BRIDGES TO POSTSECONDARY SUCCESS:

An analysis of specialized curricula in the Milwaukee Public Schools

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July 2013

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EXECUTIVE SUMMARY

As metropolitan regions across the country strive to compete in a global economy based on knowledge and innovation, schools have been charged with producing "college- and career-ready" graduates. Consequently, instead of being assessed on the basis of high school graduation rates alone, schools also will be measured by how their students fare after high school.

In Metropolitan Milwaukee, the emphasis on college and career readiness is particularly critical. According to a recent analysis by The Brookings Institution, only 21.4% of Milwaukee's citizens possess a four-year college degree, ranking it 76th out of 100 large cities. The ability of Milwaukee's Kindergarten-12th grade (K-12) schools to improve upon this circumstance is seen as critical to efforts to build a local economy that can successfully compete with other metro areas across the country, and around the globe.

This report attempts to shed light on one important component of the larger effort to produce more college- and career-ready high school graduates in Milwaukee: whether specialized curricula used in the Milwaukee Public Schools (MPS) are positively related to higher college matriculation rates for MPS graduates. The aim is to better understand the role specialized offerings in urban public high schools might play in improving long-term outcomes for specific populations of students.

More specifically, this study analyzes the relationship of Advanced Placement, International Baccalaureate, Project Lead the Way, and career and technical education to postsecondary enrollment. Using data from MPS course enrollment records and the National Student Clearinghouse's college matriculation StudentTracker, we estimate the probability of college matriculation for students enrolled in specialized curricular programs over a recent four-year period. Results are disaggregated by race, gender, and socioeconomic status, allowing us to understand not only which specialized courses are associated with greater postsecondary enrollment, but also which segments of the student population benefit most from such specialized courses.

The main findings from our investigation of the impact of specialized curricula on MPS postsecondary outcomes:

- **MPS students who enroll in specialized high school courses generally are more likely to enroll in a postsecondary institution.** Broadly speaking, specialized curricula "works." Every specialized program demonstrated a statistically higher rate of postsecondary enrollment over the sample period. In addition, students who took greater numbers of specialized courses were even more likely to enroll in postsecondary schooling.
- **Postsecondary enrollment trends for students with specialized high school coursework are not the same for all student groups.** The effect of specialized courses varies widely by student demographic group and by type of curricular program. Some programs show promise for shrinking the racial matriculation gap.

Findings by specialized curricular program:

- *Advanced Placement (AP):*
    - MPS graduates with AP experience are more likely to attend a postsecondary institution than graduates with no AP experience.
    - The greater the number of AP courses taken by a student, the greater the likelihood of that student attending a postsecondary institution.
    - AP coursework by African-American, Asian, and white students has a stronger relationship with postsecondary enrollment than it does for Hispanic students.
    - The effect of AP coursework for economically disadvantaged students is roughly the same as the effect for non-economically disadvantaged students.
- *International Baccalaureate (IB):*
    - MPS graduates with IB experience attend college much more frequently than graduates who have not taken IB coursework.
    - The likelihood of attending college for MPS IB graduates is higher across all racial groups.
    - The greater the number of IB courses taken, the greater the likelihood of attending college.
- *Project Lead the Way (PLTW):*
    - MPS graduates with PLTW experience are more likely than non-PLTW graduates to enroll in postsecondary institutions.
    - PLTW courses have proportional representation of males and females, and a high representation of Hispanic and economically disadvantaged students.
    - Male, Hispanic, white, and at-risk PLTW graduates are more likely to attend college than the average graduate.
- *Career and Technical Education (CTE):*
    - CTE programs attract underrepresented high school student populations, both racially and socio-economically.
    - CTE students tend to score higher on state standardized assessments of reading and math than the general MPS student population.
    - The majority of CTE students reported furthering their education after high school graduation.
    - Between 2008-2011, a greater percentage of CTE graduates reported attending a postsecondary institution than the average MPS graduate.

While the findings suggest that MPS may wish to consider strategies to expand enrollment in specialized curricular programs as a means to increase postsecondary enrollment, it is important to recognize that specialized courses come at a significant cost to school districts. Aside from the financial obligations for adoption of programs, the administrative commitment of time and resources necessary to run such programs is substantial. In an era of steep budget challenges, information on the effectiveness of costly programs is imperative. Consequently, state and local education leaders also may wish to further explore the costs of greater enrollment in these programs in order to more accurately weigh the relative beneficial impacts.

INTRODUCTION

The Milwaukee Public Schools (MPS) is Wisconsin's largest school district, with a population of nearly 80,000 students. It also is an extremely diverse district from the perspectives of race, economics and academics. The district faces significant challenges, therefore, as well as significant opportunities in adopting comprehensive strategies to promote long-term success for all students.

With the recent state and local policy shifts toward greater accountability for post-graduation outcomes, many school districts have been looking for effective curricular options to promote college and career readiness. As a result, school administrators have begun to emphasize postsecondary-aligned curricula, including specialized programs such as Advanced Placement, International Baccalaureate, and Project Lead the Way. In addition, MPS has invested heavily in career and technical education offerings in recent years.

This study analyzes the effect of Advanced Placement, International Baccalaureate, Project Lead the Way, and career and technical education on college-going behavior over a recent four-year period. Using data from MPS course enrollment records and the National Student Clearinghouse's college matriculation StudentTracker, we estimate the probability of college matriculation for students enrolled in specialized curricular programs over the past five years. Results are disaggregated by race, gender, and socioeconomic status, allowing us to understand not only which specialized courses are associated with greater postsecondary enrollment, but also which segments of the student population benefit most. The goal is to provide MPS and other large urban districts with clues as to what types of specialized programs may best advance schools and students towards an expanded definition of long-term success.

Redefining "success" for Wisconsin schools

In August 2012, Wisconsin Superintendent of Public Instruction Tony Evers released *Agenda 2017: Every Child a Graduate, College and Career Ready*, signaling a shift to a new set of educational objectives for the state. Expanding beyond goals grounded in academic achievement or high school graduation, *Agenda 2017* redefined educational success as "college and career readiness." This expanded definition emphasized the role of K-12 education as a *means* rather than an *end* to student success. As a result, strategies intended to link students with positive postsecondary outcomes, as opposed only to high school graduation, have driven methodological, curricular, and administrative realignment.

Under this expanded accountability, new responsibilities and challenges emerge for schools to prepare students for real-world achievement. To identify these concerns, a consortium of representatives from colleges and universities across southeast Wisconsin formed the College Completion and Success Team (CCST) to define concrete barriers to college completion for

Wisconsin students.[1] The CCST defined three "barriers to college completion" that fall within the locus of primary and secondary education:[2]

1. Barrier I-Transition Gap: A lack of academic alignment to and preparedness for college-level work.
2. Barrier II-College Knowledge Gap: A lack of information on college planning and admissions.
3. Barrier III-Career and Academic Mismatch: A lack of exposure to careers and the educational requirements for them.

K-12 educators have been charged with developing and implementing strategies that address these barriers to college completion. Research into concrete, proven approaches that align to *Agenda 2017* is necessary in order to meet its expectations. In addition, the urgency of a 2017 timeframe will likely drive schools to seek "turnkey" programs that offer curricula, professional development/teacher trainings, and program evaluations, allowing schools to more quickly launch new offerings.

Success at Milwaukee Public Schools

In light of Agenda 2017, MPS has identified several approaches it has taken, and will undertake, to confront the barriers to college completion.[3] Those approaches include:

- Increased graduation requirements for the class of 2015.
- Incorporation of the Common Core State Standards into the Comprehensive Literacy Plan and Comprehensive Mathematics and Science Plan.
- District-wide ACT testing for high school juniors.
- Increased training and focus for school counseling services on college and career readiness, including an online Career Cruising tool.
- TEAM UP College Access Centers for offsite college, scholarship, and financial aid research and counseling.
- Multiple corporate and community partners offering services for college and career readiness.

A notable omission from this set of strategies is enhanced focus on specialized curricula, particularly curricula aimed specifically at postsecondary college and career objectives. MPS currently offers multiple specialized programs of this type, such as Advanced Placement,

[1] For a more comprehensive overview of the College Completion and Success Team outcomes, see Milwaukee Talent Dividend. *A Look at College Success: College Completion and Success in Southeastern Wisconsin.* University of Wisconsin-Milwaukee, Center for Urban Initiatives and Research, University of Wisconsin Milwaukee, 2012.

[2] Ibid., 29-32.

[3] Milwaukee Public Schools Administration. "Informational Report and Possible Action on College and Career Readiness Initiatives in the Milwaukee Public Schools." 2013.

International Baccalaureate, Project Lead the Way, and career and technical education. These specialized, postsecondary-focused courses have long been a principal means to prepare students for college and careers outside of the generalized curriculum.

In light of the general shift towards college and career readiness, as defined by the Common Core State Standards, the role and success of such specialized curricular tracks is worthy of analysis. In particular, it will be important for MPS to determine whether specialized programs offer it a means to significantly increase college and career readiness.

Objectives of the report

This report approaches that question by exploring the relationship between participation in specialized courses and postsecondary outcomes for MPS graduates. The relationship is explored through two general questions that will be informational for district administrators and board members:

1) Are students who take specialized courses more likely to enroll in a postsecondary institution?
2) To the extent that we find a relationship between enrollment in specialized high school programs and postsecondary enrollment, may other factors also be having an influence on outcomes?

In addition, the results of this research will be relevant to policymakers and administrators who determine the applicability of specialized high school courses towards industry certification requirements or college credit.

Finally, findings of this report are aimed at parents and school officials, to better inform both as to whether high school course offerings are living up to their expectations.

The report begins with a contextual "snapshot" of seniors at MPS, noting their self-reported plans for the future, as well as their demonstrated ability to achieve those plans. A brief overview of the specialized curricular programs available to MPS students follows. After the overview, each program is analyzed in turn. The program analyses include detailed descriptions of each program, student enrollment trends, and an investigation of the program's relation to postsecondary outcomes. The report concludes with a program comparison, general conclusions and recommended areas for future research.

DATA AND METHODOLOGY

This investigation relies on student-level MPS enrollment data covering the 2007-08 to 2010-11 school years. The MPS student database includes every course each student took at an MPS high school during the sample time frame and includes demographic characteristics for each student, such as gender and ethnicity. Our sample is limited to MPS high school graduates during that time period.

All graduates to their record in the National Student Clearinghouse's StudentTracker dataset, if possible. StudentTracker is a nationwide dataset that reports student enrollment from more than 3,400 colleges and universities. The data include 96% of all enrollment in public and private, two- and four-year postsecondary institutions.[4] Our final sample consists of 18,177 MPS graduates, 9373 of whom have enrolled in college according to StudentTracker.

To determine if students exposed to specialized curricula are more likely to matriculate to a postsecondary institution, MPS graduates who enrolled in a specialized course are compared to graduates who did not enroll in one. Comparisons for Advanced Placement (AP) and International Baccalaureate (IB) are made with a maximum likelihood estimation model, whereby the probability of enrolling in a postsecondary institution is calculated for any given student, based on his or her characteristics. From this model, the likelihood of postsecondary enrollment can be estimated based on how many specialized courses the student took, while eliminating (or examining) the effects of other contextual characteristics, such as the student's ACT score, gender, ethnicity, economic status, or the academic climate of the school they attended. Instead of merely comparing which programs have more students matriculate to a postsecondary institution, this method allows us to estimate the likelihood of postsecondary enrollment for *each* student.[5]

Sections on Project Lead the Way (PLTW) and career and technical education utilize a different methodology, as a result of low observations or different categorizations. Project Lead the Way enrollment is too low to make predicted probability estimates with any level of confidence; thus, cross tabulation is calculated for each program category. Average enrollment rates over the four-year sample period are compared to postsecondary enrollment rates of students who did not participate in specialized courses. As a result, the analysis of PLTW is descriptive rather than predictive.

The career and technical education section also is descriptive, and utilizes an annual survey of MPS graduates.[6] With 1,099 respondents, the annual survey asks career and technical education graduates about their status a year after leaving MPS. While less comprehensive than the methods above, the survey offers one dimension not available in other analyses: a measure of postsecondary employment rates. With a measure of both postsecondary enrollment and employment, the career and technical education follow-up survey provides a more appropriate means to gauge post-graduation outcomes for that particular curricular program.

Several data limitations require cautious interpretations of the findings. For example, the data cannot reveal whether students choose to take specialized courses because they have postsecondary plans, or whether students develop postsecondary plans after taking specialized courses. **Thus, we cannot conclude specialized courses are *causing* a particular likelihood of postsecondary enrollment, only that specialized course enrollment is *associated* with a particular likelihood.**

[4] For further information on StudentTracker, see: http://www.studentclearinghouse.org/colleges/studenttracker/
[5] For more information on methodology, see Appendix 2.
[6] Reporting year is 2010. More recent data may be available.

AMBITION AND ABILITY: SNAPSHOT OF MPS SENIORS

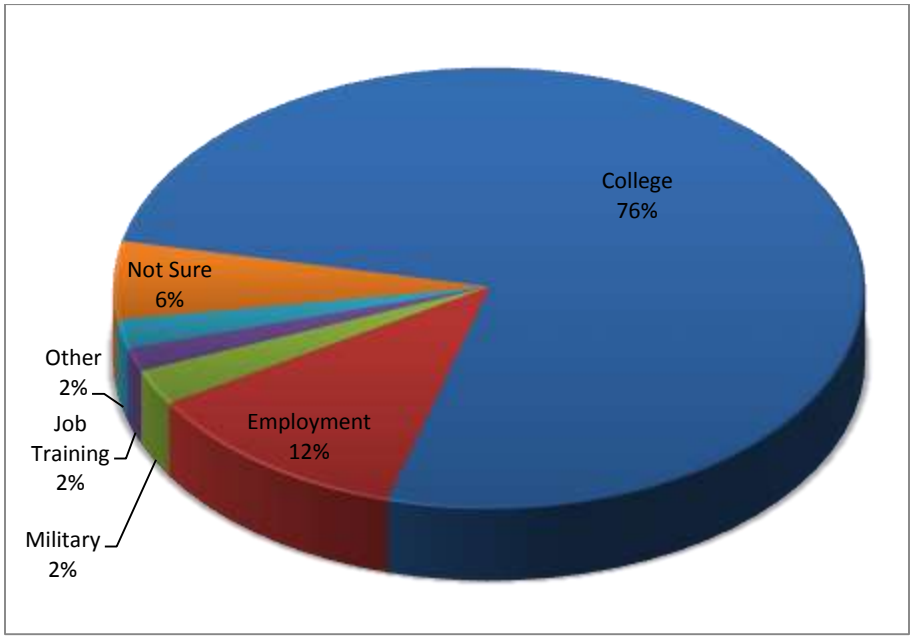
To provide context and background in assessing specialized programs at MPS, this section presents trends among recent graduates. Of specific interest are the trends in post-graduation plans and ACT benchmarks. The former is a measure of what students expect to do after graduation, while the latter is a measure of what they are capable of doing. While several efforts are underway statewide and nationally to hold schools more accountable for long-term outcomes, the success of a school ultimately will rest on both the aspirations of its students, and the school's ability to enable students to develop the skills that match their future aspirations.

Post-graduation plans 2011

MPS annually collects seniors' post-graduation plans in a report to the Wisconsin Department of Public Instruction (DPI). In 2011, MPS conducted the Senior Exit Survey, an instrument designed to add compatibility and depth to post-graduate plan data.[7] Results of the survey data offer a snapshot into the aspirations of MPS students on perhaps the most crucial function of academic success: transitioning into a career.

Figure 1.1 summarizes the primary plans for 2011 seniors. Nearly 76% of MPS seniors planned to attend either a four- or two-year institution. Other plans included employment, the military, and job training. Six percent of seniors were not sure about their post-graduation plans.

Figure 1.1: 2011 MPS Post-graduation Plans

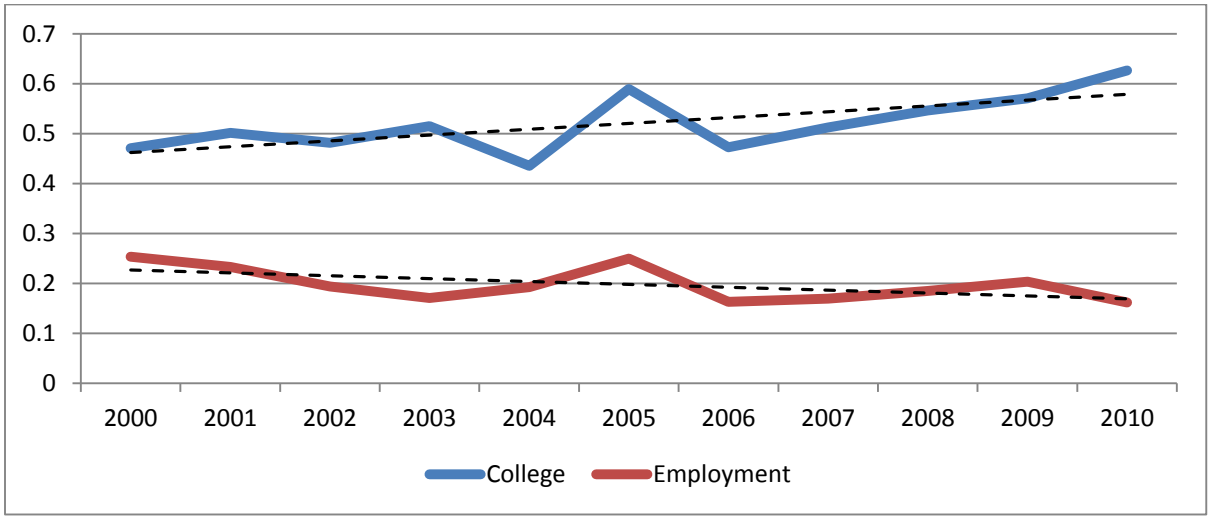


[7] Carl, Bradley, and Kristin Kappleman. *Executive Summary: Post-Graduation Plans, Postsecondary Enrollment Trends, and College Readiness among MPS Seniors*. Milwaukee Public Schools, 2012. Response rate at 73.4%, n = 3599.

Historical trends

An historical breakdown of post-graduation plans reveals a different picture. **Figure 1.2** shows the post-graduation plans of the classes of 2000 to 2010.[8] The employment category includes employment, military, and job training. The dotted lines show the general data trend over the period. While a slight decline in employment plans can be observed during the time period, the change is not statistically significant, and generally can be considered flat.

Figure 1.2: MPS Postgraduate Plans 2000-2010



The change in college plans has been statistically significant for the same time frame, however, with an average increase of 1.2 percentage points per year.[9] When broken down between two- and four-year plans, as shown in **Figure 1.3**, there is a slight increase in four-year college plans (.2 percentage points per year), while the increase in two-year college plans is nearly one percentage point per year, a statistically significant increase.[10] From this, it is clear that the percentage of students planning on attending college, particularly two-year institutions, is increasing amongst relatively unchanging (or slightly declining) plans to join the workforce immediately after high school graduation.[11]

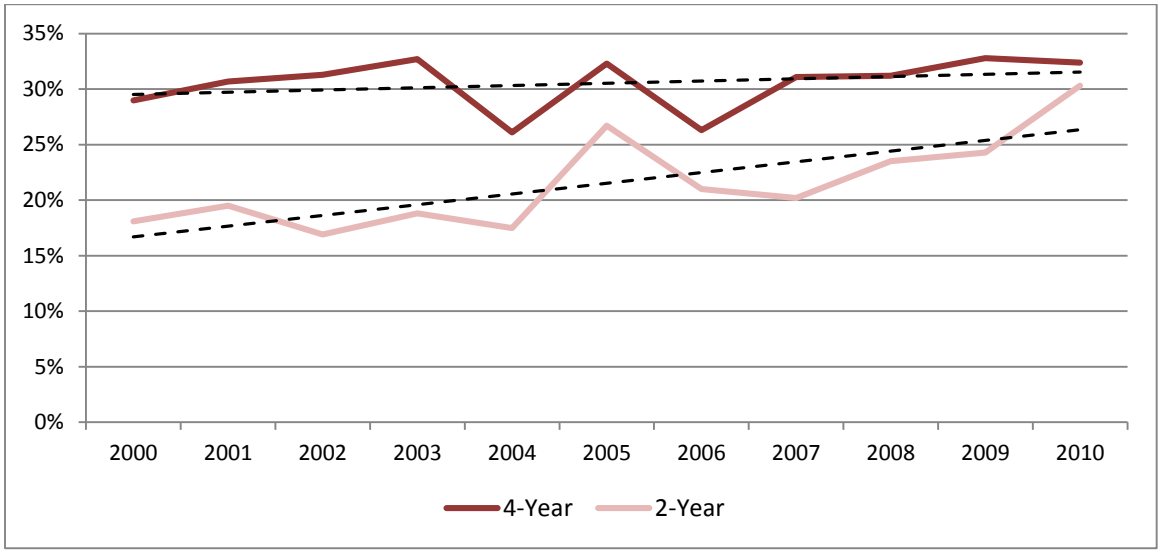
[8] Survey results obtained for 2011 are not included because the results were unusual, likely because of a change in the survey method. As such, data from 2000-2010 are more reliable when establishing general trends. In 2005, there also was a change in questionnaire methodology, as observed in the parallel bumps for that year. Removal of the data point yielded analogous results for significance in all tests. Longitudinal data comes from Wisconsin's Information Network for Successful Schools (WINSS). During the sample period, collection and reporting methods differed, so results can be considered samples or estimates of true trends. For more information on collection changes, see: http://spr.dpi.wi.gov/spr_post_q&a.

[9] $p < 0.05$.

[10] $p < 0.05$.

[11] Categories of employment, military, job training, and undecided demonstrated no statistical significance.

Figure 1.3: Type of MPS Education Plans 2000-2010



Plans by race

Averages of post-graduation plans may hide significant trends associated with racial differences. MPS historically has struggled to close racial achievement gaps, as minority students have consistently underperformed white students along several indicators.[12] And yet, in examining post-graduation plans by race, a different story emerges. **Figures 1.4-1.5** demonstrate seniors' post-graduation plans from 2000-2010, disaggregated by race. [13] This breakdown reveals that post-graduation plans of students of differing racial or ethnic backgrounds are not significantly different.[14]

[12] Milwaukee Public Schools Office of the Superintendent. 2010. Consolidated Improvement Plan for Milwaukee 2010-2011, pg. 44.

[13] Due to low population sizes or uneven distribution, categories of 'American Indian,' 'Asian,' 'Pacific Islander,' and 'Two or more' have been omitted from these figures. Low response rates led to incoherent visual representations. These groups were included in all statistical computations. In addition, response categories for "plans after high school" of Not Sure, Job Training, Military, and Misc/Other have been omitted. As a result, racial totals do not add up to 100%.

[14] Coding race as a factor and including interaction effects, marginal differences between racial groups yielded no statistically significant results in the categories of education, employment, military, job training, or other.

Figure 1.4: Plans for Employment by Race

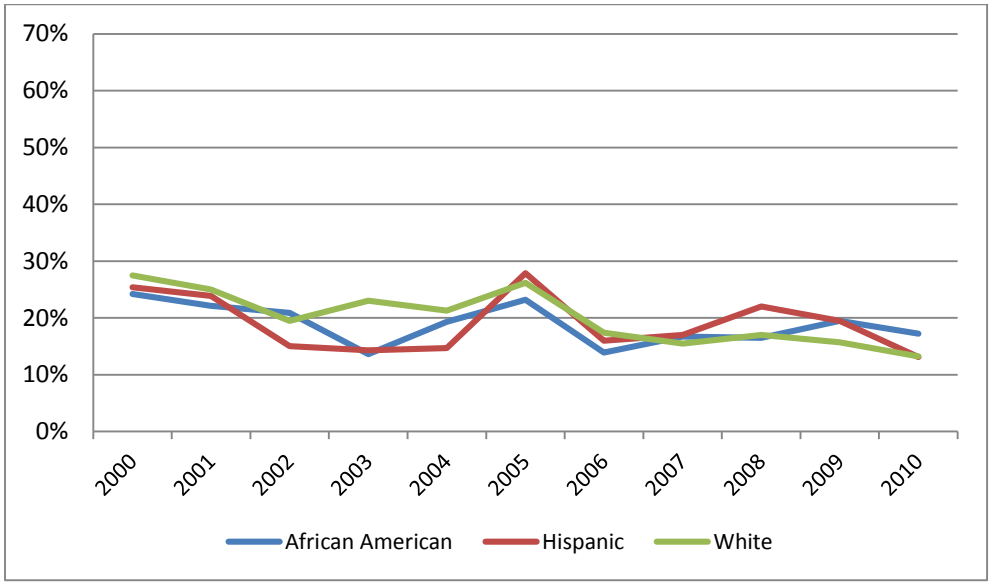
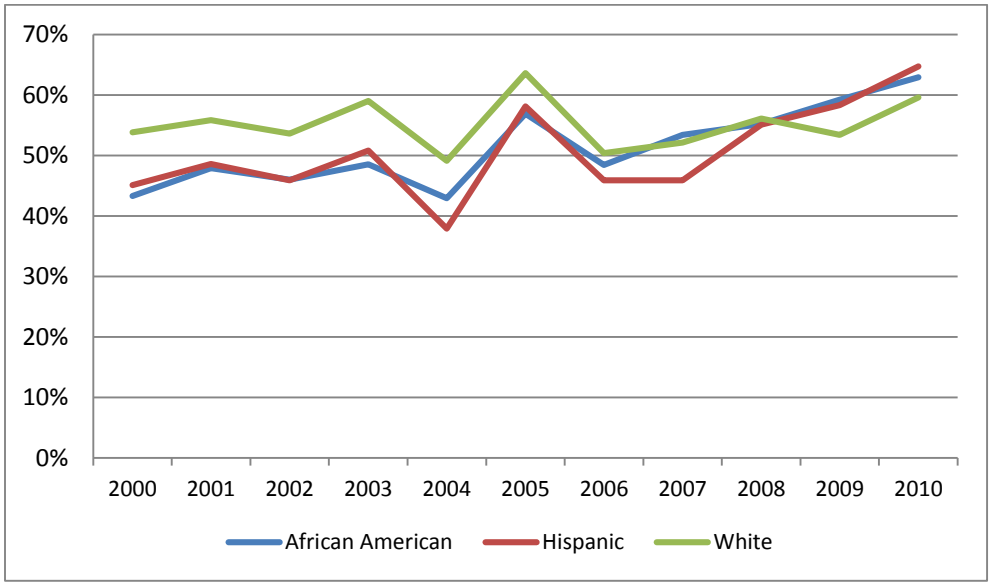


Figure 1.5: Plans for College by Race



Two implications can be drawn from these results. The first is that historically under-performing student groups generally maintain the same aspirations as other MPS students. In addition, we can conclude that factors influencing post-graduation plans appear to generally affect all groups equally. This is a positive implication for MPS, demonstrating that attempts to build a college-going culture have been effective across all races. Our second conclusion is that, because of the racial achievement gap in student performance, certain groups are likely to have a greater gulf between performance/ability and aptitude/expectations. This "expectation gap" should be a matter of concern for MPS. While it is not the purpose of this study to investigate the gaps in achievement along racial lines, a brief overview of the situation may help establish further context with regard to postgraduate ability.

College preparedness: ACT benchmarks

As a means to promote matriculation to college, MPS has adopted and funded the ACT test for all juniors, setting aside an in-school day for test administration. Taking the ACT not only is a necessity for most college admissions decisions, but it also serves to comparatively gauge college readiness. As a means to assess the ability of students to succeed in college coursework, the ACT has developed college readiness benchmark scores. These benchmarks predict the minimum score necessary to have a 75% probability of obtaining a C or higher in the respective college-level coursework. For example, 75% of students with a score of 18 on the English portion of the ACT are likely to earn a C or higher in a college English Composition class.

For purposes of this study, benchmark scores on the ACT help assess whether MPS students are equipped to achieve their post-graduation plans. In 2011, 75.5% of MPS students planned on attending college, either in two- or four-year institutions. But did they have the skills necessary to succeed?

Figure 1.6 shows the recent trend in ACT scores for MPS students. We see that ACT scores at MPS demonstrate a slight, statistically insignificant decline. It should be noted that in the 2009-10 school year, the district's new ACT policy went into effect, causing student participation rates to jump from 48% to 83%. With the increased number of students taking the ACT, a decline in scores is to be expected; an inverse and significant correlation exists between the percentage of MPS students taking the ACT and average composite scores.[15]

Figure 1.6: ACT Composite Scores: 1996-2012

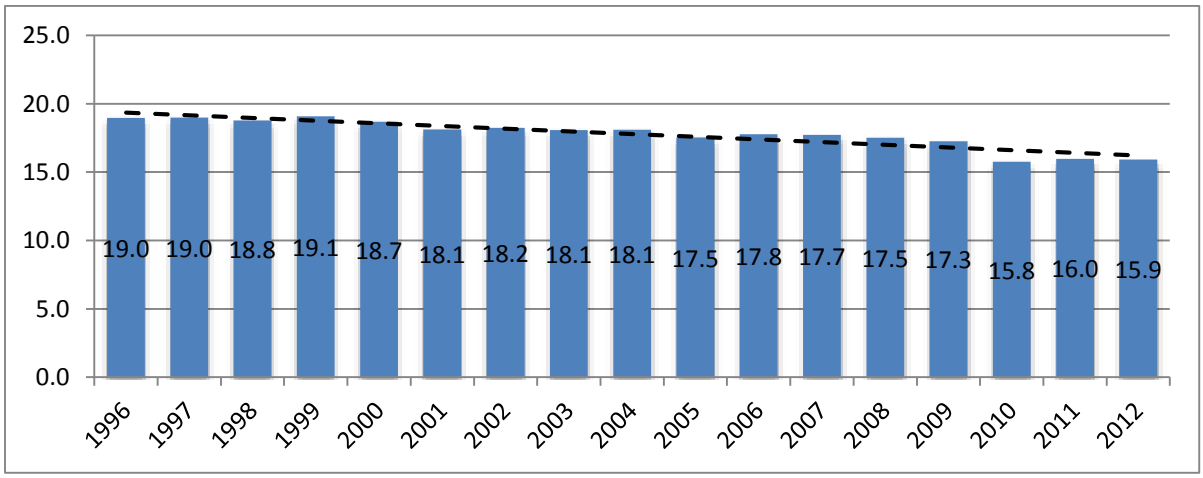


Figure 1.7 illustrates the average number of MPS students reaching college readiness benchmarks on the 2011 ACT test. In total, only 7% of students are prepared for all subjects of college-level coursework. Furthermore, scores vary considerably between racial groups.

[15] Correlation between participation rate and composite score: r^2=0.86. Estimated slope of ACT scores: -0.2 points per year, a significant result at 95% confidence.

The variability in readiness among the demographic groups contrasts starkly with the near-unanimity of planned college attendance. The furthest-right column shows the average percentage of MPS students planning postsecondary education after graduating high school for each racial or ethnic group. The gap between the percentage of students ready for college in all subjects, and the percentage of students planning to attend college, exceeds 50 percentage points for all groups except white students. It is important to note that ACT benchmarks measure four-year college readiness, while students' college plans may indicate intent to attend two-year institutions. Still, it is clear that in many instances, student's skills are too low for their aspirations, or students' aspirations are too high for their skills. Under the new banner of college and career readiness, finding a means to reduce this gap between skills and postgraduate plans appears to be an imperative for MPS, as well as districts throughout Wisconsin.

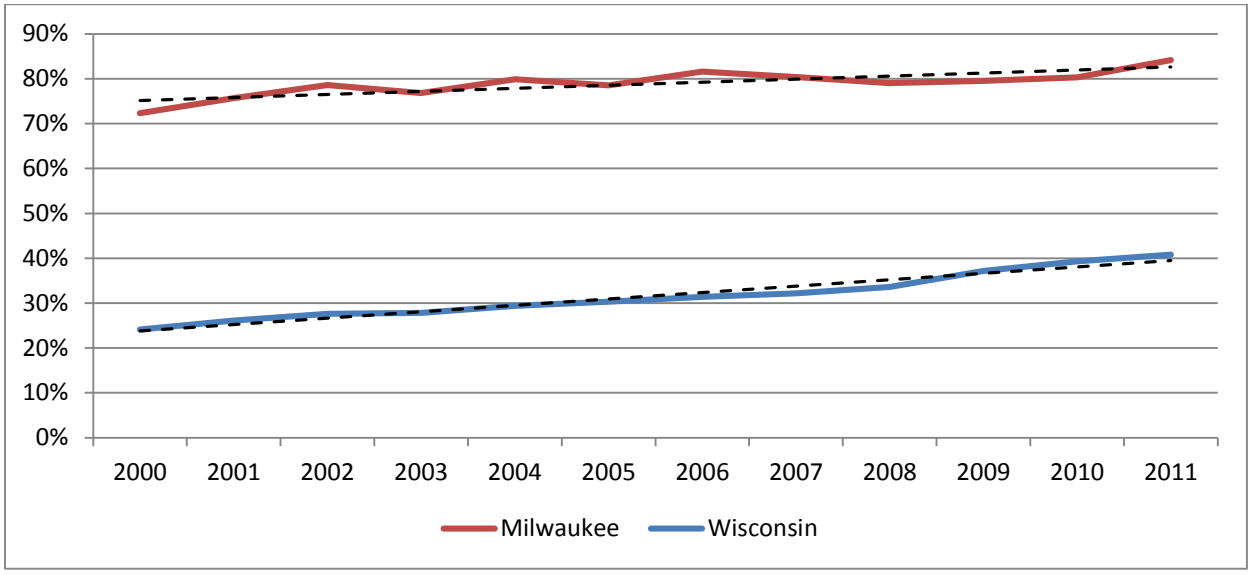
Figure 1.7: Percent of Students Meeting ACT College Benchmarks by Race, 2011

Group	English	Math	Reading	Science	All Benchmarks	College Plans
All MPS	32%	14%	19%	6%	7%	76%
African American	20%	4%	15%	16%	1%	78%
American Indian	4%	4%	0%	0%	0%	90%
Asian/Pacific Isl.	32%	20%	20%	8%	4%	74%
Hispanic	28%	13%	16%	17%	4%	69%
White	77%	52%	22%	22%	29%	73%

Economic impacts

Among the barriers to college attendance identified as the responsibility of the K-12 system, the "expectations gap" may be the most considerable. Other significant barriers also exist, however, including the cost of attending college. A notable trend regarding MPS students is an increase in those classified as "economically disadvantaged." This category includes: (1) Students eligible for free or reduced-price lunch; and (2) students who have not been specifically identified as eligible for free or reduced-price lunch, but for whom other evidence indicates that the student's household is at or below the free or reduced-price guidelines. As evidenced in **Figure 1.8**, the percentage of economically disadvantaged students has been on the rise in MPS, with an average annual increase of 2.24 percentage points. In light of the relatively stable levels of post-graduation plans despite this increase in economically disadvantaged students, it is clear that recent economic hardships have not dimmed students' aspirations for the future.

Figure 1.8: Economic Disadvantage



Summary

To summarize, MPS post-graduation data and ACT scores indicate:

- The percentage of MPS students who have post-graduate plans for college is increasing at a statistically significant rate.
- Post-graduate plans are similar across racial/ethnic categories.
- Increases in economic disadvantage have not resulted in significant changes in post-graduate plans.
- Although in 2011 roughly 76% of MPS students planned on attending a postsecondary institute, only 7% demonstrated skills to succeed in a four-year college on the ACT exam.

Given these findings, there are several implications for the district, including:

- Changing trends in standards and content delivery over the past decade have not been accompanied by changing postgraduate plans.
- There is an "expectations gap" between students' demonstration of skills and postgraduate plans.

Providing the tools to succeed is one goal of MPS, but matching those skills to students' future expectations opens a much more dynamic and individualized target for MPS teachers and administrators. Shrinking the "expectations gap" may become a significant factor in moving MPS closer towards its goal of "success in higher education, careers and responsible citizenship." This raises the question: Outside of standards and content, what options are available to MPS students, parents, and administrators to help match achievement to goals?

OVERVIEW OF SPECIALIZED PROGRAMS

MPS has a long history of offering specialized curricula aimed at successfully transitioning student experience to post-graduation success. This history can be obscured, however, when viewing the district as a whole, in large part because of the fractured structure MPS employs to provide such opportunities. In light of the many specialty high schools and district-wide school choice options, each school in MPS is not a microcosm of the district's overall mission of comprehensive educational opportunities. Rather, many high schools provide specialized programs that offer particular pathways to college and career success, as shown in **Figure 2.1**. The following is a brief overview of available programs.

Figure 2.1: MPS High Schools Specialized Program Availability[16]

School	AP	IB	PLTW	Career Pathway
Academy of L & S		Y		
Audubon Hi	Y		Y	AV Technology & Film
Banner Prep				
Bay View Mid and Hi	Y		Y	Construction, Business Finance, Food & Beverage Services, Engineering & Tech
Bradley Tech Hi	Y		Y	Construction, Visual Arts, Engineering & Technology
Career and Te Ed			Y	
Carmen Hi	Y			
Hamilton Hi	Y		Y	Construction, Printing Tech, Management, Marketing, Engineering & Tech
King International		Y		Family and Community Services
Madison Academic Campus	Y			Therapeutic Services, Law Enforcement Services
MKE Sch of the Arts	Y			
MKE Sch of Entrepreneurship				Marketing
MKE Sch of Languages	Y			
Montessori Hi		Y		
Morse Marshall			Y	Engineering & Tech
New School				AV Technology & Film
Professional Learning Inst	Y			
Pulaski Hi	Y			Administrative Support, Business Finance, Transportation Operations
Reagan Hi		Y		
Riverside Hi	Y		Y	Therapeutic Services, Early Childhood Development
South Division Hi	Y		Y	Business Finance, Early Childhood Dev, Engineering and Technology
Vincent Hi	Y		Y	Management, Facility and Mobile Equipment Maintenance, Urban Agriculture
Washington Hi	Y		Y	Travel and Tourism
Washington Hi IT				Programming and Software Development
WI Conserv of Lifelong Learning	Y			

[16] Information comes from 2011-12 MPS data on course offerings. Schools may have internal programs as well, or may have changed/altered program offerings for the current school year.

Advanced Placement

The goals of Advanced Placement (AP) courses are twofold. First, AP courses offer students college-level curriculum and thereby offer a taste of the rigors of the college experience. More than 30 courses are available from the College Board (the creator of the AP program) in statistics, calculus, biology, English, and several other fields. Each course culminates in an exam each May. The second goal is to offer high school students the chance to earn college credit. Passing scores on AP exams may result in the possibility of either college credit or reduced requirements, depending on the college. While direct transcripted credit is not universally granted for passing the AP exam, several postsecondary institutions accept passing AP test scores as a means to bypass prerequisite courses. In addition, students often take AP courses as a means to stand out on college applications, even if no credit is granted by the institution.

International Baccalaureate

Designed as an internationally standardized set of distinguished curricula, International Baccalaureate (IB) offers courses emphasizing underlying theories of knowledge, multiple languages, independent research, and application of critical thinking skills. The mission of the IB program is to "develop inquiring, knowledgeable and caring young people who help to create a better and more peaceful world through intercultural understanding and respect."[17] As such, IB is focused on underlying skills and perspective rather than specific subjects. Unlike AP, IB requires rigorous restructuring of school administration and service delivery to be certified. While the IB "diploma programme" is not designed to directly transfer to postsecondary education, its emphasis on critical thinking and applied learning often serves as a distinguishing credential for college admissions. Students earn an IB diploma based on accumulated scores from written examinations and demonstrated course proficiency, which some colleges may accept for college credit or waivers from requirements.

Project Lead the Way

Project Lead the Way (PLTW) is a non-profit group that designs curricula and staff training aimed at increasing student interest and achievement in science, technology, engineering, and math (STEM). Evolving out of digital electronics courses in New York, PLTW is now a nationwide set of courses offering hands-on experiential learning specifically targeted at STEM career fields. For example, students may take courses like principles of engineering or computer-integrated manufacturing to prepare directly for a career in either engineering or biomedical sciences. The curriculum for each course is centered on "activities, projects, and problem-based learning;" meets graduation requirements; and culminates with end-of-course exams. PLTW partners with local universities and institutions to provide admissions preferences, transcripted credit, scholarships, and/or program services. While recognition of PLTW for college admissions is not as broad as AP or IB, the focus on creating unique local partnerships ensures close

[17] From the International Baccalaureate Organization mission statement. See www.ibo.org/mission/.

collaboration between high schools and particular institutions. The goal of PLTW is to lead students to postsecondary success by directly exposing them to specific science- and technology-based career fields.

Career and technical education

Unlike the other programs analyzed in this report, career and technical education (CTE) is not a singular set of specialized curricula, but a blanket term covering several vocational education programs in MPS. Traditionally, CTE has referred to tracks of courses for occupations that do not require four-year degrees, such as automotive repair or carpentry. Since CTE is developed by school districts themselves, however, it now often incorporates training for both vocations and careers that require two- or four-year degrees. At MPS, the CTE department designs, implements, and oversees several educational programs, and also works to develop partnerships with the community to offer real-world learning experiences. The adjacent text box outlines the areas of CTE offerings in MPS.[18] Below is a brief overview of some of the CTE programs helping students transition to postsecondary success.[19]

CAREER AND TECHNICAL EDUCATION AT MPS

Business and Marketing Education
- Accounting
- Administrative support
- Entrepreneurship
- Finance
- Information technology

Family and Consumer Science Education
- Child care and human services
- Culinary arts
- Health careers

Trade and Technical Education
- Advanced manufacturing
- Communications
- Construction/architecture
- Media/animation
- STEM – Engineering, robotics
- Transportation (auto and aviation)

Work-based learning
- Cooperative education
- Internships
- Youth Apprenticeship

Business and postsecondary partnerships
- Advisory boards
- Classroom speakers
- Fields trips
- Job shadowing
- Mentors, role models
- Student placements
- Technical expertise

Career Pathways

Career Pathways is a meta-program that seeks to build an individualized learning plan for each student linking course choice, dual enrollment, job training, and college curriculum. Participating in Career Pathways requires coordination between school counselors, employers, and postsecondary institutions. The pathways are structured into 16 career clusters, including marketing, health care, or construction. A website helps students explore careers, alternatives, and postsecondary intuitions, while the guidance counselor helps to design a feasible program that identifies necessary courses and experiences in high school and in a postsecondary institution. In this capacity, Career Pathways incorporates and coordinates between several programs to offer experience in a particular field. Beyond just high school, the

[18] Figure reproduced from MPS CTE website, see: http://www5.milwaukee.k12.wi.us/dept/cte/about-us/what-is-cte/
[19] For more information of CTE programs, see: http://www5.milwaukee.k12.wi.us/dept/cte/

plan includes a roadmap of what tests to take, certificates to complete, and courses to take once in a postsecondary institution. Some career pathways end in a state-issued certificate, while others culminate in a four-year degree.

Youth Apprenticeship

Initiated in 1991, the Youth Apprenticeship program combines classroom instruction and a paid internship for on-the-job training. The program is managed by the Wisconsin Department of Workforce Development and includes one- and two-year programs in areas such as drafting and design, financial services, graphic arts, health services, information technology, and manufacturing.[20] Programs result in a state-issued certificate and possible technical college credit. Students are hired for the paid apprenticeships by partners while paired with appropriate curriculum in the high school.

Youth Options (Dual Enrollment):

Wisconsin has a long standing dual enrollment program, called Youth Options, whereby high school juniors and seniors may take postsecondary courses on the campuses of participating Wisconsin System colleges and universities, technical colleges, or other participating postsecondary institutions. Students are thereby "dual enrolled" to receive both high school and college credit. Student eligibility is determined by a number of factors, including academic and attendance records. The school district pays the course tuition if it is not comparable to courses offered by the district. Beginning this fall, MPS will initiate a full dual-enrollment program in which high school teachers with appropriate masters degrees will teach college courses in high schools or online for college credit, thus providing an opportunity for students to gain college experience and credits.

Supplementary programs

MPS students frequently take part in an assortment of career exposure events, from classroom visits by practitioners to scholarship fairs, college application help, or career-interest tests. In addition, in 2011, MPS launched TeamUp College Access Centers. These off-campus sites offer students a space to work with mentors on researching and completing requirements for college admissions, such as applications, financial aid, and scholarships. The two sites currently operating host events such as writing seminars, financial aid workshops, college visits, and counseling sessions.

[20] For more information, see: http://dwd.wisconsin.gov/youthapprenticeship/

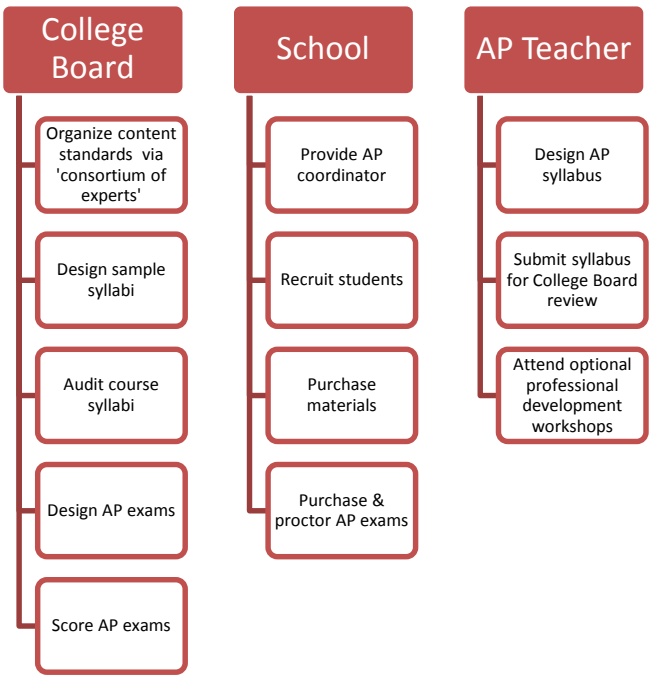
Summary

MPS approaches college matriculation from multiple angles, both inside and outside of standard curriculum. Avoiding a "one size fits all" approach certainly provides the district's diverse population with many channels for tackling the multifaceted challenges of postsecondary enrollment. However, the extent to which this heterogeneous implementation is helpful to students and families, as opposed to causing confusion, is unclear. Universal access to all programs could reduce confusion, but the limitations of staff and budget require targeted implementation of specialized programs. It is our hope that this report will help to facilitate decision-making on the breadth and scope of specialized programs by investigating the types of students most likely to benefit from participation in such programs.

ADVANCED PLACEMENT

Advanced Placement (AP) courses are college-level courses designed to be taught in high schools, where they provide an opportunity to meet college requirements and/or earn college credit. The AP program is run by the College Board, which organizes committees of college faculty and AP teachers to design course standards, and which negotiates agreements for credit at institutions of higher education. To receive the AP designation, a course's curriculum must pass an audit process facilitated by the College Board. Thus, AP courses are not uniform across schools. Furthermore, AP teachers are not required to possess additional certifications, nor does the program require specific staff professional development.

Administrative Actions of AP Program



Each May, AP exams are administered to students for a fee of $89, and scored on a scale of 1-5.[21] Scores of 3 or higher may be transferable for postsecondary credit, or may allow for a waiver of certain course requirements, depending upon the institution.[22] It is important to note that enrollment in an AP course is not a prerequisite for taking an AP exam. Rather, an AP course is merely one means of preparation for the exam.

As Wisconsin transitions to a more rigorous set of standards under the adoption of the Common Core State Standards, the role of AP courses may become more salient. DPI Superintendent Tony Evers recently set a target for a 35% increase in career and college readiness by 2017, as well as a new accountability measure for schools based on postsecondary readiness.[23] Thus, the ability to offer college-level curriculum may be increasingly attractive to both schools and students.

In 2011, MPS was awarded the U.S. Department of Education's Advanced Placement Initiative Program (APIP) grant. The grant was intended to expand the reach and quality of AP courses, and is part of a larger initiative to increase college readiness for MPS students. The activities

[21] For students on free & reduced lunch, the College Board offers a $28 fee reduction, and schools provide an additional $8 reduction. The fee for economically disadvantaged students is $53.
[22] For more information on AP courses, see: http://apcentral.collegeboard.com/apc/public/courses/index.html
[23] Wisconsin Department of Public Instruction. "Agenda 2017." June 2012. College and Career Readiness intended to increase from 32% to 67% by 2017.

funded by the grant are aimed at increasing participation in STEM courses,[24] as well as providing greater access to AP exams for economically disadvantaged students. The grant is set to introduce AP courses into new schools as well as overhaul and add to existing programs. The award of $650,000 per year for three years will help offset budget reductions and staffing reductions from previous years.

AP efficacy

Research on the success of AP courses in helping students transition to college has been mixed. The publications of the College Board, as well as independent studies, have confirmed the intuitive link between the experience of college-level coursework and post-graduation plans. As stated in a 2001 study from the Fordham Institute: "An increase of 171% in the odds of attending a four-year postsecondary institution associated with the completion of a single AP exam suggests that AP exams provide considerable prediction of college going behavior."[25] In short, the greater the number of AP courses taken by a student population, the greater is the number of students in that population who go to college. A more recent study in the *American Educational Research Journal* found that this relationship has shown to bear a greater impact on historically disadvantaged groups.[26]

While increased college enrollment is correlated with AP coursework, however, any causal effect is difficult to determine. As highlighted in Harvard Education Press' *AP: A Critical Examination of the Advanced Placement Program*, it is likely that students predisposed to go to college are taking AP courses, instead of AP courses acting as a determinant in college attendance.[27] Furthermore, it has been found that aside from the initial trend of college admittance, AP students were no more academically successful or persistent than non-AP students once attending a university.[28] While AP courses may be related to college plans and matriculation, therefore, it is difficult to determine if they have any measurable effect on student performance in the long term.

The conflicting research on the impact of postgraduate success brings into question the role of AP courses at MPS. Given that no research finds such advanced and college preparatory courses to have any detrimental impact on postgraduate behavior, it is difficult to argue that high expectations and accountability measures are harmful. There is little evidence to suggest,

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[24] STEM generally includes science, technology, engineering, and math.

[25] Chajewski, Michael, Krista Mattern, and Emily Shaw. "Examining the Role of Advanced Placement Exam Participation in four-year College Enrollment." *Educational Measurement: Issues and Practice* 30, no. 4 (2011): 24.

[26] Long, M., D. Conger, and P. Itarola. "Effects of High School Course-Taking on Secondary and Postsecondary Success." *American Educational Research Journal* 49, no. 2 (2012): 285-322.

[27] Duffy, William II. "Persistence and Performance at a Four-Year University: The Relationship with Advanced Coursework During High School." In *AP: A Critical Examination of the Advanced Placement Program*, by Philip Sadler, Gerhard Sonnert, Robert Tai and Kristin Klopfenstein, 139-163. Cambridge: Harvard Education Press, 2010

[28] Ibid., 156.

however, that AP is specifically more effective than honors or dual enrollment courses for helping students transition to college,[29] thus begging the question of whether AP is really helping.

ADVANCED PLACEMENT AT MILWAUKEE PUBLIC SCHOOLS

The goal of this report is to investigate the relationship between specialized programs and postsecondary enrollment. For the AP program, this means determining whether graduates who were enrolled in AP courses during their high school career enrolled in a postsecondary educational institution. To answer that question, we matched MPS graduates to the student records in the National Student Clearinghouse's StudentTracker database. StudentTracker works with postsecondary educational institutions to report student enrollment in postsecondary institutions. Covering 3,400 institutions and 96% of all postsecondary enrollment, StudentTracker is the most comprehensive database available to assess postsecondary trends.

The frame of analysis is 2007-08 to 2010-11. While a narrow window, it provides perhaps the most accurate description of postsecondary enrollment (PSE) possible with available data. Because StudentTracker's rate of coverage has been increasing annually, more recent data contain less systematic sampling error.[30]

The sample population used for the study consisted of all students enrolled in an MPS school between the 2007-08 to 2010-11 school years that eventually graduated.[31] The "treatment" sample was any student who enrolled in an AP course during this period, regardless of whether the exam was taken or passed.[32] Exposure to AP coursework was stratified: Graduates with 1-2 AP courses on their transcript are coded Low AP, those with 3-4 courses are Medium AP, and those with 5+ courses are High AP.[33] **Figures 3.1** and **3.2** demonstrate the sample size and stratification.

Demographics and Enrollment

Before assessing postsecondary trends for AP students, it is helpful to consider overall demographic and enrollment trends with regard to AP participation at MPS. **Figures 3.1-3.5** provide an overview of AP students between 2007-08 and 2010-11.

[29] Ibid., 156.
[30] As data becomes more recent, aggregate PSE trends decline due to late enrollment. For this reason, data from the previous year's graduating cohort cannot be viewed as an accurate description of PSE. Late enrollment trends were estimated and controlled for in the model, but dropped as they had no significant influence on the outcomes.
[31] For further information on the data, see Appendix 2.
[32] To garner the data points, unique student identifiers were used to isolate which students had enrolled in AP courses, and if so, how many courses. These unique identifiers were then matched to StudentTracker identifiers. To ensure students were not repeatedly matched, duplicates were removed. Each data point utilized is therefore the number of seniors in a graduating year (2008-11) that were matched to PSE data. If a student took an AP course in 2008, graduated in 2009, and enrolled in college in 2010, they would be counted as having taken one AP course in 2009.
[33] Factor coding based on quantiles

Figure 3.2 illustrates that while most students take two AP courses, some have enrolled in up to 20 during their high school career. All students who had enrolled in 15 or more AP courses attended either Hamilton or Riverside high schools, which offer the largest breadth of AP courses. **Figure 3.4** breaks down enrollment by school site and shows that schools with the highest aggregate AP enrollment also have greater numbers of students taking several AP courses. This finding highlights the difficulty associated with attributing causal impacts to high AP enrollment in a school system with widespread school choice. Specifically, is it the capacity of a school to facilitate high numbers of AP courses that generates more interest in them, or do students attend specific schools in order to take more AP courses?

Figure 3.1: MPS Graduates with and without AP experience

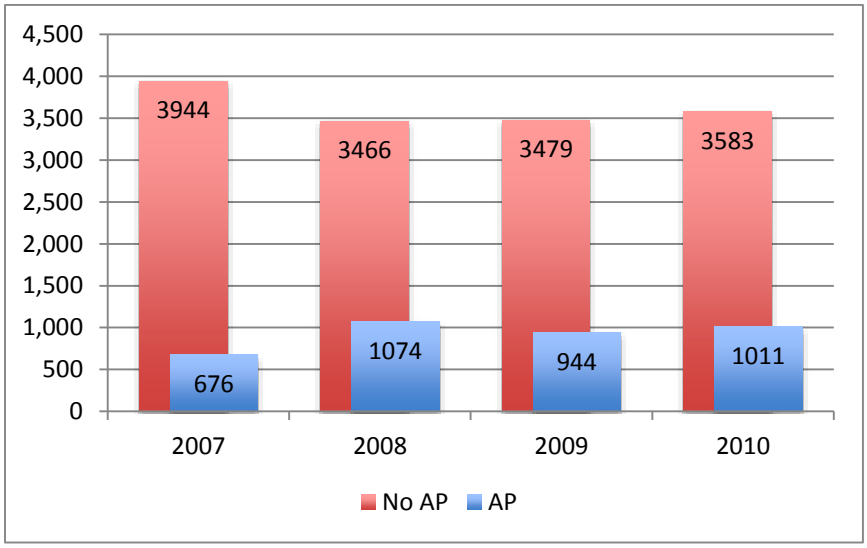


Figure 3.2: Number of graduates by frequency of AP courses, 2007-08 to 2010-11

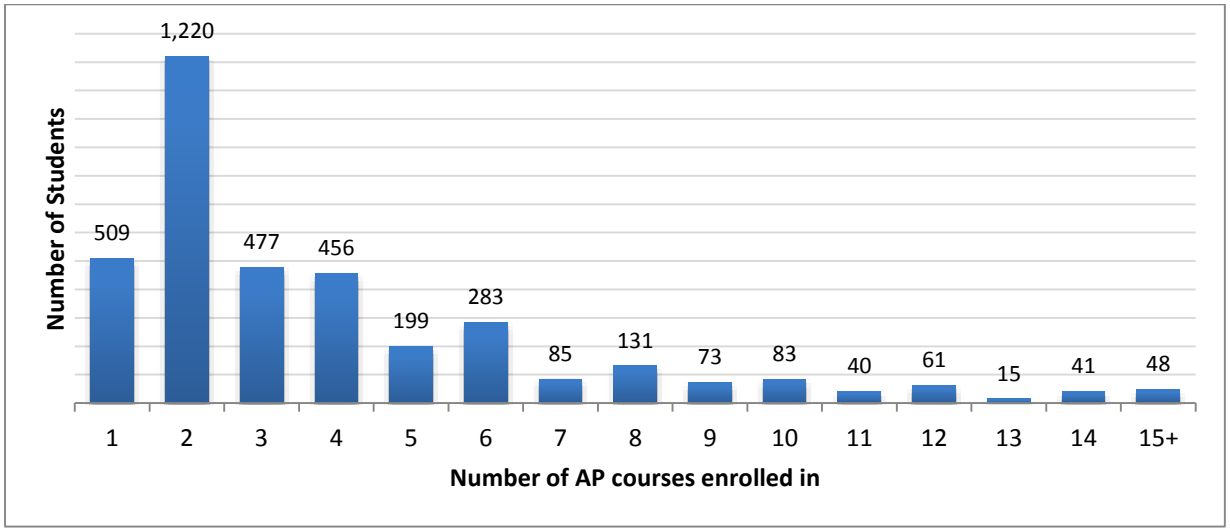
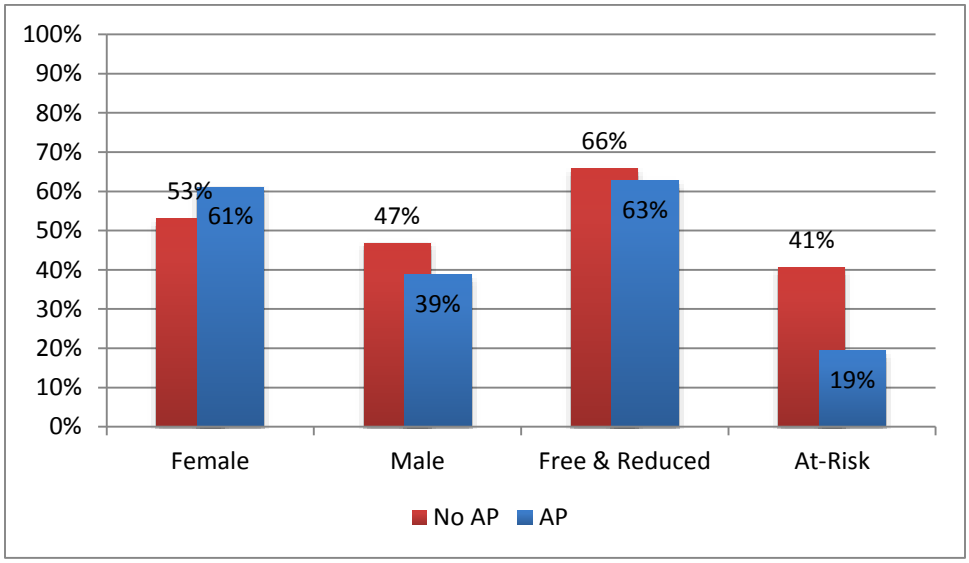


Figure 3.3 shows interesting trends regarding economically disadvantaged and at-risk students.[34] First, economic disadvantage does not appear to be a barrier to taking AP courses. The rate of eligibility for free or reduced-price lunch among AP students is only three percentage points lower than the aggregate poverty rate among MPS graduates in this time period. Second, significantly fewer students identified as at-risk take AP courses. Only 19% of AP students are at-risk, compared to 41% of all non-AP students. Finally, **Figure 3.5** reveals a roughly four-percentage point difference in the portion of Asian, Hispanic, or white students between AP enrollment and total graduates, and a 14-point difference in the portion of African American students.

Figure 3.3: AP and Non-AP enrollment, 2007-08 to 2010-11



[34]References to "economically disadvantaged" students in this report mean those students who qualify for free or reduced-priced lunch (FRL). Such students are from households at or below specific income levels set by the federal government. Many households are automatically designated based on tax status. References to "at-risk" students mean those students who are at risk of not graduating from high school for being significantly behind in basic skills or credits, habitually truant, adjudicated delinquent, or who have certain parental issues. See Wisconsin statute §118.153 (1).

Figure 3.4: AP Graduates by school, 2007-08 to 2010-11

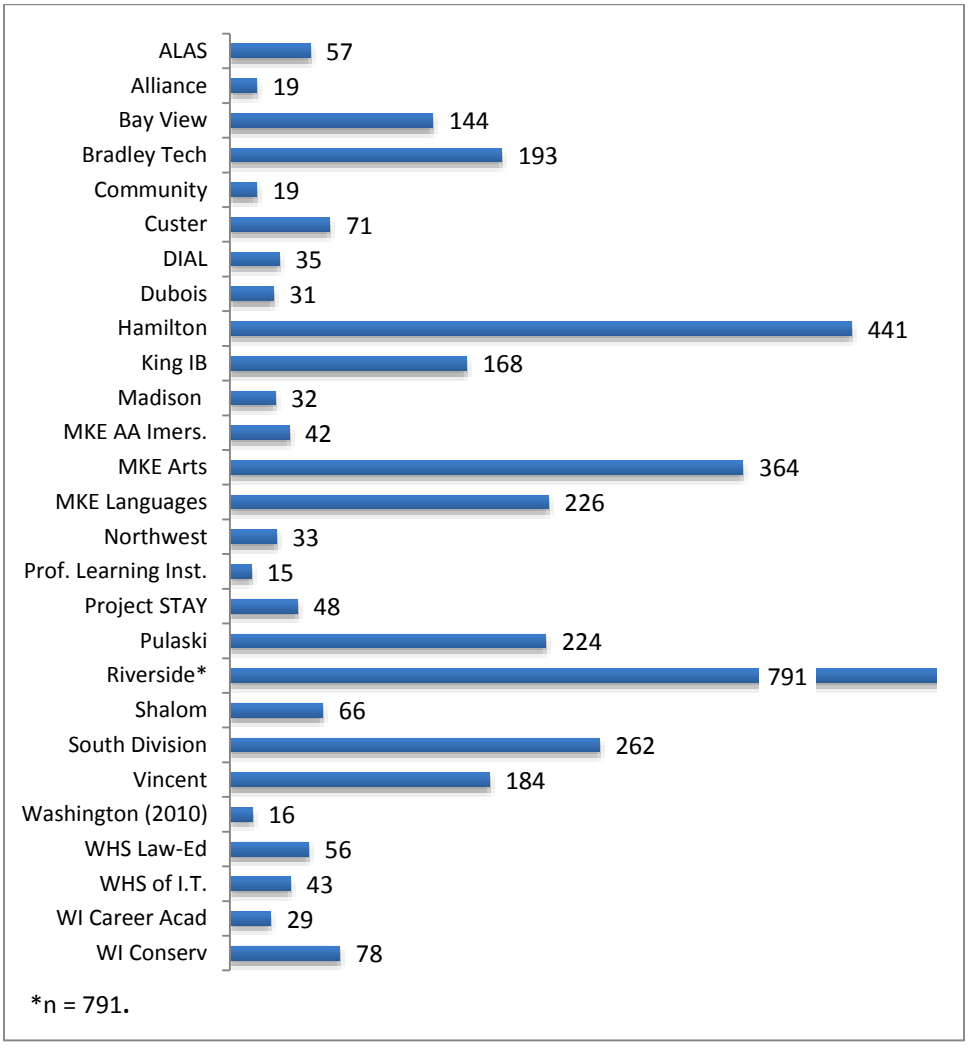
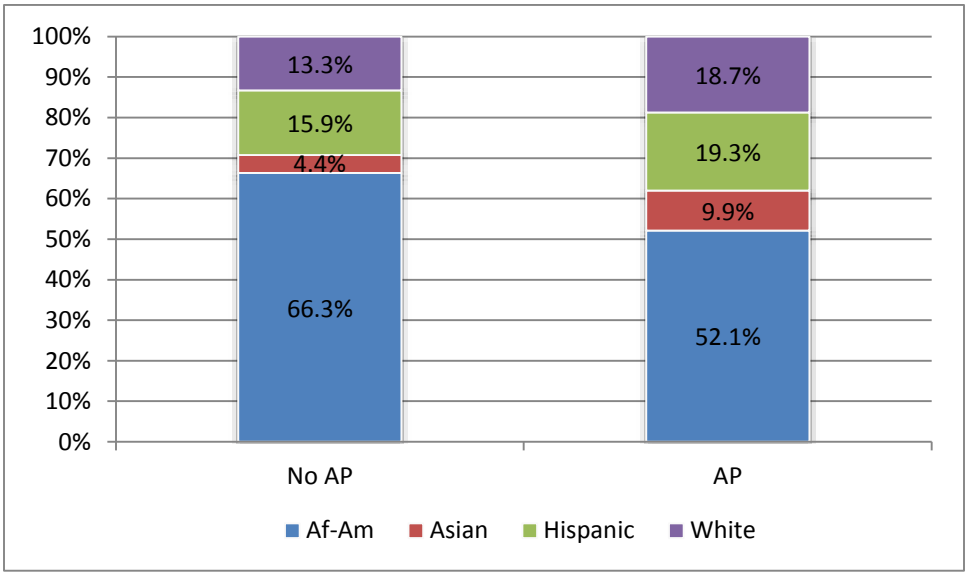


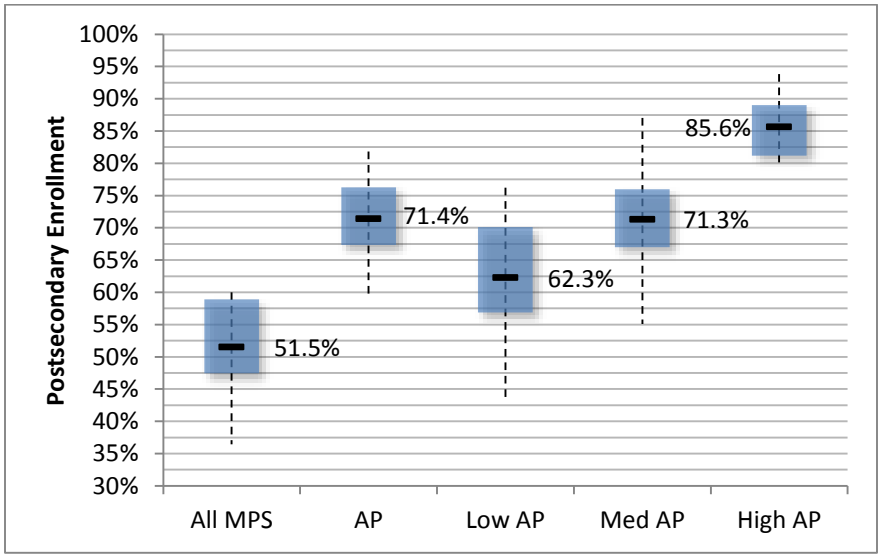
Figure 3.5: AP and Non-AP enrollment by Race, 2007-08 to 2010-11



Outcomes

Figure 3.6 shows the results of the analysis of the relationship between AP enrollment and postsecondary enrollment.[35] On average, 51.5% of MPS graduates enrolled in a postsecondary institution, compared to 71.4% of graduates with AP exposure. Statistical analysis indicates that the postsecondary enrollment rate of AP-experienced graduates was significantly greater than would be expected if AP experience had no relationship to postsecondary enrollment.[36]

Figure 3.6: Annual rate of college enrollment by graduates with AP experience, as compared to total MPS graduates



In addition, the chart shows that as the number of AP courses taken increases, so does the rate of college enrollment. Students taking one or two AP courses (Low AP) are *statistically* similar to the MPS average in terms of likelihood of attending college. As AP course participation increases, however, rates of postsecondary enrollment increase rapidly. In fact, from a statistical perspective, the effect of AP participation on college matriculation is not considered significant until AP participation reaches three to four courses. [37]

To view the relationship more closely, we plotted each year's average postsecondary enrollment rate for AP-experienced graduates against the total number of AP courses taken (see **Figure 3.7**). For each additional AP course taken, postsecondary enrollment increased by an average of 2.7 percentage points, a statistically significant increase.[38] We can thus conclude that, in the

[35] The blue boxes represent where 75% of the observations fall, while the dashed lines represent the range of the sample.

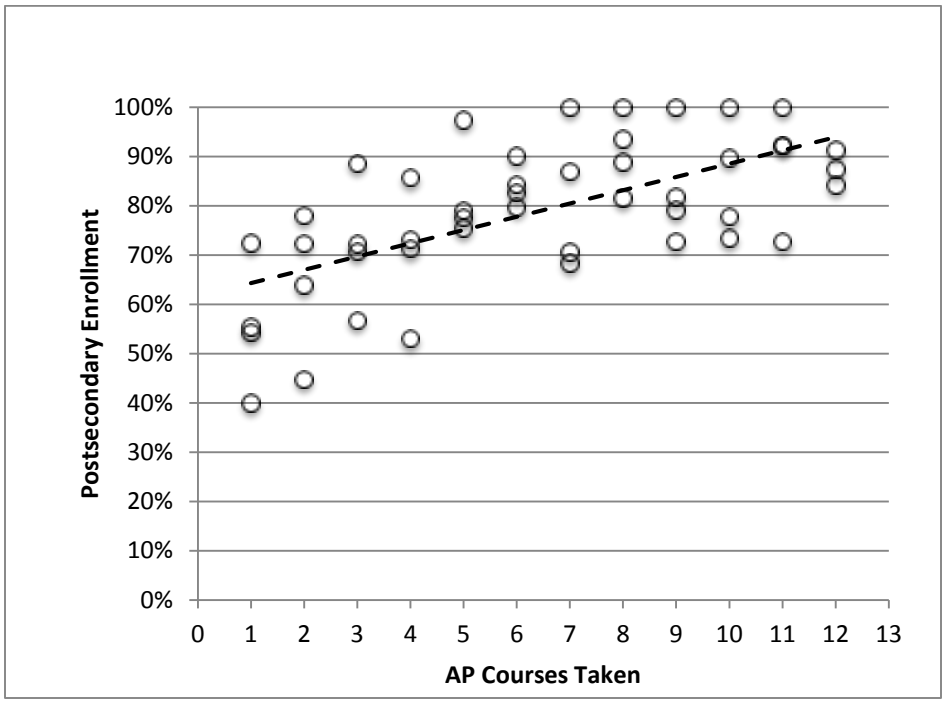
[36] t=-2.7, p<0.001.

[37] The term "effect" can be confusing when speaking of statistical results. Generally, "effect" implies a relationship with a cause. When describing statistical results, "effect" is not used to denote causality between the two concepts being measured, but an effect between the *measurements themselves.* Thus, when "the effect of AP on college matriculation" is stated in this context, it is not meant to imply a causal relationship, but a numerical one.

[38] t= 5.47, p<0.001. AP frequencies over 12 were removed due to low n.

aggregate, AP students are more likely than those without exposure to AP courses to attend a postsecondary institution, and that the rate of college matriculation among a graduating class increases as students in that class take more AP courses.

Fig 3.7: Annual rate of college enrollment by AP exposure



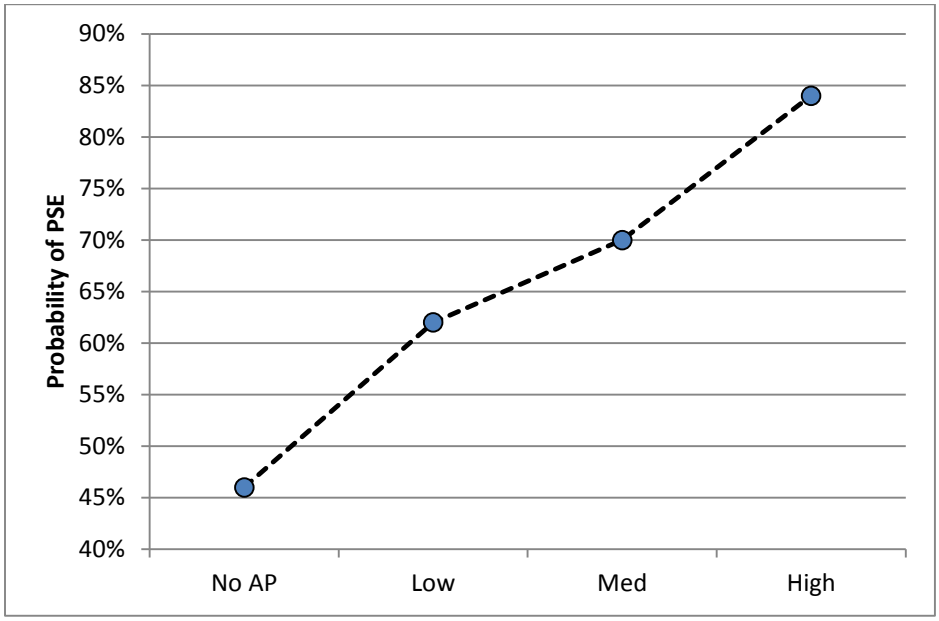
While **Figures 3.6** and **3.7** rely on aggregate trends to estimate the effect of AP courses on graduating classes, a probability model can estimate the effect on individual students. Generally, the probability model determines the maximum likelihood of enrolling in a postsecondary institute for any given student who took an AP course or courses.

Figure 3.8 illustrates this model, controlling for the effects of contextual characteristics.[39] The blue dots represent the estimated probability of college matriculation for any given student who has taken AP courses. Here, it can clearly be seen that as AP exposure increases, so does the probability of enrolling in a postsecondary institution.[40]

[39] 'Contextual characteristics' denote holding the influence of gender, race, economic status, at risk status, ACT score, and school academic climate constant during prediction. For further information on the model used, as well as the coefficients, see Appendix 2.

[40] Note that the scale of the axis has been magnified to emphasize the differences.

Fig 3.8: Probability of enrolling in college as AP exposure increases



While the outcome of the probablity model is similar to estimations of yearly averages, an interesting difference also emerges. Aggregate trends do not demonstrate a significant effect on college matriculation for low levels of AP exposure (one or two AP courses). For individual students, however, even a low level of AP participation is related to a greater likelihood of attending a postsecondary institution.

To delve deeper into the relationship of AP exposure to postsecondary enrollment, demographic factors were included in the model, to help isolate where AP coursework may demonstrate more leverage. **Figures 3.9-3.10** show the marginal effects of a given demographic factor on college matriculation. To keep visualizations simple, these figures only show the marginal effect of AP exposure (AP or No AP).[41]

Figure 3.9 illustrates the effect of AP exposure on postsecondary enrollment by race/ethnicity. Generally, the AP effect is similar for all groups except Hispanic students, for whom the difference in effect size is comparatively smaller than for other ethnic groups.[42] This is not for lack of Hispanic students taking AP courses, as sample sizes are adequate to confidently estimate probabilities. In short, Hispanic students are taking comparable numbers of AP courses, but are much less likely to attend a postsecondary institute. Such a finding suggests that some other factor, aside from AP, is influencing postsecondary enrollment for Hispanic students.

[41] Appendix 1 contains further information on coefficients.
[42] p=0.009

Figure 3.9: Estimated probability of postsecondary enrollment by AP exposure on race/ethnicity

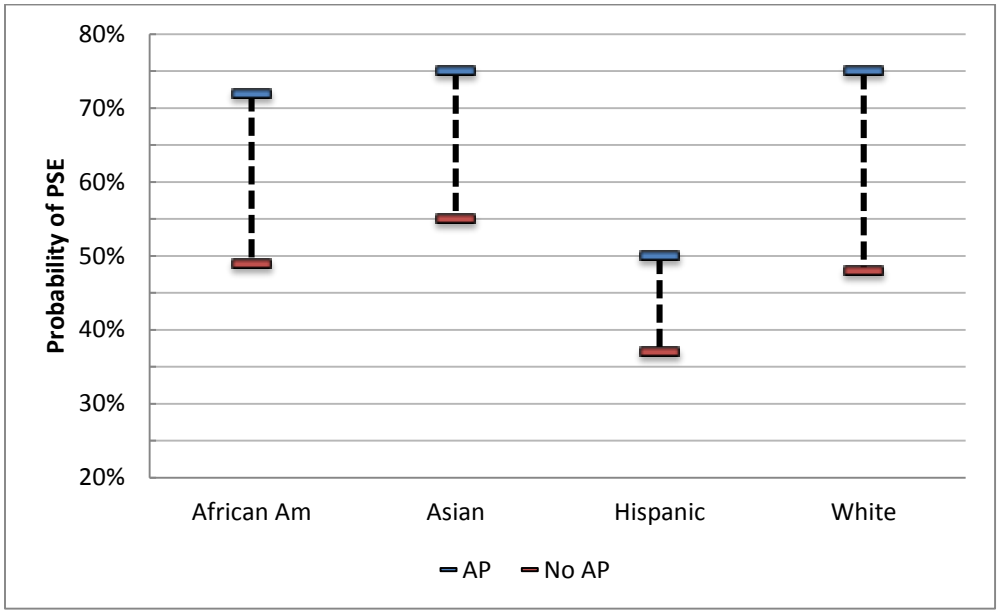
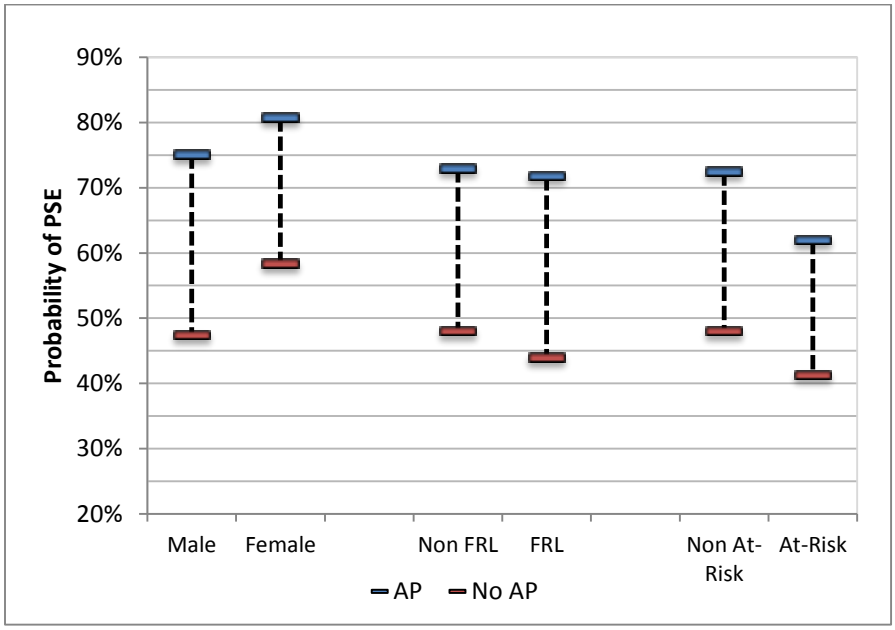


Figure 3.10 similarly shows the effect of AP exposure by gender, poverty, and at-risk status. With regard to gender, it can be seen that while women's levels of postsecondary enrollment are higher overall, the effect of AP on men is slightly (and insignificantly) higher. Of particular interest is the AP effect by poverty status (as measured by eligibility for free or reduced-price lunch). Here, there is no difference, statistically speaking, between impoverished students and others who take AP courses, indicating that economic status is not a significant factor in determining the effect of AP courses on postsecondary enrollment. Finally, the chart shows that at-risk students gain less from AP, in terms of college matriculation, than other students, but not by a statistically significant margin.[43]

[43] Note that the vertical axes have been scaled to better view the effect sizes.

Figure 3.10: Estimated probability of postsecondary enrollment by AP exposure on demographic factors



Implications of findings

Results demonstrate that in every demographic category, MPS graduates with AP experience are significantly more likely to attend a postsecondary institution than graduates without AP exposure. Additionally, as students take more AP classes, the probability that they enroll in a postsecondary institution increases significantly. **While a causal direction cannot be established from the data presented here**, encouragement of these programs broadly would not appear to have any detrimental effects on postsecondary enrollment trends, and in fact may improve them.

Participation in the AP program is positively related to college matriculation, even from just one or two courses. The fact that African American AP students in MPS demonstrate roughly the same probability of college matriculation as Asian or white AP students is particularly promising, given the persistence of the racial achievement gap in the district. [44]

The smaller effect size of the AP/postsecondary enrollment relationship for Hispanic students raises some questions. From the current data, it is unclear if AP courses are less likely to correlate with college matriculation, or if general college-going behavior is less likely for Hispanic students. This may mean policies governing AP enrollment, or the relevance of AP as a means to promote college matriculation, may differ in schools with large Hispanic student populations.

[44] For an overview of the current achievement gap along racial lines at MPS, see: Milwaukee Public Schools. 2012. *2010-2011 District Report Card*. p. 27.

The lack of a significant difference in AP effect for impoverished students, on the other hand, suggests that AP has a stronger relationship with college matriculation for lower-income students than other students. The data suggest that AP courses may "even out" the postsecondary enrollment discrepancies by income. For a district with a rising student poverty rate, AP may offer a method to maintain college matriculation rates.

INTERNATIONAL BACCALAUREATE

International Baccalaureate (IB) schools offer a comprehensive curriculum, with three main "programmes" for elementary, middle school and high school. At each level, the IB programme involves a set of required courses aligned to international educational standards. The goal of the programme is to foster critical thinking and an international perspective. Unlike AP, which is solely focused on emulating college standards, IB is "designed to address the intellectual, social, emotional and physical well-being of students."[45] As a holistic curriculum, the IB diploma programme requires students to take a broad range of content courses, along with a theory of knowledge course. Other requirements include an extended essay and a "creativity, action, service" requirement.

Assessment scores for IB students are determined by a combination of scores from course exams, comprehensive exams, and the essay project. Students need to earn at least 24 of 45 possible points from these assessments. Generally, these assessments require a $145 registration fee and run $100 per assessment. At MPS, the price is subsidized at $125 for the first exam and $50 for each subsequent exam.

To run an IB programme, an entire school must be authorized through a two- to three-year process of self-assessment, candidacy applications, reviews, and visits.[46] The school must demonstrate that it has designed and implemented the appropriate governing body, internal restructuring, staff requirements, data requirements, and contextual support.[47] All IB teachers must undergo mandatory workshops in their content area before the school can be considered. Fees are assessed on schools to cover the costs of administering the requirements. As such, to be an IB-certified school requires a major commitment from the district, administration, and staff. In the U.S., only 777 high schools are IB-certified.[48]

The combination of school commitment, holistic curriculum and international standards has led several colleges to recognize an IB diploma as equivalent to college credit, while other institutions offer advancement, scholarships, or honors benefits to IB students.[49]

IB efficacy

Research on the success of IB in terms of college and career readiness generally is positive. Although IB is not overtly focused on promoting postsecondary education, research by the IB organization has found that 99% of IB students in the U.S. report plans to attend a college or

[45] Ibo.org/diploma/
[46] For a comprehensive overview of the process, see: http://www.ibo.org/iba/become/documents/DPApplicationProcessFeesFebMarENG_001.pdf
[47] Further information can be found at ibo.org/become/
[48] Ibo.org/facts
[49] International Baccalaureate. "The IB Diploma Graduate Destinations Survey 2012: Country Report: Unites States of America." 2012, 28

university.[50] IB diploma candidates are found to generally score higher than the national average in each subject on both the SAT and ACT.[51] Additionally, the acceptance rate of IB students into postsecondary institutions has been found to be 22% higher than the general population, while acceptance into Ivy League institutions is between 3% and 13% higher for IB diploma holders.[52] Furthermore, at least one study has suggested that the effect of IB courses on postsecondary enrollment is significant, even when controlling for similar academic and demographic factors.[53]

The cost of IB to both students and districts, combined with the selective nature of the approval process, has typically relegated IB to a small but prestigious group of students within a school district. This has raised concerns about the feasibility of expanding IB offerings while maintaining high levels of achievement. Concerns about expanding IB include the potential of undermining expected standards of quality, as well as the possibility of re-stratifying ethnic divisions.[54]

A recent longitudinal study on the expansion of the IB programme in Chicago, however, found that IB students generally were representative of the district.[55] By comparing IB students to students in selective enrollment schools, the study found that racial differences were much less pronounced for IB students than selective enrollment students. Similarly, the percentage of economically disadvantaged IB students was identical to the population, a trend not found in selective enrollment schools.

The implications for further adoption of IB in MPS are promising, therefore, though cost considerations will be significant. Currently, three MPS high schools offer the IB diploma programme, two of which were recently ranked as the first- and second-best performing schools in the state by *U.S. News and World Report*.[56] It should be noted, however, that student self-selection undoubtedly plays a large role in the current success of IB schools at MPS. The limited number of schools and their prestigious reputations surely attract highly motivated students, a precondition that may not be met should the number of IB schools be expanded. In addition, the expansion of IB is not a quick means to improve college and career readiness. The high cost of the program, alongside the significant requirements of staff and administrative restructuring, requires a high level of dedication to the program and confidence in its capability.

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[50] Ibid.,14.
[51] Ibid.
[52] Ibid.
[53] Coca, Vanessa, et al. Working to My Potential: The Postsecondary Experiences of CPS Students in the International Baccalaureate Diploma Programme. The University of Chicago Consortium on Chicago School Research, 2012.
[54] Kelleher, M. "Using AP, IB to Change Shcools." *Catalyis Chicago*, May 2001: 4-6; Sharp, T. "Elitist Programs no Gift to School System [Letter to the Editor]." *Chicago Sun-Times*, August 11, 2001: 54.
[55] Coca, et al. Working to My Potential, 2012.
[56] U.S. News and World Report. *Top Wisconsin High Schools, 2013.* 2013.

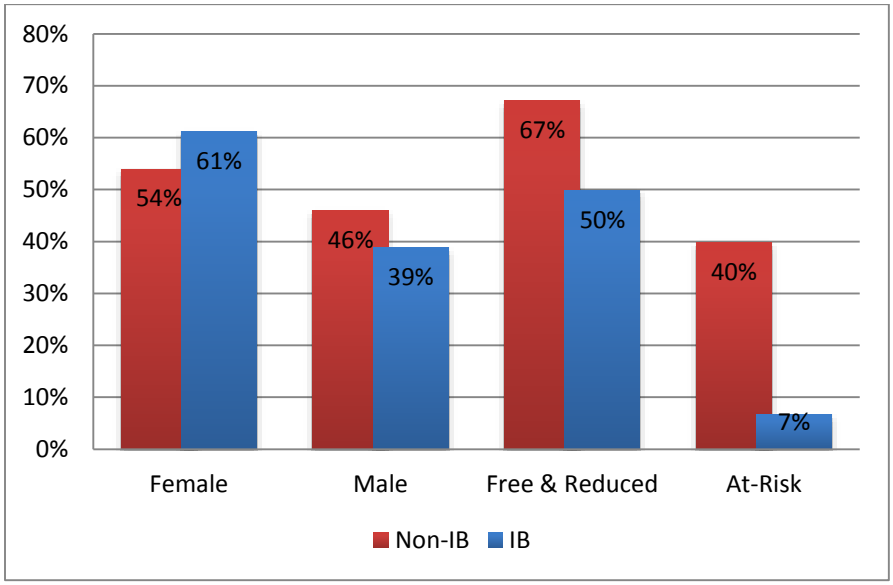
INTERNATIONAL BACCALAUREATE IN MILWAUKEE PUBLIC SCHOOLS

Like the Advanced Placement analysis, the sample population for the IB analysis is all students enrolled in an MPS school between 2007 and 2010 who eventually graduated. The National Student Clearinghouse StudentTracker database was utilized to determine whether these graduates enrolled in a two or four-year institution within four years of high school graduation. The treatment sub-sample includes any graduate enrolled in an IB course during this period, regardless of whether the student received the IB diploma.

Demographics and Enrollment

Understanding the trends of students enrolled in IB courses allows us to contextualize later findings, and also offers a window into possible differences between IB students and MPS' general population. **Figures 4.1-4.2** illustrate enrollment and demographic trends over the sample period.[57] **Figure 4.1** shows that, similar to AP, females students are over-represented in IB courses. Unlike AP, however, low-income students (as measured by eligibility for free or reduced-price lunch) are under-represented in IB courses. An even larger discrepancy (over 30 percentage points) is found in the rate of students in IB courses identified as at-risk.[58]

Figure 4.1: IB Demographic Factors

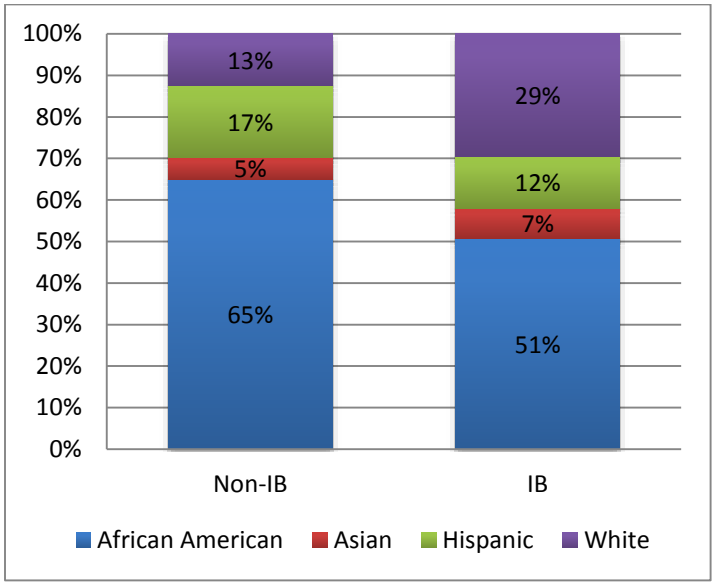


[57] Sample size for MPS=18,177; IB=1,960.

[58] Here, the enrollment data conflicts with the Chicago study, suggesting that the culture of IB varies between location and levels of availability of IB sites.

The racial and ethnic makeup of IB students, illustrated in **Figure 4.2**, demonstrates some interesting trends as well. African American and Hispanic students are under-represented in IB, while Asian students are somewhat over-represented. White IB students are significantly over-represented.

Figure 4.2: IB Ethnic Comparison

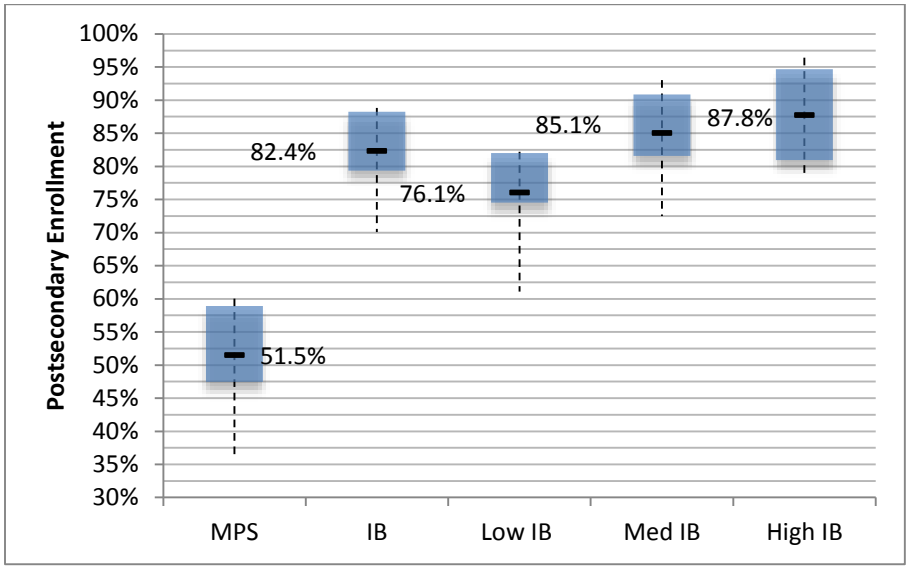


Outcomes

Figure 4.3 charts the rate of postsecondary enrollment by exposure to IB. The blue boxes represent where 75% of the observations fell, while the dashed lines represent the range of the sample. On average, 51.5% of MPS graduates enrolled in a postsecondary institute, compared to 82.4% of IB graduates, a statistically significant difference.[59] Unlike our findings regarding AP exposure, IB students differ significantly from the average MPS graduate at all levels of exposure. Students who took one to six IB courses are coded Low IB, students with seven to 10 courses are Medium IB, and students with at least 11 courses are High IB.

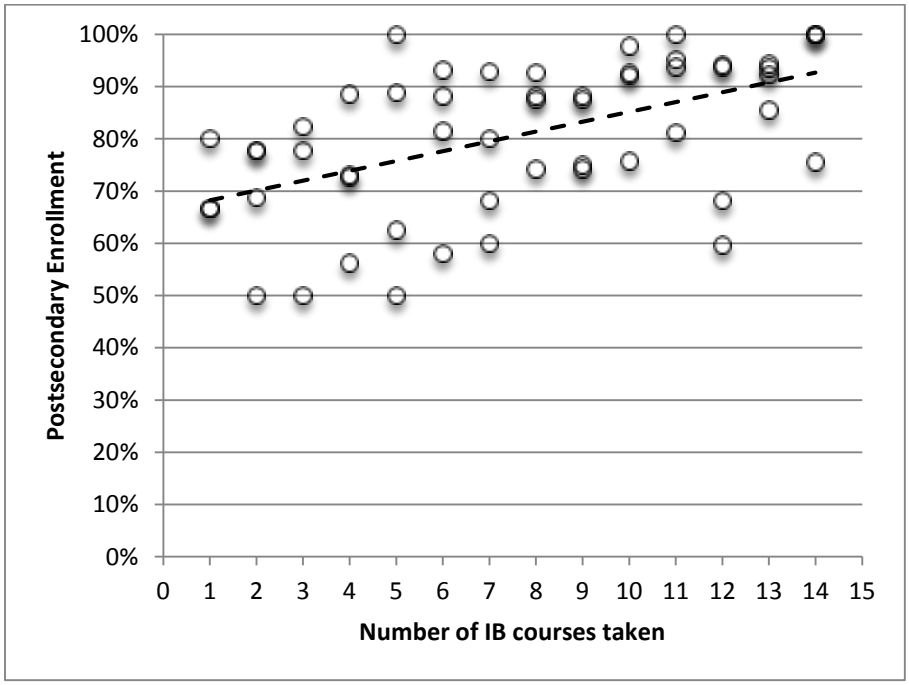
[59] t=-6.16, p=0.001

Figure 4.3: Annual PSE by IB Level



This relationship may be seen more closely in **Figure 4.4**, where each year's average rate of postsecondary enrollment for IB-exposed graduates is plotted against the number of IB courses taken. For each additional IB course taken, an increase of 1.8 percentage point in college matriculation is observed, a significant difference.[60]

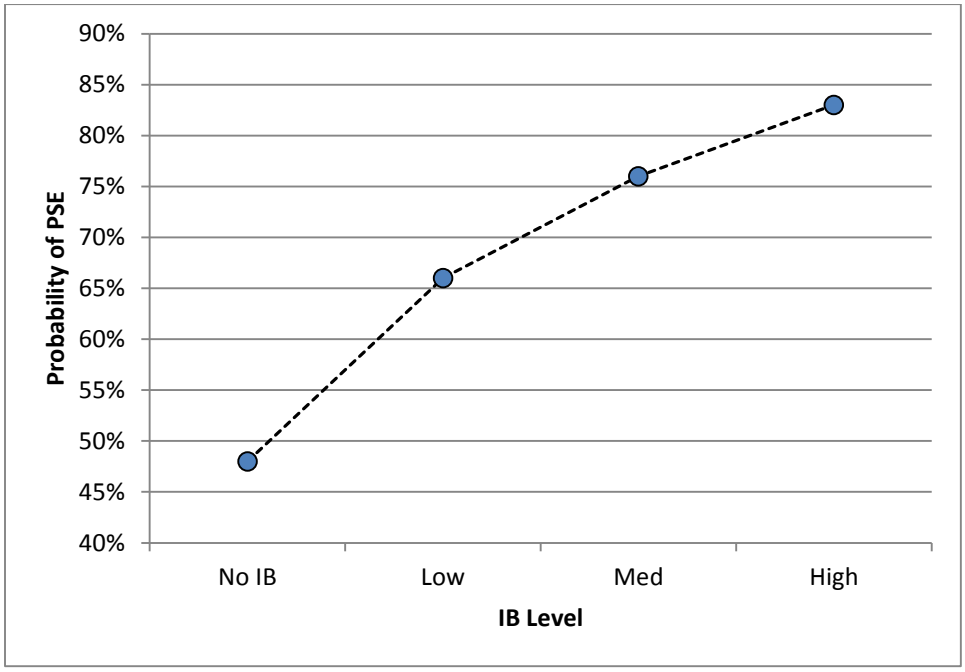
Figure 4.4: Annual PSE by IB Frequency



[60] Frequencies greater than 14 removed due to low n. t=4.46, p<.001.

While the information in **Figure 4.4** demonstrates the trend in aggregate, more useful information comes from looking at the effect of IB courses on individual students. [61] **Figure 4.5** illustrates the estimated probability of any given student enrolling in a postsecondary institution given the number of IB courses taken by that student once certain demographic characteristics are taken into account.[62] Again, it can be seen that there is generally a positive linear relationship between IB exposure and postsecondary enrollment, even when keeping the influence of gender, race, and socioeconomic factors constant.[63]

Fig 4.5: Probability of PSE by IB Level Controlling for other Factors



Figures 4.6-4.7 demonstrate the marginal effects of IB exposure on college matriculation for specific demographic factors. To keep visualizations simple, these figures show only the effect size of IB exposure or no IB exposure.[64]

Figure 4.6 shows the relative effects size of IB exposure by race/ethnicity. Results are similar to AP in that the effect size of IB is significant in all cases, and similar for each racial or ethnic group. In this case, however, the effects of IB on Hispanic and White students are significantly different from other student groups, with smaller effect sizes.

[61] As stated earlier, the term "effect" can be confusing when speaking of statistical results. Generally, "effect" implies a relationship with a cause. When describing statistical results here, "effect" is not used to denote causality between the two concepts being measured, but an effect between the *measurements themselves.* Thus, when "the effect of IB courses" is stated in this context, it is not meant to imply a causal relationship, but a numerical one.

[62] As with the study of AP, demographic characteristics controlled for are gender, race, FRL status, at-risk status, ACT score, and school climate.

[63] Coefficients for IB factor levels all demonstrate statistical significance. Note that the scale has been magnified to emphasize the effect.

[64] See Appendix 2 for more information on coefficients.

Fig 4.6: Estimated probability of postsecondary enrollment by IB exposure on race

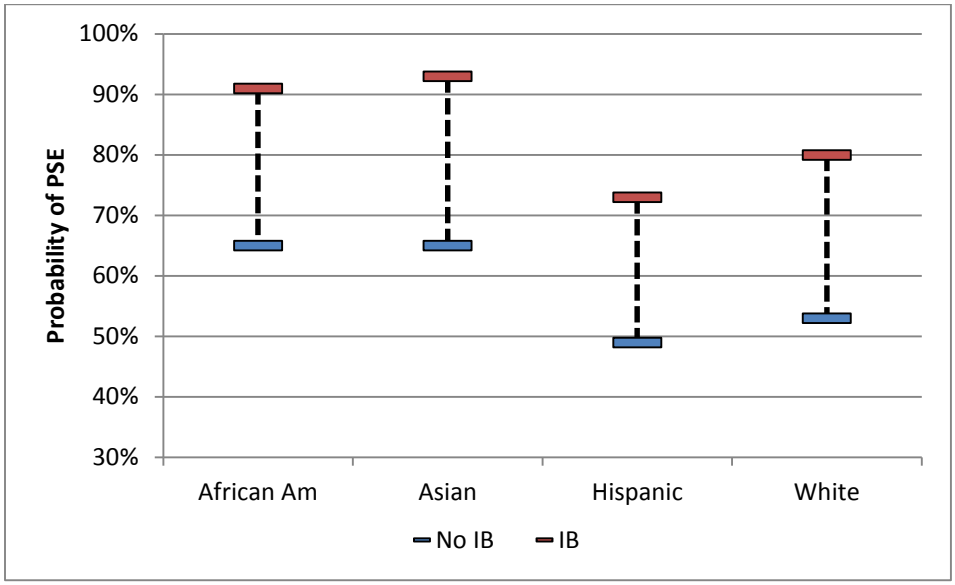
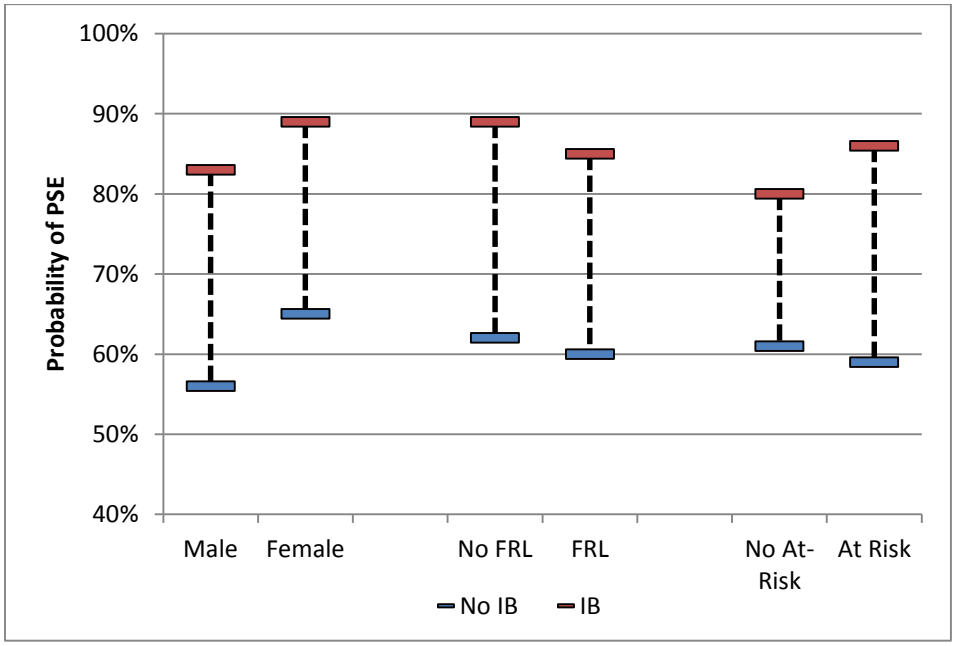


Figure 4.7 further illustrates the effect size of IB exposure by particular demographics. Of note is the lack of effect on at-risk students, although a lower number of data points for at-risk students in IB programmes make these estimates tenuous. They cannot be considered accurate with any confidence, but do suggest less influence of IB among this demographic group.

Fig 4.7: Estimated probability of postsecondary enrollment by IB exposure on demographic factor



Implications of findings

There is no doubt that MPS graduates with IB experience attend postsecondary institutions at a much higher rate than non-IB graduates, and that greater exposure to IB coursework is related to higher rates of college enrollment. While it is unknown whether students who take IB courses do so because they want to go to college – as opposed to students wanting to go to college because they have taken IB courses – the relationship between IB exposure and college matriculation is significant.

We find:

- MPS graduates enrolled in IB courses attend college at much higher rates than non-IB graduates of MPS.
- The likelihood of attending college for MPS IB graduates is significantly higher for all racial groups.
- As students take more IB courses, their likelihood of attending college increases.
- Due to low sample size, it is unclear if MPS IB graduates identified as at-risk are more likely to attend college.

While expansion of the IB programme for MPS would be a time-consuming and costly endeavor, it may produce significant results. Particularly promising are the effect sizes for Hispanic and low-income students in terms of postsecondary enrollment.

PROJECT LEAD THE WAY

Project Lead the Way (PLTW) is a non-profit group that designs curricula and teaching methods aimed at increasing student interest and achievement in science, technology, engineering, and math (STEM). Evolving out of digital electronics curricula pioneered in upstate New York, PLTW is now a nationwide set of courses emphasizing hands-on teaching techniques that expose students to relevant industry practices. Since the launch of the "Pathways to Engineering" program in 1997, PLTW curricula have been adopted by more than 4,700 schools.[65]

PLTW courses are aligned with the Common Core State Standards, and can serve as an alternative means to attain science and math requirements. The allure of PLTW lies in the method used to present these standards. PLTW does not consist of stand-alone survey courses, but rather is a four-year sequence of curriculum aligned directly to a career field, and aimed at teaching the relevant content as it would be applied in the field. The two high school programs – labeled Pathways to Engineering and Biomedical Sciences – focus on simulating the type of problem-solving required of those fields, while supporting students with industry-relevant resources and technology.

Each PLTW sequence includes two foundation courses, a series of specialization courses, and a capstone course. PLTW also provides students with extra-curricular opportunities through a number of partnerships with national firms and universities. In some cases, students may receive admissions preference, scholarship opportunities, or transcripted credit for PLTW courses.[66]

In terms of commitment of time and resources from school administration, implementation of PLTW lies between AP and IB. This does not equate to an easy adoption, however. Former MPS Career and Technical Education coordinator Lauren Baker recently noted that *"PLTW works, but you need to invest fully – not half heartedly. Speaking from experience, in the first year we underestimated the amount of energy a school needs to give the program. We needed to make some adjustments, but a year later we had it turned around and it's been fabulous ever since."*[67]

Courses require training and oversight, but the program does not call for a reorganization of staff and administration. Adoption of the program takes roughly a year and includes administrative visits to established PLTW schools, identification and designation of teachers, teacher training sessions, and material purchases. While the curriculum is provided at no cost to the school, the cost of materials, software, and training can be significant depending upon the site, program, and population. PLTW teachers are required to advance through three phases of training, must pass

[65] For a more comprehensive overview of what PLTW is, see: http://www.pltw.org/about-us/who-we-are

[66] For a full list of postsecondary partners, see: http://www.pltw.org/colleges-universities. For example, the Milwaukee School of Engineering grants direct transcript credit for completing either the Pathways to Engineering or Biomedical Sciences program.

[67] Quoted in: Wisconsin Project Lead the Way. "Models of Success." 2009.

certification exams, and are coordinated through an online community. School counselors also receive training to help fit students to the program.

PLTW efficacy

PLTW's focus on STEM echoes the national call to emphasize science and math in a real-world, career-centered manner. The President's Council of Advisors on Science and Technology has emphasized the need for workforce development strategies to address declining rates of students in engineering and science-related fields.[68] As a result, a significant body of research has begun to emphasize the need for practical, career-oriented education over "just college," and PLTW serves as a pre-packaged and standardized means to approach this need.[69] In light of the focus on career-oriented education, PLTW has been rapidly expanding nationwide, adding roughly 1,300 new school programs in the last three years.[70]

Research on the success of PLTW has been generally promising, with a few mixed results.[71] PLTW reports that 97% of alumni planned to pursue a four-year degree, and tend to have GPAs 0.21 points higher than other first-year college students.[72] In addition, a study of Iowa PLTW students finds that PLTW participants tend to have higher mathematics and science achievement scores.[73] Some studies have indicated, however, that PLTW students demonstrate no significant difference on standardized tests.[74] In sum, while overall research on objective outcomes is positive, there are some grey areas.

Since its introduction in MPS in 2004, 28 schools have adopted PLTW, with plans to expand further. With support from the Waukesha-based Kern Family Foundation and other donations, schools in Wisconsin have been able to afford the costs of software, materials, and training.[75] In

[68]President's Council of Advisors on Science and Technology. Engage to Excel: Producing One Million Additional College Graduates With Degrees in Science, Technology, Engineering, and Mathematics. Executive Office of the President, 2012.

[69]Harvard Graduate school of Education. Pathways to Prosperity: Meeting the Challenge of Preparing Young Americans for the 21st Century. Pathways to Prosperity Project, 2011.

[70]http://www.pltw.org/about-us/our-history

[71] For a more in-depth overview of relevant research, see: Tai, R. *An Examination of the Research Literature on Project Lead the Way.* Project Lead the Way, 2012.

[72] http://www.pltw.org/educators-administrators/outcomes

[73] Schenk Jr., T, D. Rethwisch, M. Chapman, F.S. Laanan, S.S. Starobin, and L. Zhang. "Achievement outcomes of Project Lead the Way: A Study of the Impact of PLTW in Iowa (Working Paper)." 2011.

[74]Tran, N, and M Nathan. "Pre-College Engineering Studies: An Investigation of the Relationship Between Pre-College Engineering Studies and Student Achievement in Science and Mathematics." *Journal of Engineering Education* 99, no. 2 (April 2010): 143-157; Wheeler, T. *Efficacy of "Project Lead the Way" curricula in improving mathematics skills for students in the high schools of a small metropolitan school district.* Doctoral Dissertation, Available from ProQuest Dissertations and Theses database (UMI No. 3339004), 2008. It should be noted that these studies had a much smaller sample size of 140 and 1337 students respectively, as opposed to the sample of 26,030 for the Iowa study. Conclusions from the Iowa study can thereby be considered more robust.

[75]Hetzner, Amy. "Project Lead the Way's Huge Expansion Includes Milwaukee Area Schools." *Milwaukee Journal Sentinel*, September 23, 2009.

fact, as a result of this support, MPS now has more schools and students participating in PLTW than any other district in the nation.[76]

Evaluations of PLTW at MPS have found positive results, although small samples lead to limited generalizations. In a study conducted by the Center on Education and Work by the University of Wisconsin-Madison, PLTW students at Riverside University High School appear to have higher attendance rates in high school, and tend to be more likely to score proficient on 10th grade WKCE tests. In addition, PLTW students tend to take the ACT at a greater rate than traditional students.[77]

In light of these findings, PLTW offers a unique and potentially beneficial angle on the use of specialized curriculum. Unlike other programs, PLTW is focused on college as an intermediary, rather than a goal, and is directly oriented towards career interest and readiness. This makes measurement of college-going behavior only a partial indicator of success, but aligns PLTW directly with the state's overarching goal of "college and career readiness."

This results in a unique implication regarding PLTW courses and a school's college-going culture. Whereas AP and IB programs tend to be offered in schools where college-going behavior is likely the precursor in the motivation to enroll, PLTW's straddling between technical education and advanced engineering may produce a much different dynamic. For students not inclined to pursue college plans, PLTW's reputation and culture may be more accessible and less off-putting. As such, PLTW's reputation as experiential and practical may act as a more effective generator of college plans, instead of a self-selector for students predisposed towards college. While such assumptions are difficult to measure due to their subjective nature, demographic comparisons may help to illuminate unique trends in PLTW enrollment.

PROJECT LEAD THE WAY AT MILWAUKEE PUBLIC SCHOOLS

This section of the report is aimed at identifying the relationship between exposure to PLTW courses during high school and enrollment in a postsecondary educational institution. Similar to the methods of the previous sections, we attempted to match all MPS graduates with any PLTW courses on their high school transcripts to the National Student Clearinghouse's StudentTracker data on enrollment in two- or four-year postsecondary institutions. The sample population includes all students enrolled in an MPS high school between 2007 and 2010 who eventually graduated. Findings in this section are descriptive rather than predictive, due to the smaller sample size.

The particular focus of the PLTW courses is not identified. While it would certainly be interesting to know the effect of those students who had completed a particular sequence (such as Pathways to Engineering or Biomedical Sciences), this study is aimed at the effect of PLTW courses overall. While further research on the total effect of the sequence, or the effect of earlier PLTW coursework, may be warranted, it is outside the scope of this study.

[76]Wisconsin Project Lead the Way. "Models of Success." 2009, 16-17.

[77]Phelps, Allen. *Urban School Research Snapshot: Milwaukee Riverside University High School.* Research Brief, University of Wisconsin-Madison Center on Education and Work, 2009. It should be noted that the sample size was 37, and the universe of the population (Riverside High School), greatly limits generalizations that can be inferred from the results.

Demographics and Enrollment

Prior to assessing the postsecondary trends of PLTW students, it is helpful to examine the demographic and enrollment trends at MPS to approach the question raised earlier of PLTW's reach into the MPS populations with the lowest rates of college attendance. We find that PLTW students demonstrate a slightly lower composite ACT score than non-PLTW MPS students.[78]

Figures 5.1-5.2 show enrollment trends in PLTW courses between the 2007-08 and 2010-11 school years.[79] Several interesting factors stand out. In terms of racial composition of PLTW students, African American and Asian students stayed within roughly three percentage points of the district-wide sample. However, the percentage of Hispanic PLTW students is 10 points greater than the district sample and there are fewer white PLTW students.

Figure 5.1: PLTW Enrollment by Race, 2007-08 to 2010-11

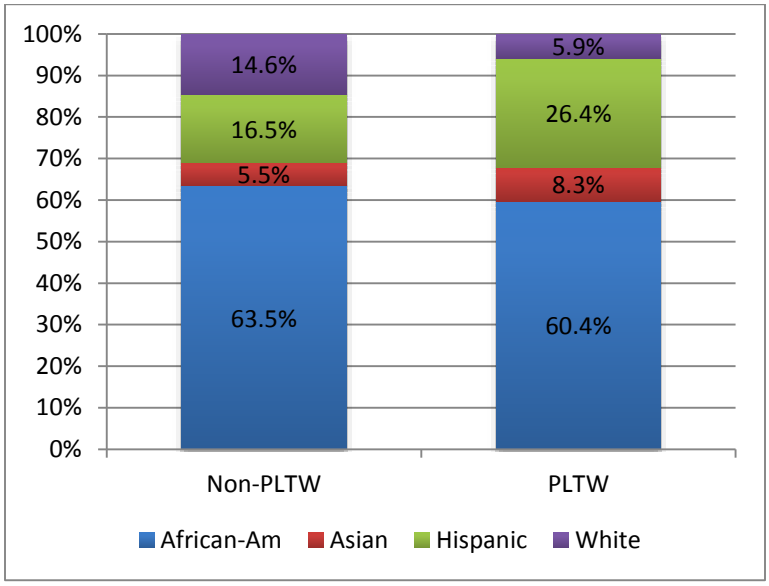
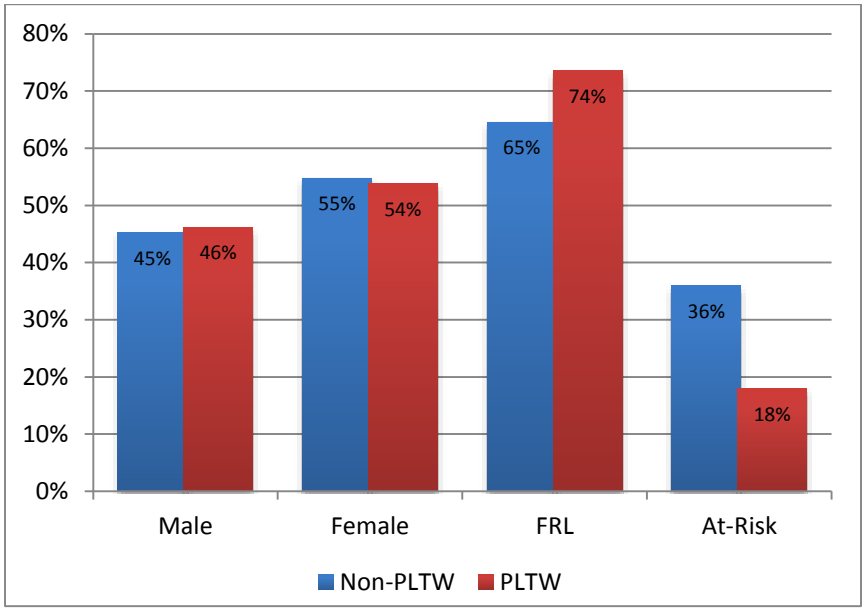


Figure 5.2 shows a demographic comparison of PLTW graduates and total MPS graduates with regard to gender, poverty (measured by eligibility for free or reduced-price lunch), and at-risk status. Interestingly, males and females are virtually identical in terms of program representation. This is particularly noteworthy, as females typically are underrepresented in programs emphasizing STEM or career and technical education.

Additionally, the number of low-income students demonstrates a crucial departure from the other types of specialized curriculum analyzed in this report, as the 10-percentage-point higher composition of PLTW graduates as compared to MPS graduates indicates that PLTW captures the typically under-represented low-income demographic. The under-represented at-risk student population of PLTW, however, is similar to both AP and IB.

[78] MPS composite average = 16.19, PLTW composite average = 15.97.
[79] Sample size for MPS=18,177; PLTW=303. Note that the figures depict PLTW participants who graduated, not all students taking PLTW courses

Figure 5.2: PLTW Enrollment, 2007-08 to 2010-11



Outcomes

Unlike previous sections, the low sample size of PLTW graduates precludes an estimation of the probability of college matriculation for each student. Instead, in **Table 5.3**, we present a cross-tabulation table of the total rates of college matriculation for each category of student, comparing MPS graduates who took no specialized courses to PLTW graduates.[80] While MPS graduates who have not taken any specialized courses have a total postsecondary enrollment rate of 42.3%, PLTW graduates enrolled at a rate of 57.8%, a statistically significant difference of 15.5 percentage points. PLTW students, therefore, are significantly more likely to enroll in college than other MPS graduates.[81]

Hispanic and white students show a larger increase in college enrollment rates than Asian or African-American students, while male PLTW graduates had nearly twice the increase of female graduates. All groups of PLTW graduates are more likely to attend college than the typical MPS graduate who did not take any specialized courses.

[80] Unlike the previous sections, the influx of PLTW students in recent years has skewed yearly averages of PSE. Weighted averages provided a more accurate description of PSE for PLTW students.

[81] t=-2.196, p=0.03. It should be further noted that because of low variance in PLTW course frequency, stratification categories of low, medium, and high were omitted.

Table 5.3: Postsecondary enrollment of PLTW participants, 2007-08 to 2010-11

Sample size	Rate of postsecondary enrollment		Difference
	No specialized courses	PLTW	
All	**42.3%**	**57.8%**	**+15.5**
Enrolled in college	5,296	175	
Total sample	12,531	303	
African-American	**45.5%**	**58.5%**	**+13**
Enrolled in college	3,926	107	
Total sample	8,638	183	
Asian	**45.7%**	**56.0%**	**+10.3**
Enrolled in college	227	14	
Total sample	497	25	
Hispanic	**32.2%**	**54.5%**	**+22.3**
Enrolled in college	661	42	
Total sample	2,050	77	
White	**35.8%**	**66.7%**	**+30.9**
Enrolled in college	482	12	
Total sample	1,346	18	
Male	**37.4%**	**57.9%**	**+20.5**
Enrolled in college	*2,243*	*81*	
Total sample	6,003	140	
Female	**46.8%**	**57.7%**	**+10.9**
Enrolled in college	3,053	94	
Total sample	6,528	163	
FRL	**42.8%**	**57.4%**	**+14.6**
Enrolled in college	3,656	128	
Total sample	8,537	223	
At-Risk	**43.2%**	**58.9%**	**+15.7**
Enrolled in college	2,470	33	
Total sample	5,720	56	

Implications of Findings

Because the focus of PLTW is on long-term career preparation, and not necessarily on a shorter-term goal of college matriculation, the pragmatic and practical nature of the courses eschews traditional college preparatory work. As such, postsecondary enrollment results cannot be considered a comprehensive measure of "success" for PLTW. Nevertheless, the real-world nature of PLTW courses, as well as their straddling between college and career preparation, may help to attract students who are less inclined to the notion of college enrollment. In short, while lacking a reputation as a source of college-focused courses, PLTW may better reach into student groups who have been less likely to attend college.

The relatively low PLTW enrollment makes it difficult to posit concrete findings, particularly regarding the effects of PLTW coursework on demographic sub-groups when controlling for other factors. But aggregate trends do demonstrate that PLTW populations have higher rates of matriculation among groups that are traditionally less likely to attend college (males and Hispanic students).

General conclusions include:

- PLTW graduates attend college at higher rates than non-PLTW graduates
- PLTW has proportional representations of males and females, and high representations of Hispanic and low-income students
- The difference in college matriculation rates for males and for Hispanic PLTW graduates, as compared to non-PLTW male or Hispanic MPS graduates, is larger than for PLTW graduates in general as compared to the typical non-PLTW graduate.

CAREER AND TECHNICAL EDUCATION

The fourth area of specialized curricula we examine for this report is career and technical education (CTE) at MPS. Unlike the analysis in previous sections, the goal with regard to CTE is not to measure its relationship to postsecondary enrollment. Rather, the following analysis emphasizes a broader set of outcomes better tailored to the unique role of CTE as a pathway to both college *and* career readiness.

In this report, we use CTE as an umbrella term encompassing several types of courses and programs offered in MPS schools. Unlike the other three curricular programs analyzed in this report, CTE courses are not necessarily developed by a party outside the school district, nor do they necessarily build upon one another. In addition, the district's CTE courses may or may not be designed to satisfy postsecondary education or training requirements. Finally, while AP, IB, and PLTW are national programs, CTE at MPS has been developed as a context-specific dialogue between the school district and the larger community, including employers. CTE offers an opportunity, therefore, to explore the full definition of postsecondary success in the state's Agenda 2017. In particular, analysis of CTE truly is an analysis of the district's own policies and strategies to improve postsecondary outcomes.

Traditionally, CTE programs have faced criticism for failing to improve academic performance, as measured by standardized exams.[82] Additionally, CTE programs have been considered an "undesirable curricular track" by those intent on a goal of college degrees for all students.[83] CTE has received greater attention recently, however, from those seeking to realign school achievement goals with the realities of the labor market. In the Harvard Graduate School of Education's 2011 *Pathways to Prosperity* report, the opportunities of so-called "middle-skill" jobs are posited as a solution to the increasing rates of post-graduation unemployment, racial inequalities, and underemployment. *Pathways* seeks to illuminate the wealth of opportunities in, and increasing demand for, middle-skill occupations that do not require a four-year degree. With nearly a third of middle-skill workers earning more than the average bachelor's degree recipient, CTE is being rebranded as a viable and desirable means to achieve success outside of the "college for all" mentality.[84]

[82] Ball, John Fredrick. "Are High School Career and Technical Students Less Prepared for College?" *Techniques: Connecting Education and Careers* 80, no. 6 (2005): 38-40.
[83] Dare, Donna. ""The Role of Career and Technical Education in Facilitating Student Transitions to Postsecondary Education." *New Directions for Community Colleges*, no. 135 (2006): 73.
[84] Harvard Graduate school of Education. Pathways to Prosperity: Meeting the Challenge of Preparing Young Americans for the 21st Century. Pathways to Prosperity Project, 2011.

Furthermore, research on the academic impact of CTE programs has sought to reconcile the perceived disconnect between CTE and academic skills.[85] Previous studies have shown that CTE students are equally prepared to succeed in college preparatory curriculum,[86] and that there is no significant difference between CTE and non-CTE students on standardized academic indicators.[87] In short, a body of research now argues that "the once common assumption that CTE does not prepare students for higher education is no longer valid."[88]

In light of these shifting assumptions, MPS' longstanding commitment to alternative educational paths is now better aligned with the goals of state and federal education policymakers. For MPS, CTE is focused on direct training for careers in high-demand fields, regardless of skill level requirements. CTE emphasizes skills training in both traditional middle-skill occupations, as well as those demanding high skill levels. Consequently, it could be argued that MPS has aligned CTE with college and career readiness, rather than positioning it as a less intensive option outside of traditional academic expectations.

The structure of CTE curricula at MPS is both targeted and diverse. It is an interlocking set of career-themed programs, overlapping with Project Lead the Way, Career Pathways, Youth Apprenticeship, and several others. To maintain diversity and depth, CTE programs often are specialized by high school site. For example, while Vincent High School offers a program in urban agriculture, Pulaski High offers courses in automotive design, engineering, and repair. Programs can be coordinated through Career Pathways or designed specifically to meet requirements for industry standards. CTE programs offered by MPS are listed in **Table 2.1** on page 18. School site programs often are bolstered by partnerships with local businesses, which facilitate opportunities for direct experience and access to industry resources.[89]

CAREER AND TECHNICAL EDUCATION AT MPS

Unlike the programs analyzed in previous sections, CTE courses and programs at MPS schools are not uniform in their delivery. While this makes it difficult to compare the results of particular CTE programs, descriptive generalizations can be made about the programs at large. The primary data source in this section is 2012 data reported to the Wisconsin Department of Public Instruction as part of the Wisconsin Career and Technical Education Enrollment Reporting System. The data include a survey of CTE students while enrolled in courses, matched to results from a follow-up survey given annually to recent CTE graduates. With 1,099 respondents (40.3% response rate), the postsecondary outcomes of CTE students can be reliably explored both in terms of employment *and* postsecondary enrollment rates. Findings in this section are descriptive rather than predictive.

[85] Hudson, L., and Hurst, D. "Students Who Prepare for College and a Vocation." *National Center for Education Statistics Issue Brief,* 1999, *1*(4), 1–2; DeLuca, S., Plank, S., and Estacion, A. *Does Career and Technical Education Affect College Enrollment?* St. Paul: University of Minnesota, National Research Center for Career and Technical Education, 2006.

[86] Hudson and Hurst, 2009; Dare, 2006.

[87] Ball, 2005; Brown, C.H. 2000. "A Comparison of Selected Outcomes of Secondary Tech Prep Particicipants and Non-Participants in Texas." Journal of Vocational Education Research, 25 (3), 55-62.

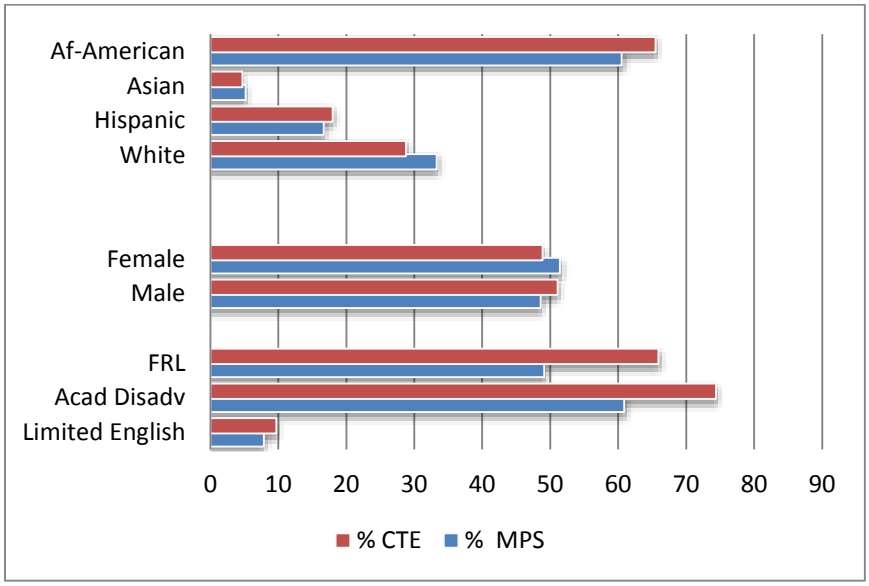
[88] Dare, 2006, 73.

[89] For more in-depth and specific details, see: http://www5.milwaukee.k12.wi.us/dept/cte/

Demographics and Enrollment

Figure 6.1 shows the demographic make-up of 2010 CTE students as compared to the general MPS population of juniors and seniors. CTE students generally are within about five percentage points of the district average for any given category. Proportionally, African American and Hispanic participation in CTE programs is high. Furthermore, a much larger percentage of economically disadvantaged students, as measured by eligibility for free or reduced-price lunch, are participating in CTE, at 16.8 percentage points above the MPS population average for 11th and 12th grade. Finally, there is a higher representation of students classified for limited English proficiency (+1.8 percentage points) and academic disadvantage[90] (+13.5 percentage points) in CTE.

Figure 6.1: CTE v MPS Demographics



MPS tracks 10th grade state standardized exam performance for CTE students. While still well below state averages, students in CTE programs generally have higher scores on the state exams than the district average. In 2011-12, 57% of CTE students scored proficient or above in 10th grade reading on the WKCE, as compared to 39% of 10th graders district-wide. Similarly, for 10th grade math, 45% of CTE students scored proficient or above, while the MPS average was 30%. [91]

Figure 6.2 shows CTE enrollment by program concentration. Business courses have the largest enrollment, followed by technology, marketing, and family & consumer sciences (FCS).

[90] An "academically disadvantaged" student is defined as a student who 1) scores at or below the 25th percentile on a standardized achievement or aptitude test; 2) whose secondary school grades are below 2.0 on a 4.0 scale or; 3) fails to maintain minimum academic competencies. For more information on Carl Perkins Act designations, see: http://cte.dpi.wi.gov/files/cte/pdf/10cpaglossary.pdf

[91] WKCE scores do not reflect the NAEP cut scores that the state began using with the 2012-2013 WKCE administration.

Fig 6.2: CTE Program Concentration

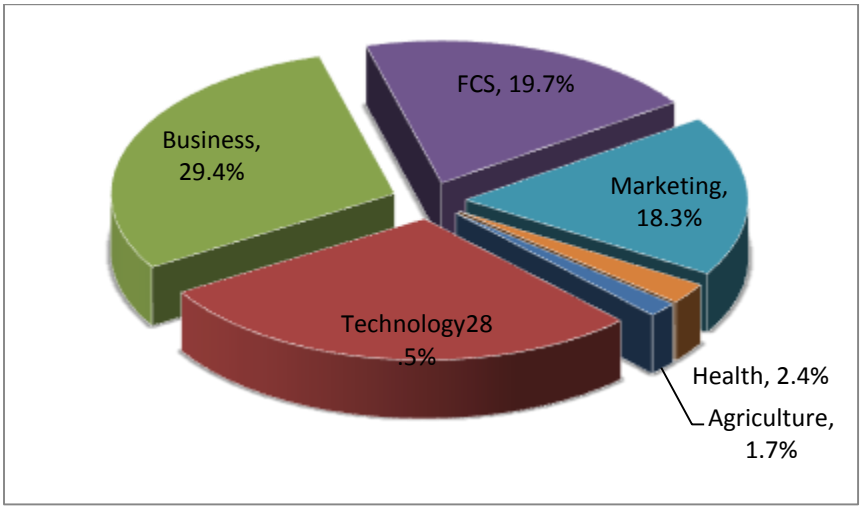


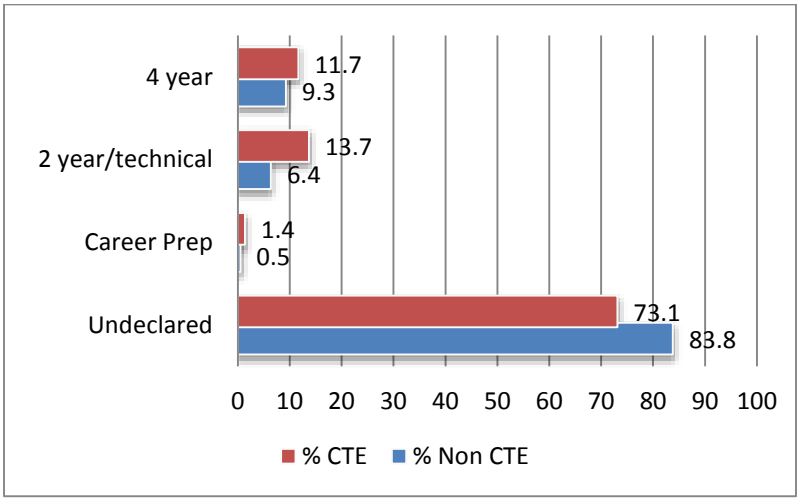
Table 6.3 summarizes participation rates in the various specialized programs offered through CTE in 2010.

Fig 6.3: CTE Program Methodologies

Methodology	Participants	% of all CTE Participants
Co-op	78	1.3%
Supervised Occupational Experience	848	13.9%
Youth Apprenticeship	30	0.5%
Youth Options	23	0.3%
Tech Prep: Transcripted Credit	18	0.3%

With regard to post-graduation plans, 73% of CTE students were undecided in 2012, compared to about 84% for MPS as a whole. CTE students plan to attend four-year colleges at similar rates to their peers, but a much higher percentage plan on pursuing a two-year degree.

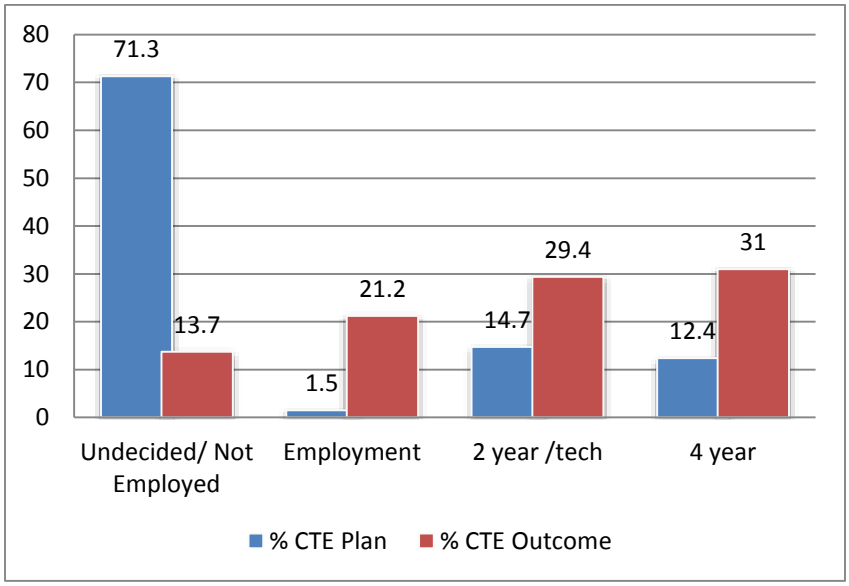
Fig 6.4: CTE Post-graduate Plans



Outcomes

CTE students' success in achieving their post-graduation plans can be measured by comparing the results of the CTE participants survey, highlighted above, with the results of an annual follow-up survey the district conducts with former CTE students as part of the federal Carl Perkins Career and Technical Education Act of 2006. **Figure 6.5** categorizes the post-graduation plans and outcomes into broad categories.[92] It should be noted that the categories for post-graduation plans and outcomes are not fully commensurable, as "undecided" does not equate to no activity at all, but merely a lack of specific plans.

Fig 6.5: CTE Plans v Outcomes



The chart shows that more than 60% of 2011 CTE graduates report enrolling in either a two- or four-year postsecondary institution, which is higher than the 51.5% of all MPS graduates who entered college between the 2007-08 and 2010-11 school years.[93] Interestingly, more students are enrolled in postsecondary education than had planned on furthering their schooling. Considering the high levels of "undecided" plans for CTE students, this demonstrates a positive trend for CTE students. Nearly 14% of CTE graduates were unemployed at the time of the survey, however, which compares to an 11.9% unemployment rate for the City of Milwaukee at that time.[94]

A further breakdown of outcomes of 1,099 respondent students with CTE concentrations helps to isolate trends. **Table 6.6** indicates that the career clusters were relatively analogous in terms of

[92] Discrepancies between post-graduation plans in figure 6.4 and 6.5 are a result of sampling error. Figure 6.4. is from MPS reporting, while figure 6.5 is based off of survey responses. None of the discrepancies can be considered statistically significant.

[93] Margin of error 2.7% at 95% confidence. 2011 PSE rates garnered from StudentTracker data are less reliable due to late enrollment. For this reason, the aggregate PSE rate from 2007-08 to 2010-11 was used as the comparison.

[94] Unemployment data from worknet.wisconsin.gov.

rates of employment, those pursuing further education, and those seeking employment. The majority of CTE students in each concentration are furthering their education.

Marketing stands as the concentration that has the highest rate of employment (31.3%), with the majority of other concentrations clustered around the 20% mark. The data do not reveal whether the employment is in a field related to the student's area of concentration, however.

Fig 6.6: CTE Program Concentrator Outcomes[95]

	Agriculture	Business	FCE	Health	Marketing	Tech	Total
Count	12	316	214	11	201	345	1099
Employed	16.7%	18%	20.1%	9.1%	31.3%	19.4%	21.2%
Further Education	66.7%	68.0%	62.1%	54.5%	47.8%	67.5%	62.9%
Seeking Employment	16.7%	11.7%	15.9%	36.4%	17.4%	11.3%	13.7%

Implications of Findings

While the nature of the CTE outcomes survey does not allow a direct comparison to the larger MPS graduate population, the demographic and postsecondary trends do suggest interesting results. Most broadly, it is clear that CTE graduates attend postsecondary institutions as much, if not more, than MPS graduates in general. This finding may challenge the assumption that CTE is solely for non-college bound students.

General conclusions include:

- CTE programs enroll greater proportions of minority, low-income, and academically disadvantaged students than the general student population.
- CTE students tend to score higher on 10th grade WKCE assessments of reading and math than the general MPS student population.
- The majority of CTE students further their education after graduation.

[95] Totals do not add up to 100% due to the omission of the following survey categories: Homemaker, Not Seeking Employment, Military, and Deceased.

CONCLUSION

This report has broadly sought to evaluate the relationship between postsecondary education enrollment for MPS students and their participation in specialized curricular programs. The four programs – Advanced Placement, International Baccalaureate, Project Lead the Way, and career and technical education – represent curricular programs with postsecondary goals. While postsecondary enrollment is only one factor in the notion of "success" for public schools in Wisconsin, it is nonetheless a major component of the state superintendent's Agenda 2017. Consequently, it is important for MPS – and the community at large – to understand the potential of specific specialized curricular programs to positively impact postsecondary enrollment.

Our analysis reveals two major findings:

- **MPS students who enroll in specialized courses generally are more likely to enroll in a postsecondary institution.** When looking at aggregate trends, each specialized program has a statistically higher rate of postsecondary enrollment during the sample period. This rate of postsecondary enrollment increases in likelihood for students who take greater numbers of specialized courses. The trend holds even when controlling for the influence of other factors, such as each student's ACT scores and the academic climate of their school.
- **Postsecondary enrollment trends for specialized curricula are not the same for all student groups.** While aggregate trends demonstrate a general level of significance, the effect of specialized courses on college matriculation varies greatly by demographic group. For example, males have higher-than-average rates of postsecondary enrollment when exposed to AP or PLTW, but not IB. Hispanic and at-risk students have higher-than-average college enrollment rates when exposed to PLTW, but not AP or IB. Low-income students have higher-than-average college enrollment rates when exposed to AP or PLTW. In short, while the overall relationship was positive for nearly every demographic group, the size of the effect differed by program.

These findings, in turn, suggest several implications for MPS:

- **The initiative to expand access to specialized curriculum is supported.** The results show that MPS students enrolling in specialized courses are more likely to enroll in a postsecondary institution. While a causal relationship cannot be measured, there is no evidence that these programs hinder postsecondary outcomes and they may in fact improve them.
- **Implementation of any one program universally would be both costly and, in all likelihood, ineffective.** While the curriculum may be packaged as "turnkey," the results are not. In terms of postsecondary enrollment, certain populations are more receptive to particular curricular programs than others.
- **MPS can seek to maximize the efficiency and effectiveness of its specialized programs through strategic implementation**. MPS can strategically implement specialized curriculum in two ways. If a program demonstrates high leverage for a particular demographic group, it can seek to implement the program at school sites with

high concentrations of that group. Otherwise, it can seek to add incentives for specific populations to participate in specialized programs. For example, MPS could seek to expand AP access to students eligible for free or reduced-price lunch given that AP students eligible for free or reduced-price lunch demonstrate the greatest increase in college matriculation across all programs. Or, it could seek increased access to PLTW curriculum for at-risk students given that PLTW is the only program that demonstrates a statistically significant relationship to postsecondary enrollment for those students.

The limitations associated with the analytical approach used in this report also must be considered, however. While the goal of our analysis is to better inform MPS and interested parties regarding the relationship of specialized curricular programs to postsecondary enrollment, data limitations prevent us from analyzing relative costs of the programs. Thus, the practicality of program expansion and implementation are beyond the scope of this report. The variety of factors and opportunity costs that impact expansion of a specialized program, such as available staff and administration, as well as parental support, also need to be taken into account when determining future courses of action.

In addition, it is outside the scope of this report, as well as beyond currently available data sources, to determine if students who enrolled in specialized courses persisted in postsecondary institutions, or if they graduated with postsecondary degrees. Such results would require long-term tracking of student enrollment records. Plans to construct a P-20 data system as part of the State Longitudinal Data System grant soon may make such tracking possible in Wisconsin, however.[96]

Finally, as referenced earlier, there is an inherent selection bias issue with the data. It is impossible to disaggregate students choosing to take specialized courses because they have postsecondary plans from students with postsecondary plans that were formulated as a result of taking a specialized course. Consequently, generalizations must be made with care. Our analysis does clearly indicate that students who take specialized courses *are more likely* to attend a postsecondary institution. It cannot be concluded, however, that specialized courses are *causing* a higher likelihood of postsecondary enrollment.

As a result of these findings, as well as their inherent limitations, there are several areas in which further research is warranted and data collection efforts should be made, including:

- The total cost of each specialized program at the district and site level.
- Long-term results of students who participate in specialized programs with regard to college persistence.

[96] The P-20 initiative is currently under development. It is aimed at connecting the patchwork of data reporting systems across the state to allow for student records starting with initial public school enrollment to postsecondary completion to maintain consistency and connection. For further information on the P-20 initiative, see: http://wise.dpi.wi.gov/wise_projects#P20

- Savings to students and/or taxpayers incurred from UW System students who graduate early because of credit earned in high school.
- The factors behind formation of students' post-graduation plans (perhaps through MPS student surveys), as well as student opinions of specialized curriculum in the context of post-graduation plans.
- Adherence of postsecondary concentration (employment or academic focus) to specialized curricular field. For example, are PLTW students matriculating to engineering fields after graduation?

APPENDIX 1: COMPARISON OF AP, IB, AND PLTW

The following table compares AP, IB and PLTW PSE outcomes from the 2007-08 to 2010-11 school years. The percentage of students for each group that enrolled in a postsecondary institution is shown in **bold**. The italicized numbers underneath show the percentage point change from the "No Specialized Courses" category. This category represents all MPS graduates who did not take any identified specialized courses during the sample period. The number of graduates who enrolled in a postsecondary institution is given, as well as the total number of graduates for each category. Because of the different data collection method, CTE cannot be included in this comparison.

Fig A1.1: Postsecondary Enrollment Averages by Curricular Program

	No Special Courses	AP	IB	PLTW
All MPS Graduates	**42.3%**	**70.5%**	**78.2%**	**57.8%**
Percentage Point Change		*+28.2*	*+35.9*	*+15.5*
PSE	5296	2612	1543	175
Sample	12531	3705	1973	303
African-American	**45.5%**	**73.0%**	**78.1%**	**58.5%**
Percentage Point Change		*+27.6*	*+32.7*	*+13.0*
PSE	3926	1409	783	107
Sample	8638	1930	1002	183
Asian	**45.7%**	**76.2%**	**88.1%**	**56.0%**
Percentage Point Change		*+30.6*	*+42.4*	*+10.3*
PSE	227	279	126	14
Sample	497	366	143	25
Hispanic	**32.2%**	**52.9%**	**65.0%**	**54.5%**
Percentage Point Change		*+20.6*	*+32.8*	*+22.3*
PSE	661	378	160	42
Sample	2050	715	246	77
White	**35.8%**	**78.7%**	**81.4%**	**66.7%**
Percentage Point Change		*+42.9*	*+45.6*	*+30.9*
PSE	482	546	474	12
Sample	1346	694	582	18
Male	**37.4%**	**67.4%**	**73.2%**	**57.9%**
Percentage Point Change		*+30.1*	*+35.8*	*+20.5*
PSE	*2243*	*971*	*560*	*81*
Sample	6003	1440	765	140
Female	**46.8%**	**72.5%**	**81.4%**	**57.7%**
Percentage Point Change		*+25.7*	*+34.6*	*+10.9*
PSE	3053	1641	983	94
Sample	6528	2265	1208	163
FRL	**42.8%**	**68.1%**	**74.3%**	**57.4%**
Percentage Point Change		*+25.2*	*+31.5*	*+14.6*
PSE	3656	1582	731	128
Sample	8537	2324	984	223
At-Risk	**43.2%**	**59.3%**	**45.5%**	**58.9%**
Percentage Point Change		*+16.1*	*+2.3*	*+15.7*
PSE	2470	427	60	33
Sample	5720	720	132	56

APPENDIX 2: STATISTICAL DETAILS OF PREDICTION MODELS

Data utilized in this study were compiled from MPS student enrollment records for the 2007-08 to 2010-11 school years. In estimating the relationship of specialized curricula to postsecondary enrollment, the figures relying on annual averages are a less direct way to describe the student-level data. Yearly averages were used as data points instead of the data points themselves in **Figures 3.6, 3.7, 4.3 and 4.4**. This method was presented for its ease of interpretation. While coefficients were similarly significant, they were not as accurate as possible. Either students attend college (1) or do not (0), and to interpret figures of yearly averages as relating to student outcomes is to generalize to the wrong group.

The tests of significance were obtained using a generalized linear model, whereby the probability of the independent variable occurring was estimated. Logit models were used to coerce a normal distribution. For AP/IB/PLTW, the initial probability presented was again utilized to answer the blunt question of PSE by specialized curricula. However, when incorporating the measures of gender, ethnicity, FRL, at-risk, ACT, and school climate provided a more robust explanation of the data while controlling for spurious effects. This was confirmed by a type II analysis of deviance test, as well as a greater proportional reduction in error.

Control variables were generally comprised of standard demographic data, such as race, gender, FRL status and At Risk status. ACT scores were included as a proxy for academic ability, so that the removal of their influence more appropriately measured the courses themselves instead of general student ability. Finally, school climate was used to control for the effects of the school itself on college going behavior. This measure was an index of the annual MPS school climate survey, whereby student, teacher, and parent ratings on both school environment and academic rigor were compiled and standardized. This was used to control for the effect of "college going climate" from prediction, so that the effect of AP/IB courses on PSE were further isolated.

The results demonstrate the effect to which AP/IB courses interacted with the demographic on postsecondary enrollment when isolated. While the coefficients are not necessarily interpretable on their own, their relative position is interesting. **Tables A2.1-A2.2** demonstrate the estimated probability of PSE for each group without specialized courses and with any number of specialized courses. The standard error is noted in parenthesis below the estimate. Asterisks note if the p-value of the effect is statistically significant. The rightmost column demonstrates a significance test between the size of the effect for non-AP and AP for each factor category in the model.

Table A.1: AP Models

	Non-AP PSE	AP PSE	Non-AP v. AP effect
Intercept	-3.861*	-0.541	< 0.001*
	(0.342)	(0.714)	
Female	0.364*	0.306*	0.521
	(0.052)	(0.093)	
Asian	-0.082	-0.073	0.972
	(0.114)	(0.153)	
Hispanic	-0.698*	-1.049*	0.009*
	(0.076)	(0.113)	
White	-0.702*	-0.427*	0.105
	(0.088)	(0.143)	
FRL	-0.112	-0.149	0.705
	(0.059)	(-0.038)	
At Risk	-0.118*	-0.133	0.984
	(0.059)	(0.125)*	
ACT	0.241*	0.174*	<0.001*
	(0.009)	(0.015)	
School Climate	0.034	-0.061	0.025*
	(0.018)	(0.038)	
n	7027	2912	
PRE	0.296	0.217	

*Notes: *p<0.05. African-American male used as baseline. All coefficients are logits, standard error in parentheses.*

Table A.2: IB Models

	Non-IB PSE	IB PSE	Non-IB v. IB effect
Intercept	-2.668*	0.926	< 0.001*
	(0.334)	(1.716)	
Female	0.339*	0.512*	0.263
	(0.048)	(0.147)	
Asian	0.019	0.111	0.784
	(0.095)	(0.322)	
Hispanic	-0.685*	-1.388*	0.001*
	(0.066)	(0.205)	
White	-0.559*	-1.017*	0.033*
	(0.080)	(0.199)	
FRL	-0.107	-0.320*	0.154
	(0.054)	(0.154)	
At Risk	-0.107*	-0.573	0.146
	(0.053)	(0.316)	
ACT	0.230*	0.201*	0.201
	(0.008)	(0.021)	
School Climate	0.022	-0.045	0.45
	(0.017)	(0.087)	
df	8323	1622	
PRE	0.315	0.26	

*Notes: *p<0.05. African-American male used as baseline. All coefficients are logits, standard error in parentheses.*

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