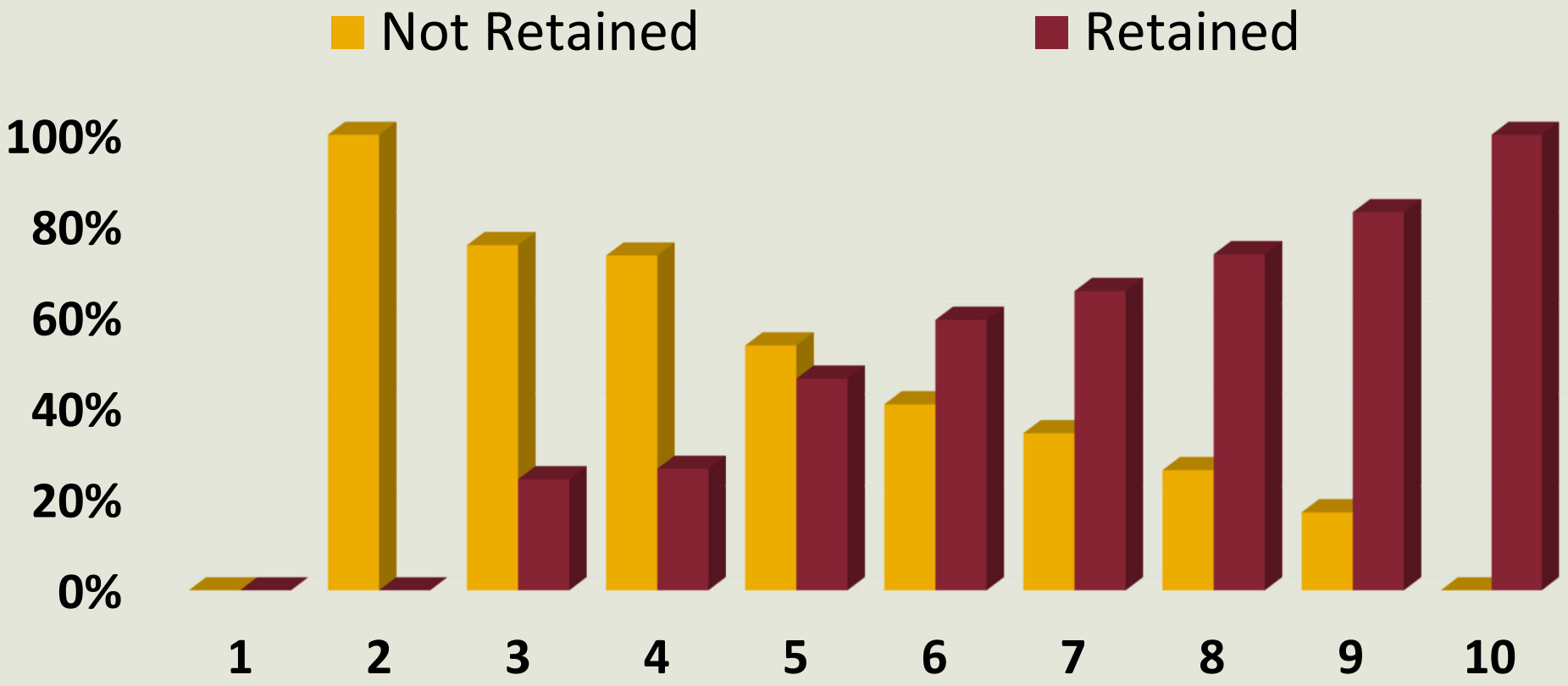
a.The cut value is .500; HL sig = .617; Nagelkerke R sq = .126

a.Base Rate 65.6%

Before Fall Logistic Regression

Predictors	B	S.E.	Wald	df	Sig.	Exp(B)
Unmet100	**-0.01**	**0.00**	**58.10**	**1**	**0.00**	**0.99**
high school % rank	**-0.01**	**0.00**	**20.23**	**1**	**0.00**	**0.99**
woman(1)	**-0.46**	**0.12**	**14.75**	**1**	**0.00**	**0.63**
entranceexam	**0.06**	**0.02**	**9.83**	**1**	**0.00**	**1.06**
white(1)	**0.27**	**0.12**	**4.81**	**1**	**0.03**	**1.31**
campushousing(1)	0.20	0.14	2.02	1	0.16	1.22
distance	0.00	0.00	0.31	1	0.58	1.00
Constant	**0.31**	**0.42**	**0.55**	**1**	**0.46**	**1.36**

Predicted Decile Retention Prior to Fall



Retention Probability Before Fall

- Not nearly as accurate as prediction with term GPA
- Demographic and academic indicators become more important
  - Commonly associated with academic success
- Academic success of students is driving retention
  - Need better indicators of success
  - Need to understand students' perceptions/need

Why Focus Groups?

Pros:

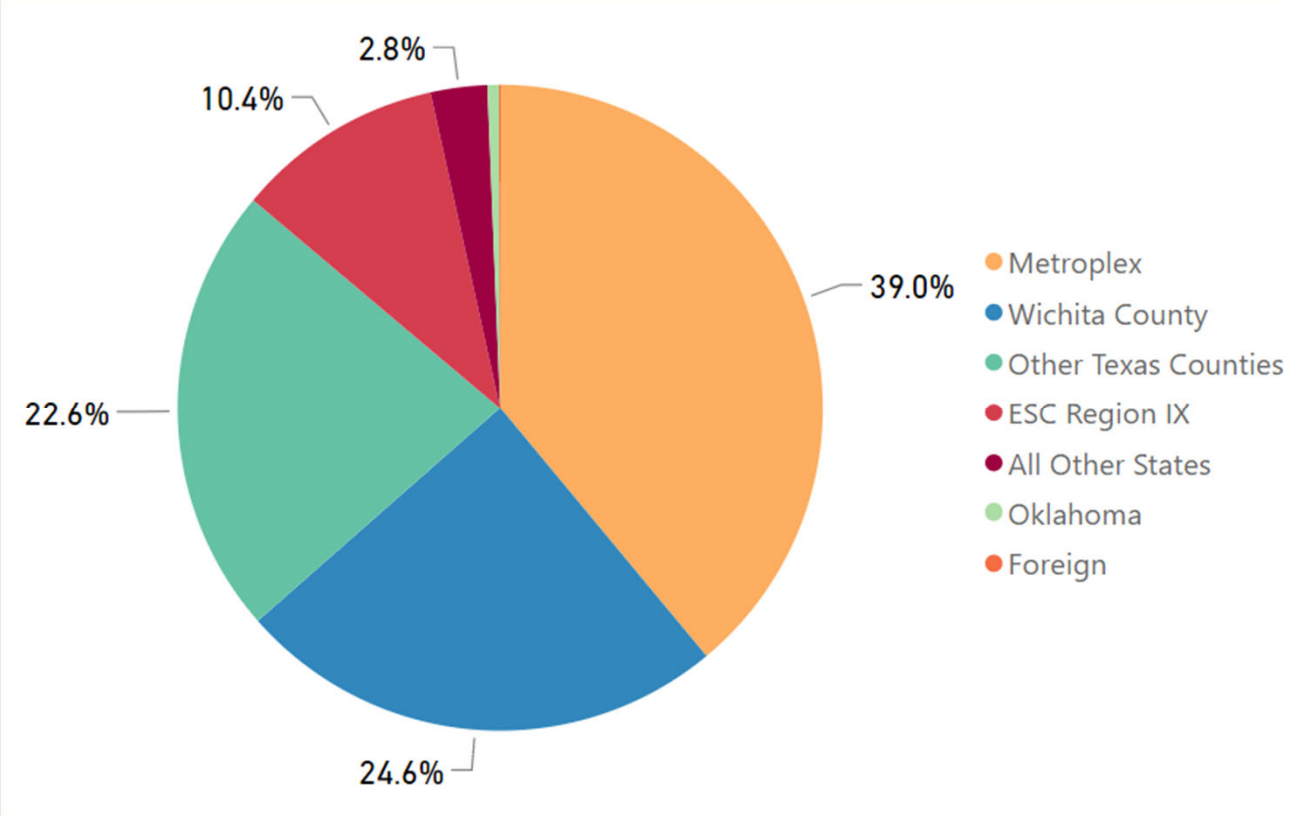
- **Helps to understand perceptions, beliefs, thought processes**
- **Small number of participants**
- **Focus groups encourage group interaction and building upon ideas**
- **Responsive in nature**
- **Relatively low costs involved**

Cons:

- **Getting participants (think of time/places)**
- **Data collection and analysis takes time**
- **Data is as good as the facilitator**
- **Beware of bias in analysis reporting**
- **Meant to tell story, may not help if numbers are needed**
- **Data is not meant to be generalizable**

Fall 2018 Cohort Focus Groups

- High School Class rank between 20-75%
- US Resident
- IPEDS first year
- Full Time (12+ hrs)
- Retained to Spring 2019



Focus Group Sample Sizes

- Student Group #1 – 5 students (4 Female, 1 Male)
- Student Group #2 – 9 students (8 Female, 1 Male)
- Advisor Group – 11 advisors including Financial Aid, Academic Advisors, Tutoring, Counseling, and disability services.
- Faculty Group – 8 Faculty members representing all of the MSU colleges

Academic Integration

Academic Performance

What is academic success to you? (Student Perspective)

- A successful career
- Having a good GPA
- Disciplined enough to go to class

Academic Integration

Academic Performance

Describe the elements of a successful student. (Faculty)

- Attend class regularly
- Eagerly participate
- Motivation – “I need a job.”

Academic Integration

Faculty/Staff Interaction

What do you wish your professors knew about you? (Students)

- They would teach slower
- In the smaller classes, “they know who I am”
- “Without overheads or notes, I tend to zone out”

Academic Integration

Faculty/Staff Interaction

What skills are required for a student to succeed in your classroom? (Faculty)

- Students need to be motivated … many struggle with short attention span
- Many students don't even know "who we are"
- Have to be able to write

Social Integration

Extra-Curricular Activities

How are you involved in the MSU Community? (Students)

- "I've been wanting to, but I don't know where to look." (2)
- Was looking at one of the sororities and a Hispanic organization
- Go to the Rec Room and the Gym once in a while

Social Integration

Extra-Curricular Activities

Do your students seem to be engaged in the MSU Community? (Faculty & Advisors)

- They seem to *enjoy* the food pantry
- So many work, so they're unable to come to evening programming
- Many are busy taking care of their own families

Social Integration

Peer Interactions and Performance

What non-academic issues do you and/or peers have? (Students)

- A roommate left because of homesickness
- A roommate left due to finances
- A roommate left because she had life issues and advisor didn't help

Social Integration

Peer Interactions and Performance

Which issues do you feel are most burdensome for your students? (Advisors)

- "They don't have a mom to take care of things anymore"
- Food and nourishment can be an issue for some
- Some students take care of siblings … feel guilty about being "selfish"

Social Integration

Peer Interactions and Performance

What non-academic obstacles have you observed impeding your students' learning? (Faculty)

- Parents divorcing
- Childcare
- Mental health issues – fail a midterm – begin downward spiral

Discussion?