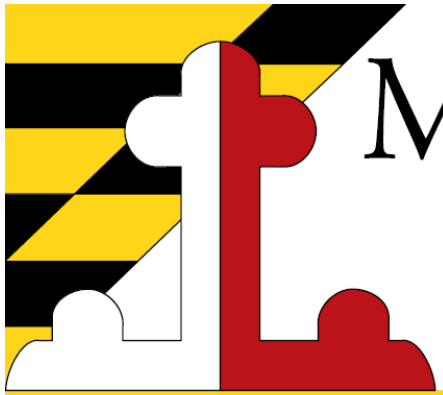

MLDS Center

Maryland Longitudinal Data System

Better Data • Informed Choices • Improved Results

Towards Equity: The Relationship Between Opportunity Gaps and Educational Outcomes for Black Students in Maryland

Dr. Frimpomaa Ampaw, Morgan State University
Dr. Sarah Williams, Grand Valley State University

MLDS Center Research Series Presentation
January 30, 2026

MLDS Center
Maryland Longitudinal Data System

Acknowledgements

R. Jerome Anderson

Ebunoluwa Otunubi

Background

- Students who complete Algebra earlier are more likely to pursue higher-level math courses, attend college, and access STEM majors (Spielhagen, 2006; Lee & Mao, 2020)
- Students who take AP/IB courses or dual enroll in high school are more likely to enroll in college, complete their degree, and have a shorter time to degree completion (Dynarski et. al., 2023)
- Research studies tend to focus on individual factors in understanding postsecondary access and outcomes

MLDS Center
Maryland Longitudinal Data System

Background: Systems Perspective

- Ecological systems theory: school as a system that interacts with individual factors to affect success (Bronfenbrenner and Morris 2006; Spencer 2006).

- Opportunity gap explanatory framework: Differences in systems by race that contribute to the "achievement gap" for systemically marginalized people (Milner, 2012; Welner & Carter, 2013).

MLDS Center
Maryland Longitudinal Data System

Ways to View the Opportunity Gap

Between Schools

- Black students tend to go to schools that do not offer the higher-level courses.

Within Schools

- There is a gap between what the Black students are getting versus the other students.
- Differences in course-taking by race observed within a school cannot be attributed to individual decision-making but rooted in systemic issues.

Purpose & Research Question

This study seeks to understand the prevalence of opportunity gaps in coursework for Black students attending public high schools in Maryland and whether these gaps are related to high school degree completion and college enrollment.

- What does the opportunity gap look like for Black students in Maryland?
- How is the opportunity gap associated with high school completion and college enrollment for Black students?

MLDS Center
Maryland Longitudinal Data System

Cohorts & Exclusion Criteria

- Data are from the Maryland Longitudinal Data System (MLDS)
- Three 9th-grade cohorts
  - 2014, 2015, 2016
- Exclusion criteria
  - Repeated the 9th grade and/or changed schools (n=24,880)
  - Changed schools at any point during their time in 9th grade (n=21,205)

MLDS Center
Maryland Longitudinal Data System

Sample Characteristics (*N* = 184,955)

Demographics - All Students	**Percent**
Ethnicity	
Hispanic	14.5%
Non-Hispanic	85.5%
Race	
White	49.3%
Black	33.9%
Asian	6.5%
Hawaiian/Other Pacific Islander	0.4%
American Indian/Alaskan Native	3.5%
Multiracial	6.4%
Gender	
Female	50.8%
Male	49.2%
Free and Reduced Meals (FARMS)	
No	59.8%
Yes	40.2%

MLDS Center
Maryland Longitudinal Data System

Black Student Demographics

Demographics of Black Students in Sample

Variable		*n*	%
Gender			
Female		30,513	49.67
Male		30,917	50.33
FARMs			
No		24,894	40.5
Yes		36,536	59.5
	n	*M*	*SD*
Days in attendance	61,430	170.58	30.78
Middle school science assessment scale score	54,168	384.30	53.85

Note. FARMs=Free or reduced-price meals.

MLDS Center
Maryland Longitudinal Data System

Research Question #1

What does the opportunity gap look like for Black students in Maryland?

MLDS Center
Maryland Longitudinal Data System

Opportunity Gap Calculation

- 3 types of opportunity:
  - Passing Algebra I course C - or higher before grade 10
  - Taking AP/IB courses at any time during high school
  - Taking dual enrollment at any time during high school
- School level variables
  - For each opportunity type, all students who had the opportunity were coded as 1; students who did not were coded as 0.
  - School level percentage was calculated for just Black students in the school.
  - School level percentage was calculated for just non-Black students in the school.
  - Opportunity Gap was the school-level difference between Black and non-Black students.
- We then merged the school-level gap data onto the student-level cohort dataset.

MLDS Center
Maryland Longitudinal Data System

Opportunity Gap Interpretation

- A positive opportunity gap indicates that Black students pass or take the course at lower rates than White students.
- A negative opportunity gap indicates that Black students pass or take the course at higher rates than White students.

Opportunity Gaps

Opportunity Gaps (N=184,955)

Gap Type	*M*	Min	Max	*SD*
Passing Algebra I course	-0.05*	-0.63	0.5	0.10
Taking AP/IB courses	0.06*	-0.10	1	0.10
Taking dual enrollment	0.03*	-0.46	0.44	0.07

Note. * $p < .01$. *p*-value calculated with a *t*-test of equal variance comparing the mean opportunity gap for Black students to the mean opportunity gap for non-Black students.

Prevalence of Attending Schools with Gaps

Percentage of Total Black Students Attending a School with an Opportunity Gap

Variable	*n*	Students attending a school with an opportunity gap
Passed algebra	15,509	25.30
Took AP/IB	40,035	70.60
Took dual enrollment	33,050	55.29

- The majority of Black students attend a school with an opportunity gap in terms of taking advanced courses and participating in dual enrollment

MLDS Center
Maryland Longitudinal Data System

Research Question #2

How is the opportunity gap associated with high school completion and college enrollment for Black students?

Measures

- Independent variables
  - Individual level course taking
  - Opportunity Gap
- Control variables
  - Student demographic variables
    - Eligible for free and reduced meal (FARMs)
    - Gender (male, female)
  - Student attendance (how many days at school)
  - Maryland Integrated Science Assessment (to control for academic performance)
- Dependent variables
  - High school graduation (diploma/certificate) at their expected graduation date (students who took more than four years or received a GED later were marked as non-completers for this analysis)
  - Enrollment in any college

Methods

- Statewide descriptives for Black Students
- Multi-level modeling (Raudenbush & Bryk, 2002) with students nested in their high schools

MLDS Center
Maryland Longitudinal Data System

Outcomes for Black Student Sample

High School Graduation and College Enrollment for Black Students

Outcome	*n*	%
Graduated high school	50,782	82.67
Enrolled in college		
Never enrolled	36,153	58.85
Bachelors	12,411	20.20
Associates	12,139	19.76
Certificates	727	1.18

Results: High School Completion

High School Completion Rates for Black Students Attending High Schools With and Without Opportunity Gaps

Gap Type	Without	With
Passing Algebra I course	83.06	81.61
Taking AP/IB courses	81.82	84.57
Taking dual enrollment	82.81	83.82
Total	82.67	

Interpretation: For example, 83.06% of Black students who attended a school without an Algebra I opportunity gap graduated from high school. However, 81.61% of Black students who attended a school with an Algebra I opportunity gap graduated.

Results: High School Completion

MLDS Center
Maryland Longitudinal Data System

Multilevel Logistic Regression Analyses Predicting High School Completion

Parameter	Model 0 *OR (SE)*	Model 1 *OR (SE)*	Model 2 *OR (SE)*	Model 3 *OR (SE)*
Fixed effects				
Intercept	1.47***	4.001**	0.839	0.041**
	(0.066)	(0.302)	(0.079)	(0.006)
Level 1 (student)				
MS science assessment scale score			1.005**	1.002**
			(0.00)	(0.00)
Female				1.364**
				(0.038)
FARMs				0.652**
				(0.021)
Days belonging				1.024**
				(0.001)
DE				9.890**
				(1.364)
Algebra pass				2.187**
				(0.070)
AP/IB				1.691**
				(0.105)
Level 2 (high school)				
Algebra opportunity gap		0.86	0.987	1.159
		(0.425)	(0.351)	(0.377)
AP/IB opportunity gap		5.322**	2.270*	1.518
		(3.034)	(0.861)	(0.520)
DE opportunity gap		2.614	1.677	1.149
		(2.000)	(0.884)	(0.562)
Random parameters				
Level-2 variance				
Log likelihood	-26,923.48**	-26,857.37**	-20,962.49**	-18,548.07**
ICC	0.233	0.197	0.084	.065
	(0.020)	(0.018)	(0.011)	(0.009)

Note. $*p < 0.05$, $**p < .01$.

Multilevel Model Results

- There at first appears to be a significant *positive* relationship between attending a school with an AP/IB opportunity gap and high school completion.
- Without controlling for other factors, students who attend schools with AP/IB opportunity gaps are MORE likely to complete high school.
- This relationship persists after controlling for student middle school academic performance.
- After controlling for other student factors this relationship disappears.

Results: College Enrollment

College Enrollment Rates for Black Students Attending High Schools With and Without Opportunity Gaps

	Never enrolled		Enrolled bachelors		Enrolled associates		Enrolled certificates	
Gap Type	Without	With	Without	With	Without	With	Without	With
Passing Algebra I course	58.21	60.40	20.03	20.90	20.53	17.65	1.23	1.04
Taking AP/IB courses	59.76	56.54	18.15	22.39	20.81	19.92	1.28	1.15
Taking dual enrollment	59.49	57.37	20.48	20.46	18.92	20.91	1.11	1.26
Total	58.85		20.20		19.76		1.18	

MLDS Center
Maryland Longitudinal Data System

Summary of Results

- The average student in our cohort sample attended a high school with AP/IB and dual enrollment opportunity gaps between Black and non-Black students.
- The average student in our cohort sample attended a high school with a *negative* Algebra opportunity gap.
- Most Black students in our sample attended schools with AP/IB and dual enrollment opportunity gaps.
- Only one-fourth of Black students in our sample attended schools with an Algebra opportunity gap.

MLDS Center
Maryland Longitudinal Data System

Summary of Results, cont'd

- For this sample of Black students, high school completion rates were *lower* for students who attended schools with Algebra opportunity gaps, but *higher* for students who attended schools with AP/IB or DE gaps.
- Controlling for other factors, we found no relationship between attending a school with any kind of opportunity gap and high school completion.
- Descriptive results suggest there may be a relationship between attending a school with some kinds of opportunity gaps and some types of college enrollment.

Future Directions

- Examine differences between Black students entering 2-year and 4-year colleges
- Explore entry into selective 4-year colleges
- Explore transfer to a 4-year college for students who started in a 2-year college
- Use multilevel models to predict college enrollment using opportunity gap measures
- Add interaction terms between student-level course taking and opportunity gap measures

Limitations

- Generalizability is limited to students who were first enrolled in the ninth grade at a Maryland public high school during the 2013-2014, 2014-2015 & 2015-2016 school years, and who did not change schools during high school or repeat 9th grade.

MLDS Center
Maryland Longitudinal Data System

Questions and Discussion

Dr. Frim Ampaw
Frimpomaa.Ampaw@morgan.edu

Dr. Sarah Williams
williasb@gvsu.edu