Elite Course-Taking and Racial Disparities in STEM

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ABSTRACT

African American and Latinx populations are still disproportionately underrepresented in science, technology, engineering, and math (STEM) fields. To understand why racial disparities persist, this article investigates African American and Latinx students' high school careers. Specifically, it examines whether students take a course in trigonometry, pre-calculus, or calculus students' (elite math courses) in their senior year. Using the theoretical framework of *categorical inequality*, I examine whether racial disparities exist in elite math courses that often serve important gatekeeping functions for future STEM pathways.

Data are from the Educational Longitudinal Study of 2002 (ELS:02) public use data, focusing on data from the first follow-up (when the students are in their senior year of high school) and postsecondary education transcripts collected in 2012. I use logistic regression methods to examine the odds of taking an elite math course across racial and ethnic subgroups. Then I analyze the odds of high school graduation rates, postsecondary enrollment across different racial/ethnic subgroups, and whether students obtained a bachelor's degree in STEM, after accounting for elite math courses taken in high school. Surprisingly, my findings show that African American and Latinx students have similar odds as White students of taking an elite math course and have higher odds of enrolling in a postsecondary institution than their white counterparts.

INTRODUCTION

Careers in science, technology, engineering, and mathematics (STEM) have become one of the fastest growing areas in the United States; however, racial and gender disparities continue to persist in the STEM workforce (Chen 2013). The representation of African American and Latinx populations in STEM fields is still considerably low; where only 9% of the STEM workforce is African Americans and 7% is Latinx (Pew

Research Center 2018). Moreover, only 7% of African Americans and 12% of Latinx students graduated with a degree in STEM, lower than the national average of 15% (Fry et al. 2021; Pew Research Center 2018).

Examining math course-taking in high school can help us understand the factors that contribute to students pursuing and persisting in STEM (Sanabria and Penner 2017). In doing so, my study highlights the disparate pathways of minority racial and ethnic groups in STEM. Prior research has established that the type of math courses taken in high school often serves a gatekeeping function into STEM in higher education. Students are differentially sorted into higher-level math courses offered in high schools and evidence shows that students from minority groups are less likely to enroll and take higher-tracked math courses, such as trigonometry, pre-calculus, or calculus, than White and Asian American students (U.S. Department of Education 2018). Advanced math course-taking in high school is a strong predictor for attending college (Long et al. 2010). Additionally, higher-level math courses operate as a "gatekeeper" in STEM, limiting the rate at which students can prepare for college coursework in STEM fields. Investigating the extent to which African American and Latinx students take these higher-tracked math courses in high school (which I will refer to simply as elite math courses in this thesis) and earn a bachelor's degree in STEM can better illuminate a key mechanism in racial stratification in STEM. Thus, this thesis examines the racial disparities in STEM elite math courses taken in high school, high school graduation, postsecondary attendance, and STEM degree attainment.

LITERATURE REVIEW

This thesis will be drawing from previous literature which utilized various theoretical frameworks to demonstrate why the categorical inequality framework can better explain racial disparities in STEM. This thesis will also examine previous literature which focus on math course taking at the high school level, their findings and how racial disparities in math course taking has contributed to STEM attrition among African American and Latinx students.

Racial Disparities in Higher-Level Math Courses

Previous researchers have focused on patterns relating to math course-taking and race. As previously stated, research on racial disparities in STEM has been an ongoing issue for decades with researchers focusing on several factors affecting math course taking. For example, Daempfle's (2004) study on STEM attrition at the undergraduate level found that there was a disconnect between high school and college teachings that impacts for students' opting out of STEM majors. While Daempfle's research focused on students at the undergraduate level, others researched students at the high school level. Some of the earlier studies conducted on math course taking at the high school level found that elite math courses can predict postsecondary attendance (Riegle-Crumb 2006; Tyson 2007; Riegle-Crumb and Grodsky 2010), math course taking across different racial/ethnic subgroups has increased (with some exceptions) across different cohorts (Dalton 2007), African American and Latinx students have lower odds of taking higher level courses (Archbald and Farley; Ripple 2012), and elite math and science courses in high school play a significant role in STEM persistence amongst students of color (Lichtenberger and George-Jackson 2013).

While these studies contributed greatly towards the understanding of STEM attrition and persistence among students of color, they are outdated. Some of the studies used data from the National Education Longitudinal study of 1988, Beginning Postsecondary Students Longitudinal Study (BPS:96/01), and Adolescent Health and Academic Achievement (AHAA) which was conducted in the 1990's. Although the data used in these studies were instrumental in research and policy, newer data would help researchers today in understanding why STEM attrition continues to persist.

Categorical Inequality Framework

Plenty of research on racial disparities in STEM discusses the relationship between elite math course taking and racial disparities at different intervals of students education (Riegle-Crumb 2006; Dalton et al. 2007; Kelly 2009; Kokkelenberg and Sinha 2010; Riegle-Crumb 2010; Archbald and Farley-Ripple 2012; Domina and Saldana 2012; Xie et al. 2015; Champion 2016;

Shi 2017; Fong 2020; Sanabria 2020; McEachin et al. 2020; Irizarry 2021). This thesis examines the impact of math course taking at the high school level and how this affects students' STEM pathways after they transition to a postsecondary institution. More recent studies (2016 onward) analyzed similar data to that of this article but used different theoretical frameworks to explain racial disparities. Much like this thesis, previous research focused on students starting from high school to understand how math courses might affect STEM persistence at the postsecondary level. For example, Fong and Kremer (2020) used the expectancy value theory to examine math underachievement at the high school level and found that 'math motivation' was a significant predictor in underachievement which played a role in the students' transition to college. Riegle-Crumb et al. (2019) used the opportunity hoarding framework in their study of underrepresentation of racial/ethnic groups in STEM and found STEM is a high value degree and due to opportunity hoarding, racial disparities continue to persist. The theoretical frameworks used in these studies were instrumental in providing relevant and significant findings, the categorical inequality framework will contribute to understanding why racial disparities continue to persist in STEM.

Previous researchers used a myriad of theoretical frameworks to investigate and further understand why racial disparities exist in STEM (Fong and Kremer 2020; Andersen and Ward 2013; Domina and Saldana 2012; Archibald Farley-Ripple 2012; Daempfle 2004; Crisp 2009; and Riegle-Crumb et al. 2019). However, this article uses the categorical inequality framework (Domina et al. 2018) to explore racial inequality in elite math courses in high school. In their review, Domina, Penner and Penner (2018) discuss and apply the theoretical framework of categorical inequality to education. Unfortunately, within the institution of education, schools have been sorting and categorizing students, placing them on track to higher education, technical schools, or elsewhere, leading them on a specific pathway. For working class students, female students and people of color, education is sometimes the only clear path towards a successful life.

> By creating categories and sorting youth among them, schools develop templates that influence the contours of inequality throughout contemporary societies…The categorical inequality perspective draws attention toward the organizational processes through which schools create categories and sort individuals into them, and how, in doing so, they generate and reinforce social inequalities. (Domina, Penner, and Penner 2018)

By sorting students, educational institutions are creating and perpetuating inequalities; students who are sorted into lower-level courses are at a disadvantage compared to students sorted into higher level courses. Applying the categorical inequality framework towards elite math course-taking and racial disparities in STEM gives insight as to the important role sorting students based on race and status has on the persistence of racial disparities.

The Current Study

This project examines the relationship between elite math courses and STEM pathways, as well as the role of sorting in math courses on racial disparities. In sum, the literature suggests that math course taking plays an important role in continuing on the STEM pathway. Thus, this thesis asks (1) What are the racial disparities in elite math course-taking in high school? After accounting for elite math courses taken, I ask the following questions: (2) What is the high school graduation rate across racial and ethnic groups? (3) What are the odds of ever attending a postsecondary institution across ethnic/racial subgroups? And after students have enrolled in a postsecondary institution, I ask (4) what are the odds of obtaining a degree in STEM across ethnic/racial subgroups, after accounting for elite math courses completed in high school?

I expect that my findings for research question 1 will support previous research on math course taking and racial disparities (Tyson et al. 2007; Kelly 2009; Riegle-Crumb 2010; Irizarry 2021). I hypothesize African American and Latinx students would have lower odds of taking elite math courses in high school compared to White students. I hypothesize that

African American and Latinx students would be less likely to complete high school compared to their White counterparts even after accounting for elite math courses taken in high school.

Previous research has demonstrated evidence of math course taking at the high school level playing a significant role in students' STEM pathways after high school (Lichtenberger and George-Jackson 2013; Shi 2017; Riegle-Crumb et al. 2019; Fong 2020; Sanabria 2020; Irizarry 2021). As previous studies suggest that taking elite math courses in high school affects students' decision in attending a postsecondary institution and obtaining a degree in STEM. Therefore, this project proposes two more research questions: For my third research question, I hypothesize African American and Latinx students are less likely to attend a postsecondary institution compared to their White counterparts.

Previous research has found that students sorted into different levels of math courses affect students' decisions in choosing a STEM major (Irizarry 2021). Therefore, for my final research question, I hypothesize that among those who attend a postsecondary institution, African American and Latinx students are less likely to obtain a bachelor's degree in STEM even after accounting for elite math courses taken in high school. As students enter postsecondary institutions, required courses for STEM majors affect African American and Latinx students persisting in STEM (Chen 2009).

METHODS

Data

Data is drawn from the Educational Longitudinal Study of 2002 (ELS:02) by the National Center for Education Statistics (NCES) public-use data, specifically focusing on high school seniors graduating in spring 2004. The ELS (2002) is a longitudinal study that followed a baseline representative sample of approximately 17,500 tenth-grade students over ten years, beginning in 2002. The ELS data contains a nationally representative sample of high school seniors graduating in 2004 and follows students' trajectories into enrollment and degree completion at postsecondary institutions. As a longitudinal panel study, ELS experienced sample attrition and non-response bias. To adjust for the sampling frame, the ELS:02 replenished the sample with additional respondents. I adjust for attrition by using a sampling weight and only including students who are non-missing on key outcome, predictor, and control variables in my analyses.

ELS (2002) collected a wide range of individual-level details from students, including race, gender, socioeconomic backgrounds, family housing composition, and family educational background. ELS surveyed students through four waves: base year (BY) during the students' tenth-grade year in 2002, first follow up (F1) during the student's senior year in 2004, second follow-up (F2) in 2006 two years after high school, and third follow up (F3) occurred in 2012 (eight years after high school). High school transcripts were collected in the first follow-up (F1) and postsecondary transcripts were collected in 2012 in the fourth follow-up (F4).

Measures

I examine whether racial disparities in elite math course-taking and persist across a range of academic outcomes: high school postsecondary attainment, and STEM degree completion. The key independent variable is race and ethnicity. The categories under race and ethnicity in the ELS (2002) data were American Indian/Alaska Native, non-Hispanic; Asian, Hawaii/Pacific Islander, non-Hispanic; Black or African American, non-Hispanic; Hispanic, no race specified; Hispanic, race specified; More than one race, non-Hispanic, and White, non-Hispanic. Due to the small sample of American Indian/Alaska Native and More than one race, these categories were combined into one category and categorized as "other." For this study, White, non-Hispanic, is the reference category due to their overrepresentation in the STEM fields and workforce (Pew Research Center 2021).

Given that this paper investigates the role of elite math course taking on future student outcomes, the four dependent variables used in this thesis are whether the student has taken and elite math course (pre-calculus or higher), high School diploma or GED equivalent, enrollment at a postsecondary institution, and a bachelor's degree in STEM.

Demographic variables will be student-level covariates, which include gender, socioeconomic status, family composition, math item response theory (IRT) scores in senior year, and parents' highest level of education. For Research Questions 2, 3 and 4, elite math course is added to the complex models as a control. In addition, models for Research Questions 3 and 4 only include students who have obtained a high school diploma (or equivalent).

Sample

As shown in Table 1 (n = 17,500), the sample was fairly evenly split by gender consisting of 48.85% male and 50.15% female students, with male students being the reference category. The racial composition consisted of White (62.22%), Hispanic, race specified (8.46%), Hispanic, no race specified (6.6%), Black (13.34%), Asian (4.51%), and Other (4.86%) students. Socioeconomic status (SES) is measured in quartiles with students fairly evenly distributed across quartiles. Family composition was categorized as: 'mother and father' (60.08%), 'female guardian only' (1.22%), with 'mother only' (17.66%), and the following categories were combined: 'mother and male guardian', 'father and female guardian', 'two guardians', 'lives with student less than half time', and 'father only, male guardian only' (17.73%). Parent's highest level of education was divided into three categories: 'Did not finish high school' and 'graduated from high school or GED' (25.03%); 'Attended 2-year, no degree,' 'Graduated from 2-year school,' attended college no 4-year degree' (34.21%); 'graduated from college,' 'completed Master's degree or equivalent,' 'completed Ph.D., MD, other advanced degree' (34.78%). Students' math scores are on a continuous scale ranging from 13.74 to 83.03 (std=13.84). This variable measures the probability of students correctly answering, "each of the items in the pool" (NCES 2014).

The key dependent variables: elite math course, high school attainment, postsecondary enrollment, and bachelor's degree in STEM were collapsed into dichotomous variables. The categories for 'elite math course' were 'no math course or math course is other,' 'pre-algebra, general or consumer math,' 'Algebra I,' 'Geometry,' and 'Algebra II' which were combined (54.03%) and my reference category and trigonometry, pre-calculus, or calculus as the reference category (45.08%). High school attainment was categorized as: 'successful graduate (HS diploma recipient),' 'marginal graduate (HS diploma recipient),' 'Completer (GED/equivalency/certificate of attendance),' and 'non-completer.' The categories were collapsed into 'completer' (90.24%) and 'non-completer' (2.6%) with non-completer as the reference category. The categories for postsecondary enrollment were already dichotomous 'has some postsecondary enrollment' (87.9%) and 'no postsecondary enrollment' (12.1%) which was the reference category. The final key dependent variable 'Bachelor's degree in STEM' was collapsed into 'STEM' (10.25%) and 'non-STEM' (31.99%) categories (57.76% were missing or NA); non-STEM was the reference category.

Analytical Strategy

Given that the key dependent variables are dichotomous (has taken an elite math course or not), I use logistic regression to examine (1) racial disparities in elite math course taking by senior year of high school; after accounting for elite math course taking: I examine the odds of (2) high school attainment (3) postsecondary enrollment and (4) STEM degree attainment. With each research question and corresponding key dependent variable I examine the students' transition into a postsecondary institution and whether students earned degrees in STEM. For ease of interpretation, logit coefficients from the analyses are exponentiated into odd ratios that are then interpreted as either an increase (>1) or decrease in odds (<1) of the outcome variable occurring. The analyses start with a baseline model to estimate the association between elite math course-taking and race:

$$logit(ELITE_i) = \beta_0 + \beta_2 Race + \chi_i + \varepsilon_i$$

$(ELITE)_i$ estimates the odds of taking an elite math course by senior year of high school for every student. I first examine the odds of taking an elite math course across racial and ethnic subgroups. In the second model, I include the following student-level covariates: gender, socio-economic status, family composition, parent's highest level of education, and prior math achievement, represented as X_i. The second model with added controls examines whether elite math courses have a distinct relationship with racial disparities in STEM relative to other significant predictors.

$$logit(DIPLOMA_i) = \beta_0 + \beta_2 Race_i + \beta_3 Elite_i + \chi_i + \varepsilon_i$$

Equation 2 predicts the odds of high school attainment across racial/ethnic groups, controlling for whether the student had taken an elite math course by senior year. Then, the second model includes controls. Analyses for Research Questions 3 and 4 follow a similar equation as Equation 2 to predict the odds of attending postsecondary education and STEM degree attainment.

RESULTS

Table 2 reports the odds ratios for taking an elite math course by the students' senior year of high school. Model 1 (n = 13, 300) reports the baseline model without controls showing the odds of taking an elite math course across racial and ethnic categories. We can see that Asian, Hawaii/Pac. Islander students had twice the odds ($\beta = 2.0$; $p < 0.001$) of taking an elite math course compared to their white counterparts. Black, non-Hispanic ($\beta = 0.6$; $p < 0.001$), Hispanic, race specified ($\beta = 0.5$; $p < 0.001$), Hispanic, no race specified ($\beta = 0.4$; $p < 0.001$), and Other ($\beta = 0.7$; $p < 0.001$) students had significantly lower odds than White students of taking an elite math course by their senior year.

Model 2 in Table 2 (n = 13,000) shows the odds of taking an elite level math course by senior of high school with the following covariates: gender, SES, Family composition, prior math achievement, and parents' education. We see in Model 2 that Black, non-Hispanic ($\beta = 2.2$; $p < 0.001$) and Asian, Hawaii/Pac. Islander ($\beta = 2.4$; $p < 0.001$) students have twice the odds of taking an elite math course compared to White students. Hispanic, no race specified, was no longer statistically significant after introducing controls. However, Hispanic, race specified, and Other were only marginally significant ($\beta = 1.2$; $p < 0.10$; $\beta = 0.7$; $p < 0.10$ respectively).

Table 3 reports the odds ratio of completing high school by race/ethnicity after accounting for elite math course taking. Model 1 (n = 12,800) represents the baseline model without controls, showing that the odds of completing High School were significantly lower for Black non-Hispanic ($\beta = 0.4$; $p < 0.001$), Hispanic no race specified ($\beta = 0.4$; $p < 0.001$), Hispanic race specified ($\beta = 0.3$; $p < 0.001$), and Other ($\beta = 0.3$; $p < 0.001$) race compared to White students; Asian, Hawaii/Pac. Island students were just as likely to complete High School as white students and was not statistically significant.

After accounting for control variables in Model 2 (n = 12,000), the odds of Asian students completing High school lowered slightly and were not significant ($\beta = 0.9$; $p > 0.10$). For Black ($\beta = 0.6$; $p < 0.001$), Hispanic, race specified ($\beta = 0.5$; $p < 0.001$), and Other ($\beta = 0.4$; $p < 0.001$) students, there wasn't much change from Model 1, the odds increased slightly and remained statistically significant. However, interestingly Hispanic, race specified, students were slightly more likely to complete High School than White students but lost significance in Model 2. The elite math course covariate was marginally significant ($\beta = 0.7$; $p < 0,10$).

Table 4 reports odds ratios predicting enrollment at a postsecondary institution. Model 1 (n=10,400) shows the baseline model without controls, showing the odds of students ever attending a postsecondary institution by race. Hispanic, no race specified ($\beta = 0.6$; $p < 0.001$) and Other students ($\beta = 0.6$; $p < 0.001$) had lower odds of ever attending a postsecondary institution; Black and Hispanic, race specified were not statistically significant. Asian students were more than twice as likely to attend a postsecondary institution than White students ($\beta = 2.3$; $p < 0.00$).

After accounting for controls in Model 2 (n = 10,000), the odds of ever attending a postsecondary institution increased significantly for each category of students with the exception of Other students who were just as likely as white students to attend a postsecondary institution although this was not significant ($\beta = 1.0$; $p > 0.10$). Model 2 shows Asian students have three times the odds ($\beta = 3.0$; $p < 0.00$) than White students to attend a postsecondary institution. Black ($\beta = 2.1$; $p < 0.001$), Hispanic, race specified ($\beta = 1.8$; $p < 0.001$), and Hispanic, no race specified ($\beta = 1.8$; $p < 0.001$), students were about twice as likely as White students to ever attend a postsecondary institution. The control, family household composition was only marginally significant, and the parent's highest level of education was only statistically significant for the parents in the category High School/GED or less. Highest elite math course taken was statistically significant ($\beta = 0.4$; $p < 0.00$).

Table 5 reports the odds ratios of attaining a bachelor's degree in STEM. Model 1 (n = 4,700) shows the baselines without controls with White students as the reference category. Asian students had twice the odds of earning a STEM degree ($\beta = 1.7$; $p < 0.001$) compared to White students; all other categories were not statistically significant. After accounting for controls in Model 2 (n = 4,500), the odds for earning a STEM degree compared to White students lowered slightly for Asian students but remained statistically significant ($\beta = 1.5$; $p < 0.001$). However, even after accounting for controls, Black, Hispanic, race specified, Hispanic, no race specified, and Other students were still not significant. Students who did not take an elite math course were less likely than students who took pre-calculus, calculus, and/or trigonometry to earn a STEM degree ($\beta = 0.5$; $p < 0.00$).

When examining elite math course taking, I hypothesized that African American and Latinx students were less likely to take an elite math course in high school compared to their White counterparts, the results presented in table 2 shows that Model 2 does not support my hypothesis. As previously stated, African American and Latinx students were twice as likely or just as likely to take an elite math course by their senior year of high school. This finding shows that students of color are slowly narrowing the gap in elite math course taking. For the second hypothesis: African American and Latinx students are less likely to complete high school compared to their counterparts (after accounting for elite math), Table 3 supports my second hypothesis. Apart from Hispanic, no race specified, African American and Latinx (when race is specified) students are less likely to complete high school compared to White students.

Regarding postsecondary enrollment, I hypothesized that African American and Latinx students were less likely to ever attend a postsecondary institution compared to White students (after accounting for elite math course). Table 4 shows that the results do not support my hypothesis. Results show African

American and Latinx students are about twice as likely to ever attend a postsecondary institution compared to White students. Lastly, when looking at the first known bachelor's degree, I hypothesized that African American and Latinx students are less likely to obtain a bachelor's degree in STEM, after accounting for elite math course taking. Unfortunately, results were not statistically significant therefore I was not able to conclude if African American and Latinx students were more or less likely to obtain a bachelor's in STEM.

DISCUSSION & CONCLUSION

This paper examined the effects of taking an elite math course in a nationally represented dataset and provided a better understanding of how elite course taking plays a role in persisting on the STEM pathway. This study shows that while students of color are enrolling in elite math courses in high school at similar or increased odds as White students, African American and Latinx students are shown to have lower odds of attaining a high school diploma. However, according to data, African American and Latinx students are more likely to attend a postsecondary institution but results on STEM degree attainment could not provide evidence of the odds of which students of color earned a bachelor's in STEM. Unsurprisingly and consistent with prior research, Asian students are more likely to earn a bachelor's degree in STEM compared to their White counterparts (Chen and Weko 2009; Kokkelenberg and Sinha 2010; Ma and Liu 2015).

This project contributes to literature on racial disparities in STEM education and persisting on the STEM pathway, despite some of the thesis' limitations. The first limitation was sample attrition; as with longitudinal designs, one of the issues is losing participants over time. Furthermore, another limitation was from analyzing data from ELS:02 public use data instead of their restricted data; unfortunately, some variables of interest were restricted. For example, students' first choice of major and institution type (two-year vs. four-year) was inaccessible. In addition, access to students' first choice of major would have provided important information on STEM attrition across racial/ethnic subgroups.

Previous research shows there is a relationship between math courses taken and STEM persistence (Chen 2013). While some of my findings aligned with prior research, others contradicted it. Findings suggest that African American and Latinx students were just as likely or more likely to take an elite math course by their senior year. This finding supports previous literature comparing students from different cohorts (1982, 1992, and 2004). Students in 2004 earned more math credits than the other two cohorts with the exception of Latinx students who did not show much difference from 1992 to 2004 (Dalton et al. 2007; Domina and Saldana 2012). This finding also supports Xie and co-authors (2015) study who found that the racial gap in elite course taking in high school has narrowed.

Future research should focus on why students of color are more likely to be sorted in lower-level math courses compared to White students (Xie et al. 2015). Furthermore, even though this thesis did not find any statistically significant results on African American and Latinx students' odds of obtaining a bachelor's in STEM, previous research found evidence of racial disparities in obtaining a degree in STEM (Chen and Weko 2009; Ma and Liu 2015). More research should be conducted to these seemingly contradictory results.

It is important for researchers and policymakers to understand why African American and Latinx students do not persist in STEM once they've enrolled in a postsecondary institution. Perhaps developing pre-college programs aimed at creating a smooth transition from high school to postsecondary institutions could lower attrition rates among these students. Sorting students also plays a significant role in STEM persistence as students of color, African American female students in particular were found to be less likely to have been recommended for elite math courses (Francis et al. 2019). Policies need to be developed to prevent bias against students of color who qualify for enrollment in elite math courses. On a structural level, perhaps school districts can consider making elite math courses mandatory. In most public schools in the United States math requirements usually go up to Algebra II or students need to fulfil only three years of math by making elite a requirement it might work to motivate students or introduce them to math courses that are relevant and lay a foundation to a STEM education.

Although some of the hypotheses were not supported by the results, the findings from this thesis contributes to literature and future research. For example, students of color were found to have taken elite math courses at equal and or double the odds as White students. Future research should continue research on elite math course taking and its relationship with STEM persistence. As previously stated, African American and Latinx students have higher odds of enrolling in a postsecondary institution, future research should be conducted to determine whether postsecondary enrollment in two-year vs. four-year institutions would be significant in persisting in STEM across racial/ethnic subgroups.

The theoretical framework of categorical inequality helps explain students being sorted in elite level courses. Previous research utilized different theoretical frameworks when researching racial disparities in course taking and STEM. For example, Fong and Kremer (2020) used the expectancy value theory which focuses on the students, their perceptions of reality and how this affects their academic performance. Categorical inequality shifts the focus from the student to the educational institution by stating that schools create categories based on status and sort students accordingly. It focuses on sorting at the institutional and organizational levels and frames racial status as more salient in elite math courses.

When analyzing data from ELS:02 I found that students are taking elite math courses at similar rates. However, racial disparities continue to persist in STEM education and workforce. Future researchers should utilize this framework to understand how sorting students in elite math courses versus non elite math courses at the secondary level and its effects of STEM persistence.

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APPENDIX

Table 1: Descriptive Statistics for study sample (N=17,500)*

	Percentage
Race	
Other	4.86%
Asian, Hawaii/Pac Islander	4.51%
Black	13.34%
Hispanic, no race specified	6.6%
Hispanic, race specified	8.46%
White	62.22%
Sex	
Male	49.85%
Female	50.15%
Socioeconomic Status quartile	
Lowest quartile	22.24%
Second quartile	24.34%
Third quartile	26.02%
Highest quartile	27.4%
Family Household Composition	
Mother and Father	60.08%
Father or Male Guardian only	3.32%
Other	17.73%
Female guardian only	1.22%
Mother only	17.66%
Parent's highest level of education	
High school or GED or less	25.03%
Attended 2-year no 4-year degree	34.21%
At least a 4-year degree or higher	34.78%
Elite Math Course	
Trigonometry, pre-calculus, or calculus Pre-Calculus or higher	45.08%
Algebra II or lower	54.03%
High School completion	
Completer	90.24%
Non-completer	2.6%
Ever attended a postsecondary institution	
No postsecondary enrollment	87.9%
Attended a postsecondary institution	12.1%
First Known Bachelor's degree	
STEM	10.25%
Non-STEM	31.99%

*N is approximate
Source: NCES

Table 2: Logistic Regression – estimated odds ratios (OR) of taking an elite math course (pre-calculus or higher) by 12th grade

	Model 1 Elite math course	Model 2 Elite math course
Race		
Asian, Hawaii/Pac. Islander	**2.0*** **	**2.4*** **
	(6.4)	(7.1)
Black, non-Hispanic	**0.6*** **	**2.2*** **
	(-4.8)	(6.3)
Hispanic, no race specified	**0.4*** **	1.2
	(-7.2)	(1.1)
Hispanic, race specified	**0.5*** **	**1.2+**
	(-6.0)	(1.5)
Other	**0.7*** **	**1.2+**
	(-2.9)	(1.7)
Gender		
Female		1.3***
		(5.1)
Socio-economic status		
Second quartile		1.1***
		(0.5)
Third quartile		1.1+
		(1.2)
Highest quartile		1.5
		(2.8)
Family Household Composition		
Mother and Father		1.3***
		(2.9)
Father or Male guardian only		1.1
		(0.3)
Female guardian only		1.8***
		(2.2)
Other		0.9+
		(-1.6)
F1 math IRT (BY scores)		1.1***
		(33.7)
Parent's highest level of education		
High School/GED or less		0.7***
		(-2.6)
Attended 2-year no 4-year degree		0.8***
		(-2.8)
Constant	1.0	**0.0*** **
	(-0.7)	(-26.9)
Pseudo R^2	0.0	0.2
N	13,300	13,000

Note N is approximate. Standard errors underneath coefficients in parentheses. Controls are in reference to White, male, lowest quartile, mother only and parent's highest level of education as 4-year degree or higher. $^{+}p < 0.10$, $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$
Source: NCES

Table 3: Logistic Regression – estimated odds ratios (OR) of completing High School

	Model 1 H.S.	Model 2 H.S.
Race		
Asian, Hawaii/Pac. Islander	1.0	0.9
	(0.1)	(-0.5)
Black, non-Hispanic	**0.4*****	**0.6*****
	(-3.8)	(-4.8)
Hispanic, no race specified	**0.4*****	1.2
	(-2.9)	(0.4)
Hispanic, race specified	**0.3*****	**0.5*****
	(-4.8)	(-6.1)
Other	**0.3*****	**0.4*****
	(-3.5)	(-6.8)
Gender		
Female		1.9***
		(2.4)
Socio-economic status		
Second quartile		1.7***
		(3.0)
Third quartile		1.9***
		(2.1)
Highest quartile		2.4***
		(2.4)
Family Household Composition		
Mother and Father		1.3***
		(2.0)
Father or Male guardian only		0.7
		(-1.1)
Female guardian only		1.0
		(0.2)
Other		0.8***
		(-4.0)
F1 math IRT (BY scores)		1.1***
		(15.3)
Parent's highest level of education		
High School/GED or less		0.9
		(-0.3)
Attended 2-year no 4-year degree		1.0
		(-0.1)
Highest math course taken		
Algebra II or lower		0.7+
		(-1.6)
Constant	**58.3*****	**3.6*****
	(22.8)	(16.7)
Pseudo R^2	0.0	0.2
N	12,800	12,000

Source: NCES *Note N is approximate.* Standard errors underneath coefficients in parentheses. Controls are in reference to White, male, lowest quartile, mother only, parent's highest level of education as 4-year degree or higher, and pre-calculus or higher. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4. Logistic Regression – Estimated odds ratios (OR) of ever attending a postsecondary institution compared to white students

	Model 1 Bachelor's	Model 2 Bachelor's
Race		
Asian, Hawaii/Pac. Islander	**2.3***	**3.0***
	(4.1)	(4.8)
Black, non-Hispanic	0.9	**2.1***
	(-0.5)	(4.4)
Hispanic, no race specified	**0.6***	**1.8***
	(-2.6)	(2.6)
Hispanic, race specified	0.8	**1.8***
	(-1.4)	(3.2)
Other	**0.6***	1.0
	(-2.6)	(-0.1)
Gender		
Female		2.3***
		(7.8)
Socio-economic status		
Second quartile		1.4***
		(2.2)
Third quartile		2.2***
		(4.6)
Highest quartile		4.7***
		(5.8)
Family Household Composition		
Mother and Father		1.1
		(1.0)
Father or Male guardian only		0.7+
		(-1.6)
Female guardian only		0.6
		(-1.2)
Other		0.8+
		(-1.5)
F1 math IRT (BY scores)		
		1.0***
Parent's highest level of education		(8.9)
High School/GED or less		0.7***
		(-2.1)
Attended 2-year no 4-year degree		0.8
		(-1.2)

Table 5: *Logistic Regression – estimated odds ratios (OR) of students who attended a postsecondary institution and graduated with a STEM degree*

	Model 1 Elite math course	Model 2 Elite math course
Race		
Asian, Hawaii/Pac. Islander	**1.7***** (3.2)	**1.5***** (2.4)
Black, non-Hispanic	1.0 (-0.2)	1.2 (1.0)
Hispanic, no race specified	1.0 (-0.2)	1.1 (0.2)
Hispanic, race specified	1.0 (-0.2)	1.2 (0.7)
Other	0.9 (-0.2)	0.9 (-0.5)
Gender		
Female		0.7*** (-4.0)
Socio-economic status		
Second quartile		1.1 (0.6)
Third quartile		0.8 (-0.7)
Highest quartile		0.7 (-1.2)
Family Household Composition		
Mother and Father		1.2 (1.3)
Father or Male guardian only		0.9 (-0.2)
Other		1.0 (0.2)
F1 math IRT (BY scores)		1.0*** (3.4)
Parent's highest level of education		
High School/GED or less		1.0 (-0.2)
Attended 2-year no 4-year degree		0.9 (-1.0)
Highest math course taken		
Algebra II or lower		0.5*** (-5.2)
Constant	**0.4***** (-19.2)	**0.2***** (-3.8)
Pseudo R^2	0.0	0.0
*N**	4700	4500

Source: *Note* N is approximate. Standard errors underneath coefficients in parentheses. Controls are in reference to White, male, lowest quartile, mother only, parent's highest level of education as 4-year degree or higher and pre-calculus or higher. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$