Predicting High School Outcomes in the Baltimore City Public Schools

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Matthew Messel

The Senior Urban Education Research Fellowship Series

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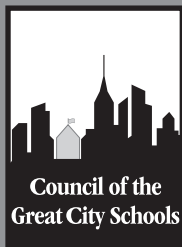### Predicting High School Outcomes in the Baltimore City Public Schools

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THE SENIOR URBAN EDUCATION RESEARCH FELLOWSHIP PROGRAM

Large urban public school districts play a significant role in the American education system. The largest 67 urban school systems in the country—comprising less than one half of one percent of the nearly seventeen thousand school districts that exist across the United States—educate about 14 percent of the nation's K-12 public school students, including over 20 percent of the nation's economically disadvantaged students, 28 percent of its African American students, about a quarter of its Hispanic students, and a quarter of its English Language Learners. Clearly, any attempt to improve achievement and to reduce racial and economic achievement gaps across the United States must involve these school districts as a major focus of action.

These school districts face a number of serious, systematic challenges. To better understand the problems in urban education and to develop more effective and sustainable solutions, urban districts need a program of rigorous scientific inquiry focusing on what works to improve academic outcomes in the urban context. Moreover, in order to produce such evidence and to move public education forward generally, the standards of evidence in education research must be raised in such a way as to bring questions regarding the effectiveness of educational interventions and strategies to the fore and to promote careful scrutiny and rigorous analysis of the causal inferences surrounding attempts to answer them.

It has been argued that, in order to move such an effort forward, a community of researchers, committed to a set of principles regarding evidentiary standards, must be developed and nurtured. We contend further that, in order to produce a base of scientific knowledge that is both rigorously derived and directly relevant to improving achievement in urban school districts, this community of inquiry must be expanded to include both scholars and practitioners in urban education.

Though a great deal of education research is produced every year, there is a genuine dearth of knowledge regarding how to address some of the fundamental challenges urban school districts face in educating children, working to close achievement gaps, and striving to meet the challenges of No Child Left Behind. Moreover, while there is a history of process-related research around issues affecting urban schools, relatively few studies carefully identify key program components, document implementation efforts, and carefully examine the effects of well-designed interventions in important programmatic areas on key student outcomes such as academic achievement. In sum, there is an absence of methodologically sound, policy-relevant research to help guide practice by identifying the conditions, resources, and necessary steps for effectively mounting initiatives to raise student achievement.

In order to address this need, the Council of the Great City Schools, through a grant from the Institute of Education Sciences, established the Senior Urban Education Research Fellowship (SUERF) program.

The Senior Urban Education Research Fellowship was designed to facilitate partnerships between scholars and practitioners focused on producing research that is both rigorous in nature and relevant to the specific challenges facing large urban school districts. We believe such partnerships have the potential to produce better, more practically useful research in at least three ways. First, by deepening researchers' understanding of the contexts within which they are working, the program may help them maximize the impact of their work in the places where it is needed the most. Second, by helping senior staff in urban districts become better consumers of research, we hope to increase the extent to which the available evidence is used to inform policy and practice, and the extent to which urban districts continue to invest in research. Third, by executing well-designed studies aimed at the key challenges identified by the districts themselves, we hope to produce reliable evidence and practical guidance that can help improve student achievement.

The primary goals for the Senior Urban Education Research Fellowship are to:

- promote high quality scientific inquiry into the questions and challenges facing urban school districts;

- facilitate and encourage collaboration, communication, and ongoing partnerships between senior researchers and leaders in urban school districts;

- demonstrate how collaboration between scholars and urban districts can generate reliable results and enrich both research and practice;

- produce a set of high quality studies that yield practical guidance for urban school districts;

- contribute to an ongoing discussion regarding research priorities in urban education; and

- promote the development of a "community of inquiry", including researchers and practitioners alike, committed to both a set of norms and principles regarding standards of evidence and a set of priorities for relevant, applied research in urban education.

The SUERF program benefitted greatly from the guidance and support of a Research Advisory Committee made up of experts and leaders from large urban school districts and the education research community. The committee included Dr. Katherine Blasik, Dr. Carol Johnson, Dr. Kent McGuire, Dr. Richard Murnane, Dr. Andrew Porter, and Dr. Melissa Roderick. This extraordinary group helped to identify and define the objectives and structure of the fellowship program, and we thank them for lending their considerable insight and expertise to this endeavor.

The following volume of the Senior Urban Education Research Fellowship Series documents the work of Dr. Martha Mac Iver working in collaboration with the Baltimore City Public Schools. Both the research and reporting is the sole intellectual property of Dr. Mac Iver, and reflects her personal experience and perspective.

Dr. Mac Iver's examination of factors linked to high school graduation and college enrollment outcomes in Baltimore adds to a growing base of research documenting the strength and potential use of early warning indicator data. We are improving our understanding of the warning signs of students at risk of dropping out of school, and the patterns are striking. Course failure, absenteeism, behavior problems—we increasingly see that these are clear signs we need to track and address—and they are challenges shared by schools and districts across the nation. The challenge for us as educators and policymakers, then, is to use what we know—to more systematically track student data and to intervene faster and more effectively to keep students on track to graduate.

Baltimore has taken important steps in responding to this early warning indicator data on Baltimore public school students. At the same time, Dr. Mac Iver offers a unique perspective as a researcher on some of the work that still needs to be done, and some of the structural forces that may be impacting system-wide progress on this front.

We hope you will find this report both interesting and relevant to your own work in education.

Thank you.

Michael Casserly
Executive Director
Council of the Great City Schools

Martha Abele Mac Iver is an Associate Professor at the Center for Social Organization of Schools in the School of Education at Johns Hopkins University. A political scientist who made the transition into educational policy research after more than a decade of research on both the Northern Ireland conflict and the political transformation of Europe after 1989, she has focused her recent research on the effectiveness of numerous school and district educational interventions designed to improve student achievement. She served as co-investigator on the National Science Foundation ROLE grant to study the achievement effects of a decade of educational reforms in Philadelphia, and principal investigator on an analytical effort to provide useful information for data-informed decision making on the part of Colorado districts participating in an initiative aimed at cutting Colorado's dropout rate.

She has also studied educational reform efforts in the Baltimore City Public Schools for the past fifteen years, and participates actively as a researcher with the Baltimore Education Research Consortium (BERC). Her articles have appeared in *Educational Evaluation and Policy Analysis, Phi Delta Kappan, Education and Urban Society, Journal of Policy Research, Journal of Vocational Education Research, Urban Education,* and other journals.

ABOUT THE RESEARCH PARTNERSHIP

This study grew out of a long-standing relationship I have enjoyed with the Baltimore City Schools Research Office (under the Office of Achievement and Accountability) since the late 1990s, as well as the close collaboration of researchers and district staff through the Baltimore Educational Research Consortium (BERC). Launched in fall 2006, BERC is a partnership among Johns Hopkins University (JHU), Morgan State University (MSU), and the Baltimore City Public Schools (City Schools). Modeled loosely on the Consortium on Chicago School Research, BERC pursues both long- and short-term data analysis and research, and then directs time and resources to sharing and interpreting the findings with school system leaders and other community partners and stakeholders.

In 1998 when I joined the Center for Social Organization of Schools (CSOS) at Johns Hopkins University, Program Co-Director Sam Stringfield was articulating the vision for the Consortium that was eventually realized later in the creation of BERC under the leadership of Steve Plank, Associate Professor of Sociology at Johns Hopkins University. In the late 1990s, Sam Stringfield was also beginning the process of building a collection of yearly administrative data files from the Baltimore City Schools. The existence of these data files facilitated the construction of longitudinal cohort files for a series of Baltimore studies, of which the current study of two first-time ninth-grade cohorts and their progression to graduation and post-secondary education is the most recent and comprehensive.

Having conducted similar studies in several other urban districts with CSOS colleagues, I was delighted to have the opportunity to do this work in my own city. Using actual Baltimore City data in presentations with district administrators and other community stakeholders made a more compelling case for addressing the basic issues of attendance, behavior, and course failure that are so closely tied to graduation outcomes and college enrollment.

In the concluding section of this report I reflect in more detail on the progress Baltimore has made thus far in addressing these early warning indicators, as well as the structural issues that remain as challenges for the district in specifically addressing the problems of ninth-grade chronic absence and course failure. These reflections begin the preliminary work for what I envision to be a larger, systematic study of how districts are responding in the face of growing national discussion of early warning indicators.

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ACKNOWLEDGEMENTS

EXECUTIVE SUMMARY

This study of high school outcomes in the Baltimore City Public Schools builds on substantial prior research on the early warning indicators of dropping out. It sought to investigate whether the same variables that predicted a non-graduation outcome in other urban districts—attendance, behavior problems, and course failure – were also significant predictors of non-graduation in Baltimore. The study specifically probed the relationship between eighth- and ninth-grade early warning indicators as predictors of graduation outcomes, as well as the relationship between ninth-grade indicators and college enrollment outcomes. In particular, it sought to address the following questions:

1. To what extent did students in two ninth-grade cohorts exhibit early warning indicators of non-graduation in eighth grade and ninth grade? To what extent were eighth- and ninth-grade early warning indicators correlated?

2. To what extent do eighth-grade early warning indicators (attendance, behavior problems, and course failure) explain the variation in graduation outcomes? How do they compare with ninth-grade indicators in their explanatory power?

3. To what extent do ninth-grade school-level factors influence non-graduation outcomes?

4. To what extent do eighth- and ninth-grade student outcomes influence college enrollment outcomes?

5. What do findings about the relationships between early warning indicators and graduation and college enrollment outcomes suggest about the kinds of intervention strategies needed to improve student outcomes?

METHODOLOGY

The analysis was based on two cohorts of all ninth graders in Baltimore City Public Schools in 2004-05 and 2005-06,[1] and drew on yearly data on school enrollment and withdrawal, grade level, attendance, test scores, suspensions, and course grades. In addition, data from the National Student Clearinghouse on college enrollment were merged into these cohort files.

The results are divided into three parts. Parts I and II present descriptive analyses of the data, including frequencies, cross-tabulations, means, and other descriptive summaries that show the relationship between various student behaviors/early warning indicators (such as absenteeism, GPA, or course failures) and high school graduation and college enrollment outcomes. Part III then reports the results of multi-level modeling analyses of the data, wherein the relative impact of eighth- and ninth-grade early warning indicators on high school graduation and college enrollment outcomes are presented.

RESULTS

- As expected, ninth-grade indicators proved to be more powerful predictors of high school outcomes than eighth-grade indicators, suggesting that interventions designed to prevent students from slipping into chronic absence and course failure in ninth grade are crucial for increasing the graduation rate in Baltimore and similar districts.

- At the same time, the strength of eighth-grade variables (particularly chronic absence) in predicting outcomes was striking. These findings provide evidence of the importance of interventions mounted prior to the beginning of ninth grade to help reverse chronic absenteeism and increase the probability of graduation for struggling students.

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[1] See Methodology and Appendix A for important details on the construction of the cohorts

- Analyses also indicate the importance of explicitly addressing the needs of male students, since they are still significantly less likely to graduate, even when controlling for their higher levels of behavioral early warning indicators.

- In addition, the findings emphasize how being over-age for grade reduces the probability of graduation, even controlling for the associated behavioral indicators. Finding ways to increase learning time during the school year and summer, rather than retaining students in grade in the elementary grades, may be a crucial step in reducing the number of students who fail to graduate from high school.

- The findings also indicate that eighth-grade proficiency in math and reading and both cumulative GPA and ninth-grade GPA increase the probability of college enrollment, suggesting that the "gatekeeper issues" of low ninth-grade GPAs and the lack of proficiency upon entrance to high school need to be addressed as crucial steps for reaching the goal of raising college readiness rates and the proportion of students who enroll in college after high school.

DISCUSSION

The discussion section of this report examines how the district has responded to research on early warning indicators. While important steps have been taken, particularly in the area of increasing attendance and reducing the number of suspensions, challenges remain for the district in preventing students from falling off-track to graduation through course failure.

The discussion explores structural factors that may be influencing the district's orientation towards early warning indicators, including the district's decentralized, "portfolio" approach to school governance. Several topics and areas for future research are identified, and the report concludes with an examination of the role the Baltimore Education Research Center could play in future district efforts to address and integrate research data into school reform efforts.

INTRODUCTION

INTRODUCTION

After considerable focused attention to the national dropout problem over the past decade,[2] graduation rates appear to be rising.[3] At the same time, in the most recent *Diplomas Count report from Education Week* and the Editorial Projects in Education Research Center, Swanson (2011) concludes that "despite such clear indications of progress, the fact is that too many students continue to fall through the cracks of America's high schools."[4] It is crucial to find ways to intervene for these students who are still struggling to attain the minimal credential for success in a twenty-first century economy.

Our focus on addressing early warning indicators of high school outcomes can be situated within the context of the much larger body of research seeking to explain why students drop out of high school. The framework provided by Rumberger and Lim (2008) in their extensive review of more than 25 years of research emphasizes several sets of interrelated factors that contribute to explaining dropout outcomes:

- Demographic/individual characteristics;
- Out-of-school behaviors;
- Institutional factors (family, community, and school);
- Attitudinal factors; and
- School-related behaviors and performance (including the "early warning indicators").

As Rumberger and Lim (2008) note, different theoretical frameworks diverge in their emphasis on particular factors, and it is useful to distinguish broadly between out-of-school versus school-related factors. Battin-Pearson et al. (2000) found that the school-related behavior of academic performance was the strongest predictor of dropout in analyses testing the impact of variables related to five different theories (general deviance; deviant affiliation; poor family socialization; structural/demographic strains; and academic mediation). Academic performance (linked to school bonding) mediated the other relationships, though

there were still independent effects of socioeconomic status, deviance, and deviant affiliation.

While numerous studies have found dropout rates to be higher among some demographic groups than others (e.g., high poverty, Hispanic and Black, limited English proficiency, students with cognitive disabilities), Gleason and Dynarski (2002) have shown that demographic factors do not efficiently predict which students will drop out. This is probably related to the mediating factor of academic performance.

Out-of-school factors are certainly critical in explaining dropout outcomes. Other studies reviewed by Rumberger and Lim (2008) generally found significant relationships between negative out-of school behaviors (delinquency, interactions with justice system, drug or alcohol use, and pregnancy/child-bearing) and dropping out. Many of these behaviors are linked to the family and community contexts in which students find themselves. Students who live in a family without two parents (and the greater supervision of school performance that occurs in such families), with families that have prior histories of dropping out, substance abuse, mental health issues, or arrest, or with families experiencing high rates of residential mobility are at greater risk of dropping out of school than those in more stable families. Residence in communities characterized by high levels of unemployment and violence is also a significant predictor of dropping out.

These risk factors characterize the large majority of students attending public schools in many of the nation's urban districts (as well as high-poverty rural districts). Although it is certainly crucial to address the structural issues of poverty to make progress in educational reform and increasing the graduation rate in the nation's inner cities,[5] there are malleable, school-related student behaviors and school practices related to high school outcomes that can be addressed until more structural social reforms are accomplished.

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[2] e.g. Balfanz, Fox, Bridgeland, & McNaught, 2008; Bridgeland, DiIulio, & Morison, 2006

[3] Swanson, 2011

[4] Swanson 2011

[5] e.g., Berliner, 2006

The theoretical construct of engagement in school[6] has proven to be very useful in framing research on graduation outcomes. Measures of engagement focused on emotions, attitudes, and cognitive beliefs – often related to experiences within families, communities, and schools – have been shown to be related to dropout outcomes, though school-related behaviors (which are highly correlated with attitudes by the ninth grade) are more strongly related to outcomes than are attitudes.[7] Recent research has focused on the behavioral manifestations of disengagement with schooling that are regularly measured by schools. One of the most obvious (and regularly measured) factors is absenteeism. And while schools do not directly measure the disengagement behaviors of students' failure to pay attention and complete assignments, these behaviors are closely related to course grades, which now generally exist as electronic data. Schools also keep track of misbehavior at school (if only the most serious offenses result in suspension).

Building on the original research studies in Chicago and Philadelphia that identified the relationships among middle and high school attendance, behavior problems, course failure, and graduation outcomes,[8] researchers have seen the same patterns repeated in district after district.[9] Educational organizations such as Achieve, America's Promise Alliance, the Alliance for Excellent Education, the National High School Center, the Mid-Atlantic Equity Center, SEDL, and others have translated research findings into practical advice for district and school leaders regarding implementation of early warning systems and interventions to keep students on-track to graduate.[10] Yet comprehensive studies of how schools and districts are actually implementing and using early warning systems and interventions are just beginning to be conducted,[11] and more systematic studies are a crucial next step for the education research community.

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6   e.g., Fredricks, Blumenfeld, & Paris, 2004

7   e.g., Alexander, Entwistle, & Kabbani, 2001

8   Allensworth & Easton, 2005, 2007; Balfanz & Herzog, 2005; Balfanz, Herzog, & Mac Iver, 2007; Neild & Balfanz, 2006These research studies were themselves based on the earlier work of Finn, 1993; Roderick, 1993; Roderick & Camburn, 1999; and Wehlage et al., 1989.

9   Balfanz & Boccanfuso, 2008a, 2008b; Balfanz & Byrnes, 2010; BERC, 2011; Mac Iver, Balfanz, & Byrnes, 2009; Meyer, Carl, & Cheng, 2010

10   e.g., Heppen & Therriault, 2008; Jerald, 2006; Kennelly & Monrad, 2007; Pinkus, 2008

11   e.g., Bruce, Bridgeland, Fox, & Balfanz, 2011

METHODOLOGY

METHODOLOGY

This study sought to investigate whether the same variables that predicted a non-graduation outcome in other urban districts were also significant predictors of non-graduation in Baltimore. The study specifically probed the relationship between eighth- and ninth-grade early warning indicators and graduation outcomes, as well as the relationship between ninth-grade indicators and college enrollment outcomes. In particular, it sought to address the following questions:

1. To what extent did students in two ninth-grade cohorts exhibit early warning indicators of non-graduation (attendance, behavior problems, and course failure) in eighth grade and ninth grade? To what extent were eighth- and ninth-grade early warning indicators correlated?

2. To what extent do eighth-grade early warning indicators (attendance, behavior problems, and course failure) explain the variation in graduation outcomes? How do they compare with ninth-grade indicators in their explanatory power?

3. To what extent do ninth-grade school-level factors influence non-graduation outcomes?

4. To what extent do eighth- and ninth-grade student outcomes influence college enrollment outcomes?

5. What do findings about the relationships between early warning indicators and graduation and college enrollment outcomes suggest about the kinds of intervention strategies needed to improve student outcomes?

Through the existing Baltimore Educational Research Consortium data-sharing agreement, the research team had access to the de-identified yearly administrative student-level data files from the Baltimore City Public Schools Office of Achievement and Accountability from the mid-1990s through 2009-2010. These files included demographic variables, school status variables (grade level, school, special education status, limited English proficiency [LEP] status, etc.), attendance, state test scores, SAT scores, suspensions, and course history files, which permitted construction of student cohort files (following all first-time ninth graders in 2004-05 and 2005-06 forward in time until their on-time graduation year and one year past: 2008, 2009, and 2010). In addition, we had access to data from the National Student Clearinghouse on college enrollment linked to Baltimore City student records for members of these two cohorts.

Cohorts were constructed by identifying all ninth graders from administrative records in 2004-05 and 2005-06, and then tracing these students back in district records over a five-year period to determine whether there was any record of having been enrolled in ninth grade previously in the district. Students without previous records in the district were coded as "new to district," and included in analyses as first-time ninth graders even though it was theoretically possible they had been enrolled in a ninth grade in another district. Demographic and attendance data for the ninth-grade year were available for all students identified as cohort members. Missing data for other variables used in analyses will be discussed in the relevant sections of the report. Based on the last available withdrawal code, we coded students as graduates, non-graduates, or as transfers to a school outside of the district. Transfer students, whose final outcome could not be ascertained, were excluded from analyses of graduation outcomes (except where noted in the text of the report). The cohorts did not include students who transferred into the district later, and so findings reported here differ from the adjusted cohort graduation rate, which does include students transferring in after the first ninth-grade year. (See Appendix for more details on how calculation of graduation outcomes differs somewhat from state calculations. The goal of this research was to focus on the predictors of non-graduation rather than the exact magnitude of the graduation rate.)

Yearly aggregate school-level data (e.g., school type, enrollment size, percent eligible for free/reduced price lunch, percent special education students, percent of teachers highly qualified, average attendance, average incoming achievement levels) were also available from the Maryland State Department of Education to permit the construction of school-level files. In addition, the research team had access to yearly school climate surveys conducted by the Baltimore City Public Schools. School-level variables based on surveys of students, teachers, and parents included measures of the physical environment's conduciveness to learning (safety, cleanliness, temperature, etc.), personalization (perception that teachers know students by name and care about students, etc.), parental involvement in the educational process, and satisfaction with the school, which were constructed into scales.[12]

> **Part I** of the results section presents the descriptive analyses of these data, including frequencies, cross-tabulations, means, and other descriptive summaries of rates of failure and high school outcomes for the full sample and subsamples (e.g., graduation rate by number of semester course failures in ninth grade).

> **Part II** of the results section presents descriptive analyses of rates of college enrollment (two-year and four-year) for the full sample and subsamples (e.g., college enrollment rate by number of course failures in ninth grade).

> **Part III** then reports the results of multi-level modeling analyses of the data. Logistic hierarchical linear modeling was used for analyses focused on dichotomous graduation/non-graduation outcomes.

Analyses of graduation/non-graduation outcomes followed a sequential pattern of analyses first with demographic variables only, then sequentially adding behavioral variables, then school-level variables. At Level 1, the student level, we modeled student outcomes as a function of demographic characteristics and early warning indicators (attendance, suspensions, and course failure) at both the eighth- and ninth-grade levels (separately because of multicollinearity issues). At Level 2, the school level, we estimated the impact of school characteristics (selective vs. non-selective) on student outcomes.

We also used multinomial logistic regression models to analyze the relationship between various predictor variables and four categories of college enrollment outcomes (enrollment in a four-year college, enrollment in a two-year college, graduation with no college enrollment, and non-graduation).

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[12] Melick, Feldman, & Wilson, 2008; Plank, Bradshaw, & Young, 2009

RESULTS

PART I: STUDENT CHARACTERISTICS AND THEIR RELATIONSHIP TO GRADUATION OUTCOMES

Table 1 summarizes the demographic characteristics of the first-time ninth graders in Baltimore in 2004-05 and 2005-06.[13] The percentage of students overage for grade upon entering ninth grade for the first time was relatively high (more than one third of the 2005-06 cohort). District records indicated that the larger size of the 2005-06 cohort (7729 vs. 6812 students) was related to more prior retentions in grade in the elementary years. Nearly one in ten students was new to the district (with no eighth-grade data available).

EIGHTH-GRADE BEHAVIORAL CHARACTERISTICS

The prior research on middle grades behavioral outcomes as predictors of graduation outcomes emphasizes the importance of attendance, behavior, and course failure.[14] To what extent were these first-time ninth graders exhibiting these early warning indicators of non-graduation in eighth grade? At least partial data were available for more than 90 percent of each cohort (fewer than 10 percent were new to the district).

We defined chronic absence as missing more than 20 days of school,[15] using a metric defined by the Maryland State Department of Education. Behavioral problems were operationalized as whether or not the student had been suspended (using a suspension of at least 3 days as the more predictive indicator).[16] Core course failure in eighth grade was measured by final course grade from the course history files: whether or not students had a failing grade in either reading or math.[17] Core courses in high school included math, science, social studies, and English. The percentage of students in each cohort manifesting

these characteristics is summarized in Table 2. We report percentages based on the entire cohort (treating missing data as a separate category), as well as percentages based on only those students with data available.

NINTH-GRADE BEHAVIORAL CHARACTERISTICS

Ninth-grade attendance, behavior and course failure have also been shown to be strong predictors of graduation outcomes in prior research.[18] Table 3 summarizes the percentage of first-time Baltimore City ninth graders in 2004-05 and 2005-06 who exhibited each of these early warning indicators in ninth grade. For ninth grade, we noted whether or not students had failed one or more (or two or more) courses in the core areas of English, math, science, and social studies. Measures of chronic absence and behavior problems were calculated in the same way as for eighth grade.

What were the patterns of eighth- and ninth-grade early warning indicators among these cohorts of students? As Table 4 indicates, the largest group of students (more than one-third of each cohort) demonstrated early warning indicators in both eighth and ninth grade, while only roughly one in five did not demonstrate any early warning indicators either year. The group of resilient students who were off-track in eighth grade but recovered to have no early warning indicators in ninth grade was considerably smaller than the group of students who exhibited no problems in eighth grade but fell off-track in ninth grade. The rest of the students were missing data in at least one grade (primarily from eighth grade).

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[13] See Appendix A for a description of how "overage for grade" and "new to district" were defined; other variables were taken directly from district administrative files.

[14] Balfanz, Herzog & Mac Iver, 2007. This study focused on behavioral early warning indicators during the sixth-grade year.

[15] Since 20/180 days represents 1/9 of days on roll in a full school year, we also used attending less than 8/9 of days enrolled as a measure of chronic absence for students who may have been enrolled for less than a full school year.

[16] See BERC, 2011, for full discussion of analyses that led to using this measure of suspension.

[17] following Balfanz, Herzog, & Mac Iver, 2007

[18] e.g., Allensworth & Easton, 2007; Mac Iver, Balfanz, & Byrnes, 2009

TABLE 1. DEMOGRAPHIC CHARACTERISTICS OF FIRST-TIME NINTH GRADERS

DEMOGRAPHIC CHARACTERISTIC	2004-05 (N= 6812)	2005-06 (N= 7729)
FEMALE	50.9%	50.9%
FREE OR REDUCED LUNCH	64.1%	58.3%
OVERAGE FOR GRADE	27.2%	34.3%
SPECIAL EDUCATION	17.2%	17.5%
LIMITED ENGLISH PROFICIENCY	1.3%	0.8%
AFRICAN-AMERICAN	88.9%	89.6%
NEW TO DISTRICT	9.1%	8.8%

TABLE 2. PERCENTAGE OF STUDENTS WITH EIGHTH-GRADE
EARLY WARNING INDICATORS (EWI) IN THE TWO FIRST-TIME NINTH-GRADE COHORTS

EARLY WARNING INDICATOR	2004-05 (N= 6812)	2005-06 (N= 7729)
CHRONICALLY ABSENT	29.7% 34.9%* (N=5800)	29.9% 34.1%* (N=6779)
FAILED ONE OR MORE CORE COURSES (READING AND/OR MATH)	24.9% 32.6%*(N=5205)	30.9% 39.2%* (N=6100)
EVER SUSPENDED	20.9%	16.0%
SUSPENDED THREE OR MORE DAYS	16.2%	12.6%
ANY EWI IN 8TH GRADE	43.7% 51.4%*(N=5797)	52.4% 59.2%* (N=6840)

* *Excluding students missing EWI data. Other percentages in table are based on including missing data as a
separate category for the complete cohort of students.*

PART I: STUDENT CHARACTERISTICS AND THEIR RELATIONSHIP TO GRADUATION OUTCOMES (CONT'D)

TABLE 3. PERCENTAGE OF STUDENTS WITH NINTH-GRADE
EARLY WARNING INDICATORS (EWI) IN THE TWO COHORTS

EARLY WARNING INDICATOR	2004-05 (N= 6812)	2005-06 (N= 7729)
CHRONICALLY ABSENT	39.5%	45.1%
FAILED ONE OR MORE COURSES	45.5% 53.0%* (N=5853)	45.4% 52.9%* (N=6635)
FAILED TWO OR MORE COURSES	30.8% 35.8%* (N=5853)	29.9% 34.9%*(N=6635)
EVER SUSPENDED	17.3%	16.0%
SUSPENDED THREE OR MORE DAYS	13.4%	12.6%
ANY EWI IN 9TH GRADE	62.8% 66.0%* (N=6486)	65.3% 67.9%* (N=7436)

* *Excluding students missing EWI data. Other percentages in table are based on including missing data as a separate category for the complete cohort of students.*

TABLE 4. DISTRIBUTION OF EIGHTH- AND NINTH-GRADE
EARLY WARNING INDICATORS (EWI) IN THE TWO COHORTS

	2004-05 (N= 6812)	2005-06 (N= 7729)
NO 8TH- OR 9TH-GRADE EWIs	20%	19%
8TH GRADE, BUT NOT 9TH-GRADE EWI	7%	8%
9TH GRADE, BUT NOT 8TH-GRADE EWI	20%	17%
BOTH 8TH- AND 9TH-GRADE EWIs	36%	42%
EWI ONE YEAR, DATA MISSING THE OTHER YEAR	9%	7%
NO EWI, DATA MISSING AT LEAST ONE YEAR	9%	8%
TOTAL	101%*	101%*

* *Percentages add to 101% because of rounding*

Figure 1 depicts the trajectory of the 2004-05 cohort students from their eighth-grade early warning indicator status, to their ninth-grade warning indicator status and their eventual graduation status in June 2008. More than three-quarters of the students with an eighth-grade early warning indicator exhibited at least one signal in ninth grade as well. This group of students has the lowest graduation rate (30%). By contrast, the small group of students who recovered from an eighth-grade early warning indicator and finished ninth grade successfully had nearly as high a

graduation rate as students with no warning signals either year (85% vs. 92%).

Eighth graders with no early warning indicators divided almost equally between manifesting a ninth-grade indicator or not. While there was a large difference in their graduation rates (61% vs. 92%), the probability of on-time graduation was much higher for those students who did not manifest an early warning indicator until ninth grade. Even though both groups had early warning indicators, the ninth-grade

FIGURE 1. TRAJECTORY OF 2004-05 COHORT STUDENTS' OUTCOME, BY EWI STATUS

8TH Grade	9TH Grade	Graduation Outcome
8TH-Grade EWI (n=2980, 43.7%)	9TH-Grade EWI (81.8%)	Graduate (30.4%) / Non-Graduate (69.6%)
	No 9TH-Grade EWI (15.4%)	Graduate (85.4%) / Non-Graduate (14.5%)

8TH Grade	9TH Grade	Graduation Outcome
No 8TH-Grade EWI (n=2817, 41.4%)	9TH-Grade EWI (47.6%)	Graduate (61.3%) / Non-Graduate (38.7%)
	No 9TH-Grade EWI (48.5%)	Graduate (91.8%) / Non-Graduate (8.2%)

Missing 9TH-Grade Data=3.8%

8TH Grade	9TH Grade (Selective High School)	Graduation Outcome
No 8TH-Grade EWI (n=365, 5.4%)	9TH-Grade EWI (29.6%)	Graduate (78.7%) / Non-Graduate (21.3%)
	No 9TH-Grade EWI (55.3%)	Graduate (95.1%) / Non-Graduate (4.9%)

Missing 9TH-Grade Data=15.1%

8TH Grade	9TH-Grade (Non-Selective High School)	Graduation Outcome
No 8TH-Grade EWI (n=650, 9.5%)	9TH-Grade EWI (60.6%)	Graduate (28.2%) / Non-Graduate (71.8%)
	No 9TH-Grade EWI (27.1%)	Graduate (84.8%) / Non-Graduate (15.2%)

Missing 9TH-Grade Data=12.3%

attendance rate and course passing rate was significantly higher for those newly falling off-track than for those who were already off-track upon entry to high school.

A total of 15 percent of the cohort were either new to the district or had insufficient data from eighth grade (missing course data) to ascertain whether they had eighth-grade early warning indicators. For these students, we distinguished between those enrolled in selective high schools and those enrolled in non-selective high schools for ninth grade, since this placement is based in part on academic performance in the middle grades and is a surrogate measure of the degree to which students were displaying early warning signals in eighth grade. The majority of students placed in selective high schools did not manifest a ninth-grade early warning indicator and went on to have a high probability of on-time graduation. By contrast, a majority of students who were missing eighth-grade data but enrolled in non-selective high schools did have an ninth-grade early warning indicator, and most of those with an EWI failed to graduate.

BIVARIATE RELATIONSHIPS AMONG THE EWIs AND GRADUATION OUTCOMES

Preliminary analyses examined the bivariate relationship between each early warning indicator identified in prior research in other districts and graduation outcomes in the Baltimore City Schools. Students transferring out of the district were excluded from the analyses.

Figure 2 depicts the strong relationship between ninth-grade attendance and the probability of on-time graduation (June 2008) for the 2004-05 ninth-grade cohort. Results for the 2005-06 cohort were similar, also echoing those from other districts cited previously.

Attendance is highly correlated with course failure during high school. Figure 3 depicts this relationship, examining the different patterns of attendance (overall eighth-grade attendance and month by month attendance in ninth grade) for 2004-05 ninth-grade cohort members with different levels of ninth-grade course failure. The discernible attendance differences among students with different levels of ninth-grade course failure tended to widen over the course of ninth grade, particularly for those who would go on to have high rates of failure.

Figure 4 illustrates the different attendance patterns in eighth and ninth grades for different outcome groups four years later (graduates and non-graduates, with students who transfer out of the district falling in between).

FIGURE 2. PERCENT OF 2004-05 COHORT GRADUATING ON TIME, BY NINTH-GRADE ATTENDANCE CATEGORY
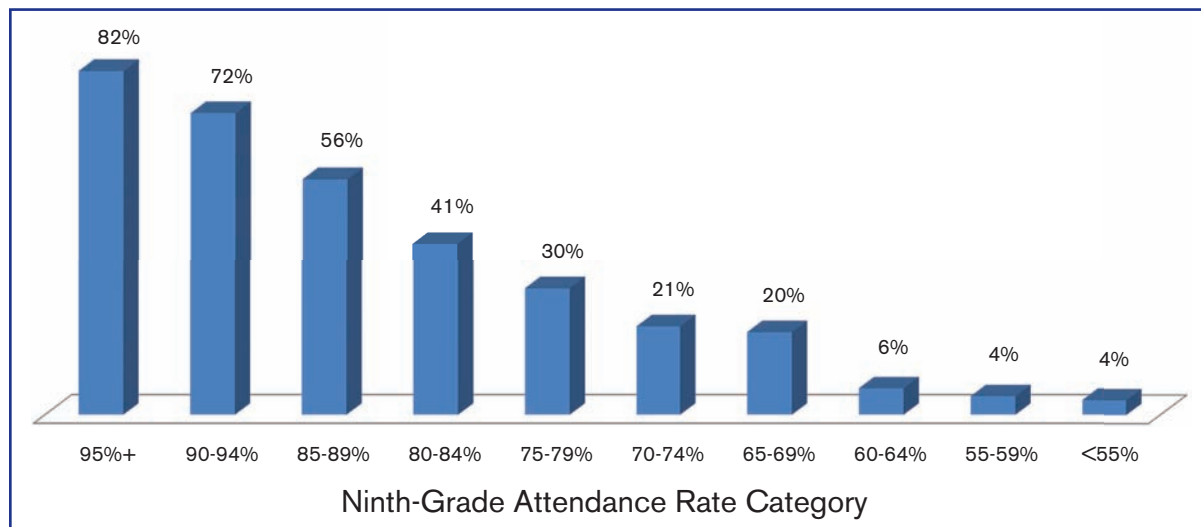
FIGURE 3. EIGHTH-GRADE ATTENDANCE, MONTHLY NINTH-GRADE ATTENDANCE, AND NINTH-GRADE COURSE FAILURE FOR THE 2004-05 COHORT
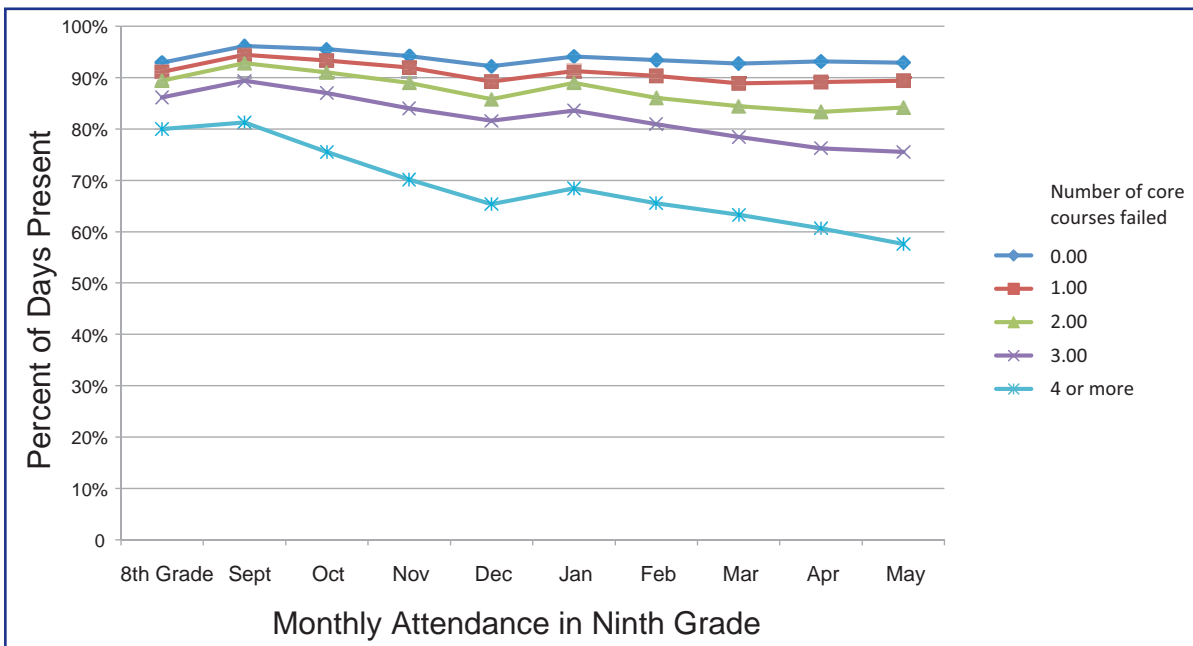
FIGURE 4. EIGHTH-GRADE ATTENDANCE, MONTHLY NINTH-GRADE ATTENDANCE, AND FOUR-YEAR GRADUATION OUTCOMES FOR THE 2004-05 COHORT
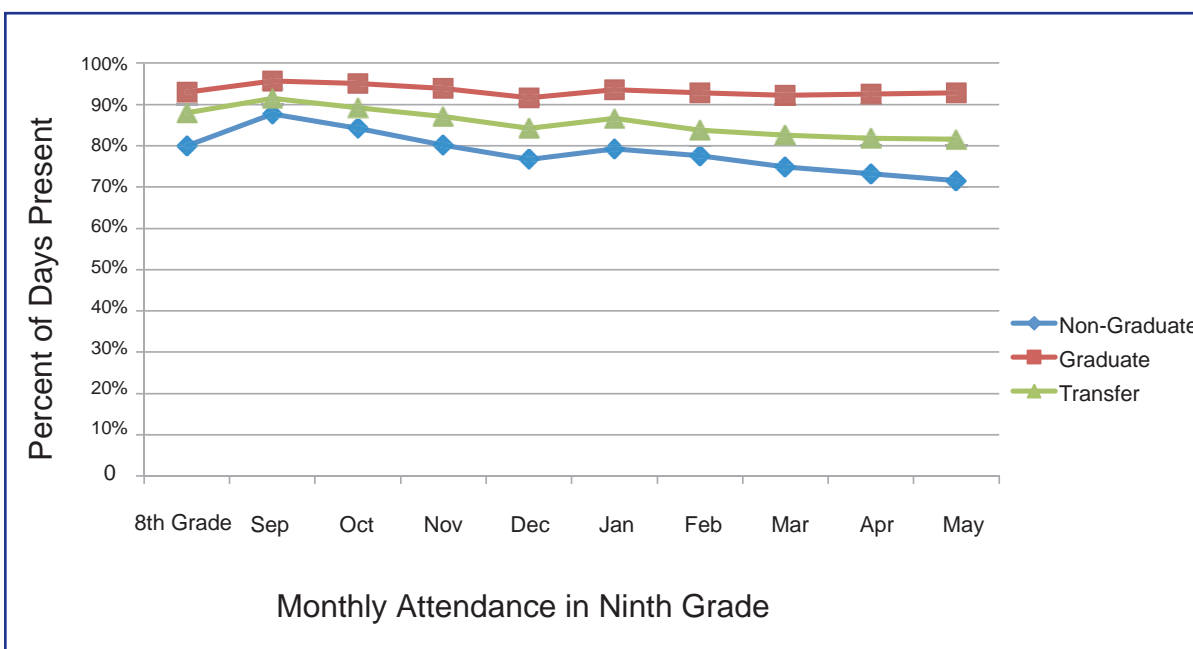
PART I: STUDENT CHARACTERISTICS AND THEIR RELATIONSHIP TO GRADUATION OUTCOMES (CONT'D)

FIGURE 5. PERCENT OF 2004-05 COHORT GRADUATING ON TIME, BY NUMBER OF NINTH-GRADE CORE COURSE[19] FAILURES

Number of Core Courses Failed in Ninth Grade
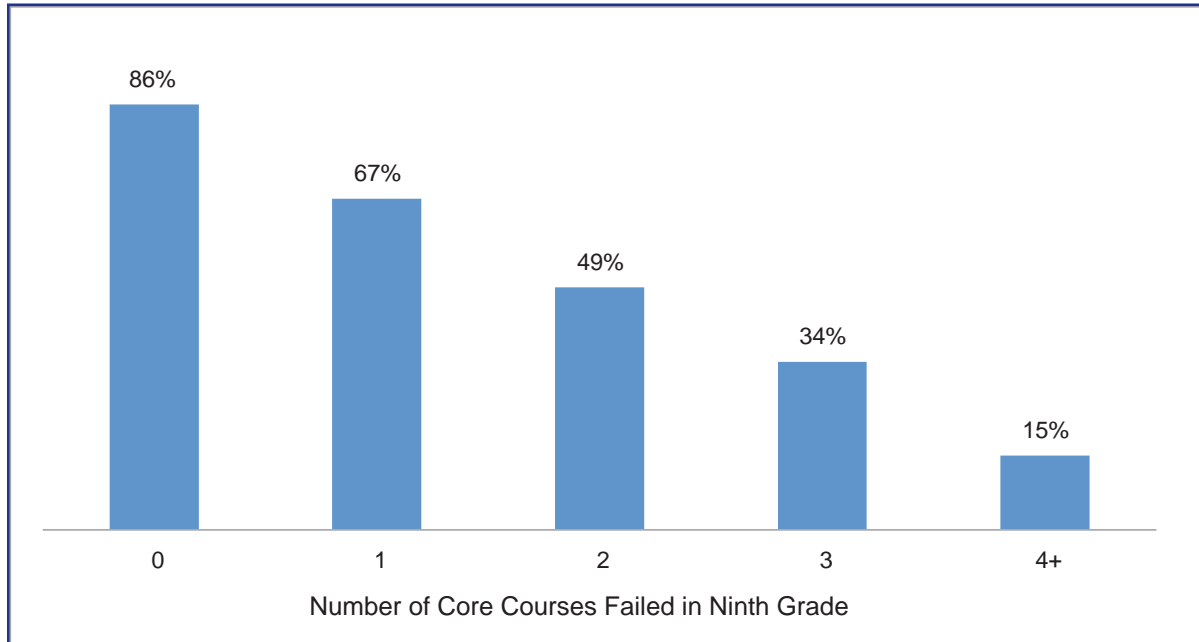
In Figure 5, we see how the probability of on-time graduation decreases with each ninth-grade course failure. These results depicted for the 2004-05 Baltimore cohort were similar to those for the 2005-06 cohort as well as those from other districts.

Graduation outcomes were also linked to student behavior in ninth grade. As Figure 6 shows, students who were suspended for at least three days in ninth grade were much less likely to graduate on time than those without that early warning indicator (28% vs. 63%).[20]

Another way to measure the usefulness of these early warning indicators is to ascertain what percentage of non-graduates could be identified by them in ninth grade. As Figure 7 indicates, almost all non-graduates in the 2004-05 cohort (92%) manifested an early warning signal in ninth grade. At the same time, almost half of graduates also displayed at least one early warning signal, but further analyses indicated that most of these had fewer courses failed and/or higher rates of attendance than did eventual non-graduates. Fewer non-graduates, but still a large majority (74%) of those with data available, manifested a warning signal in eighth grade.

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[19] Core high school courses were defined as courses in English, social studies, science, and mathematics. Students at some schools had more than one course in some of these core subjects during the ninth-grade year.

[20] The decision to use suspensions of at least three days as the behavior-related early warning indicator was based on prior analyses of a Baltimore City sixth-grade cohort. See BERC, 2011

FIGURE 6. GRADUATION OUTCOMES FOR 2004-05 COHORT BY NINTH-GRADE SUSPENSION STATUS
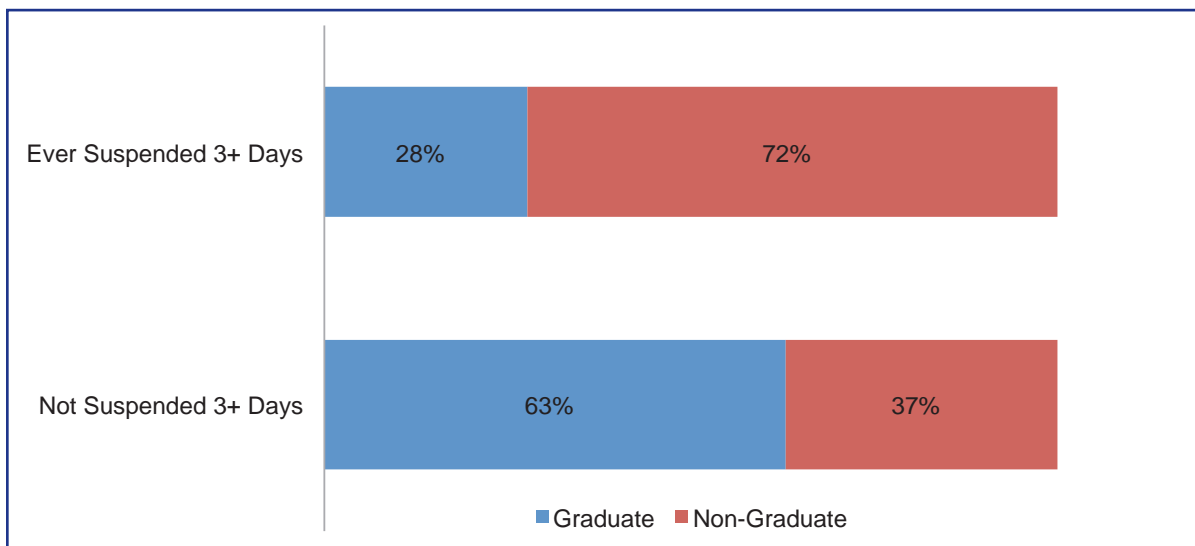
FIGURE 7. PERCENTAGE OF GRADUATES AND NON-GRADUATES IN THE 2004-05 COHORT DISPLAYING AT LEAST ONE EWI, EIGHTH GRADE AND NINTH GRADE
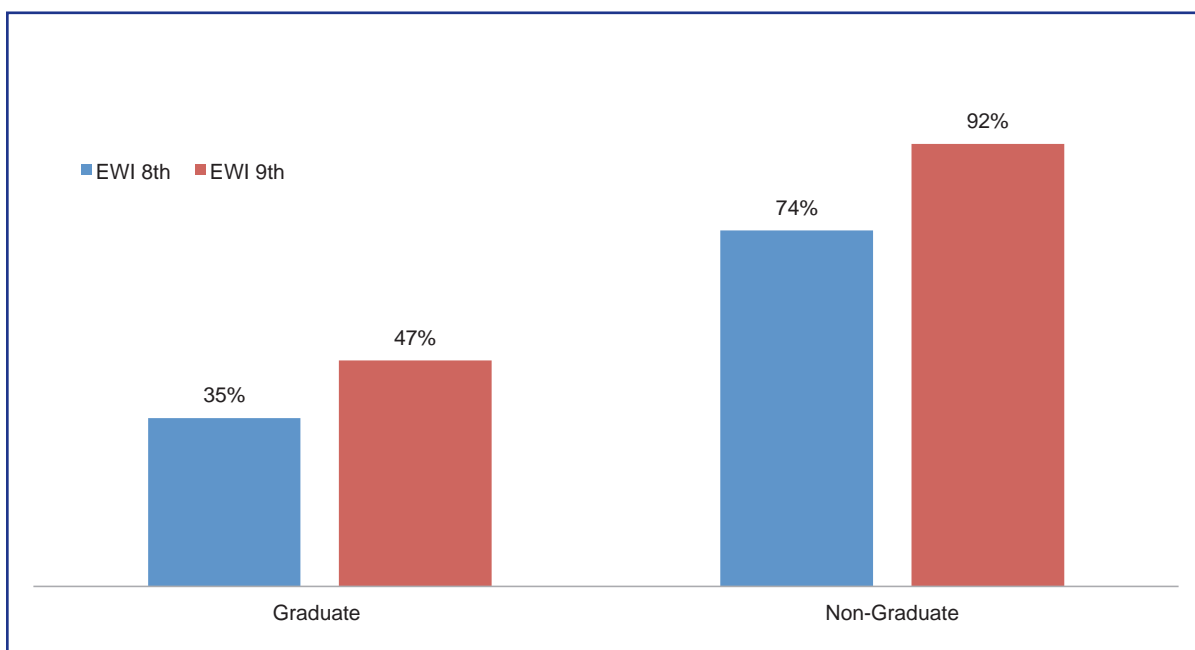
PART II: STUDENT CHARACTERISTICS AND THEIR RELATIONSHIP TO COLLEGE ENROLLMENT OUTCOMES

We hypothesized that many of the same variables associated with graduation outcomes would also be associated with college enrollment outcomes, though the relative strength of the relationships could differ. Research using cohort analyses to link ninth-grade (and even earlier grade) behaviors and academic outcomes to college enrollment outcomes is still in the early stages. Meyer, Carl, and Cheng (2010) link ninth-grade GPA to college enrollment outcomes in Milwaukee, but other extremely useful studies of college enrollment and persistence using National Student Clearinghouse data focus on characteristics of graduates rather than the entire ninth-grade cohort, and do not include ninth-grade predictors.[21]

Since high school grade point average (GPA) is such an important factor in the college admissions process[22] and an important predictor of college enrollment,[23] it is important for educational practitioners and policymakers to understand the impact of grades in the first year of high school on later college enrollment outcomes. To what extent is it possible to recover from a low ninth-grade GPA and successfully enroll in college after high school?

The following analyses build on the work of Roderick and Camburn (1999) to examine the implications of low grades in the first year of high school for later outcomes. In addition, we examine the impact of proficiency in mathematics and reading upon entry to high school to ascertain the "gatekeeping" role of such proficiency in college enrollment outcomes. Recognizing that other factors (e.g., receiving information and support for the college application process) are also crucial in ensuring that students enroll in college, we focus here, with limited administrative data sources, on the gatekeeping role of early high school performance.

Data from the National Student Clearinghouse on college enrollment for Baltimore City students were also available to the Baltimore Education Research Consortium, and several variables were merged into the cohort files used for the graduation outcome analyses: whether or not students had enrolled in college by the fall of 2010, and whether their enrollment was in a two-year or four-year college.

Descriptive analyses include frequencies, cross-tabulations, means, and other descriptive summaries of rates of college enrollment (two-year and four-year) for the full sample and subsamples (e.g., college enrollment rate by number of course failures in ninth grade).

Analyses examined the relationship between student outcomes and demographic variables as well as behavioral indicators. Results reported below are from the 2005-06 ninth-grade cohort (summarized in Figure 8). As expected, within the full cohort (including non-graduates, but excluding transfers out of district, for an n of 6497 of the total 7729), college enrollment was more common among females than males (36% vs. 22%).[24] Non-overage for grade (upon entry to high school) students had a greater college enrollment rate than overage-for-grade students (38% vs. 12%), and the gap was just as large or larger when analyses considered only high school graduates (52% vs. 30%).

Relationships were somewhat more pronounced between college enrollment and ninth-grade behavioral indicators. Figure 9 summarizes the striking linear relationship between ninth-grade attendance, graduation rates, and college enrollment rates (for both two-year and four-year colleges combined, and for four-year colleges). The college enrollment rate for students in the full cohort (including non-graduates, excluding transfers) was higher for: students who were regular attenders in

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[21] e.g., Roderick, Nagaoka, & Allensworth, 2006; Buckley & Muraskin, 2009

[22] e.g., Sterns & Briggs, 2001

[23] Berkner & Chavez, 1997; Meyer, Carl, & Cheng, 2010

[24] The gender gap was nearly as wide when only high school graduates within the cohort were included in analyses (53% vs. 42%).

FIGURE 8. COLLEGE ENROLLMENT RATES FOR FULL 2005-06 NINTH-GRADE COHORT, BY RISK INDICATOR

Category	Percentage
Females	36%
Males	22%
Non Overage	38%
Overage for 9TH Grade	12%
Not chronically absent in 9TH grade	44%
Chronically absent in 9TH grade	10%
Suspended for less than 3 days in 9TH grade	31%
Suspended for at least 3 days in 9TH grade	15%
No 9TH-grade course failures	49%
One or more 9TH-grade course failures	16%
No more than one 9TH-grade course failure	44%
Two or more 9TH-grade course failures	10%
No 9TH-grade EWIs	55%
One or more 9TH-grade EWIs	16%
No Middle School EWIs	44%
One or more Middle School EWIs	16%

Note: Percentages represent the percentage of the entire ninth-grade cohort (not just graduates) enrolling in college (e.g., 36% of all females in the 2005-06 ninth-grade cohort enrolled in college by fall 2010).

ninth grade than for those who were chronically absent (44% vs. 10%); students who had not been suspended for three days or more during ninth grade than those who had been (31% vs. 15%); and students with no ninth-grade core course failures than those with at least one failure (49% vs. 16%). Students who failed two or more core courses in ninth grade had a college enrollment rate of 10% (compared to 44% for students who failed no more than one core course in ninth grade). The college enrollment rate for students who had one or more early warning

indicators (attendance, behavior, course failure problems) in ninth grade was 16%, compared to 55% for those with no ninth-grade warning indicators. Students who had any early warning indicators during the middle school years (grades 6, 7, or 8) had a college enrollment rate of 16%, compared to 44% for those with middle school data but no indicators on record.

FIGURE 9. GRADUATION AND COLLEGE ENROLLMENT RATES BY 2005-06 NINTH-GRADE ATTENDANCE
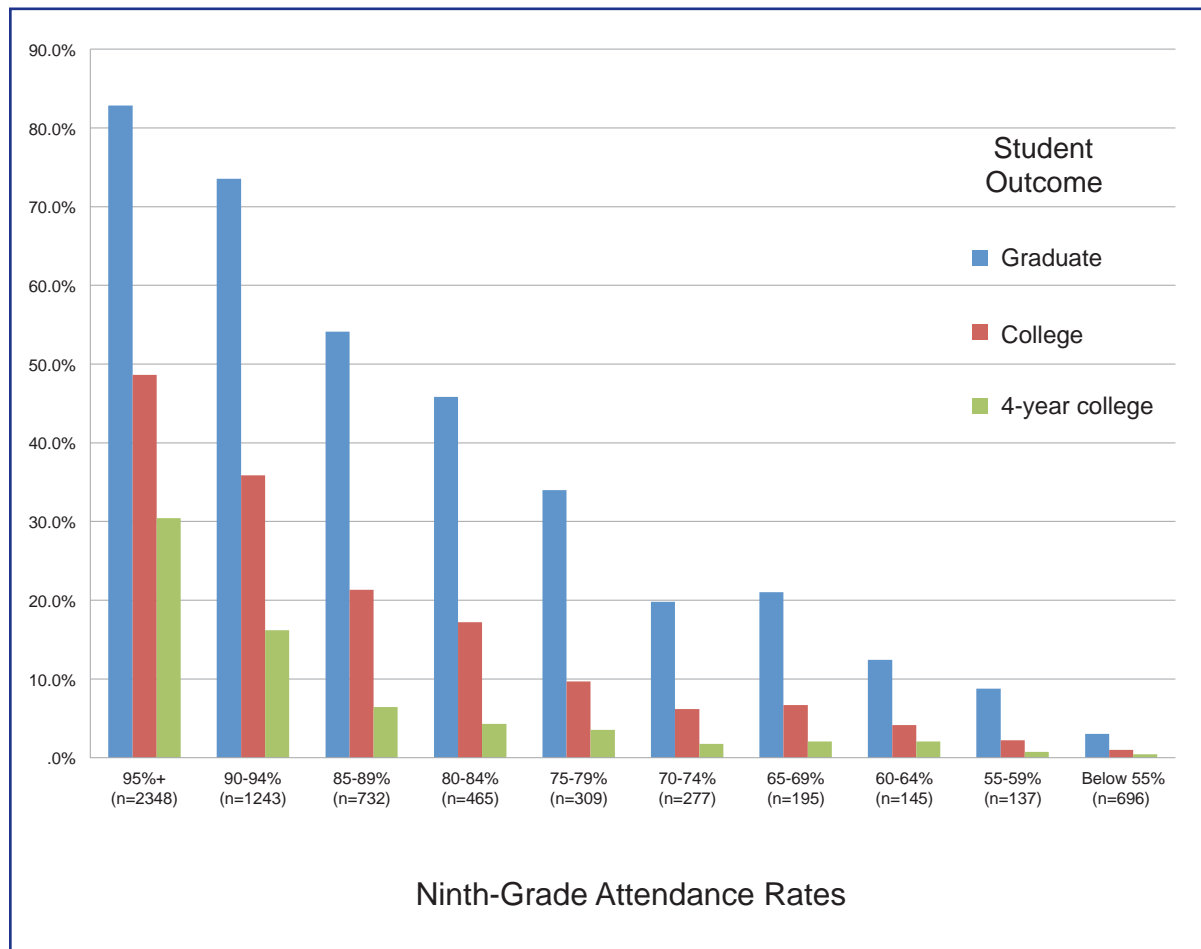
FIGURE 10. GRADUATION AND COLLEGE ENROLLMENT OUTCOMES BY 2005-06 NINTH-GRADE GPA*

■ Did Not Graduate   ■ Graduated, No College   ■ 2 yr. College   ■ 4 yr. College

	< 1.00 (n=1445)	1.00 to 1.49 (n=1191)	1.50 to 1.99 (n=1367)	2.00 to 2.49 (n=1078)	2.50 to 2.99 (n=604)	3.00 (n=300)
4 yr. College	0%	3%	12%	29%	48%	70%
2 yr. College	1%	13%	24%	22%	20%	10%
Graduated, No College	4%	38%	46%	42%	27%	15%
Did Not Graduate	94%	46%	18%	7%	5%	5%
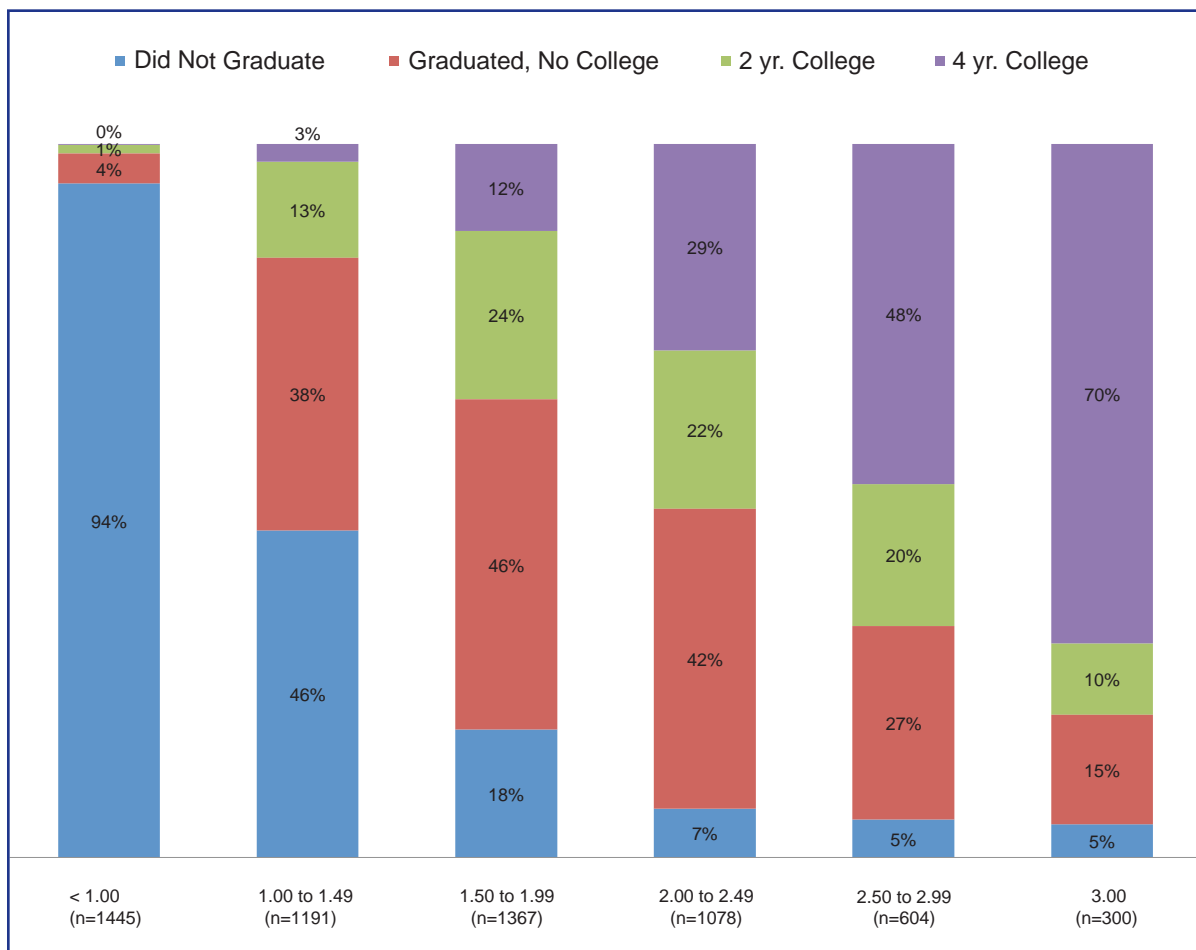
* *Out of district transfer students and those missing ninth-grade data excluded.*

Two-thirds[25] of first-time ninth graders in 2005-06 had a GPA that year of less than 2.0 (see Appendix A for discussion of issues involved in calculating GPA). Only 5 percent of this low-performing group went on to enroll in a four-year college (compared to 41% of those who had at least a 2.0 in their first year of ninth grade); a total of 18 percent of those with a ninth-grade GPA below 2.0 enrolled in any college (compared to 61% of those at 2.0 or above). (See Figure 10 for a more detailed distribution). When we examine the results from another perspective, most (80%) of those cohort members who enrolled in a four-year college had a ninth-grade GPA of 2.0 or better, and few non-graduates (5%) had a 2.0 or better in ninth grade.

Non-proficiency in reading and mathematics skills upon entry to high school (measured by eighth-grade MSA scores) was also associated with low college enrollment rates. Fewer than one in five of those who were not proficient in reading by eighth grade enrolled in any college, and just 5% of this group enrolled in a four-year college. Results were somewhat similar for mathematics (in which even fewer first-time ninth graders were proficient). Figures 11 and 12 summarize these relationships graphically.

FIGURE 11. GRADUATION AND COLLEGE ENROLLMENT OUTCOMES BY EIGHTH-GRADE READING MSA
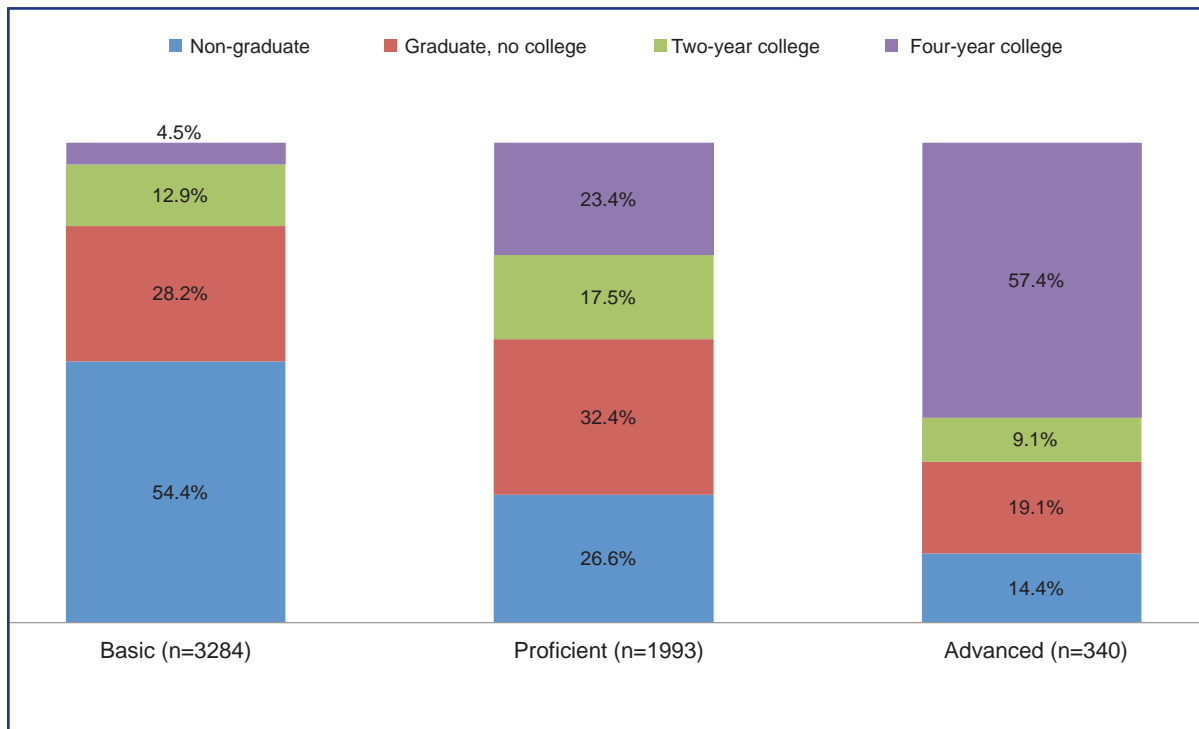
Results in this figure are for the 2005-06 Grade Cohort

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[25] Transfer students and students with missing course grade data were excluded from analyses. Since most of those missing course grades eventually had a non-graduation outcome, the proportion of those students with GPA below 2.0 is probably underestimated.

FIGURE 12. GRADUATION AND COLLEGE ENROLLMENT OUTCOMES
BY EIGHTH-GRADE MATHEMATICS MSA

Results in this figure are for the 2005-06 Grade Cohort

Analyses focused on graduation/non-graduation outcomes were conducted using logistic regression hierarchical linear modeling (HLM). F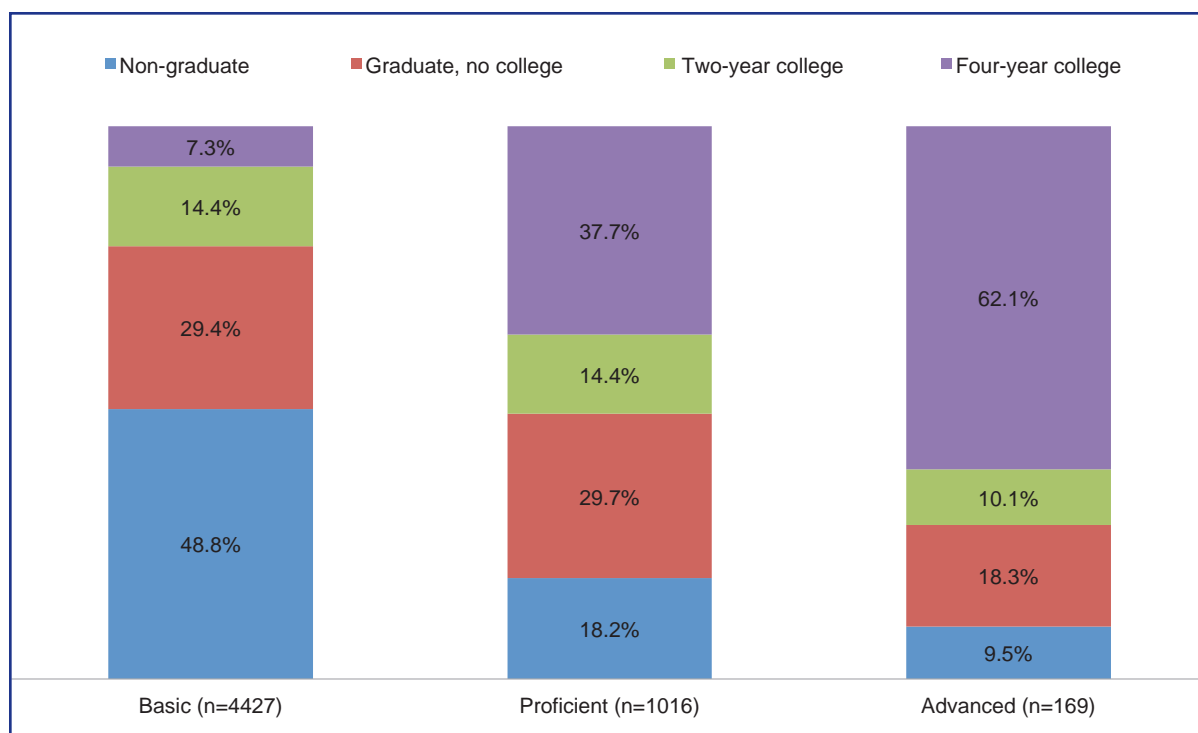or the purposes of these analyses, students were nested within the final school on record during their first-time ninth-grade year.[26] We report the technical details and results of the HLM analyses in Appendix B. In the following section we summarize the findings broadly and seek to interpret their meaning for practitioners and policymakers.

We conducted a series of sequential analyses to seek to understand the relative importance of early warning indicators at both the eighth- and ninth-grade level. This involved beginning with a preliminary model that included just student demographic and status factors (being male or overage for grade). Males and students overage for grade were significantly more likely to have a non-

graduation outcome in both cohorts than were females and non-overage students, by a factor of roughly 2.

We then added eighth-grade behavioral warning indicators (chronic absenteeism, being suspended for at least three days, and failing either math or reading/English Language Arts) into the model. One hypothesis was that the effect of being male or overage would be significantly reduced, given the relationship between these variables and the behavioral indicators. Analyses indicated that there remained a significant effect of being male or overage, even controlling for the behavioral predictors (which were also significant). In this analysis, chronic absenteeism in eighth grade was the most important predictor of non-graduation.

Next we conducted the analysis with ninth-grade (instead of eighth grade) early warning indicators. Chronic absenteeism and course failure were stronger

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[26] Mobility between district schools was an important underlying issue, particularly for students who did not graduate. Our analyses indicated that nearly half (48%) of the non-graduates of the 2005-06 cohort had a final school that was different from their first school during the first-time ninth-grade year, compared to just 17% of graduates with a different final school than their first-time ninth-grade school. Exploring this relationship between mobility and graduation outcomes, as well as related policy implications, is an important area for future research.

PART III: PREDICTING GRADUATION AND COLLEGE ENROLLMENT OUTCOMES

predictors than either suspensions or the demographic variables. But male gender and overage status again remained significant predictors of non-graduation even when controlling for ninth-grade behavioral variables. As expected, this model was better at explaining the variance in graduation outcomes than the model based on eighth-grade predictor variables.

Then we added eighth-grade test scores to demographic variables and ninth-grade early warning indicators as predictors. While eighth-grade test score was a significant predictor of graduation outcome, it added little in explanatory value. Similarly, the addition of a measure of "any eighth-grade early warning indicator" to eighth-grade test score, demographic variables and ninth-grade early warning indicators as predictors produced a significant result, but added little to the proportion of variance explained by the model.

Finally, we included a school-level variable: whether or not the school had selective admissions requirements (which included both college prep and vocational schools). This variable was a significant predictor, even controlling for the ninth-grade indicators and demographic variables. But it also added little in explanatory value. Much of the "effect"

of selective school on student outcome is mediated by the better eighth-grade outcomes (that influenced the selection process) and the better ninth-grade outcomes for students in selective schools.

We also used multinomial logistic regression models to analyze the relationship between the four categories of college enrollment outcomes (enrollment in a four-year college, enrollment in a two-year college, graduation with no college enrollment, and non-graduation) and a set of student-level predictor variables.[27] As expected, students' cumulative GPA has the strongest relationship to college enrollment. But even ninth-grade GPA alone has a strong significant relationship to college enrollment status. And once GPA is taken into account, males are no longer significantly less likely than females to enroll in four-year colleges. On the other hand, being overage for grade is still a significant predictor of non-enrollment in college, even controlling for GPA. Eighth-grade test scores also remain a significant predictor of college enrollment.[28] When models control for ninth-grade GPA, the impact of other early warning indicators in grades eight and nine varies, depending on the particular model.

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[27] See Appendix B for a discussion of decisions regarding variables included in the model.

[28] The reported analysis includes only math score, since the eighth-grade scores are highly intercorrelated. Results are similar using just reading score.

DISCUSSION

DISTRICT RESPONSE TO RESEARCH ON EARLY WARNING INDICATORS

This study contributes to the growing literature identifying early warning indicators of a dropout outcome that can guide an intervention strategy aimed at dropout prevention. Specifically, we compared the explanatory power of eighth- and ninth-grade early warning indicators (chronic absence, behavior problems, and course failure) on graduation outcomes. As expected, ninth-grade indicators proved to be more powerful predictors, indicating that sustained attention to implementing interventions to prevent students from slipping into chronic absence and course failure in ninth grade are crucial for increasing the graduation rate in Baltimore and similar districts.

At the same time, the strength of eighth-grade variables (particularly chronic absence) in predicting outcomes was striking. These findings provide more evidence suggesting the importance of interventions prior to the beginning of ninth grade to help reverse chronic absenteeism and increase the probability of graduation for struggling students.

Analyses also indicate the importance of explicitly addressing the needs of male students, since they are still significantly less likely to graduate, even when controlling for their higher levels of behavioral early warning indicators. While Baltimore has recently made significant strides in reducing the number of African-American male dropouts, males remain less likely to graduate than females.

In addition, the findings emphasize how being overage for grade reduces the probability of graduation, even controlling for the associated behavioral indicators. Finding ways to increase learning time during the school year and summer (as Baltimore has been seeking to do over the past several years), rather than retaining students in grade in the elementary grades, may be a crucial step in reducing the number of students who fail to graduate from high school.

Another contribution of this study is its attention to eighth- and ninth-grade predictors of college enrollment outcomes. Highlighting the importance of eighth-grade proficiency and ninth-grade GPA in predicting college enrollment, as the reported analyses emphasize, is a crucial step for reaching the goal of increased college enrollment rates. While educators are often generally aware of the importance of GPA and proficiency in mathematics and reading in college admissions decisions, there often does not appear to be a concerted effort within districts to address the gatekeeper issues of lack of proficiency upon entrance to high school and low ninth-grade GPAs (caused by high ninth-grade course failure rates). Ensuring that more students enter high school, on time, with proficient math and reading skills, and that they pass all their ninth-grade courses, is essential (if not sufficient) for raising college readiness rates and the proportion of students who enroll in college after high school.

In light of these potential policy implications, how has the Baltimore City school district responded? In this final section we reflect on the progress Baltimore has made thus far in addressing these early warning indicators, as well as the structural issues that remain as challenges for the district in specifically addressing them. These reflections highlight the need for a larger, systematic study of how districts and schools are responding in the face of considerable national discussion of the early warning indicators. This discussion is not based on systematic qualitative research, but rather sets forth some hypotheses and frameworks for the systematic research (including structured interviews with district and school administrators) that needs to be conducted.

We address the following questions:

1. What research findings have been communicated by BERC and Johns Hopkins University researchers to the Baltimore City Schools?

2. What steps has the district taken? What issues remain as challenges?

3. What structural issues could be influencing Baltimore's approach to addressing early warning indicators? What are some topics and areas in need of further examination?

4. What role can an organization like BERC play in helping catalyze district action to help schools use early warning indicators to intervene effectively and keep students on track to graduation?

1) COMMUNICATION OF RESEARCH FINDINGS

The Baltimore Education Research Consortium (BERC) was formed at about the same time (2006) that researchers at the Center for Social Organization of Schools (CSOS) at Johns Hopkins University were disseminating their work on "locating the dropout crisis"[29] and building on the work of the Chicago Consortium on School Research[30] with analyses focused on Philadelphia.[31] One of BERC's first demonstration projects, conducted by researchers from CSOS, was a study of the graduation outcomes for a cohort of students enrolled in sixth grade in Baltimore City in 1999-2000.[32] Another early policy brief focused on the extent of chronic absence in the Baltimore City Schools.[33] A subsequent BERC report (first delivered to the district in August 2009) expanded the sixth-grade cohort study to examine whether the same behavioral indicators found in Philadelphia were also significant predictors for Baltimore students.[34] Before completion of the current report, we also delivered to the district

in 2010 a series of shorter reports focused on likely early warning indicators for a more recent ninth-grade cohort (before the on-time graduation year had occurred) and on the prior behavioral characteristics of dropouts compared to those of graduates.[35] Each of the reports included a short executive summary that emphasized the major findings in non-technical language and suggested policy implications based on those findings.

As a group, these research reports communicated several key themes:

1. chronic absence levels (found in previous research, as well as the Baltimore sixth-grade cohort study, to be highly predictive of dropout outcomes) were very high in Baltimore City, particularly among first-time ninth graders;

2. ninth-grade course failure rates are even higher than ninth-grade chronic absenteeism, and there is a notable group of students who attend regularly but are still failing courses;

3. dropouts follow patterns of increasing chronic absence and course failure over several years before they leave school.

BERC also had occasional meetings and discussions with staff in the Office of Achievement and Accountability, and began having more regular meetings in 2010 with a larger group of central office administrators, including the CEO and CAO, to discuss these and other research findings. Several meetings focused on early findings from the current study also occurred with district administrators over the past year, and BERC distributed a policy brief in April 2011 based on preliminary findings of the current report.[36]

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29 Balfanz & Legters, 2004

30 Allensworth & Easton, 2005, 2007

31 Balfanz & Herzog, 2005; Balfanz, Herzog, & Mac Iver, 2007; Neild & Balfanz, 2006

32 Mac Iver et al., 2008

33 Balfanz, Durham, & Plank, 2008

34 BERC, 2011

35 Mac Iver & Mac Iver, 2010; Mac Iver 2010

36 Mac Iver, 2011

2) DISTRICT ACTION AND REMAINING CHALLENGES

Baltimore's graduation rates have risen substantially over the past decade. From an estimated cohort graduation rate of 46% in 2000 and 53% in 2002,[37] four-year adjusted graduation rates reported by the Maryland State Department of Education were 61.46% for the class of 2010 and 65.80% for the class of 2011. Beginning in 2008, the district vigorously reached out to dropouts in its "Great Kids Come Back" campaign, and these students who returned to school have helped to increase the graduation rate. Besides its recovery efforts, the district office has taken numerous steps that address the behavioral indicators of dropping out (attendance, behavior, and course performance). Below we summarize the steps we have observed, as well as some of the remaining challenges we see.

Attendance

In late 2008, the district created a Student Attendance Workgroup to address attendance issues within City Schools. The workgroup, which included district administrators as well as representatives from external partners such as the OSI, BERC, and the American Civil Liberties Union (ACLU), met regularly to review school-level data on chronic absence and discuss possible strategies and interventions to increase student attendance. The group was instrumental in moving data on chronic absence to a top priority item on the Principal's Dashboard data tool created by the district for its principals. It was also involved in revising protocols for schools to follow regarding student absence and expanding the data sources used by both school-based and district office staff in monitoring attendance.

The spotlight shone on attendance by this group was probably instrumental in leading the district to analyze the relationship between state test scores and attendance in 2009-10 and to publicize its findings about the strong negative relationship between absenteeism and test scores.[38] The district has also taken steps to include the research findings linking attendance and course performance in trainings aimed at school-level attendance monitors.

In 2010-11, the district's Office of Community Engagement began a new initiative focused on chronically absent students who live and attend school in four different city quadrants. Since November 2011 the program coordinator (funded by the Abell Foundation) has been recruiting volunteers from community organizations and faith-based groups to help in a grassroots effort to make direct contact with families of chronically absent students and help address the issues that have kept students out of school. The Office of Achievement and Accountability has been providing support to help analyze outcomes for targeted students.

The reduction in chronic absenteeism at the middle school level over the past several years could also be related to the simultaneous transitioning of the majority of students from large middle schools (where attendance was historically lowest) into K8s or new, smaller secondary schools. While analyses have not yet demonstrated any causal connection between these two events, it is possible that more personalized school communities could have helped to increase student attendance.

While the district has focused intensely on chronic absence data, provided data to schools, and offered specific suggestions to schools about possible interventions for chronically absent students, there has been little progress in improving attendance at the high school level. Rates over the past seven years have remained about 42 percent (43.5% in 2007). The district has offered training to attendance teams over the past several years, but school-based staff members have communicated the need for even more support in dealing with overwhelming absenteeism, especially at the high

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[37] Stringfield & Yakimowski, 2005. The State of Maryland did not calculate cohort graduation rates until 2010.

[38] Baltimore City Student Attendance Workgroup, 2010; Fothergill, 2010; Williams, Barron, Brice & Alonso, 2010

school level. Supporting high schools to ensure early identification of students at risk of becoming chronically absent and prompt interventions before absences reach a chronic level remains a significant challenge for the district. Since analyses indicate that students with a record of chronic absence in eighth grade have a low likelihood of turning their attendance around in high school, interventions focused on this group are particularly important to ensure.

Behavior

Over the past several years, Baltimore has been seeking to address behavioral issues through several different strategies, including Positive Behavior Interventions and Supports (PBIS) now implemented by nearly half of Baltimore schools. Through a series of new policies, the suspension rate, which has also contributed to student absenteeism in the district, has declined significantly under the leadership of CEO Andrés Alonso.[39] Suspensions declined from about 26,000 in 2003-04 to below 10,000 six years later (though they rose again somewhat in 2010-11). The district is focused on ensuring that schools have well-functioning student support teams in place to ensure that students identified as needing interventions receive them in a timely and effective manner, and schools must document their interventions before long-term suspensions are approved by the district. Baltimore City Schools has created additional alternative school opportunities for students with behavioral issues. In Fall 2008, the district also created a "Success Academy," housed at the district office, to provide a school for high school students with serious behavioral issues. As the CEO explained during a meeting with us, this initiative was also designed to model for schools the same willingness to work with struggling students that the district expected of its schools.

Course Performance

Baltimore City Schools has addressed student course performance through its focus on improving instruction and revising its grading policies. During 2010-11, the district discussed and adopted a grading-policy document, which includes guidance that addresses both the relationship between attendance and course performance and the issue of course failure in secondary schools. The policy states that "absences will not be used as an element of a student's grade; however, poor attendance is likely to hinder a student's ability to succeed in class,"[40] and mandates that absent students be allowed to make up assignments (without distinguishing between excused and unexcused absences). Though the policy document expressly mandates giving zeroes as grades for work not submitted, it also requires that a failing quarterly grade below 50 be calculated as a 50 (leaving grades of 51-59 as they are) in averaging grades for the final grade. The policy directly states that this reformed grading policy aims to provide a means for a student who improves in the second quarter to receive a passing grade for the semester class. This new district policy could potentially be a step forward in preventing course failure.

We recognize that asking teachers to reconsider grading practices is often a contentious process. The decision by numerous Texas districts to mandate a "no grade lower than 50" policy was a response to the conjecture that averaging zeros in the computation of final course grades often led to an average below 60, which meant the student failed the class. Public opposition to the "no grade lower than 50" policy raged in the editorial pages and influenced the state legislature to pass a bill (SB 2033) stating that districts "may not require a classroom teacher to assign a minimum grade for an assignment without regard to the student's quality of work."[41] But since course passing is one of the most important levers for increasing both the graduation rate and post-secondary opportunities, this is an issue that needs to be

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[39] Open Society Institute, 2011; Sundius & Farneth, 2008; "Suspending Hope," 2012

[40] Baltimore City Public Schools, 2011, p. 2

[41] Texas Education Agency, 2009

DISTRICT RESPONSE TO RESEARCH ON EARLY WARNING INDICATORS (CONT'D)

confronted directly in a process that builds consensus for early interventions to prevent failure.

While the new grading policy is too recent for us to ascertain its effect on course failures, it will also be important for the district to grapple more directly with the huge number of course failures at the high school level (27% of all high school courses were failed in 2010-11; 54% of all students failed at least one course, and 25% of all students failed four or more courses).[42] In order to mount more proactive efforts focused on increasing ninth-grade course passing, the district will need to pursue intervention strategies aimed at helping students recover before failing a course. While the district does encourage individual schools to plan and budget for credit recovery opportunities, there also needs to be more attention to intervention prior to the failure event. Since GPA is such an important factor considered in college admissions decisions, addressing the high rate of course failure (associated with low GPAs) is also essential for improving students' opportunities to enroll in four-year colleges.

Data Systems

Baltimore has made significant strides in making early warning indicator data available to school leaders. Building explicitly on research regarding the early warning indicators (EWI) of dropout conducted by Johns Hopkins University researchers,[43] Baltimore City Schools' Office of Achievement and Accountability created in mid-2010 a risk metric based on three previous years of data for all students in entering grades six through nine. The risk indicators included measures of overage status, chronic absenteeism, suspensions, mobility between schools, and non-proficient MSA scores. Scores on the risk scale were aggregated into four categories. Aggregate data on the percentages of students by school demonstrating various levels of risk were shared with central office staff. In addition, individual-level data files of students with

early warning indicators were shared with Baltimore City Schools network leaders[44] and with the central office liaison to secondary school counselors in July 2010. Data were updated in August 2010 for ninth-grade students. The intention was for network leaders to share these data with their schools, and for school counselors to receive information about the early warning indicator data as well.

Transitions within both the Office of Achievement and Accountability and district's data management system occurred after Summer 2010, and over the past two years the district has moved towards establishing data dashboards and reports that integrate various indicators together in a more sophisticated way. The district is currently rolling out these systems and supporting them through the data specialist assigned to each network to support data-driven instructional teams at each school. Collecting and analyzing systematic data on how administrators and teachers are using the available early warning indicator data and what barriers to data usage still remain will be important as the district seeks to improve student outcomes through these new systems. Effective district-wide communication of a unified framework for keeping students on-track to graduation (particularly in terms of credit accrual during the ninth-grade year), including how to use early warning indicator data judiciously, will also be important.

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[42] Based on preliminary analyses of 2010-11 high school course history files.

[43] Balfanz, Herzog, & Mac Iver, 2007

[44] For the past couple of years, support to Baltimore City Schools has been delivered through network teams, comprised of central office staff who provide support in different areas to a group of schools per team. In 2011-12 the district increased the number of team members and gave each team a smaller group of schools to support.

3) WHAT STRUCTURAL ISSUES MAY BE RELATED TO THE DISTRICT'S APPROACH IN RESPONDING TO EARLY WARNING INDICATOR FINDINGS? WHAT ARE SOME TOPICS AND AREAS IN NEED OF FURTHER EXAMINATION?

Reflection about the district's approach to working with schools to address the early warning indicators of dropout in a more focused way led us to consider the framework within which the district interacts with school leaders and seeks to influence student outcomes. Historically, the district has moved from considerable decentralization in the early 1990s, to more centralized control over curriculum and instruction at the elementary level beginning in 1998 (in the wake of the 1997 City-State partnership), and then back to a less centralized system under the current CEO. The high school reform process that led to the creation of small innovation schools operated by external partners, beginning around 2002, has now expanded to include a "portfolio" of many new schools. In this decentralized system, school leaders are given a much greater level of autonomy than they had previously.

The push for more decentralization within the Baltimore City Schools has encouraged many community partners to become operators of the newly created schools. Within these schools, they enjoy considerable freedom in managing their budgets and implementing their own models of curriculum and instruction. The district has also restructured the central office and created support "network" teams to provide assistance to school leaders in the areas of budgeting, student support, and instruction. Though not yet documented through rigorous research, this governance reform may well have attracted talented teacher leaders and administrators from both inside and outside the district (and even outside the education profession) who are helping improve outcomes for Baltimore's students.

At the same time, a decentralized portfolio system tends to encourage independence for schools rather than a common, unified framework and sense of responsibility for ensuring that all students remain on track to graduation. Such a system may also refrain from giving explicit suggestions to schools before they reach a point of failing to meet key achievement and accountability goals. While the new decentralization can encourage diverse, creative educational approaches within schools, prior research on decentralization efforts has shown that school leaders still require guidance from the central office regarding instructional approaches.[45] Baltimore seems to be evolving over time to find the right balance between decentralization (autonomy) and centralized guidance to schools regarding such issues as an instructional framework (related to teacher evaluation), attendance, and the need for a functioning student support team, among others.

One of the research questions we intend to pursue in future research is under what conditions a district portfolio system can coexist with a more unified district office framework for prevention. We suspect that the degree to which the central office is "siloed," with different offices not communicating or working at cross-purposes, contributes significantly to the fragmented approach to supporting secondary schools struggling with keeping students on track to graduation. Both how a district is organized to support schools in improving student outcomes and how the people within those structures conceptualize their support roles appear to be crucial variables to explore.

Another area for future research is the examination of the "multiple pathways to graduation" approach. Ongoing research on "portfolio districts" like Baltimore emphasizes the importance of a diverse set of schools to meet the needs of different groups of students.[46] Researchers at the Center for Reinventing Public Education have also begun exploring the "multiple pathways to graduation" approach, which dovetails closely with the idea of creating a portfolio of alternative programs and schools for

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[45] Simon, Foley, & Passantino, 1998; Foley, 2001

[46] Hill et al., 2009

students who have fallen off-track to graduation. Marsh and Hill (2010) discuss how good early warning indicator data are necessary for districts to be able to steer students to the appropriate schools or programs within a portfolio of school options. And so theoretically, the new, decentralized portfolio district model is not necessarily antithetical to a district-led approach to data analysis and the creation of early warning indicator systems. But the portfolio model does not have a clearly focused prevention approach. It is built on a market model of consumer choice and district reaction to poor performance after the fact (directing students to alternative schools, closing poorly performing schools, etc.). It is important to point out that a district could also use an early warning system in a negative way: to steer struggling students into alternative schools rather than to seek to implement the kinds of interventions and preventative action that researchers at the Everyone Graduates Center at Johns Hopkins have been advocating. Whether the multiple pathways approach to dealing with struggling students promotes the goal of equity remains to be seen.

Finally, the question of accountability and the incentives facing schools offers an important and timely topic for further investigation. The portfolio district model promotes decentralization within a context of accountability to the district. As Saltman (2010, p. 4) puts it: "The portfolio district concept puts into place what has been increasingly discussed in educational policy literature as market-based 'creative destruction' or 'churn.' This perspective considers public schools to be comparable to private enterprise, with competition a key element to success. Like businesses that cannot turn sufficient profit, schools that cannot produce test scores higher than competitors' must be 'allowed' to 'go out of business.'"

To be fair, districts like Baltimore are looking at other measures than test scores. At the high school level, the four-year adjusted cohort graduation rate has become an important accountability measure for schools, and could theoretically incentivize preventative action on the part of

high schools to work with struggling students. If schools are judged on their graduation rates within a portfolio system, they theoretically have an incentive to address the early warning indicators at the school level. But it is important to point out the structural problems with the school-level graduation rate accountability measure in large urban districts like Baltimore. The rate, which begins with the cohort of first-time ninth graders in a district/ school, is then adjusted by subtracting transfers out and adding in transfers into a school. The graduation rate formula itself thus contains an incentive for schools to transfer out the students who are least likely to graduate, pushing them into alternative schools that can "take the hit" on the graduation rate accountability measure.

This is not just a theoretical problem. In addition to the anecdotal stories of push-out we have heard over the years, our analyses of Baltimore's dropouts from the 2005-06 first-time ninth-grade cohort indicate that nearly half (48%) were coded as leaving a school that was different from the school attended upon entry into ninth grade for the first time. By contrast, just one in six graduates finished at a different school than they first entered in ninth grade.

Further investigation of transfers between high schools (and the extent to which such mobility is truly voluntary) is an important next step. The schools that receive ninth graders are not necessarily judged on how well they move those particular ninth graders to graduation. (And if college enrollment rates, based on the percentage of graduates entering college, are included in the group of accountability measures without accounting for the loss of students after ninth grade, schools will have another incentive to transfer out students that would pull that measure down.) Getting the incentive structure right in the precise set of accountability measures is an issue that must be tackled at the state and even national levels. One accountability measure that could be helpful would be a ninth-grade on-track measure (credits earned towards graduation), though this would have

to be adjusted by those entering ninth-grade students' prior warning indicators (e.g., chronic absence and low test scores in eighth grade) since the challenge is not distributed equally among high schools within the district.

Another challenge facing the district is whether it is possible to create incentives that will ensure that schools will provide interventions for chronically absent or otherwise struggling students in transition between eighth and ninth grade, a critical time for intervention when "ownership" of the students is in flux. Though high schools are required to have some type of orientation program for incoming ninth graders, these schools are faced with tough budget choices and may not have resources needed to implement interventions to the extent that such struggling new students require. District leadership and resources directed centrally in a preventative way for these struggling students in transition appear to be crucial for improving student outcomes.

4) WHAT ROLE CAN AN ORGANIZATION LIKE BERC PLAY?

BERC is positioned to play a similar role within Baltimore as the Consortium on Chicago School Research and the Research Alliance for New York City Schools are filling in Chicago and New York City. Aside from conducting research studies, it continues to initiate dialogue with central office administrators regarding the research findings on early warning indicators of dropout and the implications of these findings (as well as many others across the whole

K-12 spectrum) for policy and practice. As a critical friend, BERC can continue to encourage the implementation of a serious "cycle of inquiry" characterized by continual collection and analysis of "input" data as well as outcome data, framing of plans to improve educational processes, implementation of those plans, and then evaluation analysis that leads the cycle to begin again. This cycle of inquiry is a fundamental practice of a well-functioning "learning community," which is what every school and school district should be – "…organizations where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning to see the whole together (Senge, 1990, p. 3)."

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APPENDIX

APPENDIX A. DATA DEFINITIONS AND MISSING DATA

NEW TO DISTRICT

Students were coded as "new to district" if there was no evidence from administrative data files of their enrollment in the Baltimore City Public Schools in the five years prior to 2004-05 or 2005-06, depending on the cohort.

OVERAGE FOR GRADE

Overage status usually reflects a policy decision to retain students in earlier grades, which is often an early warning indicator of non-graduation. Cohort students were coded as overage for grade if they were one year or more overage entering ninth grade for the first time (15 or older, meaning that they were born before September 1, 1989 for the cohort beginning ninth grade in Fall 2004 and before September 1, 1990 for the cohort beginning ninth grade in Fall 2005). This is a conservative definition of "overage for grade" and does not include some children who could have been retained in grade. According to MSDE policy in place at the time of their entry into Kindergarten, students born in next four months up through December 31 generally entered school at age 4 and some of these could also have been retained in grade. Given the subsequent change in MSDE policy and the fact that parents could delay the school entry of their children with late birthdays, we chose the more conservative approach to classifying students as overage for grade. For those students with missing birth month and year data, we probed the data for any evidence of retention in grade, and coded children with any retentions as "overage for grade." Those students missing birth date data with no evidence of retention were coded as "not overage for grade" (though this could potentially have excluded some overage students as well).

CHRONICALLY ABSENT

Attendance data were available for all students in each cohort during the first-time ninth-grade (cohort definition) year. Students were coded as chronically absent if they missed more than 20 days (or more than 1/9 of total days on roll in the last enrollment record, for those students who were not on roll for the entire year).

SUSPENSIONS

Yearly district suspension records are available for all students with at least one suspension. Students without a record were coded as zero. The number of days suspended was calculated for each student. Based on prior analyses of a Baltimore City sixth-grade cohort (BERC, 2011), we generally used "suspended for at least three days" as the behavior-related early warning indicator (though "suspended at all" was also calculated and reported).

COURSE GRADES: FAILURE AND GPA

Ninth-grade course grades were missing for 959 (14.1%) of 6812 cohort members in 2004-05 and 1094 of 7729 (14.2%) in 2005-06. The majority of those missing data (79% for 2004-05, 85% for 2005-06) had a withdrawal code in the ninth-grade year. Those missing course grade data were excluded from analyses of course failure. Students were coded according to how many of their core courses (math, science, English, social studies) they failed in ninth grade (ranging from zero to "four or more," since students at some but not all schools were enrolled for more than four core subject courses).

	N OF STUDENTS	N MISSING BIRTHDATE (% WITH EVIDENCE OF RETENTION)
2004-05 COHORT	6812	959 (37.0%)
2005-06 COHORT	7729	1063 (63.6%)

This was converted to dichotomous variables (failed at least one/no failures; failed at least two/failed one or fewer) for some analyses. According to district policy, failing grades in 2004-05 and 2005-06 were all those below 70. In 2006-07, the district policy returned to treating all grades below 60 as failing. (In another paper we analyze how grade distributions shifted during these policy shifts. See Mac Iver & Messel, 2012.) Both ninth-grade GPA and overall GPA were calculated based on all courses on record (selecting the highest grade for a particular course number if there were more than one grade for a particular course number in a particular year). Numerical grades were converted to (unweighted) GPA based on the following algorithm used by many colleges, even though grades of 60-69 were considered failing by the district in 2004-05 and 2005-06. (This differs somewhat from the scale adopted by Baltimore City Schools in 2011.) Exact results shift slightly if other conversion systems are used, but relationships remain virtually the same.

- A+ = 4.0 = 97-100
- A = 4.0 = 94-100
- A− = 3.7 = 90-93
- B+ = 3.3 = 87-89
- B = 3.0 = 84-86
- B− = 2.7 = 80-83
- C+ = 2.3 = 77-79
- C = 2.0 = 74-76
- C− = 1.7 = 70-73
- D+ = 1.3 = 67-69
- D = 1.0 = 64-66
- D− = 0.7 = 60-63
- F = 0.0 = 0-59

ANY EARLY WARNING INDICATOR

Two dichotomous variables, "displaying any EWI indicator in eighth grade" and "displaying any EWI indicator in ninth grade" were coded for each student with sufficient data. A student with any of the three indicators (chronically absent, suspended for at least 3 days, failed a core course) was coded 1; students with no indicators were coded 0. Students who were missing data on course grades, but displayed either of the two other indicators, were coded 1 and included in analyses. If students had no early warning indicators in available data but were missing data on one of the indicators, they were coding "missing data" on the variable. Students who did not attend eighth grade in Baltimore City Schools in the year prior to their ninth-grade cohort year were coded missing on the eighth-grade early warning indicator.

GRADUATION OUTCOME

All students with high school completion codes (including certificates for special education students) were coded as graduates. All students with transfer codes into a school outside the district (together with the small number of students whose withdrawal code indicated "death") were coded as transfers and excluded from most analyses of graduation outcome. All students with dropout codes in the final withdrawal code were coded as non-graduates. Those with missing withdrawal codes (which could indicate continued enrollment in school) and no record of high school completion were also coded as non-graduates in these analyses. We treated all other final withdrawal codes (including those with transfers to "institutions with an educational program," which is generally a justice system "placement," and those with a transfer to "evening school," which may or may not have led to a GED) as non-graduates (even though these are technically considered "transfers" and not "dropouts" by the district and state). Analyses were also conducted excluding students with these "transfer" codes along with other transfer students, and results were virtually the same.

SCHOOL CLIMATE CONSTRUCTS

Plank, Bradshaw and Young (2009) theorized five constructs, which relate to school climate: physical disorder; social disorder; cohesion and shared expectations for control (two constructs that represent collective efficacy); and fear.

Listed below are the questionnaire items associated with each construct. Values for the items range from one to four. To replicate the coding scheme of Plank, Bradshaw and Young, some items were reverse-coded.

Physical Disorder

- The school building is well-maintained. (Reverse-Coded)
- The temperature in my school is comfortable all year-round. (Reverse-Coded)
- The bathrooms in my school are clean. (Reverse-Coded)
- There are a lot of broken windows, doors or desks at my school.
- Vandalism of school property is a problem at the school.

Social Disorder

- Outsiders can get into the school.
- There is fighting among students.
- There is physical or verbal abuse of teachers.
- Students possess weapons like guns and knives.
- Students pick on other students at school.
- There is student drug or alcohol abuse.
- Fires are set at the school.

Collective Efficacy

Cohesion

- Most of the students at school know me by name.
- Most of the teachers at school know me by name. [Not Available]
- Students get along well with one another.
- Students get along well with teachers.
- Teachers care about their students.

Shared Expectations for Control

- Teachers can handle students who disrupt class.
- My school has clear rules about student behavior.
- Students are rewarded for positive behavior.
- My school has programs to deal with violence and conflicts between students.
- When I do something bad at school, my parent of guardian knows about it.

Fear

- I feel safe at this school. (Reverse-Coded)
- I feel safe going to and from school. (Reverse-Coded)

Item Scores. Higher scores in *physical disorder, social disorder* and *fear* represent negative school climate, while higher scores in *cohesion* and *shared expectations* for control represent positive school climate. For instance, a student who strongly agreed that "there are a lot of broken windows, doors and desks at my school" would be assigned a score of four for that item, signifying a high level of physical disorder. On the other hand, a student who strongly agreed that "teachers care about their students" would also be assigned a score of four for that item, signifying a high level of cohesion.

Combining the Scores into Construct Scale. Scale construction involved taking the average of student's response for items that represented the construct. For instance, if a student strongly agreed that they "felt safe at school" (a score of one) but strongly disagreed that they "felt safe going to and from school" (a score of four), that student would be assigned a score of 2.5 for the *fear* construct.

Building School-Level Constructs. Construct scores for students within a given school were averaged to produce the construct score for that school. Because at least 20 percent of students from each of the schools selected for the study responded to the survey, no missing data exists at the school level.

Within-School vs. Between-School Variation. Conceptualizing school climate as a property of schools requires that significant between-school variation in school climate exists. The concept of uniformly-experienced school climate proves unsuitable if variation exists only within schools and not between them. ANOVA tests confirmed that between-school variation accounted for a statistically significant proportion of total variation in each of the constructs (at the .001 level of significance). Intraclass correlations (ICC) indicate the proportion of total variation in constructs existing between schools rather than within them. ICC values ranged from .085 to .230 for the 2005-2006 surveys, signifying that anywhere between two and thirty percent of variations in constructs resided between schools.

Analyses focused on dichotomous graduation/non-graduation outcomes were conducted using logistic regression hierarchical linear modeling (HLM). Since a primary research question involved comparing the strength of eighth- and ninth-grade behavioral outcomes on the graduation outcome, only those students with no missing data in either eighth or ninth grade were included in analyses.

At level 1, student outcomes were modeled as a function of demographic characteristics (male and overage for grade), eighth-grade reading score, and early warning indicators (chronic absenteeism, behavior problems/suspensions, and course failure) in either eighth or ninth grade. At Level 2, the school level, the impact of ninth-grade school characteristics on student outcomes was modeled.

Models were estimated sequentially to ascertain the difference in proportion of variance explained between the models. The proportion of variance explained was calculated for each model as:

$$R^2_{\text{dicho}} = \frac{\sigma^2_F}{\sigma^2_F + \tau^2_0 + \sigma^2_R}$$

The variance of the fitted values (σ^2_F) was calculated using the FITVAL variable in the Level 1 residuals file. The Level 2 intercept variance is represented by τ^2_0. The error variance, σ^2_R, cannot be estimated simultaneously with the coefficients in a model with a dichotomous dependent variable, and is defined as $(\pi^2)/3$ or 3.29.

Tables 5 and 6 (see right) summarize the series of models estimated and comparisons of the proportion of variation in non-graduation outcome explained for each cohort. For 2004-05, complete data were available for 4,104 students in 31 regular schools. For 2005-06, complete data were available for 5,530 students in 37 regular schools. (Data for students in alternative or special education schools were excluded from these analyses.)

Model 1 examined the impact of demographic and status factors (male and overage for grade). Because of little variation in student ethnicity within the district, it was not included in the model. Socio-economic status, measured by eligibility for free or reduced price lunch, was not included because of its measurement unreliability at the high school level. Special education status was included in preliminary models, but excluded because of its high intercorrelation with eighth-grade test score. Males and students overage for grade were significantly more likely to have a non-graduation outcome in both cohorts than were females and non-overage students, by a factor of roughly 2.

Model 2 examined the impact adding eighth-grade behavioral warning indicators (chronic absenteeism, being suspended for at least three days, and failing either math or reading/English Language Arts) to the demographic variables. One hypothesis was that the effect of being male or overage would be significantly reduced, given the relationship between these variables and the behavioral indicators. Analyses indicated that there remained a significant effect of being male or overage, even controlling for the behavioral predictors (which were also significant). Chronic absenteeism in eighth grade had the largest odds-ratio, and the others were roughly equivalent. The proportion of variance increased from .24 to .34 (.20 to .29 in 2004-05) by adding eighth-grade behavioral indicators to the demographic variables in the model.

Model 3 included both the demographic variables and ninth-grade early warning indicators. Chronic absenteeism and course failure were stronger predictors (had higher odds ratios) than either suspensions or the

demographic variables (though their relative strength was different, depending on the cohort year). But male gender and overage status again remained significant predictors of non-graduation when controlling for ninth-grade behavioral variables. As expected, the proportion of variance explained by this model (.42 or .43) was higher than the r-squared value associated with the model based on eighth-grade predictor variables.

Model 4 added eighth-grade test scores to demographic variables and ninth-grade early warning indicators as predictors. Preliminary models compared the results from using a dichotomized version of test score (proficient vs. non-proficient) with those using the scale score. While the dichotomized version gives a more interpretable and comparable odds ratio, the coefficient using the dichotomous version was not significant for the 2004-05 cohort (though the scale score version, with a different metric, was significant). Despite the significant test score coefficient, the inclusion of eighth-grade test score in the model added little to the proportion of variance explained. Similarly, the addition of a measure of "any eighth-grade early warning indicator" to eighth-grade test score, demographic variables and ninth-grade early warning indicators as predictors in Model 5 produced a significant result, but added little to the proportion of variance explained by the model.

Model 6 included a school-level variable: whether or not the school had selective admissions requirements (which included both college prep and vocational schools). This variable was a significant predictor, even controlling for the ninth-grade indicators and demographic variables.

But the proportion of variance explained by Model 6 was virtually the same as in Models 4 and 5. Much of the "effect" of selective school on student outcome is mediated by the better eighth-grade outcomes (that influenced the selection process) and the better ninth-grade outcomes for students in selective schools.

TABLE 5. LOGISTIC HLM RESULTS IN MODELS PREDICTING NON-GRADUATION FOR NINTH GRADERS OF 2004-05

	MODEL 1		MODEL 2		MODEL 3		MODEL 4		MODEL 5		MODEL 6	
	ODDS RATIO	P-VAL	ODDS RATIO	P-VAL	ODDS RATIO	P-VAL	ODDS RATIO	P-VAL	ODDS RATIO	P-VAL	ODDS RATIO	P-VAL
STUDENT CHARACTERISTICS												
MALE	1.74	.000	1.73	.000	1.63	.000	1.64	.000	1.59	.000	1.58	.000
OVERAGE	2.17	.000	1.95	.000	1.85	.000	1.89	.000	1.84	.000	1.79	.000
9TH-GRADE EWIs												
COURSE FAILURE					5.04	.000	5.29	.000	4.93	.000	4.82	.000
CHRONIC ABSENCE					3.40	.000	3.59	.000	3.24	.000	3.13	.000
SUSPENSION (3 OR MORE DAYS)					1.85	.000	1.86	.000	1.79	.000	1.76	.000
8TH-GRADE EWIs												
NON-PROFICIENT ON READING MSA							1.00	.009	1.00	.017	1.00	.033
ANY 8TH-GRADE EWI									1.68	.000	1.62	.000
COURSE FAILURE (MATH OR ENGLISH)			1.82	.000								
CHRONICALLY ABSENT			2.82	.000								
SUSPENSION (3 OR MORE DAYS)			1.75	.000								
SCHOOL CHARACTERISTICS												
SELECTIVE HIGH SCHOOL											.451	.000
Pseudo R²	.20		.29		.43		.44		.44		.45	

TABLE 6. LOGISTIC HLM RESULTS IN MODELS PREDICTING NON-GRADUATION FOR NINTH GRADERS OF 2005-06

	MODEL 1		MODEL 2		MODEL 3		MODEL 4		MODEL 5		MODEL 6	
	ODDS RATIO	P-VAL	ODDS RATIO	P-VAL	ODDS RATIO	P-VAL	ODDS RATIO	P-VAL	ODDS RATIO	P-VAL	ODDS RATIO	P-VAL
STUDENT CHARACTERISTICS												
MALE	1.78	.000	1.73	.000	1.82	.000	1.81	.000	1.80	.000	1.75	.000
OVERAGE	2.35	.000	2.21	.000	2.17	.000	2.11	.000	2.11	.000	2.05	.000
9TH-GRADE EWIs												
COURSE FAILURE					2.71	.000	2.65	.000	2.65	.000	2.58	.000
CHRONIC ABSENCE					4.83	.000	4.92	.000	4.92	.000	4.52	.000
SUSPENSION (3 OR MORE DAYS)					1.34	.003	1.34	.003	1.34	.003	1.30	.009
8TH-GRADE EWIs												
NON-PROFICIENT ON READING MSA							1.44	.000	1.44	.000	1.40	.000
ANY 8TH-GRADE EWI									1.78	.000	1.85	.000
COURSE FAILURE (MATH OR ENGLISH)			1.96	.000								
CHRONICALLY ABSENT			2.88	.000								
SUSPENSION (3 OR MORE DAYS)			1.76	.000								
SCHOOL CHARACTERISTICS												
SELECTIVE HIGH SCHOOL											.473	.000
Pseudo R²	.24		.34		.42		.43		.44		.46	

Additional HLM models for the 2005-06 cohort included school-level measures of school climate, constructed from data obtained from surveys conducted by the Baltimore City Public Schools.[47,48] Analyses of student survey responses built on the prior research of Plank, Bradshaw and Young (2009), who identified five constructs related to school climate: physical disorder; social disorder; cohesion and shared expectations for control (two constructs that represent collective efficacy); and fear (see Appendix A for a more complete summary of the items used in these constructs). Because of the relatively small number of schools, only one school characteristic was included at a time in estimated models. While school-level correlations between physical and social disorder during the ninth-grade year and the graduation rates for those students four years later were significant and moderate (-.34 for physical disorder, -.41 for social disorder), the coefficients for the school-level climate measures were not significant in HLM models, controlling for all the individual-level variables included in the models reported above. (The other climate measures were not significantly correlated with graduation outcomes at the school level.) A potentially fruitful focus for future research could involve more in depth analyses of the relationship between school disorder and early warning indicators such as attendance and course performance, as well as exploration of the direction of causation in the relationship.

College Enrollment Outcomes

We used multinomial logistic regression models to analyze the relationship between the nominal dependent variable (with its four categories of enrollment in a four-year college, enrollment in a two-year college, graduation with no college enrollment, and non-graduation) and a set of predictor variables. Only students who were enrolled in the district and had eighth-grade data were included in these analyses, and students with an out-of-district transfer outcome were excluded from analyses.[49] In the analyses summarized in Table 7, we compare models using ninth-grade GPA with cumulative GPA (over the entire length of the student's enrollment in the district: four years for graduates, and generally fewer years for non-graduates).

Models controlled for the impact of demographic and status factors (male and overage for grade by the beginning of ninth grade). Because of little variation in student ethnicity within the district (more than 93 percent of students included in the analyses were African-American), it was not included in the model. Socio-economic status, measured by eligibility for free or reduced price lunch, was not included because of its measurement unreliability at the high school level. Special education status was included in preliminary models, but excluded because of its high correlation with eighth-grade test score.

In addition, models included two ninth-grade early warning indicators: a dichotomous variable indicating whether the student had been chronically absent (missed more than 20 days of school) in ninth grade, and a dichotomous variable indicating whether the student had been suspended during ninth grade.[50] The "course failure" early warning indicator was measured by ninth-grade GPA. Finally, the models included a dichotomous measure of whether the student had any eighth-grade behavioral warning indicators (chronic absenteeism, being suspended for at least three days, and failing either math or reading/English Language Arts), as well as eighth-grade mathematics test scale score on state test.

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[47] Melick, Feldman, & Wilson, 2008

[48] Data were missing for too many schools in 2004-05 for the climate measures to be used in analyses for that cohort.

[49] On most indicators these students fell somewhere in-between the non-graduates and the terminal graduates, though more frequently resembled non-graduates than graduates.

[50] Because earlier Baltimore research found suspension of at least three days to be a better predictor of non-graduation outcomes, suspension was defined to be "suspended for at least three days."

Table 7 indicates that the odds ratio for cumulative GPA is larger than the ninth-grade GPA odds ratio, as expected. But even ninth-grade GPA alone has a strong significant relationship to college enrollment status. And once GPA is taken into account, males are no longer significantly less likely than females to enroll in four-year colleges. On the other hand, being overage for grade is still a significant predictor of non-enrollment in college, even controlling for GPA. Eighth-grade test scores also remain a significant predictor of college enrollment.[51] When models control for ninth-grade GPA, the impact of other early warning indicators in grades eight and nine varies, depending on the particular model.

TABLE 7. ODDS-RATIOS FROM MULTINOMIAL LOGISTIC REGRESSION ANALYSES OF COLLEGE ENROLLMENT OUTCOMES

	FOUR-YEAR VS. TWO-YEAR		FOUR-YEAR VS. GRAD., NO COLLEGE		FOUR-YEAR VS. NON-GRADUATE	
	MODEL1	MODEL 2	MODEL 1	MODEL 2	MODEL1	MODEL 2
INDEPENDENT VARIABLE						
MALE	1.04	1.19	0.88	0.99	0.81	1.06
OVERAGE	0.64*	0.65+	0.50*	0.51*	0.31*	0.32*
9TH-GRADE GPA	2.54*		2.97*		17.5*	
OVERALL GPA		3.34*		4.44*		67.9*
9TH-GRADE CHRONIC ABSENCE	1.10	1.04	1.21	1.13	0.68+	0.66+
9TH GRADE SUSPENSION	1.11	1.26	1.38+	1.58+	1.02	1.37
ANY 8TH-GRADE EWI	0.96	0.98	0.71*	0.74+	0.66*	0.74
8TH-GRADE MATH SCORE	1.02*	1.02*	1.02*	1.02*	1.03*	1.02*

* significance at the .01 level

+ denotes significance at the .05 level

EWI = Early Warning Indicator (chronic absence, suspension, failing grade in reading and/or math);
N of students with complete data and included in analyses: 5733

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[51] The reported analysis includes only math score, since the eighth-grade scores are highly intercorrelated. Results are similar using just reading score.