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Arkansas High School Freshmen Course Failures

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Summary Points

- In 2018-19, 22% of Arkansas high school freshmen failed at least one course; among economically disadvantaged students, the rate is 29%.

- Algebra I is the most commonly failed course.

- After controlling for prior achievement, economically disadvantaged students were 9 percentage points more likely to fail a course their freshman year than more advantaged peers.

- Economically disadvantaged students who are White are 11 percentage points more likely to fail a course than other White students.

- Policies to help failing students include: enacting a "no-zero" and minimum grading policy; and forming mentor relationships with students.

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In this brief, we examine course failures among Arkansas high school freshmen by different student demographic and programmatic characteristics. We find economically disadvantaged students most likely to fail a course their freshman year. We suggest policies to benefit all student demographic and programmatic characteristics.

Introduction

High school grade point averages (HSGPA) are strong predictors of future educational outcomes, perhaps even stronger than traditional performance exams (Allensworth & Clark, 2020).

The University of Chicago's Consortium on School Research finds a student's freshman GPA is highly correlated with future academic successes (Easton et al., 2017). Research conducted by the Office for Education Policy found that freshman GPAs of Arkansas students are associated with academic success like high school graduation and college enrollment (Morris et al., 2021).

Economically disadvantaged students experience the highest chance of academic loss in the freshman year transition (Seeskin et al., 2018). Students from economically disadvantaged backgrounds are at a higher risk of having lower HSGPAs. Washington state freshmen that are economically disadvantaged were 22.5 percentage points more likely to fail a course their freshman year compared to more advantaged freshmen (Gillespie, 2018; OSPI, 2017).

A possible reason course failures occur could be due to unrealized grading bias (Tobisch & Dresel, 2017). The current grading system in the United States disproportionately favors students with privilege and harms students of less privilege (Feldman, 2019). Hannah and Linden (2012) find teachers grade economically disadvantaged students more harshly than more advantaged students.

Algebra I is the most failed course for high school freshmen in America (The Gates Foundation, 2021). Although national data are unavailable, members of underrepresented racial/ethnic groups and students of lower socioeconomic status have higher feelings of believing one is incapable of learning mathematics, which could be related to higher chances of Algebra I failure (Spence, 2020).

Study Design

Our research will answer the following questions:

- What percentage of Arkansas students fail a course freshman year, and how do the failure percentages vary by student demographic characteristics and geographic regions?

- Which courses are most commonly failed by freshman students in Arkansas? Do the courses vary by geographic region?

- Does the likelihood of failing a class freshman year vary after controlling for student demographic characteristics, prior achievement, and district characteristics?

Our anonymized student-level data for Arkansas students consists of 344,624 ninth-grade students from 2009-10 through 2018-19. Data include student demographic characteristics, programmatic characteristics, and course grades. A binary course failure indicator is created for grades of F, E, NC, I-0, or 59 and below. The 2018-19 school year's sample description is below in Table 1.

Table 1: Descriptives of High School Freshmen, Arkansas 2018-19

Male	50.8%	FRL	59.1%
White	62.0%	GT	13.1%
Black	19.2%	ELL	6.8%
Hispanic	13.1%	SPED	11.6%
Other Race	5.8%	*Total N*	*35,180*

The free-or-reduced lunch program indicator, FRL, is a proxy for economically disadvantage. GT is an indicator for students in the gifted and talented program; ELL is an indicator for students who are learning English as a second language; and SPED is an indicator for students in the special education program.

Figure 1: Percentages of at Least One Freshman Course Failure by Student Demographic and Programmatic Characteristics, 2018-19
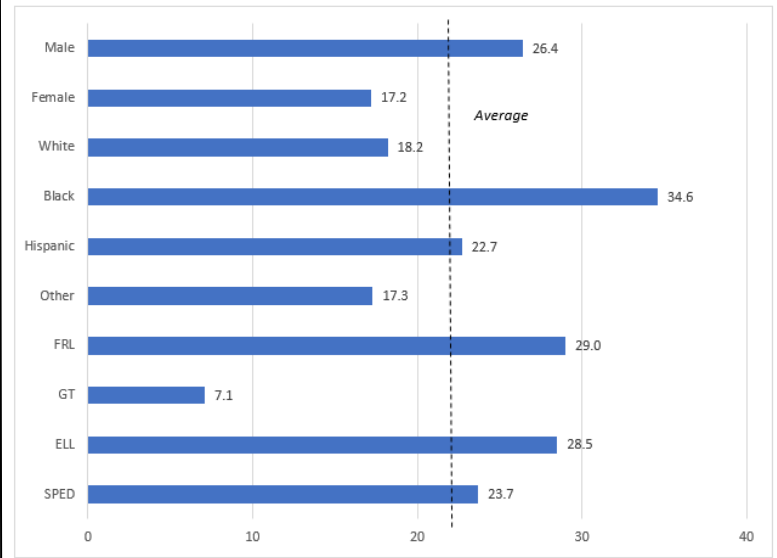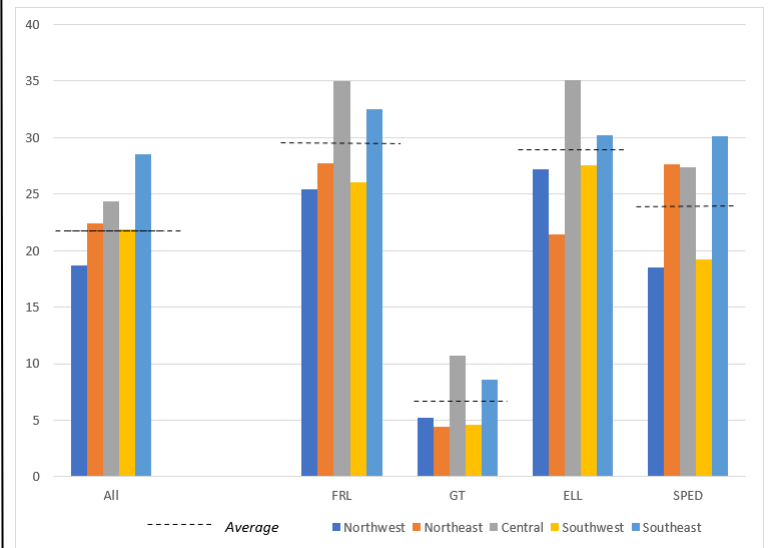

Figure 2: Freshman Course Failure Rate by Geographic Region and Program, 2018-19

Descriptive Trend Analysis

The percentage of Arkansas freshmen failing at least one course was 31.7 in 2008-09, decreasing over time to 21.9 percent in 2018-19. The percentage of students failing are presented by demographic and programmatic characteristics in Figure 1.

Black students have the highest course failure rate among freshman at 34.6 percent, with the economically disadvantaged group following at 29.0 percent in each geographic region of the state. As illustrated in Figure 2, failure rates by student programs differ across geographic regions. Black students are more likely to fail than other racial groups.

Overall, the Northwest region has the lowest failure rate at 18.7 percent, and the Southeast region has the highest failure rate at 28.5 percent. Among programmatic groups however, the FRL, GT, and ELL status course failure percentages are the highest in the Central region.

Students attending high schools in the central region that participate in FRL, GT, or ELL programs are more likely to fail at least one course than we would expect given the overall failure rate for the region and statewide average for those programmatic groups.

We report on which courses had the highest failure rates among Arkansas freshmen to explore our second research question. We limited the analysis to courses that had at least 10 percent of the freshman sample enrolled. The 2018-19 top ten most failed courses are reported below in Table 2.

Table 2: Top Ten Most Failed Courses by Arkansas Freshmen, 2018-19

	Failure Percentage	Core
Algebra I	12.3	✓
Spanish I	9.2	
Physical Science	9.1	✓
Computer Business Applications	8.9	
English 9	8.8	✓
US History since 1890	8.4	✓
Family and Consumer Sciences	6.4	
Art	5.7	
World History since 1450	5.7	✓
Oral Communications	5.1	

As reflected in Table 2, Algebra I is the course failed by the greatest percentage of students. This holds true statewide and by region for all ten cohorts. Spanish I is one of the most failed non-core course for 2018-19, but is not consistently among the most failed courses.

Multivariate Logit Analyses

Prior student achievement and district characteristics may explain the racial and programmatic differences in descriptively obtained failure rates. To explore our third and final research question, we construct a multivariate logistic regression composed of student demographic and programmatic characteristics, prior academic achievement, and district enrollment characteristics to analyze how these are associated with the likelihood of failing at least one course during the freshman year.

The analytic sample for our pooled multivariate analysis includes only freshmen from 2017-18 and 2018-19 with 7th- and 8th-grade state test scores. This limitation sample is necessary to include prior student achievement as a control variable in our analysis of the likelihood of course failures. We limit our analysis to these two groups of freshmen due to the changes in state assessments in prior years. Summary demographic and programmatic information for the sample is presented in Table 3.

Table 3: Descriptive and Analytic Sample Comparison, Freshmen 2017-18 and 2018-19

	Descriptive Sample	Analytic Sample	Difference
Total N	70,068	65,851	-4,217
% Male	51.25	51.04	-0.21
% Female	48.75	48.96	0.21
% White	62.23	62.41	0.18
% Black	19.30	19.53	0.23
% Hispanic	13.00	12.85	-0.15
% Other Races	5.44	5.21	-0.23
% FRL	59.00	59.06	0.06
% GT	13.00	13.72	0.72
% ELL	7.11	6.72	-0.39
% SPED	11.55	10.36	-1.19

The analytic limitation reduces the sample by 4,217 students or 6.1 percent. Baseline imbalance tests reveal no statistically significant differences between the descriptive and analytic sample for males, females, and FRL status students. Significant differences were present, however, for all races and other programmatic groups. This attrition of particular student groups may lead to underestimating our reported effect on freshman course failures, leaving us with a conservative estimate of the relationship between the student characteristics and the likelihood of course failure.

We account for 7th- and 8th-grade math and ELA prior achievement as a control to compare students who are academically similar to one another. We also take into account the differences in district enrollment to compare students in similar school systems. As the multivariate model expands to include controls in our preferred model, we find statistically significant differences between certain student subgroups.

After adding in all controls available for our model in Table 4, we find males are 6.8 percentage points more likely to fail at least one course their freshman year than females. FRL status students are 8.7 percentage points more likely to fail at least one course their freshman year compared to non-FRL status students. Non-ELL status students are 4.6 percentage points more likely to fail a course compared to ELL status students, and students not receiving SPED services are 13.1 percentage points more likely to fail a course their freshman year compared to students receiving SPED services. Economically disadvantaged students are more likely to fail than more advantaged students, yet the programmatic status of ELL and SPED is less likely to fail compared to non-ELL and students not receiving SPED services.

Table 4: Estimated Predictors of Having Failed at Least One Course

VARIABLES	haveFailed
Female	-6.8***
	(0.003)
Black compared to White	-1.5***
	(0.005)
FRL	8.7***
	(0.003)
GT	-3.4***
	(0.005)
ELL	-4.6***
	(0.005)
SPED	-13.1***
	(0.002)
White*FRL compared to White*Non-FRL	11.2***
	(0.004)
Black*FRL compared to Black*Non-FRL	5.5***
	(0.007)
Black*FRL compared to White*FRL	-4.5***
	(0.006)
Hispanic*FRL compared to White*FRL	-4.7***
	(0.007)
Observations	65,851
R-squared	0.2211

Robust standard errors in parentheses

***p<0.01, **p<0.05, *p<0.1

We also report on the interaction between race/ethnicity and FRL status. White FRL status students are 11.2 percentage points more likely to fail at least one course their freshman year compared to White non-FRL status students. Additionally, Black FRL status students are 5.5 percentage points more likely to fail at least one course their freshman year compared to Black non-FRL status students. Lastly, White FRL status students are 4.5 percentage points more likely to fail at least one course their freshman year compared to Black FRL status students.

This model accounts for 22% of the variance of course failures for freshmen across Arkansas. Though our model is not causal, we still report statistically significant differences between student groups and course failures. Due to Algebra I being the most commonly failed course in Arkansas, we use this same model for the probability of failing Algebra I. We don't find many practical differences between failures of student groups other than students not receiving SPED services are almost 5 percentage points more likely to fail Algebra I compared to students receiving SPED services.

Discussion

Our study examined which student demographic and programmatic characteristics were associated with a higher likelihood of failing a course during freshman year. We find large disparities between FRL status students and non-FRL status students and even greater disparities between White FRL status students and White non-FRL status students. FRL status students are on average 8.7 percentage points more likely to fail a course their freshman year than non-FRL status students, while White FRL status students are 11.2 percentage points more likely to fail a course their freshman year than White non-FRL status students.

The four programs we reported in the analysis are FRL, GT, ELL, and Special Education. Students participating in GT, ELL, and SPED demonstrate a decreased likelihood of failing a course freshman. More specifically, students not receiving SPED services are associated with a 13.1 percentage point more likelihood of course failure their freshman year than students receiving SPED services. Receiving special education services is associated with a decreased likelihood of failing, while the designation of an FRL status is associated with an increased probability of failing.

Policy Implications

Freshman course failures can lead to decreased likelihoods of graduating high school and enrolling in college (Easton et al., 2017; Morris et al., 2021). Programs that have been proven effective for reducing freshmen failures include professional learning communities (PLCs), reviewing student data that focuses on the most at-risk students (lower grades and higher absences), arranging Freshman Success meetings, and forming intentional relationships with lower GPA students (Allensworth et al., 2020; Park & Denson, 2013). For example, Chicago Public Schools' successful Freshman OnTrack program has been alerting teachers and administrators of students close to falling behind academically for high school graduation (Allensworth et al., 2018). Arkansas should consider developing a state-wide early warning indicator system.

Arkansas district leaders can enact a "no-zero" policy to prevent scores of zero from bottoming out students' course grades (Allensworth et al., 2018). Joe Feldman (2019) suggests educators to implement a minimum grading policy, where all grades should have the same weight and be scaled from 50 to 100. Feldman urges teachers and leaders to consider this policy as the current grading scale disproportionately harms students of color, low-income students, and English Language Learners.

Basing grades on soft skills –time management, completing paperwork, class participation, timeliness of submissions, etc.—should not be incorporated in grades as it can harm students who face challenges outside of the school environment, when the main purpose should be to assess if students really understand the content (Feldman, 2019).

As we report on the grading disparities among FRL status students, we encourage educators and district leaders across the state to address the possibility of grading bias occurring for this group of students. Our analysis provides descriptive evidence that there is a possibility of freshmen course grades in Arkansas reflecting potential bias. The designation of a SPED, ELL, or GT status are all associated with a lower likelihood of failing, but the FRL group of students are not. ELL and SPED status students may be receiving the supports they need to be successfully pass their classes, whereas FRL status students are not receiving the help they need to be successful.

Malecki and Demaray (2016) encourage schools to provide social mentorship programs for FRL students as their implementations are associated with higher academic performance. Shoulders et al. (2019) urge teachers and counselors to give FRL students with lower GPAs more attention and more academic assistance. Moreover, Park and Denson (2013) insist teachers and principals analyze their relationships with FRL status students further because providing financial aid for college will not help alleviate education success disparities unless the problem is met head-on—teachers and principals need to form intentional mentorship opportunities for FRL status students.

We encourage school leaders to evaluate grading practices to ensure equity for all student demographic and programmatic groups. While bringing attention to grading and grades might be uncomfortable work, it is a step in the right direction to help all Arkansas students have a more successful future.

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