IU IUPUI INSTITUTIONAL RESEARCH AND DECISION SUPPORT

Purpose of the analysis

The following analyses sought to answer three questions related to five 100-level Math courses: MATH 11000 (11000), MATH 11100 (11100), MATH M118 (M118), MATH M119 (M119) and MATH 15300 (15300). The three questions are: 1) What is the DFW rate by section?; 2) What are the characteristics of students who received a DFW in these courses?; and 3) Can we predict which students will receive a DFW in these courses? Major findings are listed below.

Major Findings

- DFW rates varied greatly by section within all five courses, though the differences were not statistically significant. Further investigation into student, faculty, and course attributes related to DFW rates may be necessary to improve student performance.
- In all five courses, students who received a D, F, or W had a lower high school GPA and lower average SAT score than students who earned a higher grade. A significantly higher percentage of African American students received a D, F, or W in 11000, M118, and 15300. A significantly higher percentage of first generation students received a D, F or, W in 11100, M118, and M119. Pell recipients had a higher DFW rate in every course except 11000.
- Continuing students had a higher DFW rate in all five courses analyzed. However, continuing students also had a lower high school GPA and were more likely to be attending part-time. In addition, continuing students in M118, M119, and 15300 had a lower average SAT score than beginners and were significantly less likely to be a direct admit.
- In four of the courses analyzed (11000, M118, M119, and 15300), continuing students were significantly more likely to be African American.
- Continuing students enrolled all five courses in the Fall semester 2016 and 2017 had a lower high school GPA and were less likely to be enrolled full-time than beginners enrolled in the same courses. In three courses (M118, M119, and 15300), continuing students also had a lower average SAT score than beginners.
- Two of the courses (11100 and 15300) were designed for STEM majors, while 3 courses (11000, M118, M119) were designed primarily for Liberal Arts and Business majors. Students intending to major in Business or Liberal Arts had much higher DFW rates when completing the STEM focus courses than when completing the Liberal Arts/Business courses.
- High school GPA and SAT scores had a significant and positive effect on earning a grade higher than a D, F, or W in both 11000 and 11100. Majoring in Engineering or the School of Science had a significant and positive effect on earning a grade higher than a D, F, or W in 11100.
- In M118, high school GPA, majoring in Business, and majoring in Nursing had a significant and positive effect on earning a grade higher than a D, F, or W. Majoring in Liberal Arts had a significant and negative effect on earning a grade higher than a D, F, or W in M118.

Question 1: What is the DFW rate by section?

DFW rates by course and section for Fall 2017 and Spring 2018 can be found in Appendix A. Though differences in DFW rates by section were not statistically significant there were several notable differences. In Fall 2017, the DFW rate for MATH 11100 section 36517 (N=43 students) was 60%, compared to a 12% DFW rate in MATH 21161 (N=51 students). Keep in mind, these differences do not

account for student composition of the class. Course level DFW rates may be affected by student factors (majors of students in the class, math ability, etc.) as well as characteristics of the course and instructor. Further investigation is warranted.

Question 2: What are the characteristics of students who received a DFW in these courses?

Appendix B displays the characteristics of students who earned a DFW in either Fall 2016 or Fall 2017 compared to those who did not. In all five courses, students who received a D, F, or W had a lower high school GPA and lower SAT score than students who earned a higher grade. A significantly higher percentage of African American students received a DFW in MATH 11000, MATH M118, and MATH 15300, and a significantly higher percentage of first generation students earned a DFW in MATH 11100, MATH M118, and M119. Students in campus housing were significantly less likely to receive a DFW in every course except MATH 11100, while students who received a Pell grant had a significantly high DFW rate in every course except 11000. (Table 1).

Table 1
Select demographic and academic characteristics by receipt of a D, F, or W
Fall 2016 and Fall 2017 students[1]

	N	African American	High School GPA	Best SAT score	Full Time [2]	Campus housing [2]	Received Pell [2]
			Average			*Percentages*	
MATH 11000							
No DFW	1,238	*12%*	*3.30*	*963*	96%	*36%*	47%
DFW	601	*19%*	*3.12*	*923*	96%	*26%*	50%
Total	1,839	*14%*	*3.25*	*950*	96%	*33%*	48%
MATH 11100							
No DFW	906	11%	*3.37*	*986*	96%	35%	*41%*
DFW	519	14%	*3.15*	*948*	93%	30%	*52%*
Total	1,425	12%	*3.29*	*972*	95%	33%	*45%*
MATH M118							
No DFW	1,825	*8%*	*3.44*	*1049*	94%	*31%*	*37%*
DFW	647	*19%*	*3.08*	*940*	90%	*15%*	*47%*
Total	2,472	*11%*	*3.35*	*1022*	93%	*27%*	*39%*
MATH M119							
No DFW	714	7%	*3.38*	*1053*	95%	*27%*	*35%*
DFW	218	11%	*3.15*	*984*	93%	*19%*	*43%*
Total	932	8%	*3.33*	*1037*	94%	*25%*	*37%*
MATH 15300							
No DFW	864	*8%*	*3.48*	*1069*	94%	*32%*	*38%*
DFW	647	*14%*	*3.25*	*997*	92%	*25%*	*45%*
Total	1,511	*11%*	*3.38*	*1039*	93%	*29%*	*41%*

[1] Items where chi-square or t-tests are significantly at $p \leq 0.05$ are bold at italicized.

[2] As of the semester in which the course was taken.

In every course, a significantly smaller percentage of students who were first-time beginners received a DFW, while a significantly greater percentage of continuing students received a DFW (Table 2). It should be noted, however, that beginners were very different from the continuing students who were enrolled in these courses. One important difference is that continuing students were significantly more likely to be African American in every course except MATH 11100. Furthermore, in every course, continuing students were significantly less likely to be attending full-time and had significantly lower high school GPAs than beginners who were enrolled in these courses. In Math M118, M119, and 15300, continuing students also had significantly lower average SAT scores than beginners, and were less likely to be directly admitted to their school. Continuing students in all five courses tended to be more at risk for lower grades than beginners who were enrolled. Interestingly, continuing students in M118 and M119 were significantly more likely to have a Pell grant than beginners. In 11000, however, continuing students were significantly *less* likely to have a received a Pell grant.

Table 2
Differences between beginners, transfers, and continuing students in
Fall 2016 and Fall 2017 courses[1]

	DFW	African American	High School GPA	Best SAT score	Full Time [2]	Campus housing [2]	Received Pell [2]
	N			*Average*			*Percentages*	
MATH 11000							
Beginners	1,451	*31%*	*13%*	*3.29*	953	*99%*	*40%*	*49%*
Transfers	182	*40%*	*19%*	*3.01*	946	*92%*	*5%*	*51%*
Continuing	206	*40%*	*20%*	*3.04*	930	*83%*	*8%*	*39%*
Total	1,839	*33%*	*14%*	*3.25*	950	*96%*	*33%*	*48%*
MATH 11100							
Beginners	1,091	*34%*	12%	*3.33*	973	*98%*	*41%*	46%
Transfers	141	*43%*	11%	*2.98*	969	*89%*	*6%*	38%
Continuing	193	*43%*	12%	*3.17*	967	*80%*	*8%*	45%
Total	1,425	*36%*	12%	*3.29*	972	*95%*	*33%*	45%
MATH M118							
Beginners	1,050	*17%*	*6%*	*3.56*	*1074*	99%	*53%*	*34%*
Transfers	336	*35%*	*14%*	*3.07*	*997*	92%	*5%*	*42%*
Continuing	1,086	*32%*	*15%*	*3.19*	*968*	87%	*8%*	*44%*
Total	2,472	*26%*	*11%*	*3.35*	*1022*	93%	*27%*	*39%*
MATH M119							
Beginners	396	*18%*	*5%*	*3.48*	*1088*	99%	*48%*	*34%*
Transfers	105	*24%*	*3%*	*3.12*	*994*	95%	*8%*	*31%*
Continuing	431	*28%*	*13%*	*3.23*	*992*	89%	*8%*	*41%*
Total	932	*23%*	*8%*	*3.33*	*1037*	94%	*25%*	*37%*
MATH 15300							
Beginners	885	*36%*	*9%*	*3.50*	*1072*	99%	*44%*	41%
Transfers	118	*49%*	*10%*	*3.09*	*1032*	88%	*5%*	36%
Continuing	508	*54%*	*15%*	*3.21*	*971*	83%	*9%*	42%
Total	1,511	*43%*	*11%*	*3.38*	*1039*	93%	*29%*	41%

*Items where chi-square or t-tests are significantly at $p \leq 0.05$ are bold at italicized.

Because different math course sequences are recommended for different majors, DFW rates by school of intended major were also calculated. These can be found in Appendix D. In STEM focused courses, students majoring in programs in Engineering and the School of Science were less likely to receive a D, F, or W than students intending to major in Technology programs. Intended major did not seem to have much effect in 11000. However, in other non-STEM courses, students intending to major in the Kelley School of Business or the School of Nursing tended to perform better.

Question 3: Can we predict which students will receive a DFW in these courses?

Logistic regression was used in order to assess and determine which factors have the greatest influence in determining which students will earn a grade higher than a D, F, or W in each course (see Appendix E). Different models using slightly different variables were developed for each of the five courses. For example, the correlation between best SAT score and high school GPA was significant but relatively modest for students taking 11000 and 11100 (r=0.20 for students in 11000, r=0.23 for students in 11100). However, the correlation was much stronger in the other three courses (r=0.32 in 15300, r=0.52 in M118, and r=0.45 in M119). Both SAT score and high school GPA were used in models for 11000 and 11100, but these were not used in 15300, M118, and M119. In addition, because different students in different degree programs are expected to take different courses, different combinations of majors were explored in each course.

Both high school GPA and SAT score were significantly associated with earning a grade higher than a DFW in both 11000 and 11100. Being an African American student had a negative association with earning a grade higher than a DFW in 11000, however the effect was not strong and may be related to other factors. For 11100, high school GPA had a positive association with earning a grade higher than a DFW. This course is designed for students pursuing STEM fields, so it is perhaps not surprising that majoring in Engineering or the School of Science was associated with earning a grade higher than a DFW. It should be noted, however, that majoring in a Technology program in the School of Engineering and Technology was not significantly associated with earning a DFW net the effect of the other variables included in the model (see Table 3). It should also be noted that, while statistically significant, neither model was particularly strong (R^2=0.069 for 11000 model; R^2=0.080 for 11100). Other student factors not studied, such as math self-efficacy, time commitments, or study strategies, may still be related to success in 11000 and 11100. Math placement test scores and previous experiences in Math courses may also lend insight into success in these courses.

The strongest model developed for any course was M118. The significant effects can be seen in Table 4 below. About 76% of Fall 2016 and Fall 2017 students were correctly classified as receiving a DFW or not using this model. Once again, high school GPA was significantly and positively associated with earning a grade higher than a D, F, or W. Intending to major in the Kelley School of Business or Nursing was also significantly and positively associated with earning a higher grade. The effect was notably strong for Kelley students, as intending to major in Kelley had about double odds of earning a grade higher than a D, F, or W than non-Kelly students. Being a Liberal Arts major, being a first generation student, and being African American were all significantly associated with earning a D, F, or W net the effect of the other independent variables.

Table 3
Significant effects for MATH 11000 and MATH 11100

Variable	MATH 11000		Math 11100	
	B	Odds Ratio	B	Odds Ratio
African American	*-0.36*	*0.70*	0.05	1.05
High School GPA[1]	*1.52*	*4.59*	*1.69*	*4.56*
Best SAT centered[2]	*2.23*	*9.32*	*1.35*	*3.84*
Engineering or Science major	--	--	*0.35*	*1.42*

[1] Effect represents high school GPA compared to class average. For 11000, the average high school GPA was 3.26. For 11100, the average high school GPA was 3.30.

[2] Effect represents SAT score compared to average SAT of students included in these analyses (mean=1002).

Table 4
Significant effects for MATH M118

Variable	MATH M118	
	B	Odds Ratio
African American	*-0.39*	*0.68*
High School GPA[1]	*1.66*	*5.27*
Majoring in Kelly	*0.72*	*2.06*
Majoring in Liberal Arts	*-0.40*	*0.67*
Majoring in Nursing	*0.68*	*1.98*

[1] Effect represents high school GPA compared to class average. For M118, the average high school GPA was 3.38.

The model estimating odds of receiving a D, F, or W in Math M119 included only beginners, as the model developed for continuing and transfer student was not statistically significant. About 77% of beginners were correctly classified in the beginner. High school GPA once again had a very strong effect. For every one grade point above average, the odds of receiving a grade better than a D, F, or W increased more than 7 times for beginners and more than 2 times for continuing students. The number of credit hours attempted also had a significant and positive effect on receipt of a grade higher than a D, F, or W net the effect of the other independent variables (see Table 5). Similarly, the model developed for 15300 was much stronger for beginners than it was for continuing and transfer students. About 70% of beginners were correctly classified using this model. For beginners in 15300, high school GPA was once again significantly and positively associated with earning a grade higher than a D, F, or W. Being African American was significantly and negatively associated with earning a GPA (see Table 6).

Table 5
Significant effects for MATH M 119 beginner model

Variable	MATH M119 - Beginners	
	B	Odds Ratio
High School GPA[1]	*2.00*	*7.36*
Hours attempted	*0.29*	*1.33*

[1] Effect represents high school GPA compared to class average. For M119, the average high school GPA was 3.35.

Table 6
Significant effects for MATH 15300 beginner model

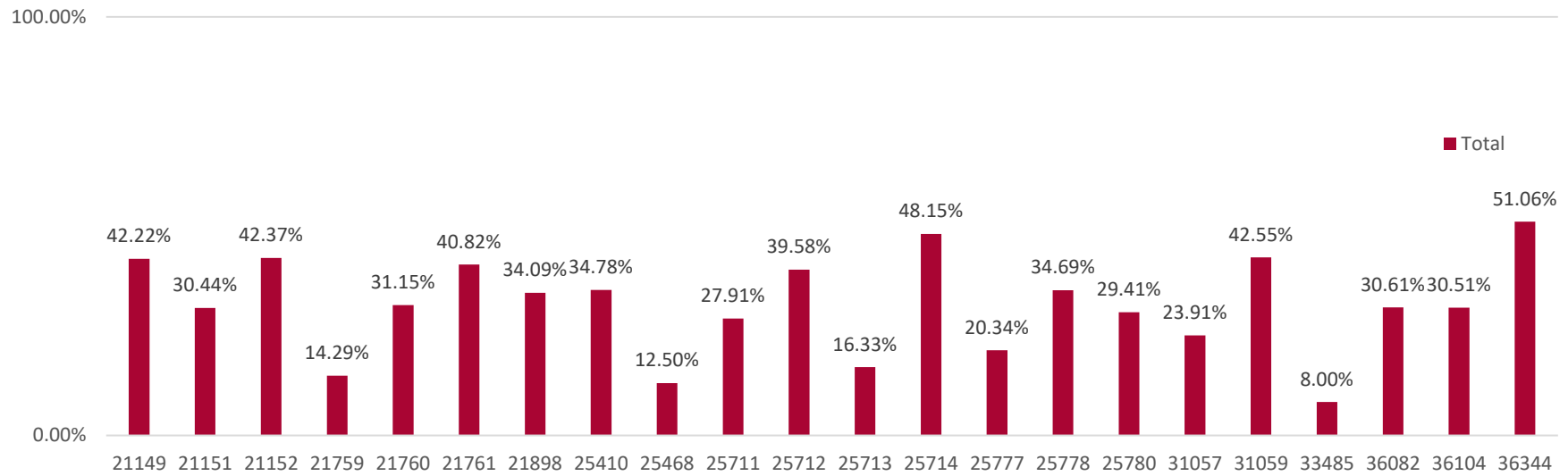|	15300 - Beginners	
	B	Odds Ratio
High School GPA [1]	*1.99*	*7.32*
African American	*-0.52*	*0.59*

[1] Effect represents high school GPA compared to class average. For 15300, the average high school GPA was 3.40.

Conclusions

Though not statistically significant, there are considerable differences in DFW rates between sections. While the exact reasons for these differences are not known at this time, further exploration could highlight the factors that contribute to section-level DFW rates. Students receiving a D, F, or W had a lower high school GPA and were more likely to be attending part-time or not living in campus housing than students who earned a higher grade, regardless of the course. Continuing students were also more likely to earn a D, F, or W than beginners in each course. However, continuing students had a lower high school GPA, were more likely to be attending part-time, and (in M118, M119, and 15300) had a lower SAT score than beginners as well. The predictive models for beginners were also stronger than the predictive models for continuing students in M119 and 15300. Clearly, continuing students in these courses have more characteristics that would indicate the need for additional support. Additional analysis using data such as math course taking patterns or math placement test scores may provide additional help in identifying students in need of additional intervention.

Appendix A
DFW Rate by course and section
Fall 2017
Math 11000

DFW Rate for Fall 2017 Math 11000 by Section
(Average = 40.5%)

Section	Total
21149	42.22%
21151	30.44%
21152	42.37%
21759	14.29%
21760	31.15%
21761	40.82%
21898	34.09%
25410	34.78%
25468	12.50%
25711	27.91%
25712	39.58%
25713	16.33%
25714	48.15%
25777	20.34%
25778	34.69%
25780	29.41%
31057	23.91%
31059	42.55%
33485	8.00%
36082	30.61%
36104	30.51%
36344	51.06%

Math 11100

DFW Rate for Fall 2017 Math 11100 by Section
(Average = 39.2%)
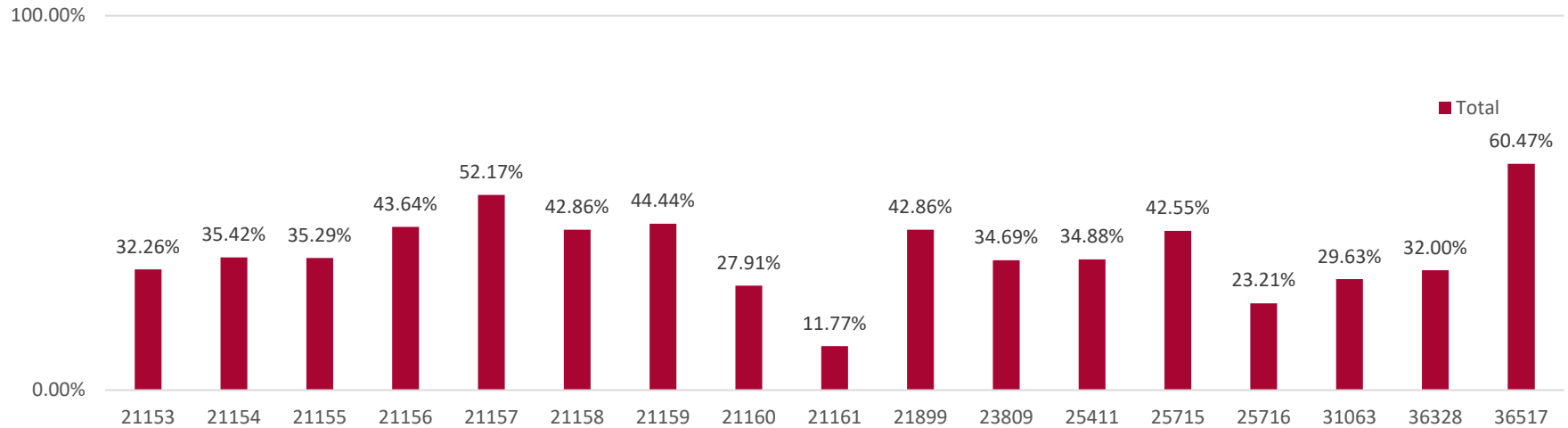
MATH-M118

DFW Rate for Fall 2017 Math M118 by Section
(Average = 25.8%)
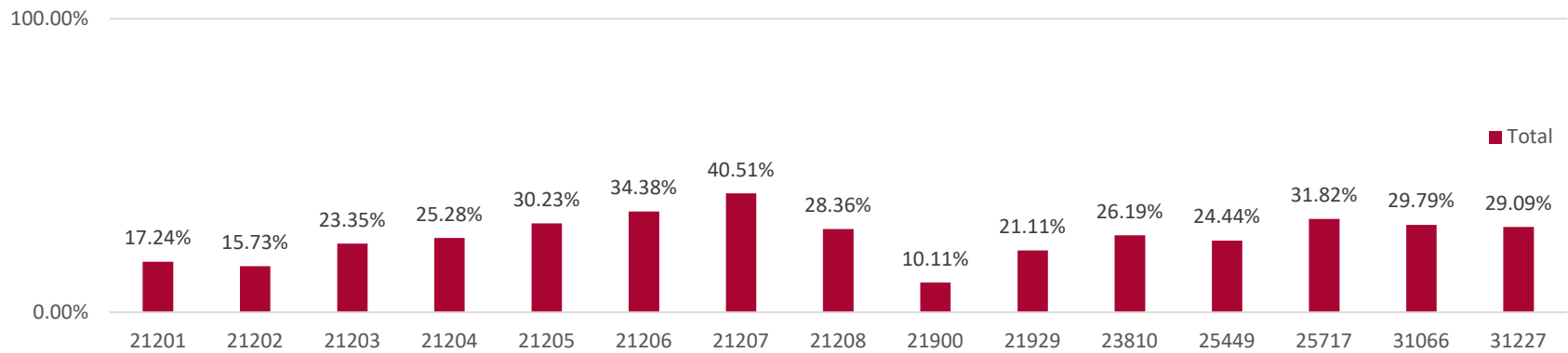
MATH M119

DFW Rate for Fall 2017 Math M119 by Section
(Average = 17.3%)

Section	Total
21209	32.86%
21210	19.40%
21211	18.18%
21213	18.18%
21214	12.12%
25719	21.82%
25720	5.26%
25721	10.53%
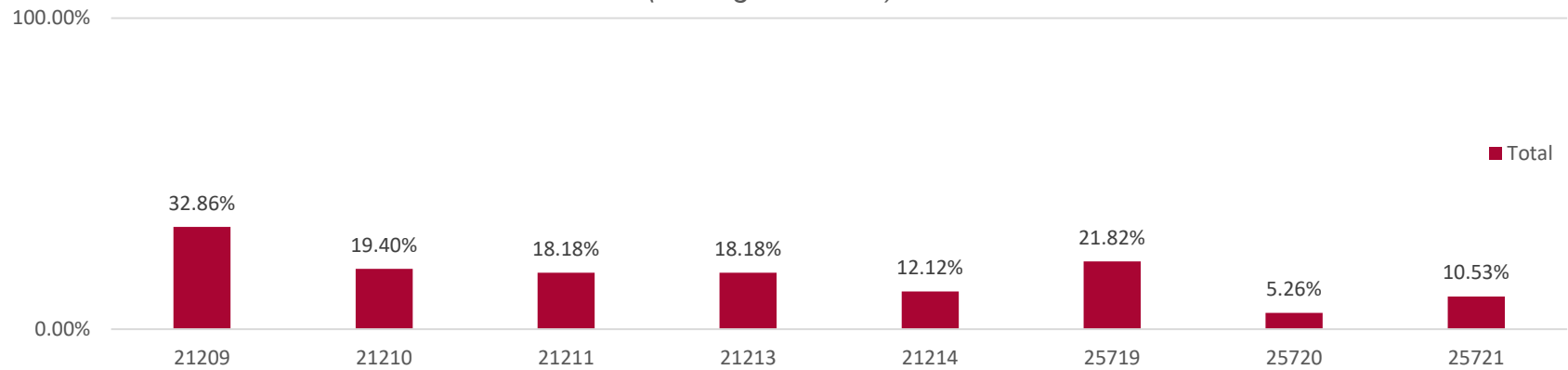
MATH 15300

DFW Rate for Fall 2017 Math 15300 by Section
(Average = 41.8%)

Section	Total
21164	40.68%
21165	46.00%
21166	37.50%
21167	40.35%
21168	33.33%
21169	45.16%
21170	38.18%
21171	47.54%
21172	52.54%
23156	41.67%
23811	38.10%
25462	54.55%
31077	33.33%
31078	36.84%
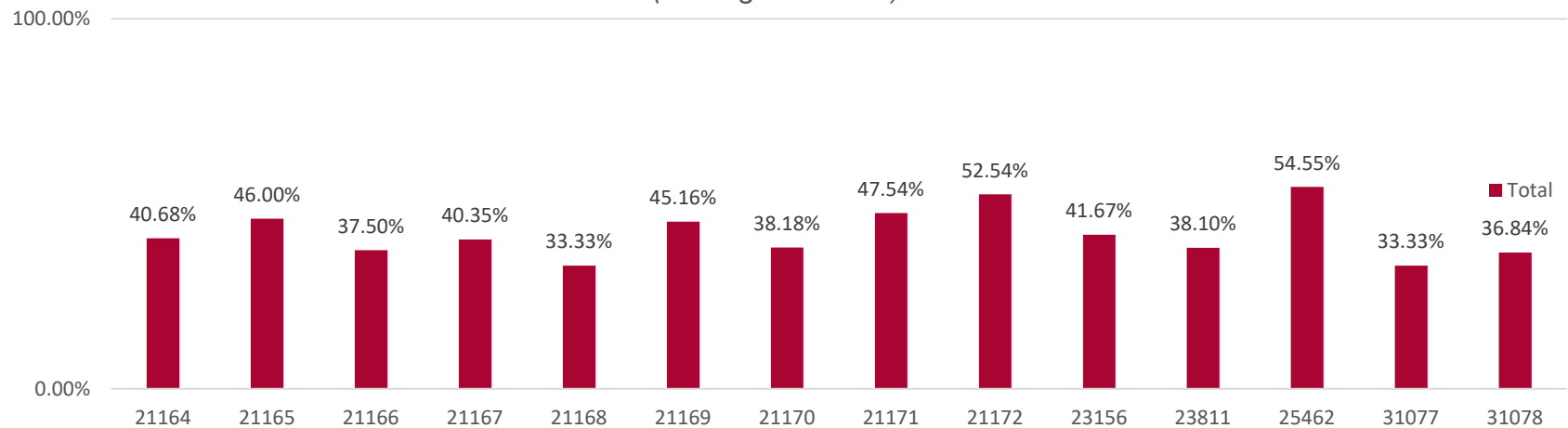
Spring 2018
Math 11000

DFW Rate for Spring 2018 Math 11000 by Section
(Average = 43.1%)
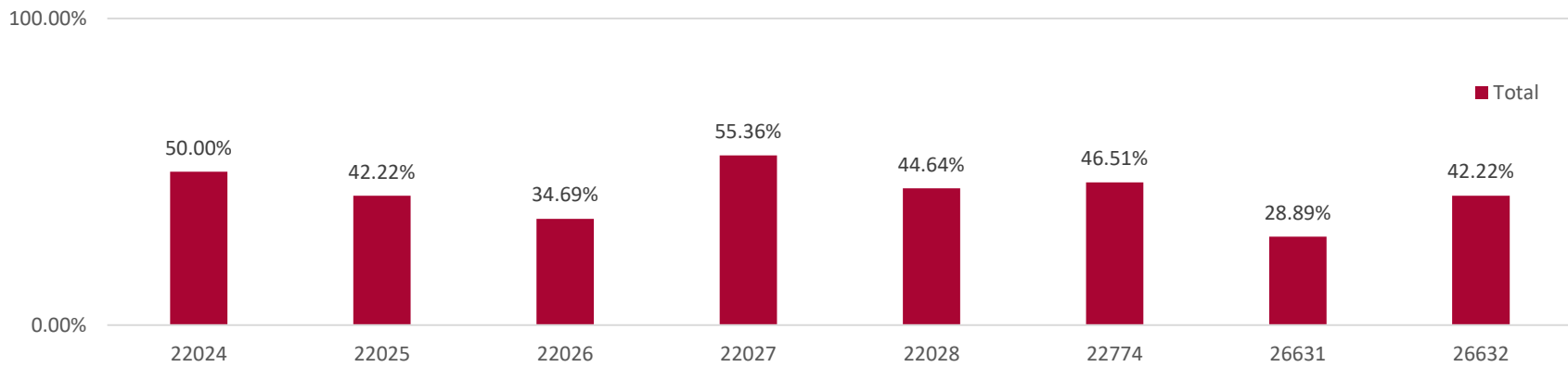
Math 11100

DFW Rate for Spring 2018 Math 11100 by Section
(Average = 43.6%)
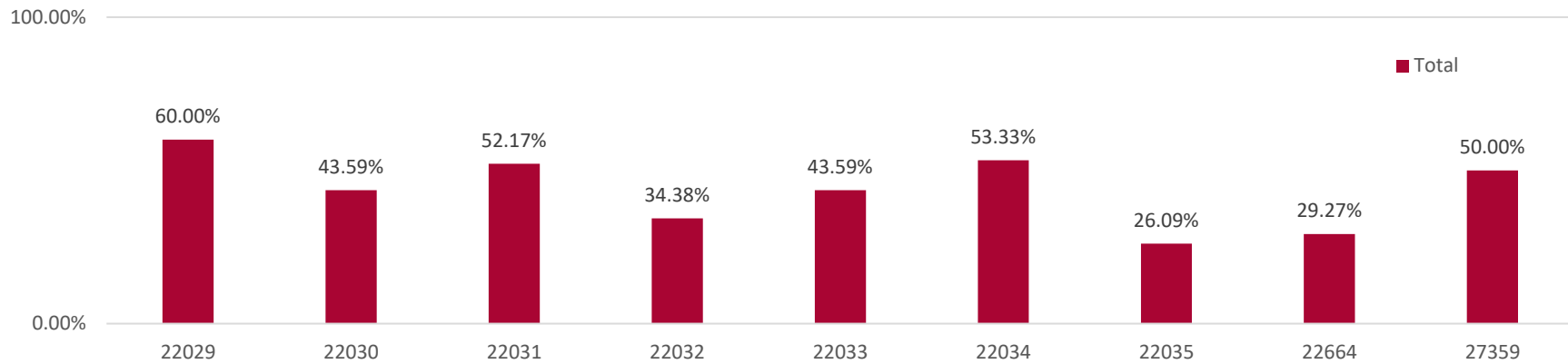
Math M118

DFW Rate for Spring 2018 Math M118 by Section
(Average = 31.9%)
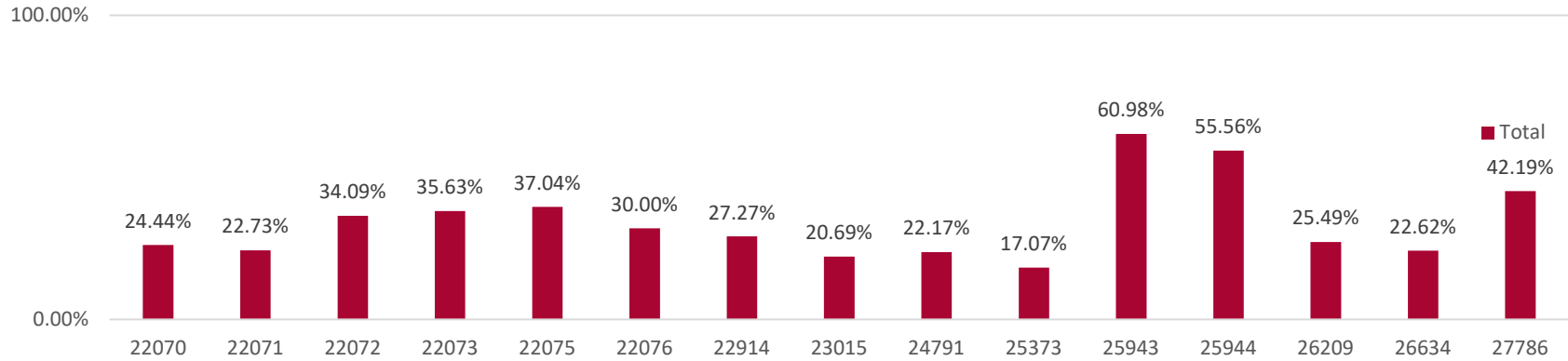
MATH M119

DFW Rate for Spring 2018 Math M119 by Section
(Average = 27.0%)
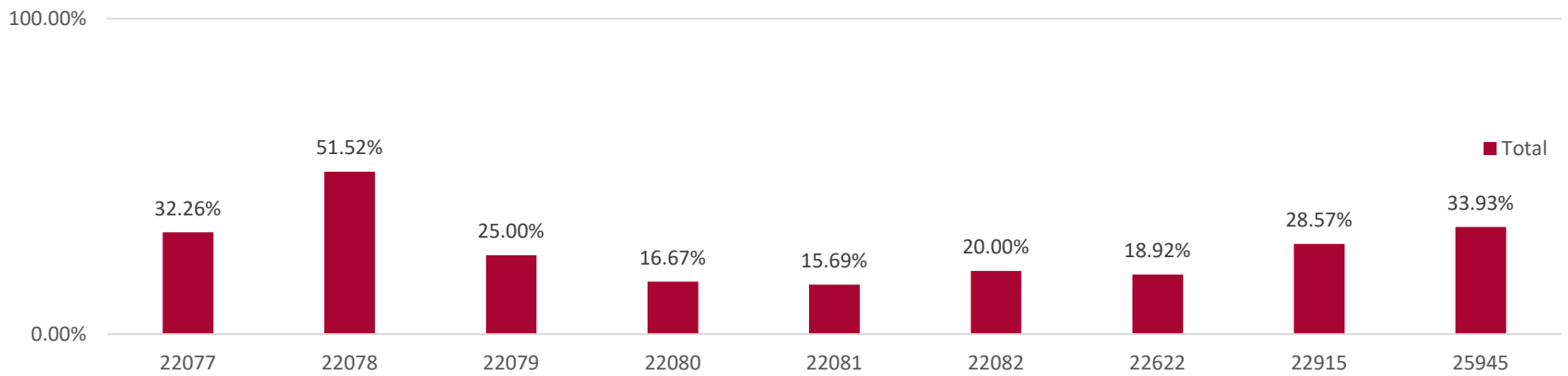
MATH 15300

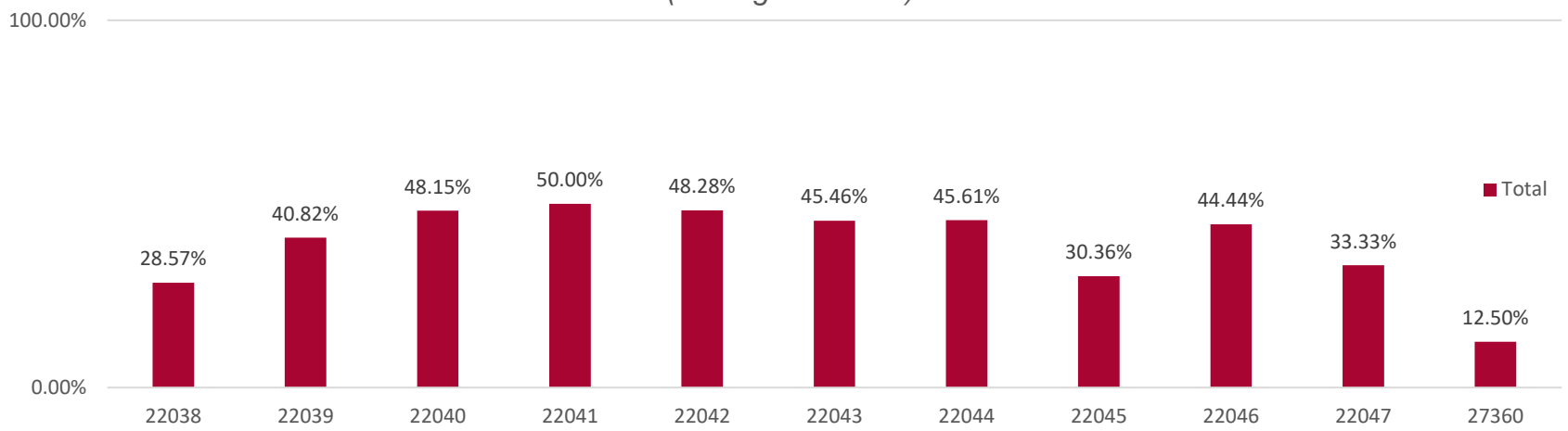### DFW Rate for Spring 2018 Math 15300 by Section
(Average = 38.9%)

100.00%

28.57% 40.82% 48.15% 50.00% 48.28% 45.46% 45.61% 30.36% 44.44% 33.33% 12.50%

■ Total

0.00%

22038 22039 22040 22041 22042 22043 22044 22045 22046 22047 27360

Appendix B

Characteristics of students who received a DFW in MATH 11000, Fall 2016 and Fall 12017

	N	Female	African American	Latinx	Two or More Races	First Generation	High School GPA	Best SAT score	Hours attempted	Attempted 15 or more hours	25 or older at fall census	Full time	Direct admit	Campus housing	Received Pell
			Percentage				Average				Percentage				
No DFW	1,238	62%	*12%*	11%	*5%*	35%	*3.30*	*963*	15.00	69%	5%	96%	28%	*36%*	47%
DFW	601	63%	*19%*	10%	*8%*	36%	*3.12*	*923*	14.89	66%	7%	96%	24%	*26%*	50%
Total	1,839	62%	*14%*	10%	*6%*	35%	*3.25*	*950*	14.97	68%	6%	96%	27%	*33%*	48%

*Items where chi-square or t-tests are significantly at p ≤ 0.05 are bold at italicized.

Characteristics of students who received a DFW in MATH 11100, Fall 2016 and Fall 12017

	N	Female	African American	Latinx	Two or More Races	First Generation	High School GPA	Best SAT score	Hours attempted	Attempted 15 or more hours	25 or older at fall census	Full time	Direct admit	Campus housing	Received Pell
			Percentage				Average				Percentage				
No DFW	906	62%	11%	10%	6%	*33%*	*3.37*	*986*	14.72	61%	6%	96%	22%	35%	*41%*
DFW	519	57%	14%	11%	7%	*39%*	*3.15*	*948*	14.54	58%	7%	93%	22%	30%	*52%*
Total	1,425	60%	12%	10%	6%	*36%*	*3.29*	*972*	14.66	60%	6%	95%	22%	33%	*45%*

*Items where chi-square or t-tests are significantly at p ≤ 0.05 are bold at italicized.

Characteristics of students who received a DFW in MATH M118, Fall 2016 and Fall 12017

		Female	African American	Latinx	Two or More Races	First Generation	High School GPA	Best SAT score	Hours attempted	Attempted 15 or more hours	25 or older at fall census	Full time	Direct admit	Campus housing	Received Pell
	N			Percentage				Average					Percentage		
No DFW	1,825	65%	**8%**	8%	4%	**30%**	**3.44**	**1049**	**14.54**	**62%**	**8%**	94%	32%	**31%**	**37%**
DFW	647	63%	**19%**	11%	5%	**35%**	**3.08**	**940**	**14.03**	**56%**	**13%**	90%	34%	**15%**	**47%**
Total	2,472	64%	**11%**	9%	4%	**32%**	**3.35**	**1022**	**14.40**	**61%**	**9%**	93%	33%	**27%**	**39%**

*Items where chi-square or t-tests are significantly at p ≤ 0.05 are bold at italicized.

Characteristics of students who received a DFW in MATH M119, Fall 2016 and Fall 12017

		Female	African American	Latinx	Two or More Races	First Generation	High School GPA	Best SAT score	Hours attempted	Attempted 15 or more hours	25 or older at fall census	Full time	Direct admit	Campus housing	Received Pell
	N			Percentage				Average					Percentage		
No DFW	714	45%	7%	7%	4%	**27%**	**3.38**	**1053**	**14.61**	61%	6%	95%	**32%**	27%	35%
DFW	218	50%	11%	9%	4%	**35%**	**3.15**	**984**	**14.17**	55%	5%	93%	**19%**	19%	43%
Total	932	46%	8%	7%	4%	**29%**	**3.33**	**1037**	**14.50**	59%	6%	94%	**29%**	25%	37%

*Items where chi-square or t-tests are significantly at p ≤ 0.05 are bold at italicized.

Characteristics of students who received a DFW in MATH 15300, Fall 2016 and Fall 12017

		Female	African American	Latinx	Two or More Races	First Generation	High School GPA	Best SAT score	Hours attempted	Attempted 15 or more hours	25 or older at fall census	Full time	Direct admit	Campus housing	Received Pell
	N			Percentage				Average					Percentage		
No DFW	864	**57%**	**8%**	9%	5%	27%	**3.48**	**1069**	14.35	57%	7%	94%	**49%**	**32%**	**38%**
DFW	647	**51%**	**14%**	9%	6%	32%	**3.25**	**997**	14.15	54%	8%	92%	**39%**	**25%**	**45%**
Total	1,511	**54%**	**11%**	9%	6%	29%	**3.38**	**1039**	14.27	56%	7%	93%	**44%**	**29%**	**41%**

*Items where chi-square or t-tests are significantly at p ≤ 0.05 are bold at italicized.

Appendix C

Differences between beginners, transfers, and continuing students in MATH 11000, Fall 2016 and Fall 12017

		DFW Rate	Female	African American	Latinx	Two or More Races	First Generation	High School GPA	Best SAT score	Hours attempted	Attempted 15 or more hours	Full time	Direct admit	Campus housing
	N			*Percentage*				*Average*				*Percentage*		
Beginners	1451	**31%**	63%	**13%**	11%	6%	35%	**3.29**	953	**15.20**	**73%**	**99%**	27%	**40%**
Transfers	182	**40%**	58%	**19%**	7%	4%	36%	**3.01**	946	**14.49**	**55%**	**92%**	24%	**5%**
Continuing	206	**40%**	59%	**20%**	7%	3%	37%	**3.04**	930	**13.73**	**47%**	**83%**	30%	**8%**
Total	1,839	**33%**	62%	**14%**	10%	6%	35%	**3.25**	**950**	**14.97**	**68%**	**96%**	27%	**33%**

*Items where chi-square or t-tests are significantly at p ≤ 0.05 are bold at italicized.

Differences between beginners, transfers, and continuing students in MATH 11100, Fall 2016 and Fall 12017

		DFW Rate	Female	African American	Latinx	Two or More Races	First Generation	High School GPA	Best SAT score	Hours attempted	Attempted 15 or more hours	Full time	Direct admit	Campus housing
	N			*Percentage*				*Average*				*Percentage*		
Beginners	1,091	**34%**	61%	12%	11%	6%	37%	**3.33**	973	**15.05**	**67%**	**98%**	21%	**41%**
Transfers	141	**43%**	59%	11%	9%	6%	27%	**2.98**	969	**13.77**	**37%**	**89%**	24%	**6%**
Continuing	193	**43%**	55%	12%	8%	9%	36%	**3.17**	967	**13.10**	**38%**	**80%**	26%	**8%**
Total	1,425	**36%**	60%	12%	10%	6%	36%	**3.29**	972	**14.66**	**60%**	**95%**	22%	**33%**

*Items where chi-square or t-tests are significantly at p ≤ 0.05 are bold at italicized.

Differences between beginners, transfers, and continuing students in MATH M118, Fall 2016 and Fall 12017

	N	DFW Rate	Female	African American	Latinx	Two or More Races	First Generation	High School GPA	Best SAT score	Hours attempted	Attempted 15 or more hours	Full time	Direct admit	Campus housing
	N				Percentage				Average			Percentage		
Beginners	1,050	*17%*	*68%*	*6%*	9%	4%	32%	*3.56*	*1074*	*15.24*	*68%*	*99%*	*37%*	*53%*
Transfers	336	*35%*	*58%*	*14%*	7%	4%	29%	*3.07*	*997*	*14.14*	*57%*	*92%*	*30%*	*5%*
Continuing	1,086	*32%*	*62%*	*15%*	9%	5%	32%	*3.19*	*968*	*13.68*	*54%*	*87%*	*29%*	*8%*
Total	2,472	*26%*	*64%*	*11%*	9%	4%	32%	*3.35*	*1022*	*14.40*	*61%*	*93%*	*33%*	*27%*

*Items where chi-square or t-tests are significantly at $p \leq 0.05$ are bold at italicized.

Differences between beginners, transfers, and continuing students in MATH M119, Fall 2016 and Fall 12017

	N	DFW Rate	Female	African American	Latinx	Two or More Races	First Generation	High School GPA	Best SAT score	Hours attempted	Attempted 15 or more hours	Full time	Direct admit	Campus housing
	N				Percentage				Average			Percentage		
Beginners	396	*18%*	44%	*5%*	8%	4%	27%	*3.48*	*1088*	*15.21*	*71%*	*99%*	*45%*	*48%*
Transfers	105	*24%*	41%	*3%*	4%	3%	30%	*3.12*	*994*	*14.44*	*47%*	*95%*	*15%*	*8%*
Continuing	431	*28%*	50%	*13%*	8%	4%	30%	*3.23*	*992*	*13.87*	*52%*	*89%*	*17%*	*8%*
Total	932	*23%*	46%	*8%*	7%	4%	29%	*3.33*	*1037*	*14.50*	*59%*	*94%*	*29%*	*25%*

*Items where chi-square or t-tests are significantly at $p \leq 0.05$ are bold at italicized.

Differences between beginners, transfers, and continuing students in MATH 15300, Fall 2016 and Fall 12017

	N	DFW Rate	Female	African American	Latinx	Two or More Races	First Generation	High School GPA	Best SAT score	Hours attempted	Attempted 15 or more hours	Full time	Direct admit	Campus housing
	N				*Percentage*				*Average*				*Percentage*	
Beginners	885	***36%***	56%	***9%***	10%	6%	28%	***3.50***	1072	***14.83***	***63%***	***99%***	***53%***	***44%***
Transfers	118	***49%***	50%	***10%***	6%	3%	25%	***3.09***	1032	***13.47***	***43%***	***88%***	***31%***	***5%***
Continuing	508	***54%***	53%	***15%***	9%	6%	31%	***3.21***	971	***13.47***	***46%***	***83%***	***33%***	***9%***
Total	1,511	***43%***	54%	***11%***	9%	6%	29%	***3.38***	1039	***14.27***	***56%***	***93%***	***44%***	***29%***

*Items where chi-square or t-tests are significantly at $p \leq 0.05$ are bold at italicized.

Appendix D

Differences in DFW rates by course and school of intended major

School of Intended Major	STEM – Focused courses				Liberal Arts/Business Focused Courses					
	MATH 11100		MATH 15300		Math 11000		Math M118		Math M119	
	N	DFW rate	N	DFW rate	N	DFW rate	N	DFW rate	N	DFW rate
Kelley School of Business	62	40%	20	65%	330	30%	526	15%	581	21%
School of Dentistry	50	38%	34	35%	59	32%	47	23%	7	0%
School of Education	20	30%	24	42%	121	36%	44	41%	8	13%
School of Engineering and Technology										
Engineering	114	33%	111	39%	33	24%	13	23%	5	40%
Technology	127	53%	207	54%	49	41%	36	44%	48	30%
Herron School of Art and Design	5	20%	8	50%	54	28%	87	25%	4	50%
School of Informatics and Computing Science	8	50%	12	50%	72	25%	147	31%	5	20%
School of Liberal Arts	57	53%	63	44%	148	40%	275	40%	37	32%
School of Medicine	80	40%	89	49%	54	24%	71	34%	13	8%
School of Nursing	167	29%	20	45%	190	26%	500	14%	11	27%
Fairbanks School of Public Health	2	0%	5	20%	7	14%	11	36%	1	0%
School of Physical Education and Tourism Management	121	40%	140	38%	129	39%	97	49%	28	50%
Lilly School of Philanthropic Studies	0	0%	1	100%	6	33%	7	57%	0	0%
School of Science	320	32%	593	40%	207	38%	233	25%	124	26%
School of Health and Rehabilitation Science	81	31%	84	39%	42	40%	43	40%	4	0%
School of Social Work	14	36%	1	0%	59	44%	68	35%	4	25%
School of Public and Environmental Affairs	20	50%	12	75%	123	34%	153	42%	10	0%
University College (Exploratory Baccalaureate)	177	33%	85	36%	154	27%	105	22%	41	34%

Note: Intended major includes students whose primary major is in that school as well as University College students in "pre" programs leading to a major in that school.

Appendix E

Logistic regression models of factors affecting earning a grade higher than a D, F, or W by class

Parameter	11000[1]			11100[2]			M 118[3]			M 119 – Beginners[4]			15300 – Beginners[5]		
	B	Std. Error	Odds Ratio	B	Std. Error	Odds Ratio	B	Std. Error	Odds Ratio	B	Std. Error	Odds Ratio	B	Std. Error	Odds Ratio
High School GPA [a]	*1.52*	*0.19*	*4.59*	*1.70*	*0.20*	*5.46*	*1.67*	*0.14*	*5.27*	*2.00*	*0.46*	*7.39*	*1.99*	*0.24*	*7.32*
SATCentered [b]	*2.23*	*0.55*	*9.32*	1.35	0.58	3.84	--	--	--	--	--	--	--	--	
Number of hours enrolled in that semester	0.02	0.04	1.02	<0.01	0.03	1.00	<0.01	0.02	1.00	*0.29*	*0.10*	*1.33*	<0.01	0.06	1.00
Female	-0.14	0.12	0.87	-0.02	0.14	0.98	-0.12	0.12	0.89	-0.43	0.30	0.65	-0.22	0.16	0.81
African American	*-0.36*	*0.16*	*0.70*	0.05	0.20	1.05	-0.39	0.16	0.68	-0.43	0.58	0.65	*-0.52*	*0.26*	*0.59*
Latinx	-0.05	0.19	0.95	0.14	0.21	1.15	-0.15	0.18	0.86	-0.04	0.52	0.96	-0.15	0.26	0.86
First Generation	0.01	0.12	1.01	-0.22	0.13	0.80	-0.21	0.12	0.81	-0.03	0.33	0.97	-0.13	0.17	0.88
Direct Admit	0.01	0.15	1.01	-0.08	0.17	0.93	0.10	0.13	1.11	0.48	0.35	1.61	0.03	0.17	1.03
Received Pell grant [c]	0.05	0.12	1.05	-0.20	0.14	0.82	-0.08	0.12	0.92	-058	0.31	0.56	-0.22	0.16	0.80
Intended major in Kelly School of Business	0.03	0.16	1.03	--	--	--	*0.72*	*0.16*	*2.06*	0.55	0.32	1.74	--	--	--
Intended major in Liberal Arts	-0.29	0.22	0.75	--	--	--	*-0.40*	*0.17*	*0.67*	-0.08	1.21	0.93	--	--	--
Intended major in Nursing	0.30	0.20	1.35	--	--	--	*0.68*	*0.16*	*1.98*	--	--	--	--	--	--
Intended major in Engineering or School of Science	--	--	--	*0.35*	*0.15*	*1.42*	--	--	--	--	--	--	-0.05	0.17	0.96
Intended major in Technology	--	--	--	-0.34	0.25	0.71	-0.42	0.36	0.66	--	--	--	-0.29	0.29	0.75
Intercept	*0.73*	*0.54*	--	0.78	0.51	--	*1.30*	*0.36*	--	*-3.03*	*1.49*	--	0.78	0.82	--

Model estimates odds that a student will *not* receive a DFW in the course. Bold and italic effects are statistically significant at $\alpha \leq 0.05$. Includes students enrolled in Fall 2017, and Fall 2018 course sections

[1] N=1,623, χ^2= 130.9, df=12, statistically significant at $\alpha \leq 0.05$. McFadden's R^2 = 0.065. 67.7% of students were correctly classified

[2] N=1,230, χ^2= 125.4, df=11, statistically significant at $\alpha \leq 0.05$. McFadden's R^2 = 0.078. 68.8% of students were correctly classified.

[3] N=2,189, χ^2= 325.6, df=13, statistically significant at $\alpha \leq 0.05$. McFadden's R^2 = 0.132. 75.6% of student were correctly classified.

[4.] N=382, χ^2= 55.5, df=10, statistically significant at $\alpha \leq 0.05$. McFadden's R^2 = 0.150. 76.7% of students were correctly classified.

[5.] N=859, χ^2= 100.2, df=10, statistically significant at $\alpha \leq 0.05$. McFadden's R^2 = 0.089. 70.1% of students were correctly classified.

[a.] In order to aid in interpretation, cumulative GPA was centered the average GPA for that course. Average high school GPA was 3.26 for 11000, 3.30 for 11100, 3.38 for M118, 3.35 for M119, and 3.40 for 15300.

[b] In order to aid in interpretation, SAT was standardized around the mean SAT (mean=1002 for students in these analyses).