Mathew C. Uretsky

University of Maryland School of Social Work
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Education

PhD	2016, University of Maryland School of Social Work Dissertation Title: "High School Completion in Context: Student and School Factors Related to On-Time Graduation for Students in their Fourth Year of High School." (Co-Chairs: Dr. Donna Harrington & Dr. Michael Woolley)
MSW	2005, San Diego State University School of Social Work
MPH	2005, San Diego State University School of Public Health Thesis Title: "The Effect of Years Lived in the United States on the General Health Status of California's Foreign-Born Populations" (Chair: Dr. Sally Mathiesen)
BA	2001, University of California at Santa Cruz, Department of Psychology

Research Interests

To identify risk and protective factors that support the development of prevention and intervention programs to address problem behaviors and support positive academic and social development for at-risk children and youth across domains including communities, schools, and families. Develop early warning systems for the identification of children and youth at risk for poor outcomes. Intervention research.

Research Skills

Evaluation design; database management; survey design; advanced data analysis including multilevel modeling, longitudinal modeling, and structural equation modeling; qualitative research methods. Statistical Software: Mplus, SAS, STATA, SPSS.

Language Skills

Spanish (Intermediate)

Awards

2016 Competitive Innovation Research Award
University of Maryland School of Social Work

2012 *Martin Luther King Award for Public Service*

University of Maryland School of Social Work

2003, 2004 *Phi Beta Delta Honor Society International Scholar Award*
San Diego State University

Successful Grant Funding

FY 2016 *Lead Author & Lead Investigator (Co-PIs Richard Barth & Wendy Lane)*
Upton/Druid Heights Neonatal Intensive Care Cost Evaluation
University of Maryland Competitive Innovation Research Award
$20,000

FY 2014-15 *Co-Author & Investigator (PI Elizabeth Greeno)*
Planning Grants to Develop a Model Intervention for Youth/Young Adults with Child Welfare Involvement at Risk of Homelessness.
HHS-2013-ACF-ACYF-CA-0636
$700,000

FY 2009-11 Author
McKinney-Vento Education for Homeless Children and Youth Program
USDE-2009-CDE 5635-8290
$375,000

Teaching Experience

Adjunct Instructor
University of Maryland School of Social Work

Spring 2012 *SOWK 631,* Social Work Practice in Communities
Masters level foundation course

Spring 2011 *SOWK 641,* Human Behavior and the Social Environment II
Masters level foundation course

Fall 2011 *SOWK 630,* Social Work Practice with Individuals
Masters level foundation course

Adjunct Instructor
Berkeley City College, Department of Human Services

Spring 2009 HUSV 109, Diverse Populations in Human Services
Undergraduate level course

Teaching Assistant
University of California at Santa Cruz, Department of Psychology

Spring 2001 *PSYCH 101,* Introduction to *Psychology*
Undergraduate level course
Under the advisement of Dr. Avril Thorne

Other Teaching Experience

Field Instructor
University of California at Berkeley School of Social Welfare
2008-2009 *Masters level foundation year*

Field Instructor
California State University East Bay School of Social Work
2008-2009 *Masters level advanced year*
2007-2008 *Masters level foundation year*

Guest Lecturer
University of Maryland School of Social Work

10/2015 *SOWK 645* Human Behavior and the Social Environment
Topic "Understanding and Addressing Prejudice in Social Work Practice"
Masters level foundation course

10/2015 SWCL 755 Assessment of Common Child Mental Health Disorders
Topic "Evidence-Based Parent Training."
Masters level advanced course

8/2014 Doctoral Student Statistics Workshop
Topic "Introduction to the ANOVA"
Doctoral level course

2/2014 SWOA 703 Program Management
Topic "Institutional Power and Oppression"
Masters level advanced course

1/2014 SWOA 703 Program Management
Topic "Institutional Power and Oppression"
Masters level advanced course

Peer Reviewed Publications

Finigan-Carr N. M., Vandigo J. E., **Uretsky, M. C.,** Oloyede, E., & Mayden, B. (2015). "You can't help a child if you don't know something yourself": A qualitative study of barriers to education in an underserved West Baltimore community. *The Journal of Negro Education*, 84(3), 298. doi:10.7709/jnegroeducation.84.3.0298

Uretsky, M. C., & Stone, S. (2016). *Factors associated with high school exit exam outcomes among homeless high school students*. *Children and Schools, 38*(2), 91–98. doi:10.1093/cs/cdw007

Greeno, J. E., **Uretsky, M. C**., Lee, B. R., Moore, J. E., Barth, R. P., & Shaw, T.V. (2016) Replication of the KEEP foster and kinship parent training program for youth with externalizing behaviors. *Children and Youth Services Review, 61,* 75-82. http://dx.doi.org/10.1016/j.childyouth.2015.12.003

Greeno, J. E., Lee, B. R., **Uretsky, M. C**., Moore, J. E., Barth, R. P., & Shaw, T.V. (2015). Effects of a foster parent training intervention on child behavior, caregiver stress, and parenting style. *Journal of Child and Family Studies.* http://dx.doi.org/10.1007/s10826-015-0357-6

Henwood, B. F., Wenzel, S., Mangano, P. F., Hombs, M., Padgett, D., Byrne, T., …Uretsky**, M. C.** (2015). The grand challenge of ending homelessness (Grand Challenges for Social Work Initiative Working Paper No. 10). Cleveland, OH: American Academy of Social Work and Social Welfare. http://aaswsw.org/wp-content/uploads/2015/04/Ending-Homelessness-GC-4-3-2015-formatted-final.pdf

Stone, S., & **Uretsky, M.** (2015). School correlates of academic behaviors and performance among McKinney–Vento identified youth. *Urban Education.* http://dx.doi.org/10.1177/0042085915602540

Uretsky, M. C., Lee, B. R., Greeno, J. E., & Barth, R. P. (2015). Trajectory of externalizing child behaviors in a KEEP replication. *Research on Social Work Practice.* http://dx.doi.org/10.1177/1049731515576546

Uretsky, M. C., & Matheisen, S. (2007). The effect of years lived in the United States on the general health status of California's foreign-born populations. *Journal of Immigrant and Minority Health, 9* (2), 125-136. http://dx.doi.org/10.1007/s10903-006-9017-7

<u>Research Reports</u>

Henneberger, A.K., Shaw, T.V., Uretsky, M.C., & Woolley, M.E. (2015) Dual Enrollment in Maryland: A Report to the General Assembly and Governor Lawrence J. Hogan. Maryland Longitudinal Data System Center: Baltimore, MD.

Greeno, E., J., Lee, B., Harburger, D., Soulé, M., & **Uretsky, M. C.** (2015) *Thrive@25 Resource Parent Survey Report.* University of Maryland School of Social Work, the Institute for Innovation & Implementation: Baltimore, MD.

Greeno, E.J., Shaw, T.V., Barth, R.P., Moore, J., **Uretsky, M.C.**, & Rozeff, L. (2011) *Maryland KEEP Annual Evaluation Report*. Ruth Young Center for Families and Children, University of Maryland School of Social Work: Baltimore, MD.

Greeno, E.J., Shaw, T.V., Barth, R.P., Moore, J., **Uretsky, M. C.,** & Rozeff, L. (2012). *Maryland KEEP Annual Evaluation Report, November 2011*. University of Maryland School of Social Work, Ruth H. Young Center for Families and Children.

Harburger, D.S., McNear, D., Acuña, R., Nadiv, S., Greeno, E., **Uretsky, M. C.,** & Zabel, M. (2014). Baltimore *City's Investments in Children and Families: A Review of Outcomes, Best Practices, and Financing for Baltimore's Promise*. Baltimore, MD: University of Maryland School of Social Work, the Institute for Innovation & Implementation.

Henneberger, A. K., Shaw, T. V., **Uretsky, M.C**. & Woolley, M. E. (2015). *Dual Enrollment in Maryland: A Report to the General Assembly and Governor Lawrence J. Hogan*. Maryland Longitudinal Data System Center: Baltimore, Maryland.

Uretsky, M. C., & Greeno, E. J., (2015) *Thrive@25 Casey Life Skills Assessment Report.* University of Maryland School of Social Work, the Institute for Innovation & Implementation: Baltimore, MD.

Woodruff, K., Harburger, D., Bertell, R., West, A., **Uretsky, M. C.,** & Barth, R.P. (2013). *Evaluation of State Laws on Child Abuse & Neglect: Commissioned Paper for the Institute of Medicine.* University of Maryland School of Social Work: Baltimore, MD.

Publications with Consultant Credits

Edovald T., & Bjornstad, G. (2013). *Investing in children technical report*. Social Research Unit at Dartington. Dartington, Tetnes. http://investinginchildren.eu/sites/default/files/Investing%20in%20Children%20-%20Technical%20Report%20%28September%202013%29.pdf

Institute of Medicine and National Research Council. (2013). *New Directions in Child Abuse and Neglect Research*. Washington, DC: The National Academies Press. http://iom.nationalacademies.org/Reports/2013/New-Directions-in-Child-Abuse-and-Neglect-Research.aspx

Research Experience

Statistician & Doctoral Research Fellow

2015-Present Maryland Longitudinal Data System Center
University of Maryland School of Social Work
University of Maryland School of Education
Conduct original research on the education and workforce experiences of students in Maryland's public PreK-12 and post-

secondary education system. Duties include supporting the center research agenda through statistical analyses, developing additional lines of research, report writing, and developing recommendations for state government.

Lead Investigator

2015-Present Upton/Druid Heights NICU Cost Evaluation
University of Maryland School of Social Work
University of Maryland School of Medicine
Develop and oversee an investigation into the drivers of, and change over time in Neonatal Intensive Care Unit costs along with other metrics of improved birth outcomes in the Upton/Druid Heights neighborhood of Baltimore Maryland. Duties include program management, developing a data system and research agenda, planning and conducting analyses, and providing programmatic recommendations.

Investigator

2014-2015 Thrive@25
University of Maryland School of Social Work
Conduct original research to support the development of an intervention designed to prevent homelessness among foster youth as they age out of the system. Mixed method design including qualitative interviews, focus groups, survey, and administrative data.

2009-Present *Maryland KEEP*
University of Maryland School of Social Work
Manage replication of evidence-based child welfare training and support program. Oversee fidelity to model and coordinate with program developers to train, supervise, and assess program facilitators.

2007-Present *McKinney-Vento Homeless Student Outcomes Study*
University of Maryland School of Social Work
University of California Berkeley School of Social Welfare
Develop and manage multi-year longitudinal study of educational outcomes for homeless students in an urban school system using administrative data sources.

Graduate Research Assistant

2004-2005 *VIDAII Health Collaborative*
San Diego State University School of Public Health
University of California San Diego School of Medicine
Universidad Autónoma de Baja California, Tijuana

Conducted public health surveys of farm worker communities in San Quintin, Mexico. Developed prevention programming for asthma.

2004-2005 *La Paz Intercambio*
San Diego State University School of Social Work
Universidad Autónoma de Baja California, La Paz
Coordinated field experiences and supplemental training for international social worker exchange program in Baja California. Administered surveys and conducted interviews on social conditions and social service provision in La Paz, Mexico.

Conference Presentations

Uretsky, M.C., Henneberger, A.K., & Woolley, M.E. (June, 2016) *Correlates and consequences of on-time graduation.* Presentation at the 2016 Maryland State Department of Education Data Summit. Ellicott City, MD.

Henneberger, A.K., Klumpner, S., **Uretsky, M.C.,** & Woolley, M.E. (June, 2016) *High school predictors of needing remedial coursework in college.* Presentation at the 2016 Maryland Longitudinal Data System Center Research Series. Baltimore, MD.

Uretsky, M.C. (April, 2016) *High school graduation in context: A multilevel exploration of the correlates and consequences of on-time graduation.* Presentation at the 2016 Maryland State Department of Education Data Summit. Ellicott City, MD.

Henneberger, A.K., Klumpner, S., **Uretsky, M.C.,** & Woolley, M.E. (March, 2016) *Successful transition from high school to postsecondary: Targeting policy and practice to prevent the need for remedial coursework.* Presentation at the 2016 Society for Research on Adolescence Biennial Meeting. Baltimore, MD.

Greeno, E. J., ***Uretsky, M. C,*** *Lee, B. R. & Harburger, D. S. (January, 2016). Well-being and psychosocial function of youth in-care and young adults with foster care histories: Implications for practice. Presentation at the Society for Social Work and Research 20th Annual Conference. Washington, D.C.*

Greeno, E. J., Lee, B. R, & ***Uretsky, M. C.*** *(October, 2015). Findings from a parenting intervention for foster and kinship families. Panel Presentation* at the 2015 Annual Public Meeting of the Counsel on Social Work Education. Denver, CO.

Bartley, L., ***Uretsky, M. C.,*** *Peters, S. C., & Chatterjee, A. (January, 2015). Social justice in social work: The role of distributive leadership and organization type.*

Presentation at the Society for Social Work and Research 19th Annual Conference. New Orleans, LA.

Uretsky, M. C., *& Stone, S. (January, 2015). Factors associated with high school exit exam outcomes among homeless high school students. Presentation at Society for Social Work and Research 19th Annual Conference. New Orleans, LA.*

Bartley, L., **Uretsky, M. C.,** *Peters, S. C., Chatterjee, A., (June, 2014). Distributed leadership for social justice action. Presentation at Network for Social Work Management Annual Conference. Boston, MA.*

Greeno, E.J., Barth, R.P., **Uretsky, M.C.,** Shaw, T.V., & Moore, J.E. (November, 2013). *KEEP: A foster and kinship parent training program impacting permanency outcomes*. Poster at the 2013 Annual Public Meeting of the Counsel on Social Work Education, Dallas, TX.

Greeno, E.J., Barth, R.P., **Uretsky, M.C.,** Shaw, T.V., & Moore, J.E. (June, 2013). *KEEP: A foster and kinship parent training program impacting permanency outcomes*. Presented at the 2013 One Child, Many Hands: A Multidisciplinary Conference on Child Welfare, Philadelphia, PA.

Stone, S., **Uretsky, M. C.** *(January 2013). Individual and School Correlates of Attendance and School Performance among Homeless Students. Presentation at Society for Social Work and Research 17th Annual Conference. San Diego, CA.*

Uretsky, M. C. (November 2011). *Promoting Educational Stability for Children and Youth Experiencing Homelessness.* Panel presentation at Maryland Partners for Justice Conference. Baltimore, MD.

Uretsky, M. C. (April 2005). *The effect of years lived in the United States on the general health status of California's foreign-born populations*. Poster at California Public Health Association Conference Oakland, CA.

Uretsky, M. C. (April, 2005) *The effect of years lived in the United States on the general health status of California's foreign-born populations.* Poster at the Public Health Colloquium. San Diego, CA.

Other Presentations and Workshops

Uretsky, M. C. *(November 2016). Creating teachable moments: A resource parents' guide to teaching life skills.* Workshop at University of Maryland School of Social Work Child Welfare Academy. Baltimore, MD.

Uretsky, M. C. *(2014-2015) Building Routines for School Success: Parent Breakfast Learning Series. Multiple* workshops *at Baltimore City Public Schools. Baltimore, MD.*

Uretsky, M.C. (December 2012) *Maryland KEEP: Using empirically based practice to reduce the challenging behaviors of children in state care.* Presentation at University of Maryland School of Social Work Title IVE Urban Fellows Workshop. Baltimore, MD.

Uretsky, M.C. (October 2011) *McKinney-Vento & Child Welfare: Serving the underserved*. Presentation at University of Maryland School of Social Work Title IVE Urban Fellows Workshop. Baltimore, MD.

Uretsky, M.C. (September 2011) *KEEP Facilitator Training*. Training at University of Maryland School of Social Work. Baltimore, MD.

Uretsky, M.C. (2007-2009) *McKinney-Vento 101: Connecting transitional students with the tools for success.* Workshops at schools and community organizations. Oakland, CA.

Selected Professional Experience

2010-2015 ***Statistician***
University of Maryland School of Social Work
Engage in the application of statistical theory and methods to collect, organize, interpret, and summarize numerical data to provide usable information for statewide analyses of linked cross-sector data. Conduct complex statistical research and analysis for legislative reports.

2010-2015 ***Program Manager***
University of Maryland School of Social Work
Support multiple research projects through program management, research design and implementation, statistical analyses, data management, report writing and scientific writing in support of child serving systems, state government and federally funded research projects.

2009-2010 ***Training Specialist***
University of Maryland School of Social Work
Coordinated and led foster and kinship parent training and support groups using the KEEP model developed by the Oregon Social Learning Center.

2009-2010 ***Consultant***
Oakland Unified School District
Provided technical assistance to retention and engagement programs for disadvantaged youth. Led development of web-based community resource mapping project.

2007-2009 ***Transitional Student and Family Specialist***

Oakland Unified School District
Developed and implemented district wide McKinney-Vento program for homeless students and families. Developed programs and coordinated services between schools, shelters, community agencies and alternative educational programs to ensure equal access to education. Provided case management and academic advising services. Supervised interns, volunteers and contract staff.

2005-2007 ***HIV/AIDS NGO Capacity Building Volunteer***
U.S. Peace Corps, South Africa
Developed and administered community based programs for orphans and vulnerable children including peer tutoring, food assistance, sports programs and mental health services. Supervised and trained volunteers and staff.

2001-2002 ***Program Assistant***
Children's Hospital Oakland
Developed programming and recruited sites for homeless youth mobile services program. Supervised and recruited volunteers.

Practicum Internships

2004-2005 ***Social Work Intern***
Consensus Organizing Center, San Diego, CA
Implemented a service-learning and supplemental education program for high school aged youth in foster care. Completed administrative review and assessment of programs.

2003-2004 ***Social Work Intern***
Cortez Hills Advocates for Community Health Actions, San Diego, CA
Provided case management, community referrals, and direct counseling services to homeless and low-income families at the Downtown Free-Clinic. Developed and implemented street outreach services.

Summer 2003 ***Social Work/ Public Health Intern***
Center for Protection from Communicable Disease, Thailand
Facilitated HIV, sexually transmitted disease, and tuberculosis treatment literacy and communication skills trainings for peer-counselors in rural areas.

Professional Service

2015-Present **Doctoral Program Recruitment Committee**
University of Maryland School of Social Work

2015-Present **Diversity and Anti-Oppression Workgroup**

University of Maryland School of Social Work

2013-Present **Doctoral Program Student Mentor**
University of Maryland School of Social Work

Spring 2015 **Expert Panel, Public Health Social Work Scholars**
University of Maryland School of Social Work

2015 **Deputy Volunteer Coordinator**
Society for Social Work and Research 2015 APM

Spring 2014 **Juror Research in Child Welfare Poster Session**
University of Maryland School of Social Work

Fall 2013 **Juror Research in Child Welfare Poster Session**
University of Maryland School of Social Work

2013 ***Student Volunteer***
Society for Social Work and Research 2013 APM

2011-2012 ***Peer Reviewer***
Journal of Immigrant and Minority Health

2010-2012 ***International Social Work Advisory Group***
University of Maryland School of Social Work

2010-2011 ***Ruth H. Young Center Strategic Planning Committee***
University of Maryland School of Social Work

2003-2005 ***Diversity and Anti-Oppression Faculty Workgroup***
San Diego State University School of Social Work

<u>Community Service</u>

2015-Present ***Early Education Data Collaborative***
Baltimore Education Resource Consortium

2013-Present ***Community Advisory Board***
Promise Heights U.S. Department of Education Promise Neighborhoods Initiative

2012-2014 ***Advisory Board***
Youth Empowerment Services Homeless Youth Drop-in Center

2009-2012 ***McKinney-Vento Program Student Stability Workgroup***
Baltimore City Public Schools, Open Society Institute

2009 ***Grant Reviewer***
California Department of Education

2007-2012 ***Writing Coach***
College Summit

Academic & Professional Affiliations:

Council on Social Work Education
National Association for the Education of Homeless Children and Youth
National Network for Social Work Managers
Society for Social Work and Research

Abstract

Title of Dissertation: High School Graduation in Context: A Multilevel Examination of the Factors Related to On-Time Graduation for Students Who Persist Through Four Years of High School

Mathew C. Uretsky, Doctor of Philosophy, 2016

Dissertation Directed by:

Dr. Donna Harrington, Professor, School of Social Work and

Dr. Michael Woolley, Associate Professor, School of Social Work

Background: Despite recent national data describing reductions in dropout and increasing graduation rates, the number of students who persist through four years of high school without earning a diploma has remained steady. Although reduced dropout is a promising trend, persisting but not graduating may not be meaningfully different from dropout in terms of life outcomes. This dissertation examined this population of *peristers*, with the goal of informing policy, programming, and practice.

Method: The dissertation sample, drawn from administrative data, included 4,190 first-time freshmen enrolled in 40 Baltimore City Public High Schools during the 2010-2011 school year (SY). Students enrolled for less than 90 days in SY 2010-2011 or that dis-enrolled from the district and did not re-enroll during SY 2013-2014 were excluded.

Multilevel models assessed the relationship between student- and school-level factors with the odds of students earning a high school diploma four years after beginning their first-freshmen year. Independent variables included student-level demographic and academic indicators, school-level concentrations of student characteristics, and staff-reported school climate.

Results: Twenty-two percent of students who persisted through four years of high school did not graduate on time. Several student-level factors were related to the odds of on-time graduation, such as below average attendance or not passing an High School Assessment by the end of the first freshmen year. The school environment played an important role in student outcomes, accounting for 25% of the variation in on-time graduation; however, among school-level factors, only staff-reported family involvement was significantly related to the odds of on-time graduation.

Conclusion: Findings shed light on an understudied population of students at high risk of not graduating on time. The multilevel examination of student- and school-level factors indicated that on-time graduation for 4-year persisters should be understood as a function of students within their academic environment. The findings presented in this dissertation suggest that the phenomenon of persisting should be considered along with dropout as a critical element of a more informative analysis of high school graduation. Implications for research, policy, and practice are discussed.

High School Graduation in Context: A Multilevel Examination of the Factors Related to On-Time Graduation for Students Who Persist Through Four Years of High School

By
Mathew C. Uretsky

Dissertation Submitted to the Faculty of the Graduate School of the University of Maryland, Baltimore in partial fulfillment of the requirements for the degree of Doctor of Philosophy
2016

Acknowledgements

I would like to thank my co-chairs Drs. Michael Wooley and Donna Harrington for their incredible patience and invaluable guidance through this process. I am deeply grateful for the amount of time you spent exploring the nuance and your consistent reminders to focus on the practical. Your mentorship has helped ground my work and provided a strong model for me to emulate. I would also like to thank my committee members, Drs. Faith Connelly, Bethany Lee, and Richard Barth. Each of you has provided me with mentorship and support that exceeds what I would have ever asked of you.

I would like to acknowledge the research team and staff at the Maryland Longitudinal Data System Center for technical expertise and general support through this process. I would also like to acknowledge Baltimore City Public Schools for sharing the school climate data.

I am deeply grateful for the support of my parents. Mom and Dad, thank you for being there for me even when I was not the most fun to be around. Your dedication to family is peerless. You have shown me the type of parent I would like to be for my children.

Joanna thank you for believing in me, encouraging me, and picking up the slack. None of this would have been possible without you. I am grateful beyond words for your patience and kindness. You are the bedrock of our family.

To my children, Hugo and Emil, thank you for making life fun and reminding me what is important. You are both such magic little people, I cannot wait to see the men you become.

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CHAPTER ONE: BACKGROUND, MODEL, AND LITERATURE REVIEW

Over the past decade, there has been a national trend towards lower dropout and increasing graduation rates, culminating in a record high four-year graduation rate of 81% in 2013 (Kena et al., 2015; Stark & Noel, 2015). Large and mid-size urban school districts such as Baltimore have shown the greatest improvements (DiPaoli et al., 2015). Despite these positive trends, a substantial number of students persist into and through four years of high school without earning a diploma (Kena et al., 2015; Maryland State Department of Education [MSDE], 2015a; Stark & Noel, 2015). This dissertation examined that population of students, with the goal of informing policy, programming, and practice to promote on-time graduation.

Among the Baltimore City students who began their first ninth grade year in the fall of 2010, 11% dropped out and 70% graduated in four years. This left an additional 19% of students who completed four years of high school, but did not earn a diploma (MSDE, 2015a). The data suggest that after accounting for the roughly 5% of students who subsequently graduated in their fifth year, as many as one in six (~15%) students who began their first ninth grade year in 2010 persisted into and through their fourth year of high school but did not earn a diploma by the end of their fifth year (MSDE, 2015a). This pattern has been observed at the national level. In 2012, 17% of first-time ninth graders attending a U.S. public school persisted through four years of high school, but did not graduate on time (Stetser & Stillwell, 2014). In this changing landscape, the data suggest that the most serious loss of students is now occurring at the tail end of their high school career.

The literature concerning high school graduation is broad; however, most previous research has focused on student dropout regardless of years of high school completed, or excluded students who persisted through four years of high school without earning a diploma (De Witte, Cabus, Thyssen, Groot & van den Brink, 2013; Rumberger & Lim, 2008). It is likely that the factors related to dropout and on-time graduation are time dependent and context specific. Therefore, serving students who persist through four years of high school, but do not earn a diploma may require different strategies than have been applied in previous efforts to reduce dropout and promote on-time graduation (Goldschmidt & Wang, 1999; Lakkaraju et al., 2015). A focus on students who remain enrolled into and through their fourth year of high school—but do not earn a diploma—may suggest ways to structure targeted intervention strategies and policies that improve school outcomes. This dissertation aimed to improve our understanding of how timing and context are associated with non-graduation in order to provide a foundation, which could be used to establish universal and targeted interventions to support persisters to the next step, graduation.

Purpose

The purpose of this dissertation was to examine and identify mutable student- and school-level factors related to on-time high school graduation among students who persisted into and through their fourth year of high school. The analyses examined the predictive utility of indicators drawn from administrative data routinely collected by a Maryland school district. The choice to use data regularly collected by school districts was made to increase the feasibility of schools being able to adapt any implications drawn from the findings for use in developing individual and school-level programming.

This chapter presents definitions for key terms and concepts, followed by a discussion of the background and significance of not earning a high school diploma. Next, the strategy used to identify relevant literature is detailed. The Conceptual Model of High School Performance, put forth by Rumberger and Lim (2008) to integrate the literature on individual and institutional influences on dropout behavior, is presented in the subsequent section. This structure of this model was adopted for the review of literature and provided a foundation for examining student and school factors that influence on-time graduation. A discussion of gaps in the literature follows. Finally, this chapter includes the study model, the current study, and research questions.

Definitions

The first term of critical interest is *first-time freshmen* –a student who is enrolled as a ninth grader and has not previously been enrolled or retained in the ninth grade. This term is important because it defines the starting cohort for the *adjusted cohort graduation rate* (ACGR), which is the percentage of first-time freshmen who earn a regular high school diploma four years later, adjusted for deaths and students who transfer into or out of the educational system. The *four-year dropout rate* is the percentage of students who terminate their formal education within four years of beginning their first-freshmen year, adjusting for deaths as well as students who transfer into or out of the system (Kena et al., 2015; Stark & Noel, 2015). The *persister rate* is the percentage of first-time freshmen who remain enrolled through their fourth year of high school, meaning they do not drop out, but do not graduate on time. Functionally, the persister rate is equal to 100 minus the sum of the ACGR and the four-year dropout rate.

A student who graduates with a regular diploma four years after entering the ninth grade as a first-time freshman is an *on-time graduate* (MSDE, 2015a). A *non-graduate* is a student who does not earn a diploma four years after beginning their first-freshman year. Within the group of non-graduates, there are two distinct sub-groups: (1) *leavers* are students who formally withdraw from school without enrolling in another degree granting institution and (2) *four-year persisters* (persisters) are students who do not formally withdraw from school and do not earn a regular diploma four years after beginning their first-freshmen year (Aguiar et al., 2015).

These terms have several advantages over the conventional term: *dropout*. First, the term dropout carries connotations that have informed a narrative focused primarily on student deficits that can distract from systemic issues that put students at risk of non-graduation (Center for Promise Research, 2015; De Witte et al., 2013). Second, although it may appear straightforward, the definition used to identify a "dropout" varies across the literature. This includes *event dropout*, which describes a student who formally withdraws from school without immediately enrolling in a diploma-granting institution (Stetser & Stillwell, 2014). This definition can be problematic as a student may drop out and then return to receive a regular high school diploma at a later date. Using the proposed nomenclature this student could ultimately be designated a leaver, a persister, or an on-time graduate. They may also transfer to other schools, complete a General Educational Development (GED) certificate, or receive an alternative education degree many years after leaving the institution where they began their high school career (Bowers, 2010; Pallas, 2003). These students could ultimately be designated a leaver or a persister under the more differentiated nomenclature used in this study.

A second definition used to operationalize dropout in the literature is *status dropout*, which describes a student ages 16 to 24 who is not enrolled in a diploma-granting institution and has not received a high school diploma or some alternative credential (Kena et al., 2015). This definition does not differentiate earning a high school diploma from alternative credentials such as a certificate of completion or a GED (Stetser & Stillwell, 2014). Researchers have generally relied on self-report measures of completion to identify status dropouts, which may bias any resulting estimates (Murnane, 2013). Finally, unlike leavers who withdraw from, or "dropout" of school, persisters remain formally engaged with the school system, which may present additional opportunities for intervention and increase their likelihood of earning a diploma at a later date. As a result, studies that combine persisters and leavers into a single group may miss important distinctions between the two groups.

For consistency and clarity, the terms defined above and listed below were used to describe the subsamples within the studies reviewed when they do not align with the previously defined key terms. The term *dropout* was used to describe a study sample that included students who withdrew from school before graduation, but excluded persisters. The term *non-graduation* was used to describe a study sample that included both dropouts and persisters.

Background and Significance

Students who leave school without earning a diploma face increased odds of multiple adverse outcomes, including: lower lifetime earnings (Rouse, 2007), higher rates of unemployment (U.S. Department of Labor, 2014), poor health outcomes (Blackwell, Lucas, Clarke, 2014), incarceration (Aud et al., 2011), and increased reliance on welfare programs (Levin & Belfield, Muennig, & Rouse, 2007; Maynard, Salas-Wright, & Vaughn, 2015). Taking into account the increased use of public assistance, higher rates of criminal activity and incarceration, Medicaid costs, and reduced tax revenue, Belfield, Levin, and Rosen (2012) calculated that each youth who did not graduate from high school in 2011 cost society an estimated $755,900 over the student's lifetime. In the same report, Belfield and colleagues estimated a total cost to society of 1.96 trillion dollars for 3.3 million youth between the ages of 16 and 24 who had not earned a diploma in 2011.

As young people transition out of adolescence and move toward adulthood, their educational attainment is strongly associated with important life outcomes such as physical health, mental well-being, and participation in the workforce (Rumberger, 2011; Lamb & Rumberger, 1999; Vaughn, Salas-Wright, & Maynard, 2014). Further, a recent study using national data found that emerging adults between the ages of 18 and 24 who reported dropping out of school had increased odds of reporting recent arrests for larceny or assault (Maynard et al., 2015). Although dropouts reported a lower risk of binge drinking and no significant additional risk for drug dependency, they were more likely than high school graduates to be arrested for drug offenses. Dropouts were also more likely than high school graduates to be unemployed, have a household income below $20,000, enroll in government assistance programs, and have a recent suicide attempt (Maynard et al., 2015).

In 2002, there were 1 in 12 (8%) high schools in the U.S., where students' chances of reaching the 12th grade were 50% or less. These schools tended to be concentrated in urban areas and serve a disproportionately high number of poor and minority students (Balfanz & Letgers, 2004). In 2008, the National Center for Education

Statistics (NCES) reported that one-third of Black students and one in five Hispanic students attended a high-poverty high school where nearly one-third of twelfth graders did not graduate (Aud et al., 2010). More recent data have revealed some progress towards reducing dropout and increasing graduation rates in communities with high concentrations of poor and minority students (DiPaoli et al., 2015). For example, in 2002, Baltimore was one of just four of the Nation's 50 largest cities with a four-year graduation rate below 35% (Swanson, 2008); however, by 2010 the Baltimore ACGR was 62% and by 2014 the ACGR had reached a historic high of almost 70% (MSDE, 2015a). In addition, the four-year dropout rate was reduced by more than half between 2010 and 2014, dropping from 24% to 11% (MSDE, 2015a).

In contrast to the improvements in graduation and dropout rates observed between 2010 and 2014, the percentage of Baltimore City Public School System (BCPSS) students who persisted into and through their fourth year of high school, but did not earn a diploma remained steady at about 19% (MSDE, 2015a). Although the four-year cohort dropout rate at BCPSS was within 2 points of the state average, the ACGR was 17 percentage points below the Maryland state average of 84% (MSDE, 2015a). The outsized role of persisting has been observed in national data, which has shown that the percentage of students persisting into and through four years of high school without earning a diploma in 2012 was greater than the cumulative percentage of students lost to dropout (Stetser & Stillwell, 2014). This highlights the need for research exploring the conditions that contribute to persisting and on-time graduation.

Persisters are unlikely to be a homogenous group and the reasons a student persists rather than graduating on time are likely complex. This distinction between persisters and "dropouts" is exemplified by persisters continued formal engagement with the school system. Rumberger and Lim (2008) conceptualized dropout as the culmination of a process that unfolds over time rather than an event that occurs at a single point in time. This conceptualization could be extended to include persisting as a midpoint between the decision to formally withdraw from school and successfully completing the requirements for a high school diploma. From a prevention science perspective, persisting would be preferred to dropout, and on-time graduation would be preferred to persisting. Both persisting and dropout are distinct from graduating in that they are actions, not outcomes. A student can do one or both and still go on to earn a high school diploma. At any point in time, it is possible that a persister would appear more similar to students that have dropped out than students that graduate on time and vice-versa. For these reasons, the goal of this dissertation was not to define the archetypal persister, but rather to identify student- and school-level factors that could be used to inform interventions that promote on-time graduation among students who might otherwise persist through their fourth year of high school without earning a diploma.

Search Strategy and Review Structure

Three recent reviews were identified that were especially germane to the study of school leaving or non-graduation. Rumberger and Lim (2008) conducted a review of factors related to dropout spanning 25 years that included 203 articles containing 389 analyses. De Witte and colleagues (2013) conducted a critical review of the dropout literature with a focus "on hitherto unchallenged commonplaces, possible underlying problems, methodological issues, and research trends" (p. 2). De Witte and colleagues based their review on Rumberger and Lim's framework, but discarded the delineation between individual and institutional factors. Instead De Witte et al. presented the individual and institutional factors as dynamic and interacting parts of a unified process. The third review was a meta-analysis conducted by Bowers, Sprott, & Taff, (2013) to determine which factors most accurately predicted the risk of dropout. Bowers et al. identified 36 articles published between 1980 and 2012 that reported sufficient information to calculate and assess the sensitivity (true-positive rate) and *1*-specificity (false-positive rate) of 110 indicators.

The review conducted by Rumberger and Lim (2008) encompassed literature related to student dropout and non-graduation published between 1982 and 2007. Therefore, for this dissertation a search was conducted for studies that were published after 2007 in EBSCO*host*, PsycINFO, Social Science Index, and ERIC using the Boolean terms [("on-time graduation" OR "high school graduate" OR "high school dropout") AND ("high school freshmen" OR "first-time freshmen")]. Out of the 54 articles identified in this search, 16 are relevant to this dissertation. Additional peer reviewed papers, books, dissertations, and gray literature were identified by searching reference lists, and by conducting separate searches for specific risk factors identified in peer reviewed papers.

The literature exploring the factors related to dropout and non-graduation is presented below and organized according to the structure suggested by Rumberger and Lim (2008) in the Conceptual Model of High School Performance (Figure 1.1), with a focus on factors that are malleable to intervention and are routinely measured by schools. Although there is considerable scholarship concerning family and community factors that influence on-time graduation and dropout, they are beyond the scope of this dissertation, which focused on data regularly collected by schools. As such, the institutional focus of this review was limited to the school environment. Similarly, the influence of individual student attitudes and peer influence on non-graduation were not reviewed, as schools do not regularly collect these data. Nor were student health, past experiences with pre-school or early childhood programs, or deviance available in the data accessed or included in the review.

Figure 1.1 Conceptual Model of High School Performance (Rumberger & Lim, 2008).

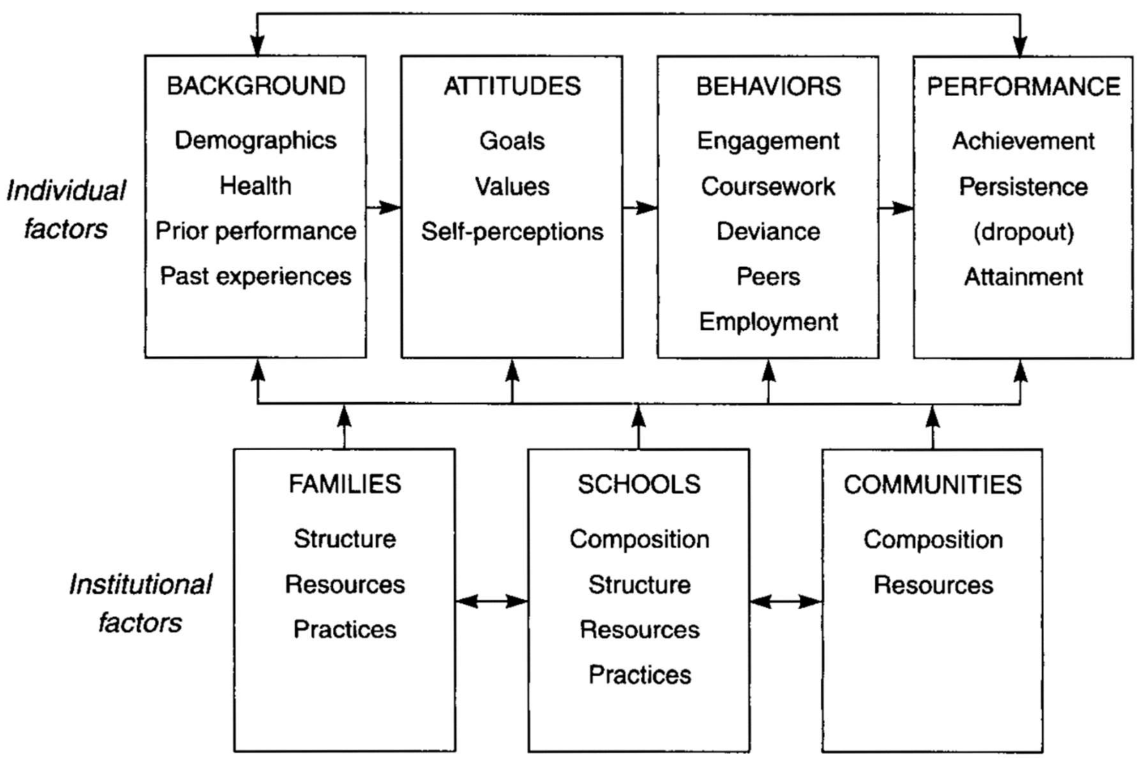


Figure 1.1 Reprinted with permission *from "Dropping out: why students drop out of high school and what can be done about it,"* by R. W. Rumberger, 2011, p. 386. Copyright 2011 by Harvard Educational Press.

Factors Related to School Leaving

Rumberger (1983, 1987) proposed that both individual and institutional factors influence student academic performance. This is in contrast to earlier work on non-graduation that focused primarily on student-level characteristics (Rumberger, 2004). Bronfenbrenner’s (1979, 2005) ecology of human development provided the framework that Rumberger and Lim (2008) used to describe the influence of the family, school, and community contexts on individual student academic performance. Rumberger and Lim did not view their model as a distinctly new approach to understanding school leaving, but rather an integration of elements drawn from previous models of student behavior and performance (e.g., Finn, 1989; Tinto, 1987; Wehlage, Rutter, Smith, Lesko, & Fernandez 1989). The Conceptual Model of High School Performance depicts the relationship between four individual and three institutional factors with student performance. The individual factors included measures of student educational performance, behaviors, attitudes, and background. Institutional factors included measures of composition, structure, resources, and practices across the three institutional contexts–family, school, and community (Rumberger, 2011; Rumberger & Lim, 2008).

Individual Factors

The line of research examining the relationship between individual student factors and dropout has resulted in a large body of literature cataloging early warning indicators, wherein student factors are used as flags to signal a student’s risk of dropout or non-graduation (Mac Iver, 2013). This literature was reviewed as it was relevant to the aims of this dissertation, including the influence of student background, behaviors, and performance on dropout or on-time graduation.

Student Background. The review of prior research concerning the relationship between student background and educational outcomes focused on the demographic characteristics of the students, including race, ethnicity, gender, immigration, and disability status. Although such patterns have been important in identifying achievement gaps for traditionally underserved student groups, they are neither malleable nor the primary focus of this dissertation. However, these factors are included as they have served an important role in identifying disparities and have acted as significant covariates in quantitative models (De White et al., 2013; Rumberger & Lim, 2008). Although Rumberger and Lim (2008) considered prior performance to be a background factor, they discussed it along with performance factors. As such, a discussion of past performance was included in the section devoted to performance factors.

Demographics. There has been a well-documented push over the last 40 years to demonstrate, understand, and address the disparities in academic performance and graduation rates by race, ethnicity, and gender (De Witte et al., 2013; Rumberger & Lim, 2008). As such, student demographics have been among the most widely examined variables in dropout literature. Nationally, only two-thirds (68%) of Black students and three-quarters (76%) of Hispanic students in the 2008-09 freshman class earned a diploma in four years compared to over four-fifths (85%) of White students (Kena et al., 2015). However, many studies of race and ethnicity have reported contradictory results depending on the covariates included in the analyses. Out of the 96 analyses reviewed by Rumberger and Lim (2008) examining differences in dropout and graduation rates between Black and White high school students, just 5 (5%) found that Black high school students were at higher risk of non-graduation compared to White students after controlling for prior academic performance and other background factors. However, two-fifths (n = 38, 40%) found White students less likely to graduate than Black students and over half (*n* = 53, 55%) found no effect of race on graduation when prior academic performance and other background factors were included in the analyses.

Rumberger and Lim (2008) identified just over 100 analyses investigating the relationship between gender and non-graduation at the high school level. Of these, just over a quarter (*n*=27, 27%) found females to be at higher risk of non-graduation, one-fifth (*n*=20, 20%) found the opposite effect, and just over half (*n*=55, 54%) found no effect for gender. More recent studies considering both gender and race have reported null or clinically meaningless effects after including academic indicators (Allensworth, 2013) or school factors and social class (De Witte & Rogge, 2013). De Witte et al. (2013) suggest that differences in academic outcomes by race, ethnicity, and gender are likely driven by societal inequity and resource imbalances, and that once the conditions that drive the inequity are controlled for, the statistical effects often wane.

Immigration status is associated with an increased risk of non-graduation for Latinos, although not among other ethnic groups (Blue & Cook, 2004; Cataldi & Kewal-Ramani, 2009). This may vary by generation, with more recent immigrants experiencing higher rates of dropout than second or third generation students. Some have argued that like race and ethnicity, immigration status is a proxy for family and community factors (Perreira, Harris, & Lee, 2006). Others have suggested that the differences are related to English language proficiency, which has also been associated with dropout in non-immigrant populations (Halle, Hair, Wandner, McNamara, & Chien, 2012). De Witte et al. (2013) called into question the efficacy of analyzing race and ethnicity without taking into account the potential confounding effects of immigration status and language proficiency.

Having an educational disability has also been associated with an increased risk of dropout and non-graduation. Both Rumberger and Lim (2008) and De Witte et al. (2013) noted higher rates of dropout for students with emotional or behavioral and learning disabilities compared to students who did not receive special education services from their school. A recent study examining administrative data from 12 states in the southern United States found that students with disabilities had a lower graduation rate and were four times more likely to drop out compared to students without disabilities (Smith, Manuel, & Stokes, 2012). Although graduation rates varied by state and disability type, students with an emotional or behavioral disability were less likely to earn a high school diploma and more likely to drop out compared to students with other types of disabilities across all 12 states. In another recent study, Zablocki and Krezmien (2013) found that academic risk factors functioned similarly among students with or without disabilities and the effect of disability type disappeared after controlling for academic, background, and engagement factors.

Rumberger and Lim (2008) concluded that demographic factors were likely functioning as proxies, highlighting differences in other factors such as inequitable access to quality public education, prior educational performance, and family background. De Witte et al. (2013) reached a similar conclusion in their review, placing the mixed findings on demographic factors in the context of wide-ranging inequities. It is important to note that in both reviews the authors identified consistent interaction effects between demographic factors and other predictors of non-graduation, suggesting that background factors may be more useful as control variables or moderators rather than the primary subject of study. Bowers et al. (2013) did not directly address demographic factors in their review of dropout indicators.

Behaviors. Student behaviors both in and out of school are associated with non-graduation. Student behavior has been measured through a myriad of methods, including self-report surveys and directly observed measures collected by schools, such as attendance (Rumberger & Lim, 2008; Rumberger & Rotermund, 2012). This review focused on elements of engagement that schools regularly measure and are available in the data accessed for this dissertation. Subjective measures of engagement and peer affiliation were not available and therefore were not reviewed.

Engagement. Student engagement denotes the manner and degree to which a student participates in academics and school related activities. Prior research has focused on three kinds of engagement: behavioral, emotional, and cognitive (Wang & Eccles, 2012). These constructs have been measured using a variety of methods, including the frequency and quality of participation in classroom or extracurricular activities.

Rumberger and Lim (2008) cited student engagement as a key behavioral antecedent of dropout. In their review, Rumberger and Lim identified 35 analyses using composite measures of engagement; of these more than two-thirds (n=24, 69%) supported the link between higher levels of engagement and lower rates of non-graduation, whereas one-third (n=11, 31%) reported finding no significant relationship between engagement and dropout. Rumberger and Lim noted that the inconsistent operationalization of engagement across studies examining non-graduation made it difficult to compare results.

Studies using directly observed indicators of engagement regularly collected by schools to examine non-graduation most frequently operationalized engagement through attendance (Rumberger & Lim, 2008). This strategy is consistent with the results of a study conducted by Archambault, Janosz, Fallu, and Pagnani, (2009) that found lower levels of engagement as measured by attendance to be related to higher risk of non-graduation, but found no relationship for cognitive or relational engagement with non-graduation. More than two-thirds (13 out of 19, 68%) of the analyses reviewed by Rumberger and Lim reported a link between lower rates of attendance and non-graduation. Multiple cohort studies found that students with higher rates of ninth grade attendance were more likely to graduate on time (Carl, Richardson, Cheng, Kim & Meyer, 2013; Mac Iver & Messel, 2013). Bowers et al. (2013) identified attendance among the most efficient predictors of non-graduation; however, the precision of the relationship depended on how attendance was operationalized within each study. De Witte et al. (2013) noted that engagement, usually operationalized in the dropout literature using attendance, is related to dropout, however, other factors such as credits earned or promotion may have more predictive utility.

Performance. The conceptualization of educational performance by Rumberger and Lim (2008) included three dimensions: (1) achievement, (2) educational persistence, and (3) attainment.

Achievement. Both test scores and grades are prominent in studies of dropout and on-time graduation. Of the 389 analyses identified by Rumberger and Lim (2008) over half included some measure of achievement. At the high school level almost two thirds (31 out of 50, 62%) found higher test scores were related to lower risk of dropout and two thirds (30 out of 45, 67%) supported the relationship between higher grades and a lower likelihood of dropout. Bower et al. (2013) found measures of change over time (e.g., standardized math scores, GPA) to be the most accurate predictors of early school leaving. The findings reported by Bower et al. support Rumberger and Lim's conceptualization of dropping-out as a process that unfolds over time.

In response to the No Child Left Behind Act of 2001 (P.L. 107-110), many states have used high school standardized tests as a high stakes graduation examination that students must pass in order to be eligible for a diploma (Holme, Richards, Jimerson, & Cohen, 2010; Reardon, Arshan, Atteberry, & Kurlaender, 2010). The evidence has not suggested that exit exams increase non-graduation in aggregate. There is, however, a link between high school exit exam requirements and lower graduation rates for students with low English aptitude, especially among minority and low-income students (Reardon et al., 2010).

Educational Persistence: Prior Dropout and Mobility**.** Rumberger and Lim (2008) listed between-school mobility and prior dropout as the two main threats to educational persistence. It is important to note that although educational persistence increases the likelihood of graduation, it does not equate to graduation.

Prior Dropout. A study conducted by Berliner, Barrat, Fong, and Shirk (2008) of a school district in southern California reported that of the 35% of students who dropped out at least once, one third (31%) reenrolled in school. Students who dropped out in the first or second year of high school were more likely to reenroll than students who dropped out of later grades. Nearly half of the students who dropped out in the first (47%) or second year (42%) of high school reenrolled, whereas less than 10% of the students who dropped out in their third or fourth year reenrolled. Of those who did reenroll, 18% graduated within a year of their expected graduation date. Notably, students who reenrolled after a drop out event in their fourth year were more likely to earn a diploma (67%) than students who reenrolled after dropping out in their first (10%), second (35%), or third year (45%). This highlights the importance of considering dropout as an event rather than a permanent outcome.

Mobility. Student mobility has been linked to delays in academic progress and disruptions in social adjustment for students at all grade levels (Benenson, Markovits, Thompson, & Wrangham, 2011; Dupere, Archambault, Leventhal, Dion, & Anderson, 2015; Fantuzzo, LeBoeuf, Chen, Rouse, & Culhane, 2012). Students who experienced between-school or residential mobility in high school had an increased risk of dropout in 10 of the 14 analyses included in Rumberger and Lim's (2008) review. In a recent study Metzger, Fowler, Anderson, and Lindsay (2015) found that middle and high school students who moved one or more times during a 12-month period were half as likely to earn a diploma by the age of 25, regardless of the relative wealth of the new neighborhood of residence. Students who experienced mobility during their high school years tended to have lower scores on standardized tests in reading and mathematics (Cutuli et al., 2013; Obradovic et al., 2009; Voight Shinn, & Nation, 2012) and lower rates of graduation (Rumberger, 1987; Rumberger & Lamb, 2003) compared to their non-mobile peers. Although the experience of mobility seems to function similarly across ethnic groups, Black and Latino students experience higher rates of mobility (Parke & Kanyongo, 2012; Rumberger & Larson, 1998) and students with fewer economic resources may be more sensitive to the impact of mobility on academic development (Feil, Haskins & Turley, 2013).

Attainment. The interrelated dimensions of credit accumulation and promotion, or its inverse, retention, are the factors most often used to operationalize attainment (Rumberger & Lim, 2008). Generally, such studies have identified students who are 1 or 2 years over the modal age for their grade as having been retained in a prior grade (Rumberger, 2008; Warren & Saliba, 2012). Three quarters (75%; 37 out of 50) of the studies reviewed by Rumberger and Lim found that students who were retained in elementary and middle school were more likely to drop out of high school and less likely to earn a high school diploma than students who had not been retained.

Unlike elementary and middle school—where students may be retained or promoted for reasons, such as immaturity or social promotion, that are unrelated to their academic performance—promotion in high school is a function of a student earning sufficient credits to advance to the next grade. Allensworth and Easton (2007) used the *on-track indicator,* a combined measure of low-course credits and failure of a core academic course (mathematics or English) in the ninth grade, to identify students who were not on a path towards graduation. Bowers et al. (2013) found that the on-track indicator demonstrated high precision, correctly identifying three-fourths of those at risk of non-graduation and maintaining a false positive rate below 16%. Two recent studies using the on-track indicator found similar results, concluding that credit accumulation and failing a core academic course in the ninth grade were effective indicators of risk for non-graduation above and beyond student characteristics and prior performance (Hartman, Wilkins, Gregory, Gould, & D'Souza, 2011; Norbury et al., 2012).

Institutional Factors

Using Bronfenbrenner's (1979, 2005) ecological model of human development, Rumberger (1983, 1987) encouraged researchers to consider how the family, school, and community contexts influence individual student outcomes. Rumberger and Lim (2008) argued that differences in (1) composition, (2) structure, (3) resources, and (4) practices are important for understanding student outcomes across settings. Previous reviews have identified family and community level factors that significantly influence a student's likelihood of graduating high school on time; however, schools do not regularly collect information necessary to measure such factors (De Witte et al., 2013; Rumberger & Lim, 2008). As such, family and community factors are beyond the scope of this dissertation and were not addressed in this review. In addition, information pertaining to school resources are not included in the data accessed for this dissertation and therefore were not included in this review.

Composition. A school's composition refers to the makeup of the student body in a given school in regards to student characteristics (Rumberger & Lim, 2008). Several studies have reported direct relationships between higher likelihood of non-graduation and higher school-level concentrations of student characteristics such as non-promotion (Rumberger & Thomas, 2000; Subedi & Howard, 2013), student mobility (Rumberger & Palardy, 2005), low income (Rumberger & Thomas, 2000), and minority students (Sander, 2001). In addition, an unbalanced composition may signal high levels of other related factors. For example, a school with a high concentration of low-income students may have more academic or behaviorally at-risk students, more student mobility, fewer experienced teachers, higher staff turnover, fewer resources, and higher concentrations of minority students; which have all been linked to increased risk of non-graduation (De White et al., 2013; Rumberger & Lim, 2008). Some researchers have reported that the effects of school composition on dropout and on-time graduation disappear after school climate factors were included in the analyses, suggesting that school climate factors may mediate the relationship between school composition and non-graduation (Rumberger & Lim, 2008).

Structural Factors. Location, size, and school type are the constructs most widely used to operationalize school-level structural factors (Rumberger & Lim, 2008). The location was held constant in this dissertation by focusing the analyses on a single school district. Thus, the impact of location on non-graduation was not addressed here. The research on school type has examined differences in academic outcomes for students who attend private, parochial, or public schools. The data accessed for this dissertation were limited to students attending public schools. Therefore, school type was not addressed. This leaves school size as the sole structural factor addressed in this dissertation.

School size. In their review, Rumberger and Lim (2008) identified three analyses where students attending large high schools were more likely to drop out, three where students were less likely to drop out, and eight that reported no significant effects. Researchers have noted the difficulty of isolating the impact of school size on student outcomes as interventions that manipulate school size tend to take place as part of larger school reform efforts (Schwartz, Stiefel, & Wiswall, 2013). A study, recently commissioned by the state of Maryland, found that smaller school size was significantly associated with small increases in standardized test scores for high schools (Humann, Palaich, Fermanich, & Griffin, 2015). A recent meta-analytic review by Luyten, Hendriks, and Scheerens (2014) considered the effect of school size on student outcomes; their results supported Rumberger and Lim's description of the literature as yielding mixed results.

Practices: School Climate. Early studies considering the impact of school climate on student outcomes tended to focus on observed characteristics of the student or school. More recent efforts to define and measure school climate have focused on the subjective experience of students, parents, or teachers regarding a school's norms, values, relationships, and physical characteristics (Thapa et al., 2013). In 2007 the U.S. Department of Education (USDE, 2007) proposed a model of school climate that included three overarching dimensions: safety, engagement (or relationships), and the physical environment. In the same year, the National School Climate Council (2007) proposed a model that slightly broadened the USDE definition to include measures of teaching and learning.

Improving school climate has been endorsed as a strategy for preventing dropout by the USDE (2007), the Institute for Educational Sciences (2008), and the Centers for Disease Control and Prevention (CDC; 2009). Thapa, Cohen, Guffey, and Higgins-D'Alessandro (2013) reviewed the existing literature on school climate and noted a consistent relationship between positive school climate as defined by the National School Climate Council (2007) and improved academic achievement. Thapa and colleagues also suggested a link between positive school climate and higher graduation rates, but did not present any supporting evidence. More recently, Peguero and Bracy (2015) identified a relationship between positive student-teacher relationships and reduced odds of dropout but found no relationship with other school climate factors. Other studies have reported lower rates of chronic absenteeism and behavior problems in schools rated by their students as having a positive school climate (Bradshaw, Waasdorp, Debnam, & Johnson, 2014; Durham, Bettencourt, & Connolly, 2014). Overall, the evidence suggests that when measured using empirically validated tools, at least some of the factors used to define a positive school climate are related to lower dropout rates and higher levels of student engagement (Dalton, Glennie, & Engels, 2009; Woolley & Bowen, 2007; Woolley & Grogan-Kaylor, 2006).

Gaps in Understanding

Within the literature on dropout and non-graduation, there is limited research exploring factors related to on-time graduation, which has for the most part been limited to studies of student-level factors (Bowers et al., 2013; De Witte et al., 2013; Mac Iver, 2013). In addition, most studies have focused on non-graduates as a homogenous group, without taking into consideration important student groups such as persisters (Aguiar et al., 2015; De Witte et al., 2013). Despite evidence that student performance is influenced by contextual factors, the influence of the school environment has been largely absent from studies of non-graduation (De Witte et al., 2013; Rumberger & Lim, 2008). This highlights a need for research examining the combined impact of individual and environmental factors on non-graduation for students who persist into and through their fourth year of high school.

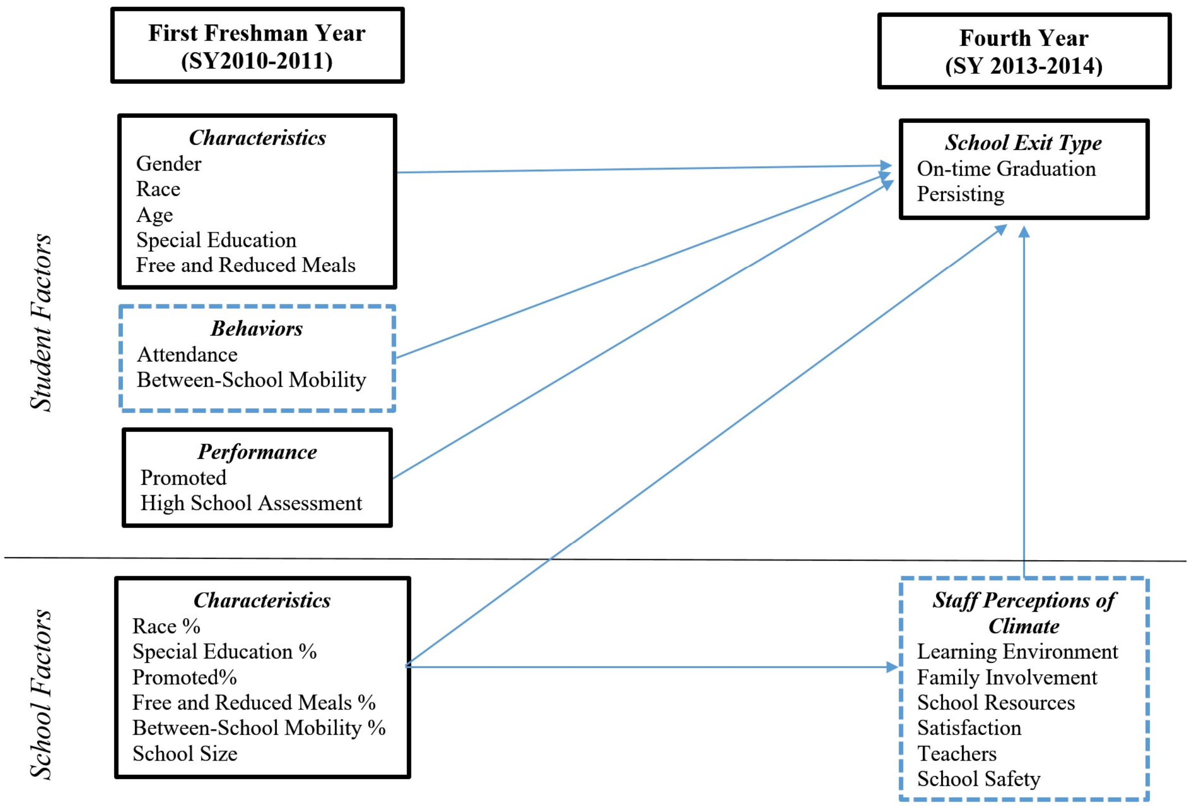
Although it is a recent trend, an increasing number of schools are surveying students, parents, and staff to measure their perceptions of school climate (Thapa et al., 2013; USDE, 2012). Studies are needed to understand the utility of using these measures and resulting data to model the impact of school climate on high school graduation (Thapa et al., 2013). The need for research that helps to elucidate the relationship between school-level factors, including school characteristics and school climate, and risk for non-graduation is made clear by the high concentrations of dropouts and low graduation rates in many poor, urban, majority-minority school districts (Balfanz & Legters, 2004; Rumberger, 2005; DiPaoli et al., 2015). Understanding how school climate is associated with the relationship between student factors and non-graduation is vital for developing interventions to promote on-time graduation.

Adapted Model for Study

For the purposes of this dissertation the Integrated Model of On-time Graduation (Figure 1.2)—informed by Rumberger and Lim's (2008) Conceptual Model of High School Performance—was developed to improve our understanding of how individual and contextual factors relate to student outcomes. The individual constructs examined in this dissertation included student characteristics, behaviors, and performance. School-level constructs included school characteristics and school climate. Factors that comprise each construct are listed within the boxes beneath the corresponding construct. Boxes with a dashed outline house factors that were theorized to be malleable to intervention. Boxes with a solid outline represent factors that were considered to be immutable or difficult to change. The arrows illustrate the relationships among factors that were addressed in this dissertation.

The Integrated Model of On-time Graduation proposed a direct relationship between student characteristics and school exit type. Student behaviors and student academic performance directly influence school exit type. School characteristics have a direct relationship with school exit type that is partially mediated by staff perceptions of school climate. Staff perceptions of school climate directly influence school exit type. This dissertation tested these hypothesized relationships for predicting the odds of persisting and on-time graduation.

Figure 1.2 Adapted Model for Study: Integrated Model of On-time Graduation



The Current Study

The Integrated Model of On-time Graduation was used to inform an examination of the relationships among malleable school- and student-level factors with on-time graduation after controlling for the effects of immutable variables (e.g., student race and gender). Even though most research has treated non-graduates as a homogenous group, there is a need for the examination of risk and predictive factors specific to persisters in order to inform interventions adapted to their unique needs. As such, this dissertation examined the risk and protective factors for on-time graduation among students who persisted into and through their fourth year of high school.

Research Aims and Hypotheses

This dissertation endeavored to identify the student- and school-level factors that contributed to on-time graduation and persisting in the 2013-2014 school year (SY) for students in the SY 2010-2011 cohort of first-time freshmen in Baltimore City Public School System. The analyses focused on malleable factors drawn from data regularly collected by the school district. Specifically, the following research questions were addressed:

Research Question 1. Do student odds of on-time graduation and persisting vary across schools?

Research Question 2. Do student- and school-level factors contribute to the odds of on-time graduation for students who persist into and through their fourth year of high school?

Research Question 3. Do staff-reported school climate factors contribute to the odds of on-time graduation after controlling for other student- and school-level characteristics?

Research Question 4. Do staff-reported school climate factors mediate the relationship between the percent promoted and the odds of on-time graduation and persisting?

CHAPTER TWO: METHOD

The methods for addressing each research question in the examination of the relationship between student- and school-level factors with on-time graduation and persisting are detailed below. First, the data sources and data protections are described, followed by a description of the sample selection criteria and sample characteristics. This is followed by a description of the measures included in the analyses. Next, the data analysis plan is described, including data cleaning, preliminary data analyses, missing data handling, and assumption checking. This chapter concludes with a description of the analytic strategies used to address each research question.

Data Sources

All student- and school-level data were drawn from the Maryland Longitudinal Data System (MLDS) with the exception of school climate data, which came from public records reported by Baltimore City Public School System (BCPSS, 2014a). The Maryland Longitudinal Data System Center (MLDSC) is an independent unit of State government responsible for building and maintaining a statewide longitudinal data system that includes linked K-12, post-secondary, and workforce data (Maryland Longitudinal Data System Center, n.d.). The MLDSC includes de-identified individual level data for all students attending public schools in Maryland beginning with the 2007-2008 school year. Data were collected in real-time by school site staff and reported annually by school districts to MSDE.

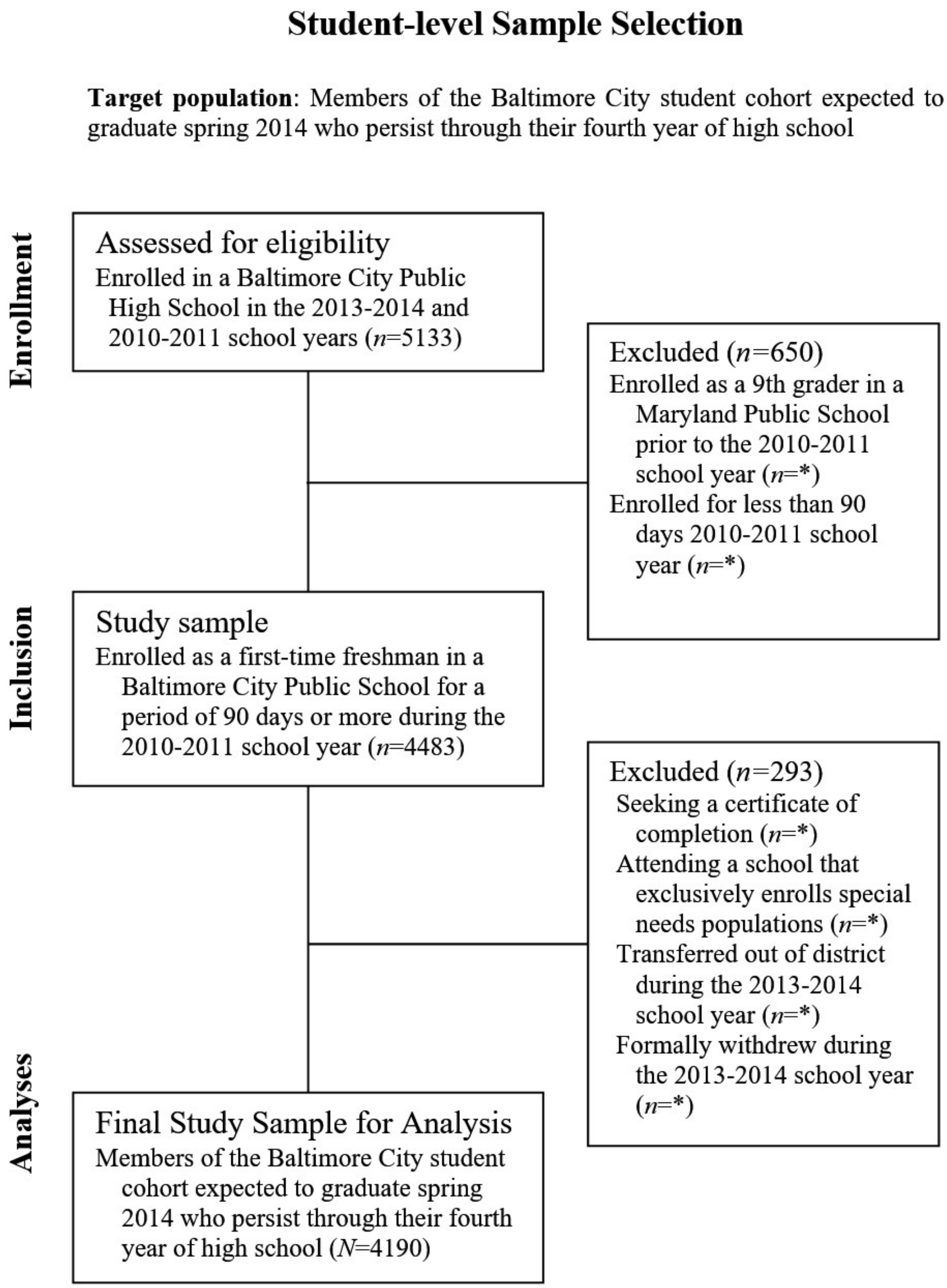
Data Protections and IRB

The Maryland Longitudinal Data System Center requires a federal background check and security training prior to accessing data. The data are housed on a protected server and can be accessed through a password protected virtual desktop. All data analyses must be conducted within the virtual desktop architecture. Data cannot be saved or transported outside of this framework. For this dissertation, the researcher underwent the required federal background check and completed all relevant security training. A static research file was created within the virtual desktop framework and stored on the MLDSC server. To protect confidentiality, all findings were aggregated to the school level. In order to ensure compliance with the MLDSC reporting standards, all percentages were rounded to the nearest whole number and any categories that included fewer than 10 students or comprised less than 5% of the relevant student groups were excluded from the analyses and reported findings (NCES, 2010). In addition to the previously stated security precautions, a research protocol was submitted to the University of Maryland Institutional Review Board and deemed exempt.

Sample Selection

An illustration of the student-level sample selection procedures for this dissertation is presented in Figure 2.1. Students were assessed for inclusion in the study sample if they had attended a BCPSS High School in the 2013-2014 school year and were enrolled as first-time freshmen in a BCPSS high school for a period of 90 days or more during the 2010-2011 school year. Per the focus of this dissertation on persisting and on-time graduation, students who formally withdrew from school and did not re-enroll during the 2013-2014 school year were excluded from this dissertation. In addition,

Figure 2.1 Consort Diagram for Selection of Study Sample.



Note. This flowchart is an adaptation of the flowchart offered by the CONSORT Group (Altman et al., 2001; Moher, Schulz, & Altman, 2001). Journals publishing the original CONSORT flowchart have waived copyright protection. * Frequencies were suppressed per MLDSC data reporting guidelines.

because this dissertation focused on a single school district, students who transferred out of the district or to a non-public school during the 2013-2014 school year were removed from the sample. Students who attended schools that exclusively enrolled special education students or were designated as seeking a certificate of completion were removed from the sample as the services provided and populations served were, by design, distinct from the general population.

Students in the study sample were enrolled in 40 BCPSS high schools. The school-level characteristics were determined by examining the characteristics of all students enrolled as ninth-graders in each of the 40 included schools for a period of 90 days or more during the 2010-2011 school year. This was done to measure the effect of school composition on the outcomes of students who persisted into and through their fourth year of school.

Sample Characteristics

Student-level characteristics of the sample used for this dissertation are presented in Table 2.1. More than three-quarters of the 4,190 students in the final sample graduated at the conclusion of the 2013-2014 school year (n=3,264, 78%). Females were slightly outnumbered by males in the final sample. Nine out of 10 students in the final sample were Black and about two-thirds were eligible for the free and reduced-price meals program (FARMs). By the end of their first-freshmen year a little less than half of the students in the sample had passed at least one high school assessment (HSA) and about 86% were promoted to the 10th grade. About 1 in 6 (16%) of the sample received special education services and about 1 in 10 students changed schools at least once in their first-freshmen year. On average, students in the sample were just under 15 years of age (M =

14.7; *SD* =.60) when they began their first-freshmen year and attended about 32 weeks (M = 32.32; SD = 1.37) in the 2010-2011 school year.

Table 2.1

Categorical Descriptive Statistics for the Study Sample (N=4190)

		f	%
School Exit Type	On-time Graduate	3,264	78
	Persister	926	22
Gender	Female	2,196	52
	Male	1,994	48
Race	Black	3,735	89
	Other Race	455	11
Special Education	Yes	648	16
	No	3,542	84
Free and Reduced-priced Meals (FARMs)	Eligible	3,248	77
	Not Eligible	942	23
Between-school Mobility	Changed Schools	373	9
	No Change	3,817	91
Passed at Least One High School Assessment	Yes	3,254	78
	No	936	22
Promoted to the 10th grade	Promoted	3,553	85
	Not Promoted	630	15

Measures

The variables included in this dissertation were selected based on their relationships to dropout and on-time graduation as documented in the existing literature. This section begins by describing the steps taken to ensure compliance with the MLDSC reporting standards. This is followed by a description of the variables included in this dissertation and how they were operationalized. Variable measurement level and response options are presented in Table 2.2.

MLDSC Data Reporting Compliance

The following steps were taken to ensure MLDSC reporting standards. Crosstabs were run for categorical independent variables by school to identify student groups with cell sizes below 10 or that represented less than 5% of the total population. The variables describing immigration status, student ethnicity, English language learner status, and dropout events in the first-freshmen year did not meet this requirement and were therefore excluded from the analyses as per the guidance issued by the MLDSC legal counsel (NCES, 2010). All racial groups other than Black were below the MLDSC reporting threshold and were therefore combined into a single student group labeled "Other Race."

Dependent Variable

School exit type. School exit type was coded as a dichotomous variable indicating that a student either persisted through four years of high school without earning a regular diploma (0 = Persister) or completed the requirements for a Maryland High School Diploma by the end of SY 2013-2014 (1 = On-time graduate).

Student Characteristics

Gender (Female). Was dummy coded as a dichotomous indicator describing whether a student identified as Male (0) or Female (1). The data did not include a code for transgender or gender non-conforming.

Table 2.2

Study Variables Measurement Level and Response Options or Range

Factor	Measurement Level (Response Options or Range)
Outcome Variable (2013-2014)	
School Exit Type	Categorical (0 = Persister, 1 = On-time Graduate)
Student Background (2010-2011)	
Gender (Female)	Categorical (0 = Male, 1 = Female)
Race (Black)	Categorical (0 = Other; Black = 1)
Age	Continuous
Special Education	Categorical (0 = No, 1 = Yes)
Free and Reduced Priced Meals	Categorical (0 = No, 1 = Yes)
Student Behaviors (2010-2011)	
Attendance	Continuous (18 - 36 weeks)
Between-School Mobility	Categorical (0 = No, 1 = Yes)
Student Performance (2010-2011)	
Promoted	Categorical (0 = No, 1 = Yes)
Passed High School Assessment	Categorical (0 = No Pass OR No Attempt, 1 = Pass)
School Characteristics (2010-2011)	
% Race (Black)	% of the 9th grade class identifying as Black/10 (0-10)
% Free and Reduced Priced Meals	% of the 9th grade class eligible for FARMs/10 (0-10)
% Between-School Mobility	% of the 9th grade class that transferred between schools/10
% Promoted	% of the 9th grade class promoted to 10th grade/10 (0-10)
% Passed High School Assessment	% of the 9th grade class that passes at least one HSA/10 (0-10)
School Size	Total student enrollment in the 2010-2011 School Year
School Climate – Staff (2013-2014)	
Administration	Continuous dimension score/10 (2.5-10)
Family Involvement	Continuous dimension score/10 (2.5-10)
Learning Climate	Continuous dimension score/10 (2.5-10)
Physical Environment	Continuous dimension score/10 (2.5-10)
School Safety	Continuous dimension score/10 (2.5-10)
Satisfaction with the School	Continuous dimension score/10 (2.5-10)
School Resources	Continuous dimension score/10 (2.5-10)
The Teachers	Continuous dimension score/10 (2.5-10)

Race (Black). Was dummy coded as a dichotomous indicator of student race. Student were coded as Other (0) if they identified as White, American Indian or Alaska Native, Asian, and Native Hawaiian or Other Pacific Islander. Students were coded as Black (1) if they identified as Black or African American. The other race category was created because each of the included student groups comprised < 5% of the final sample and thus could not be reported on individually as per MLDSC guidelines (NCES, 2010).

Age. Was coded as a continuous variable indicating students age in years on August 30, 2010.

Special education. Was coded as a dichotomous variable describing whether students were identified as having received special education services during their first-freshmen year (0 = No, 1 = Yes).

Free and reduced priced meals (FARMs). Was coded as a dichotomous variable describing whether students were eligible for the free and reduced-price meals program during their first-freshmen year (0 = No, 1 = Yes).

Student Behaviors

Attendance. Was calculated as the number of five-day school week equivalents that students were in attendance during the August-to-June reporting period of the 2010-2011 school year, ranging from 18 to 36. In order to improve comparability of students who transferred into the school system after the beginning of the school year, attendance was calculated using a two-step procedure. First, a ratio of days attended to days enrolled was calculated for each student. Secondly, the ratio was used to calculate the number of weeks that a student would have attended if they were enrolled for the entire 2010-2011 school year (Max = 36 weeks).

Between-School Mobility. Was coded as a dichotomous variable indicating whether students attended more than one school during their first-freshmen year (0 = No, 1 = Yes).

Student Performance

Promoted. Was coded as a dichotomous variable indicating whether students earned sufficient credits to advance to the 10th grade at the end of their first-freshmen year (0 = No, 1 = Yes).

Passed High School Assessment (Passed HSA). Starting with the 2005 freshman cohort, students attending a Maryland public high school were required by the state to take and four high school assessments (Algebra/Data Analysis [Math], English, Biology, and Government) as a prerequisite for earning a diploma (for information about alternative methods for meeting the HSA requirement see Maryland High School Assessments, 2014). Pass HSA was coded as a dichotomous variable indicating whether a student passed at least one HSA by the end of their first-freshmen year (0= No, 1=Yes). If a student had non-passing score or no recorded score for an HSA by the end of their first-freshmen year they were coded as a 0 (No).

School Characteristics

The variables used to operationalize school characteristics were based on the student-level characteristics for all ninth graders attending a BCPSS high school in the 2010-2011 school year. The one exception was school size, which was calculated using the total student enrollment for grades 9-12 in the 2010-2011 School Year. Level-2 measures of school characteristics were calculated based on the last school a student attended in their first-freshmen year. All school-level characteristics, were rescaled by dividing the parameters by 10, in order to produce ranges more similar in scale to the student-level parameters and improve the interpretability of the results (Kline, 2011).

Race (Percent Black). The percent of ninth graders in each school who identified as Black in the 2010-2011 school year.

Percent special education. The percent of ninth graders in each school who received Special Education services in the 2010-2011 school year.

Percent free and reduced priced meals (Percent FARMs). The percent of ninth graders in each school who were eligible for the free and reduced priced meals program in the 2010-2011 school year.

Percent between-school mobility. The percent of ninth graders in each school who attended more than one school or education program in the 2010-2011 school year.

Percent promoted. The percent of ninth graders in each school who were promoted to the 10th grade at the end of the 2010-2011 school year. Consistent with the methodology used by MSDE, all ninth graders—including both first-time freshmen and repeating ninth graders—were included in the calculation of percent promoted (MSDE, 2015a).

School size. The total number of students enrolled in each school during the 2010-2011 school year.

School Climate Factors

Staff perceptions of school climate were assessed during the 2013-2014 school year using the Staff version of the School Survey (BCPSS, 2014b). The School Survey was administered anonymously to school staff in January of 2014. All results are reported at the school-level.

The Staff version of the School Survey was developed through a partnership between researchers at Johns Hopkins University and the BCPSS Research and Assessments office. The instrument consisted of 62 questions scored on a four-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (4). Each subscale was scored at the individual level and aggregated to the school level for reporting purposes. Final scale scores ranged from 25-100, with higher scores indicating a greater degree of endorsement of the construct (Durham et al., 2014). Many of the scale items are derivative of previously developed instruments of school climate (e.g., Haynes, Emmons, & Ben Avie, 2001; Raudenbush & Sampson, 1999). The scale included nine subscales: Administration, Family Involvement, Learning Climate, Physical Environment, Safety, Satisfaction, School Resources, Teachers, Finding Meaning, and Creativity. These subscales represent theorized domains of school climate.

Two domains, Creativity and Finding Meaning, were not used in this dissertation because they consisted of one and two items respectively. The items used to construct each domain score as well as the descriptive statistics for the domains included in the analyses are provided in Appendices A and B, respectively. The school climate dimension scores were rescaled by dividing the parameters by 10, in order to produce ranges more similar to the student- and school- level parameters and improve the interpretability of the results (Kline, 2011). Reliability and validity statistics for the School Survey were not publicly available (L. Boberiene, personal communication, September 4, 2015).

Data Analysis

This section describes the steps taken to address the research questions put forth in this dissertation. This includes a description of the steps taken to prepare the data for analysis, preliminary data analyses, assumption checking, and missing data handling. All data analysis for this paper was performed using SAS software, Version 9.3 of the SAS System for Windows. Copyright © 2011 SAS Institute Inc., Cary, NC, USA.

Data Cleaning and Data Quality

Several steps were taken to clean the data and ensure quality. First, existing variables were transformed to create the variables described in the previous section. The data files were then, when appropriate, reshaped from a person-period (long) format to a person-level (wide) format. Next, the data were assessed for sample size adequacy, missing data, and outliers. In addition, data elements were cross-verified to ensure that the values were within the expected range. Finally, data files were merged into a single master file.

Preliminary Data Analyses

Bivariate relationships between categorical independent variables and the dependent variable were tested using chi-square analyses. Bivariate relationships between the continuous indicators and the dependent variable were assessed using the independent samples *t*-test (Cohen, Cohen, West, & Aiken, 2003).

Missing Data Handling

The study design and inclusion criteria precluded any missing data for the outcome variable. Similarly, there were no missing data among the variables describing student and school characteristics. Data were completely missing on the Staff version of the School Climate scale for one school. That school, and the 23 students from the sample who were enrolled in that school, were excluded from the analyses for research questions 3 and 4.

Assumption Checking

All assumptions of the multilevel logistic regression were assessed. Multilevel models with categorical outcome variables were tested using a logit link, which is a special case of linear regression calculated based on the ordinary least squares algorithm. Such models are robust to violations of the assumptions of (1) linearity of the relationship between the independent and dependent variables, (2) multivariate normality, and (3) the assumption of homoscedasticity of the error variances (Cohen et al., 2003).

Studenmund (2014) suggests that including factors with bivariate correlations above .80 may introduce multicollinearity into multilevel models. As such, the assumption of non-multicollinearity was assessed for student and school characteristics by running Pearson's product-moment correlations between normally distributed continuous independent variables (Cohen et al., 2003). The assumption of multicollinearity was not met for the school climate factors drawn from the BCPSS School Survey. Four of the 28 bivariate correlations, among the eight school Climate domains, had correlations at or above the threshold suggested by Studenmund, all relating to the learning climate dimension (see Appendix C). In order to test the scale as it is used in practice, a decision was made to retain all factors consisting of three or more items.

Data Analysis by Research Question

Two methods were employed to address the research questions for this dissertation. First, a series of multilevel models with a logit link were used to assess: (1) the degree of between-school variation in student outcomes, (2) the utility of student-level factors in predicting the odds of school exit type, and (3) the degree to which school-level predictors explain any variation in school exit type after the inclusion of student-level predictors. A multilevel modeling (MLM) approach is the suggested method for analyzing nested data (Raudenbush & Bryk, 2002). This is important for the present dissertation because the experiences of students within a school are not independent of one another. Rather, students enrolled in the same school are theorized to be influenced by features that are specific to that school (Hayes, 2006).

This lack of independence within schools requires the use of methods such as MLM that can account for the nesting of subjects within larger clusters. In addition, MLM can be used to assess the degree of between-group (school) variation in individual (student) outcomes (Raudenbush & Bryk, 2002). To this end, a random intercept model was used to examine the differences in the outcome variables across schools. All additional model parameters were treated as fixed effects. In order to assess between-school differences in persisting and on time graduation, students were nested in the school they attended for their last enrollment in year 4. The second method employed in this dissertation used the process suggested by Zhang, Zyphur, and Preacher (2009) to test the mediation of the relationship between school-level rates of promotion in the 2010-2011 school year and school exit type by staff perceptions of school climate factors in the 2013-2014 school year.

Research Question 1. Do student odds of on-time graduation and persisting vary across schools? To answer research question 1, a multilevel logit model with no predictors (unconditional model) was run to determine whether there was sufficient variability in the dependent variable across schools to justify a MLM. The results of this analysis were used to calculate an intra-class correlation (ICC) that describes the proportion of variance in the outcome variable (school exit type) that was explained by differences between schools. An ICC was calculated by comparing the level-2 variance intercept with the sum of the level-1 and level-2 variance intercept. In MLM with a binary outcome, the dependent variable is assumed to follow a logistic distribution with a level-1 variance intercept of 3.29 and a standard error of 1.8 (Hox, 2002; Hedeker, 2003).

A level-2 variance intercept that is significantly different from zero indicates a can be attributed to differences between schools, providing justification for a MLM approach (Heck et al., 2012). In a simulation study, Maas and Hox (2005) found that multilevel models with level-2 sample sizes as low as 30 were sufficient to produce unbiased estimates of the regression coefficients, variance components, and standard errors of regression coefficients (α=.05). However, for models with level-2 sample sizes of 30 and 50, the standard errors of level-2 variance intercept were underestimated, producing non-coverage rates of 8.9% (α=.011) and 7.4% (α=.026) respectfully. Given the level-2 sample size of 40 for research question 1, the threshold for rejecting the null hypothesis for level-2 variances was adjusted to compensate for the possibility the standard errors of level-2 variance intercept underestimated (α=.011).

Research Question 2. Do student- and school-level factors contribute to the odds of on-time graduation for students who persist into and through their fourth

year of high school? To answer research question 2, a series of multilevel logit models were run to assess the impact of student- and school-level predictors on the odds of school exit type using on-time graduation as the reference group. Predictors were entered into the models in blocks as illustrated in Figure 1.2 above. Model RQ2a included all of the student-level factors as level-1 predictors. Model RQ2b built on Model RQ2a by adding school characteristics as level-2 predictors along with the student-level predictors. Successive models were tested for improvements in model fit and predictive utility. Improvements in model fit were assessed using the log-likelihood ratio test. If the observed difference in log likelihood was significant, the model with more parameters was preferred. If the statistic was not significant, the model with fewer parameters provided a better fit to the data (Heck et al., 2012). Two additional measures were used to assess the fit of successive models, Akaike's Information Criteria (AIC) and Schwarz's Bayesian Criteria (BIC); for each measure a lower score indicates a better fit to the data (Singer & Willett, 2003).

The results provided an estimate of the log odds of persisting and on-time graduation for students in the sample. The log odds were exponentiated to produce odds ratios. This provided an estimate of the relationship between each of the student- and school-level factors and the odds of a student graduating on time, holding all other variables constant.

Research Question 3. Do school climate factors contribute to the odds of on-time graduation after controlling for other student- and school-level characteristics? To answer research question 3, an additional set of multilevel logit models were run to assess the impact of staff-rated school climate factors on the odds of school exit type controlling for student- and school-level predictors. The analyses followed the same methodology as described in research question 2. The results provided an estimate of the impact of staff reported school climate factors on the odds of persisting and on-time graduation for students in the sample after controlling for student- and school-level factors.

Research Question 4. Do school climate factors mediate the relationship between the percent of students in each school who were promoted to the 10th grade at the end of the 2010-2011 school year and the odds of on-time graduation and persisting? Multilevel mediation was assessed using the method outlined by Zhang et al., (2009). Multilevel mediation models using a level-2 factor as a mediating variable have three basic prerequisites (Zhang et al., 2009). First, there must be a direct effect between the level-2 predictor and the outcome, in this case percent of students promoted to 10th grade at the end of the 2010-2011 school year on school exit type. Second, there must be a direct effect between the mediating variable or variables and the outcome. In this case, school climate factors and school exit type. Finally, there must be a direct relationship between the mediated variable and the mediating variable. If the preconditions of the analysis are met, the nature and strength of the mediated relationship are tested using the PROCESS macro for SAS (Hayes, 2013).

CHAPTER THREE: RESULTS

This chapter describes the results of the analyses conducted for this dissertation. First, sensitivity analyses were conducted to estimate the effect of including students that were excluded from the individual sample in the level-2 measures of school characteristics. Second, bivariate analyses comparing the categorical and continuous predictors by exit type are presented. Next, the final analyses for each research question are presented and the model parameters are interpreted.

Sensitivity Analyses

Forty-five percent of students were excluded from the full ninth grade sample (see Table 3.1). One-quarter of students in the full ninth grade sample were excluded because they were not first-time freshmen. An additional 21% of students were excluded for other reasons, including transfer out of the school system, formal withdrawal from school, because they were seeking a certificate of completion, and death. The relevant student groups were combined to create the "Other Reason" category in order to comply with MLDSC data reporting standards.

Table 3.1

Students Excluded from the Full Ninth Grade Sample (*N*=7,626)

	Excluded from Study Sample		Percent of Full Ninth Grade Sample
	f	%	%
Excluded from Study Sample	3,482	100	45
Exclusion Reason			
Not First-time freshmen	1,891	54	25
Other Reason [a]	1,591	46	21

[a] Includes formal withdrawal from the school system, transfer out of the school system, death, or missing.

Table 3.2 presents the results of a comparison of school-level factors for the full BCPSS ninth grade sample and the study sample. Overall, the composition of the full ninth grade sample was significantly different from the study sample on all key indicators. The percentage of students who were female was three points higher in the study sample and the percent of students who were ellligible for FARMs was eight points higher in the study sample. The percent of students that changed schools in the 2010-2011 school year (between-school mobility) was four points lower in the study sample than in the full ninth grade sample. The percent of ninth graders who earned sufficient credits to be promoted to the 10th grade at the end of the 2010-2011 school year was just over 20 points higher in the study sample. The percent of students that had passed at least one high school assessment by the end of the 2010-2011 school year was 14 points higher in the study sample than in the full ninth grade sample.

Table 3.2

Results of Paired Samples t-tests Comparing School-level Factors for the Full BCPSS Ninth Grade Sample and the Study Sample (k=45)

	Full 9th grade		Study Sample				
	M	*SD*	*M*	*SD*	*df*	*t*	*p*
% Black	89.78	12.94	90.77	12.73	43	-2.44	.0189
% Female	45.83	15.35	48.83	16.82	43	-2.59	.0130
% FARMs	72.97	13.82	81.07	11.75	43	-4.98	<.0001
% Between School Mobility	19.12	10.35	14.89	12.08	43	3.16	.0029
% Promoted	59.58	23.61	80.26	15.29	43	-9.62	<.0001
% Passed HSA	47.73	23.54	62.08	20.80	43	-7.23	<.0001

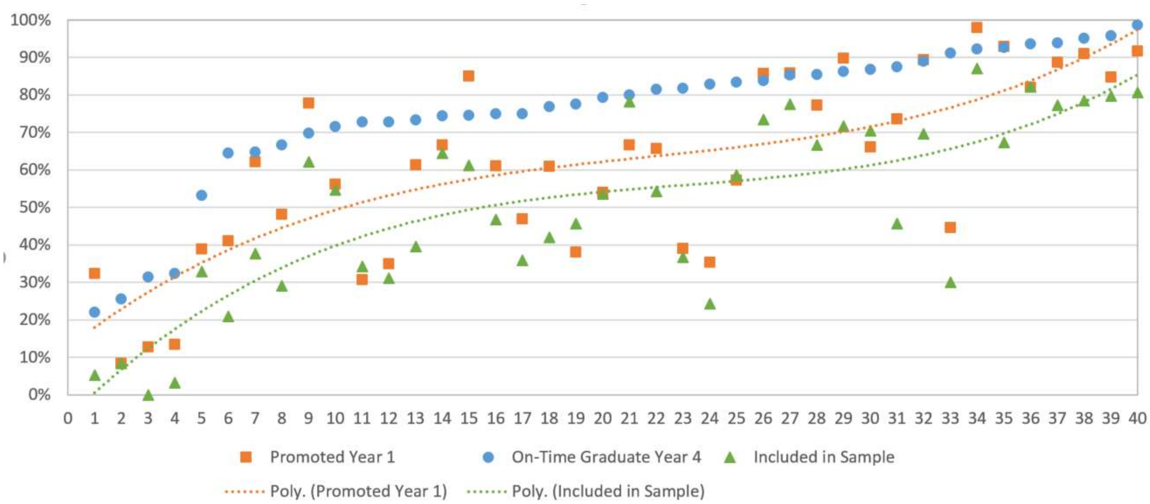
Note. k = the number of schools in the sample.

The purpose of including school-level concentrations of student characteristics was to understand the influence of school composition on student outcomes. The significant differences between the full ninth grade sample and the study sample identified in Table 3.2 suggests that school-level factors calculated using values derived from the study sample would not accurately represent the composition of the schools attended by students in the study sample durring their first-freshmen year. Therefore the full ninth grade sample was used in the calculation of the school-level concentrations of student characteristics.

Next, Pearson product-moment correlation coefficients were computed for the level-2 (school) indicators of the percent of the ninth-grade sample included in the study sample (percent included), the percent of ninth graders who were first-time freshmen (percent first-time freshmen), and the percent of students who were enrolled in SY 2013-2014 and graduated on-time (percent on-time graduate). Percent on-time graduate was significantly positively correlated with percent included ($r = 0.82$, $p > .0001$) and percent first-time freshmen ($r = 0.85$, $p > .0001$). It was hypothesized that the promoting power of a school, operationalized by the percent of students that earned sufficient credits to be promoted to the 10th grade in SY 2010-2011 (percent promoted), functioned as a proxy for the percent of students included in the study sample. This was supported by the finding that percent promoted was significantly positively correlated with percent first-time freshmen ($r = 0.89$, $p > .0001$) and the percent of students included in the study sample ($r = 0.92$, $p > .0001$).

As an additional step, a series of scatterplots were created to assess whether within-school rates of exclusion were likely to influence the outcome of the analyses conducted for this dissertation. Figure 3.1 presents an illustration of the percent promoted and the percent included in each high school ranked by percent of on-time graduates. Polynomial trend lines were added to the figure to illustrate the overall trends of percent included and percent promoted in relationship to percent on-time graduate.

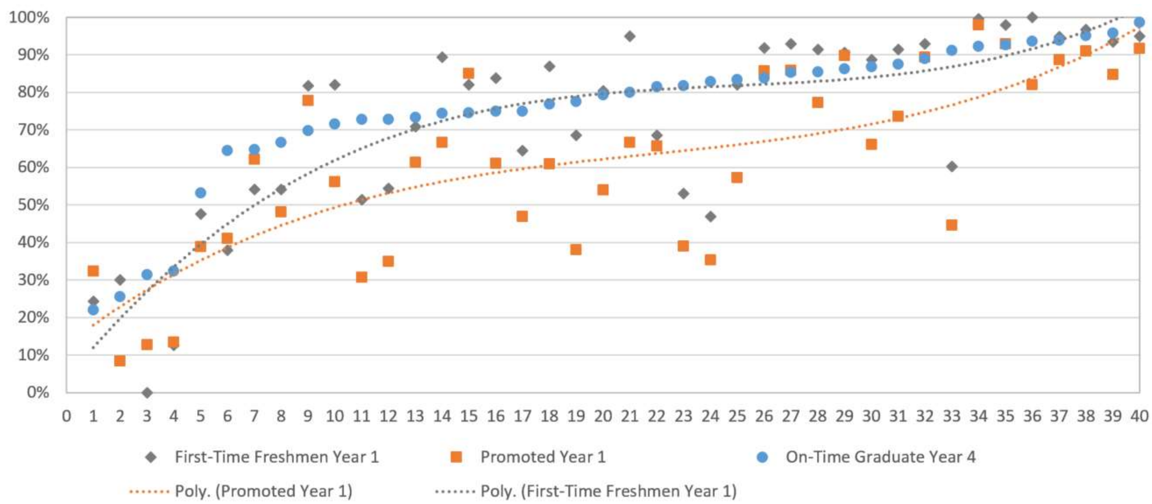
Figure 3.1 School Rankings of Percent Promoted and Percent Included in Study Sample by Percent On-Time Graduate in Year 4



Overall, percent promoted and percent included appear to have polynomial relationships with percent on-time graduate. In addition, both percent promoted and percent included appear to co-vary within each school. This suggests that the variance explained by including percent promoted in the analyses would likely overlap considerably with any variance that would be explained by including percent included or percent excluded.

The relationship between percent promoted and percent included makes sense given that first-time freshmen who are not promoted to the 10th grade in a given year generally enroll as second- or third-time freshman in the subsequent year. Consequently, they would not be included in the study sample. This is illustrated in Figure 3.2, which presents percent promoted and the percent of ninth graders that are first-time freshmen (percent first-time freshmen) in each high school ranked by the percent on-time graduate for each school. Percent promoted and percent first-time freshmen appear to co-vary within each school. This suggests that the variance explained by including percent promoted in the analyses would likely overlap considerably with any variance that would be explained by including percent first-time freshmen.

Figure 3.2 School Rankings of Percent Promoted and Percent First-time freshmen by Percent On-Time Graduate in Year 4



The results of the sensitivity analyses support the use of percent promoted in the analyses, and the omission of percent included (or percent excluded) and percent first-time freshmen. A visual inspection suggests that percent first-time freshmen and the percent included are correlated with percent promoted within each school. Including any combination of these variables would likely introduce multicollinearity into the analyses (Cohen et al., 2003). Percent first-time freshmen and percent excluded are less valuable than percent promoted as independent variables as they both measure behaviors, that for the most part, occurred before the onset of the study period. Thus, percent promoted was given preference in the study model as it is a measure of student behavior within the study period that is directly relevant to the outcome.

Bivariate Analyses

Comparisons of the categorical student-level characteristics by exit type are presented in Table 3.3. The bivariate relationships between the categorical indicators and school exit type were assessed using the chi-square test of independence. There were significant relationships (α = .05) between school exit type and all of the categorical student characteristics.

Table 3.3

Results of the Chi-Square Test of Independence for Categorical Student Factors (N=7,626)

		Persisters		On-time Graduates			
		f	%	*f*	%	χ^2	*p*
Total		926	22	3,264	78		
Gender	Female	356	16	1,840	84	92.953	<.0001
	Male	570	29	1,424	71		
Race	Black	853	23	2,882	77	10.875	0.001
	Other Race	73	16	382	84		
Special Education	Yes	227	35	421	65	74.447	<.0001
	No	699	20	2,843	80		
Free and Reduced-priced Meals	Eligible	798	25	2,450	75	51.144	<.0001
	Not Eligible	128	14	814	86		
Between-school Mobility	Changed Schools	136	36	237	64	49.049	<.0001
	No Change	790	21	3,027	79		
Passed at Least One High School Assessment	Yes	553	17	2,701	83	665.857	<.0001
	No	373	40	563	60		
Promoted	Promoted	554	16	2,999	84	574.914	<.0001
	Not Promoted	365	58	265	42		

Note. All student-level characteristics are calculated based on the student's status at the end of the 2010-2011 school year.

There was a significant relationship between gender and school exit type. Eighty-four percent of females who persisted through their fourth year of school graduated on time compared to 71% of males. The on-time graduation rate for students who identified as Black was 7 points lower than for students in the Other Race category. Students who received special education services had an on-time graduation rate that was 15 points lower than students in mainstream education programs. The on-time graduation rate among students eligible for the FARMs program was 11 points lower than students not eligible for FARMs. Students who experienced mobility in their first-freshman year had an on-time graduation rate 16 points lower than the rate for students who attended just one school during the 2010-2011 school year. The on-time graduation rate for students who passed at least one HSA in their first-freshman year was 23 points higher than students who had not. The on-time graduation rate for students who were promoted at the end of their first-freshman year was 42 points higher than students who were did not earn sufficient credits to advance to the 10^{th} grade.

Comparisons of the continuous student-level characteristics by exit type are presented in Table 3.4. The bivariate relationships between the continuous indicators and school exit type were assessed using the independent samples *t*-test. The results indicate that there were significant differences in mean values for the continuous student characteristics by school exit type (α =.05). On average, on-time graduates were about 4 months (0.34 years) younger than persisters when they entered their first-freshman year. In addition, on-time graduates attended about five more weeks of school in their first-freshman year than persisters. This means that the average on-time graduate attended about 94% of days in their first-freshmen year; compared to 80% for persisters. The latter rate of 20% absences meets the MSDE threshold for habitual or chronic truancy (MSDE, 2015b).

Table 3.4

Results of the T-tests for Independent Samples for Continuous Student-level Factors

	Persister		On-time Graduate				
	M	*SD*	*M*	*SD*	*df*	*t*	*p*
Age	14.960	.700	14.620	.546	1261	13.64	<.0001
Attendance in Weeks	28.959	6.456	33.710	2.845	1029	-21.8	<.0001

Multivariate Analyses

Research Question 1. Do student odds of on-time graduation and persisting vary across schools?

The results for the unconditional multilevel logit model (null model) run to address research question 1 are presented in Table 3.5. The *z*-test for the covariance parameters (z=4. 05, p <.0001) indicated a statistically significant between-school variation in school exit type, providing justification for the use of multilevel modeling techniques (Heck et al., 2012). The covariance parameter intercept in Table 3.5 was used to calculate an intraclass correlation of .25, indicating that a quarter of the total variation in the probability of on-time graduation or persisting can be attributed to differences between schools. This presence of statistically significant between-school variation in school exit type indicates that MLM is the appropriate method for addressing research questions two and three.

Figure 3.3 presents an illustration of the unconditional random intercepts for each high school ranked by the log-odds of on-time graduation. This provides an estimate of the school-specific variation in the probability of on-time graduation due to between-school differences before controlling for student or school-level factors. In the figure, the "d" represents the log-odds of on-time graduation or persisting for an average student in each school respectively. The bar represents the standard error of the estimate. If the standard error bar crosses zero, then the effect was not statistically significant ($p > .05$), indicating that the odds of on-time graduation for students attending that school were not significantly different from the district average. If the standard error bar did not cross zero, the odds of on-time graduation for students attending that school were significantly different from the district average ($p < .05$). If the effect was positive, the likelihood of on-time graduation was greater than the district average for students attending that school. If the effect was negative the likelihood of on-time graduation for students attending that school was below the district average. The likelihood that an average student would graduate on-time was significantly above the district mean at seven schools and significantly below the district mean at six schools.

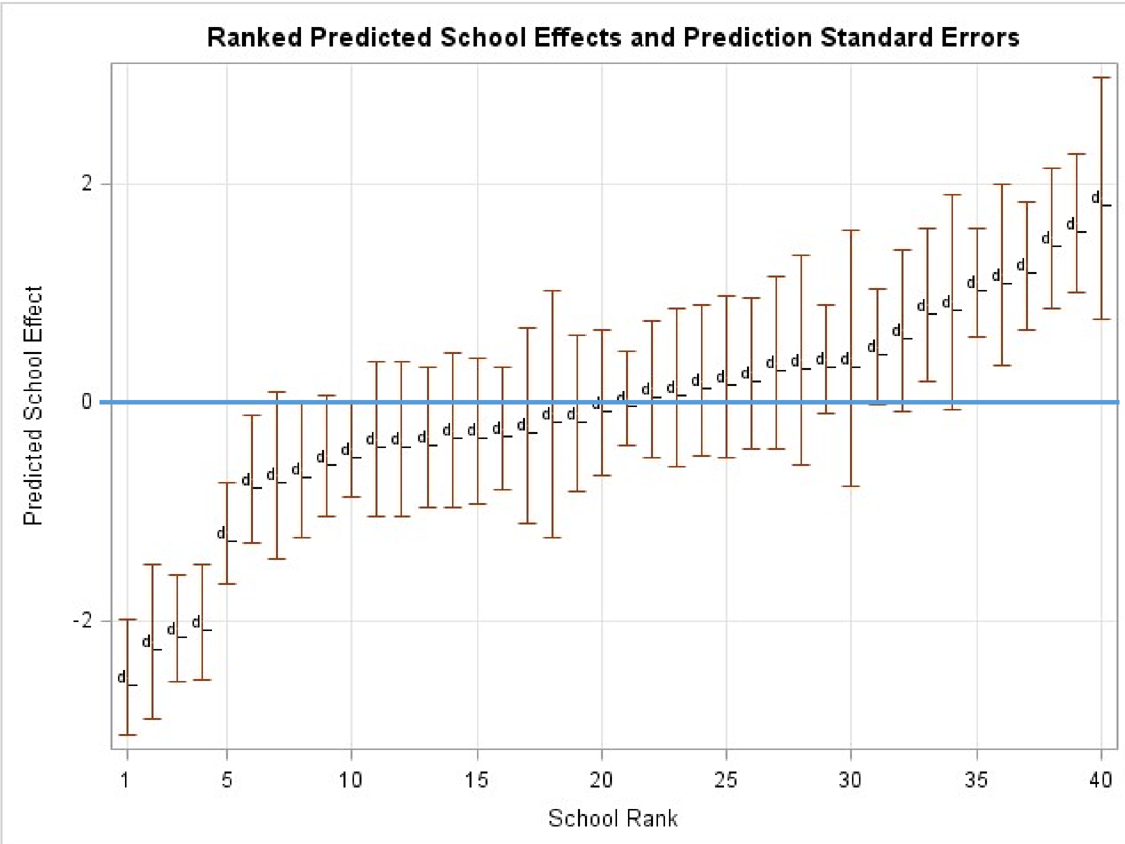
Table 3.5

Model RQ1 Results for the Unconditional Multilevel Logit Model Fitted to Evaluate the Degree of Variance in School Exit Type Due to Between-School Differences (N = 4190)

					95% CI	
	B	*SE*	*t*	*p*	Lower	Upper
Fixed Effects [a]						
Intercept	1.354	.176	39	7.70	<.0001	0.05
Covariance Parameters						
Intercept	1.112	.275	4.05 [b]	<.0001		

a. The reference category is 2.00: On-time Graduation
b. Z-score

Figure 3.3 Illustration of the Random Intercept and Predicted Standard Errors for On-time Graduation for High Schools in the Sample (*k*=40)



Research Question 2. Do student- and school-level factors contribute to the odds of on-time graduation for students who persist into and through their fourth year of high school?

The purpose of research question 2 was to examine the relationships between student- and school-level characteristics and the odds of persisting versus on-time graduation. To address this question, a series of multilevel logit models were run that included a set of within- and between-school predictors as fixed effects: (1) in Model RQ2a student-level factors were entered as level-1 predictors and (2) in Model RQ2b school characteristics were entered as level-2 predictors along with the student-level predictors from model RQ2a.

A log likelihood difference test was conducted to identify whether the inclusion of additional parameters in each successive model resulted in a significant improvement in model fit (Ene et al., 2015). The results, presented in Table 3.6, indicate that the inclusion of the student-level predictors in Model RQ2a resulted in a significant improvement in model fit over the null model (χ^2 (9) = 597.230, $p < .0001$). The inclusion of school-level characteristics in Model RQ2b did not result in a significant improvement in model fit compared to Model RQ2a (χ^2 (6) = 7.020, p =.319), indicating that school characteristics did not explain any additional variance in school exit type after controlling for student-level factors. This conclusion is supported by the larger AIC and BIC statistics in Model RQ2b relative to Model RQ2a. Therefore, Model RQ2a is interpreted. The results for Model RQ2b are presented in Appendix D. It is worth noting, in Model RQ2b percent mobility had a p-value of .055.

Table 3.6

Summary of Model Fit Statistics

Model	-2 Log Likelihood	*df*	AIC	BIC	Likelihood Ratio Test			
					Nested in	χ^2	*df*	*p*
RQ1	3724.140	2	3728.14	3731.52				
RQ2a	3126.910	11	3148.91	3167.49	RQ1	597.230	9	<.0001
RQ2b	3119.89	17	3155.89	3186.29	RQ2a	7.020	6	0.319
RQ3a	3035.63	19	3073.63	3105.24	RQ2a	91.280	8	<.0001
RQ3b	3027.080	25	3079.08	3122.33	RQ3a	8.550	6	0.201

The results of Model RQ2a are presented in Table 3.7. Older students and students who were eligible for the FARMs program were less likely to graduate on-time. Being female, having higher levels of attendance, between-school mobility, being promoted, and passing at least one High School Assessment by the end of the ninth grade were related to increased odds of on-time graduation.

Table 3.7

Model RQ2a Results for the Multilevel Logit Model Fitted to Evaluate the Contributions of Student-level Factors on School Exit Type (N=4190)

						95% CI [b]	
	B	*SE*	*t*	*p*	*OR*	Lower	Upper
Fixed Effects [a]							
Intercept	-2.271	1.385	-1.64	.109			
Student Characteristics							
Age	-.185	.078	-2.37	.018	.831	.714	.969
Female	.677	.099	6.85	<.0001	1.967	1.621	2.387
Black	-.040	.174	-0.23	.819	.961	.684	1.351
Special Education	-.029	.122	-0.24	.814	.972	.764	1.235
Free & Reduced Meals	-.293	.130	-2.25	.025	.746	.578	.963
Weeks Attended	.159	.014	11.24	<.0001	1.172	1.140	1.205
Mobility	.324	.159	2.04	.041	1.382	1.013	1.887
Promoted	.764	.126	6.08	<.0001	2.147	1.678	2.746
Passed HSA	1.164	.105	11.04	<.0001	3.203	2.605	3.939
Covariance Parameters							
Intercept	.348	.103	3.36[c]				

a. The reference category is 2.00: On-time Graduate

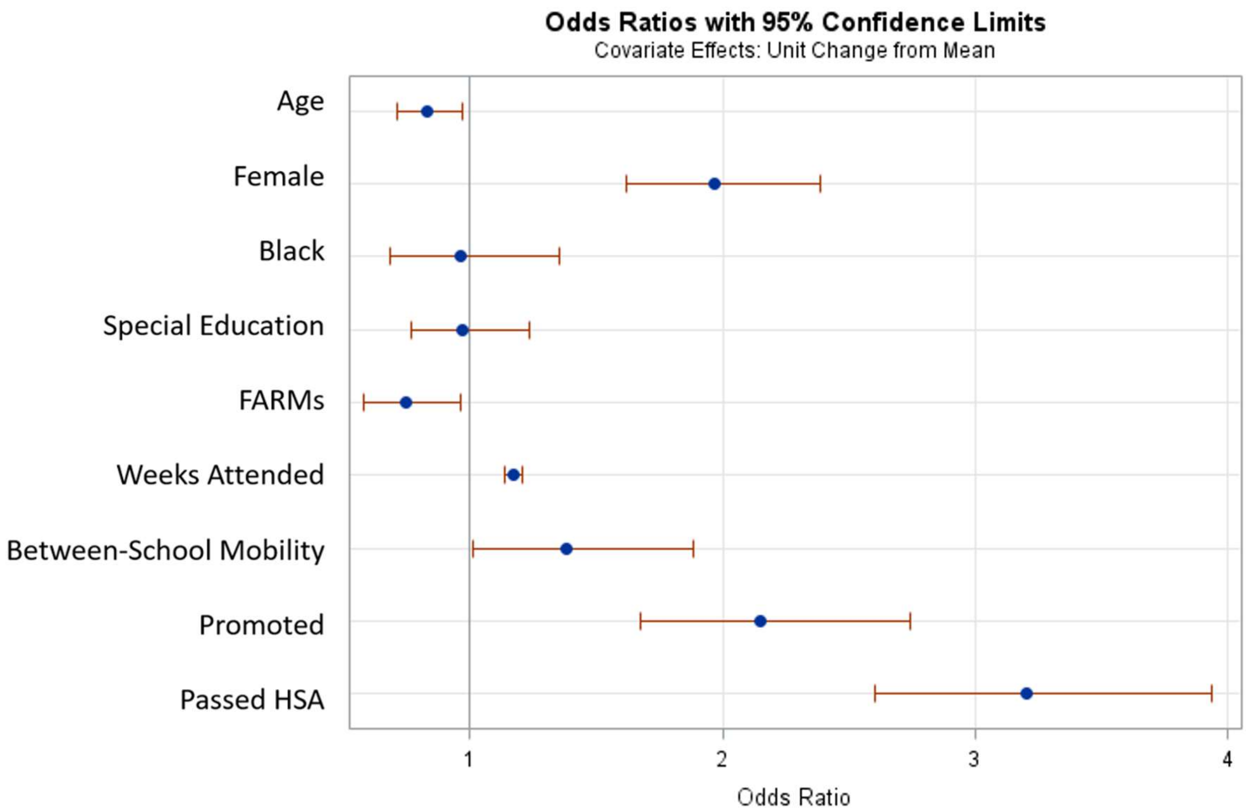
b. Confidence Interval for the Odds Ratio

c. Z-score

For students entering their first-freshman year, being one year older than the mean age represented a 17% decrease in their odds of on-time graduation. Female students had 97% higher odds of on-time graduation than males. Students eligible for FARMs had 26% decreased odds of on-time graduation compared to students who were not eligible for FARMs. Each additional week of school that a student attended during their first-freshman year, represented a 17% increase in their odds of on-time graduation. Students who changed schools during their first-freshman year had 38% increased odds of on-time graduation. Students who were promoted to the 10th grade at the end of their first-freshman year had 115% higher odds of graduating on time compared to students who were retained at the end of the 2010-2011 school year. The odds of on-time graduation were 220% higher for students who had passed at least one HSA by the end of their first-freshman year compared with those who had not passed at least one HSA. Being Black and being identified as requiring Special Education services were not significantly related to the odds of on-time graduation after controlling for the other factors in the model.

An illustration of the odds ratios (OR) and corresponding 95% confidence intervals (CI) for the student-level factors included in Model RQ2a are presented in Figure 3.4. For each parameter, the dot identifies the OR and the horizontal line represents the CI. If the CI crosses one, then the predictor was not significantly related to the odds of on-time graduation ($p > .05$). If the CI does not cross one, the value of the model parameter ($p < .05$) was significantly related to the odds of on-time graduation. If the OR was greater than one, then that parameter was significantly related to increased odds of on-time graduation. If the OR was less than one, the parameter was significantly related to decreased odds of on-time graduation.

Figure 3.4 Illustration of the Odds Ratios and 95% Confidence Intervals of the Contribution of Student-level Factors on Exit Type (N=4190)



Research Question 3. Do school climate factors contribute to the odds of on-time graduation after controlling for other student- and school-level characteristics?

The purpose of research question 3 was to examine the relationship between school climate factors on the odds of persisting and on-time graduation after controlling for student- and school-level characteristics. In order to address existing gaps in the literature, two models were run. First, a model was run that included the student-level factors drawn from Model RQ2a along with the school climate factors (Model RQ3a). Second, an additional model was run that included all of the student- and school-level factors introduced in Model RQ2b as well as the school climate factors (Model RQ3b).

One school was missing data on all School Climate dimension scores. Therefore, that school, and students nested within that school (n=23), were excluded from the analyses for Models RQ3a and RQ3b. A log likelihood difference test was conducted to identify whether the inclusion of additional parameters in each successive model resulted in a significant improvement in model fit (Ene et al., 2015). The results, presented in Table 3.6 above, indicate that the inclusion of school climate factors in Model RQ3a resulted in a significant improvement in model fit over Model RQ2a (χ^2 (8) = 91.280, p <.0001). This conclusion is supported by the decreases in both the AIC and BIC statistics between Model RQ2a and Model RQ3a.

The inclusion of school-level characteristics in Model 3b did not result in a significant improvement in model fit compared to Model 3a (χ^2 (6) = 8.550, p = .201). This indicates that the inclusion of the school characteristics did not explain any additional variance in school exit type after controlling for individual student-level and school climate factors. This conclusion is supported by the larger AIC and BIC statistics in Model RQ3b relative to Model RQ3a. Consequently, Model RQ3a was interpreted. The results for Model RQ3b are presented in Appendix E. It is worth noting, in Model RQ3b staff perceptions of School Resources had a p-value of .061.

The results of Model RQ3a are presented in Table 3.8. The level-1 measure of between-school mobility was no longer significant after school climate factors were included in the model (p = .063). There were no other changes in significance among student-level predictors between models RQ2a and RQ3a. The odds of on-time graduation were 70% higher for students attending a school with a staff reported Family Involvement dimension score 10 points above the mean. The remaining dimension scores were not significantly related to the odds of on-time graduation. An illustration of the odds ratios and corresponding confidence intervals for the parameters included in Model RQ3a is presented in Figure 3.5.

Table 3.8

Model RQ3a. Results for the Multilevel Logit Model Fitted to Evaluate the Contributions of Staff Perceptions of School Climate on Exit Type (n = 4077)

						95% CI [b]	
	β	*SE*	*t*	*p*	*OR*	Lower	Upper
Fixed Effects [a]							
Intercept	-5.310	2.502	-2.12	.042			
Student Characteristics							
Age	-.197	.079	-2.49	.013	.821	.704	.959
Female	.688	.101	6.83	<.0001	1.990	1.633	2.425
Black	-.036	.173	-0.21	.837	.965	.687	1.356
Special Education	-.016	.125	-0.13	.897	.984	.770	1.257
Free & Reduced Priced Meals	-.323	.133	-2.43	.015	.724	.558	.940
Weeks Attended	.162	.014	11.16	<.0001	1.176	1.143	1.210
Between-School Mobility	.303	.163	1.86	.063	1.354	.983	1.865
Promoted	.788	.127	6.18	<.0001	2.198	1.712	2.822
Passed HSA	1.174	.108	10.9	<.0001	3.236	2.620	3.997
School Climate Factors							
Administration	-.179	.197	-0.91	.364	.836	.569	1.230
Family Involvement	.533	.233	2.29	.022	1.704	1.080	2.690
Learning Climate	-.007	.328	-0.02	.982	.993	.522	1.890
Physical Environment	-.018	.099	-0.18	.859	.983	.810	1.193
Safety	-.006	.138	-0.04	.966	.994	.758	1.303
Satisfaction	.022	.285	0.08	.939	1.022	.585	1.785
School Resources	-.398	.250	-1.59	.112	.672	.411	1.097
Teachers	.369	.334	1.1	.270	1.446	.751	2.781
Covariance Parameters							
Intercept	.224	.0800	2.8[c]	.003			

a. The reference category is 2.00: On-time Graduate

b. Confidence Interval for the Odds Ratio

c. Z-score

An illustration of the random intercept and predicted standard errors for on-time graduation for Model RQ3a is presented in Figure 3.6. The figure represents the between school effects for high schools in the sample after controlling for student characteristics and school climate factors. The likelihood that an average student would graduate on-time was significantly above the district mean at one school and significantly below the district mean at three schools; compared to seven above and six below in Model RQ1. This finding along with the improvement in model fit indices reported above in Table 3.6 suggests that Model RQ3a explained some of the between-school variation in school exit type observed in Model RQ1.

Figure 3.5 Illustration of the Odds Ratios and 95% Confidence Intervals for Student Factors and School Climate Factors (*n*=4,177)

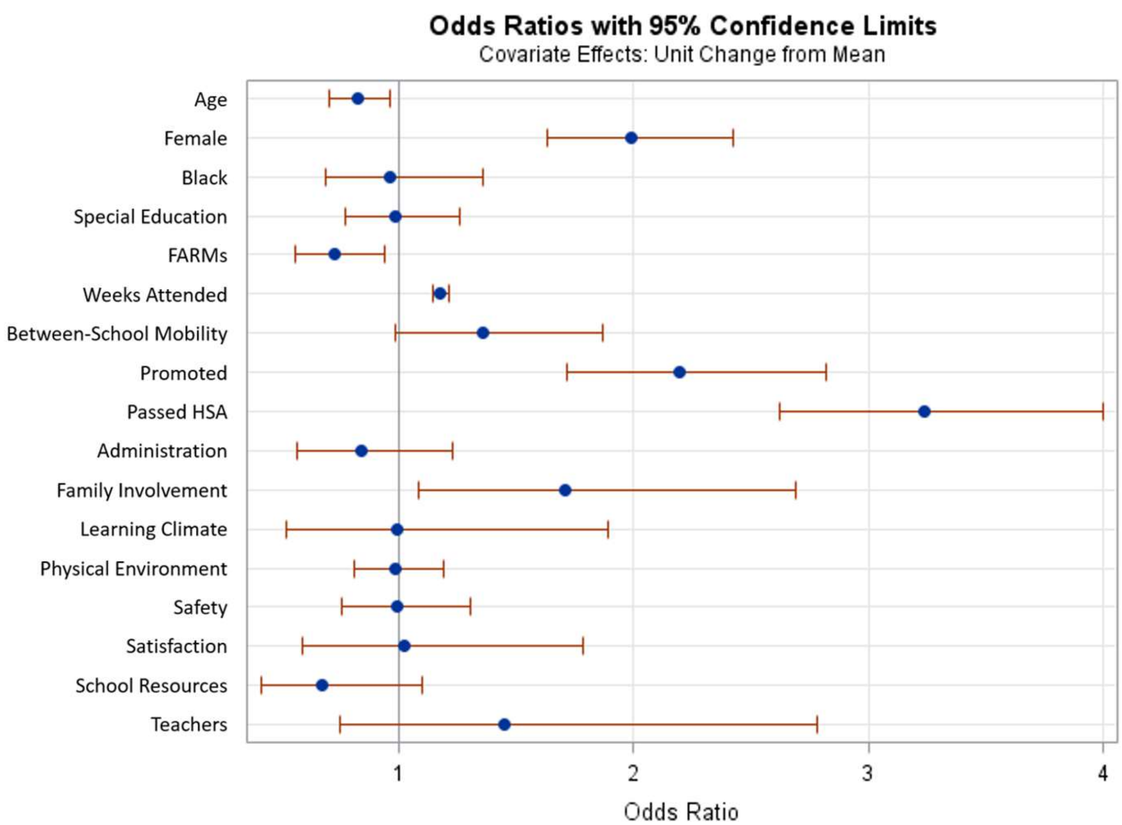
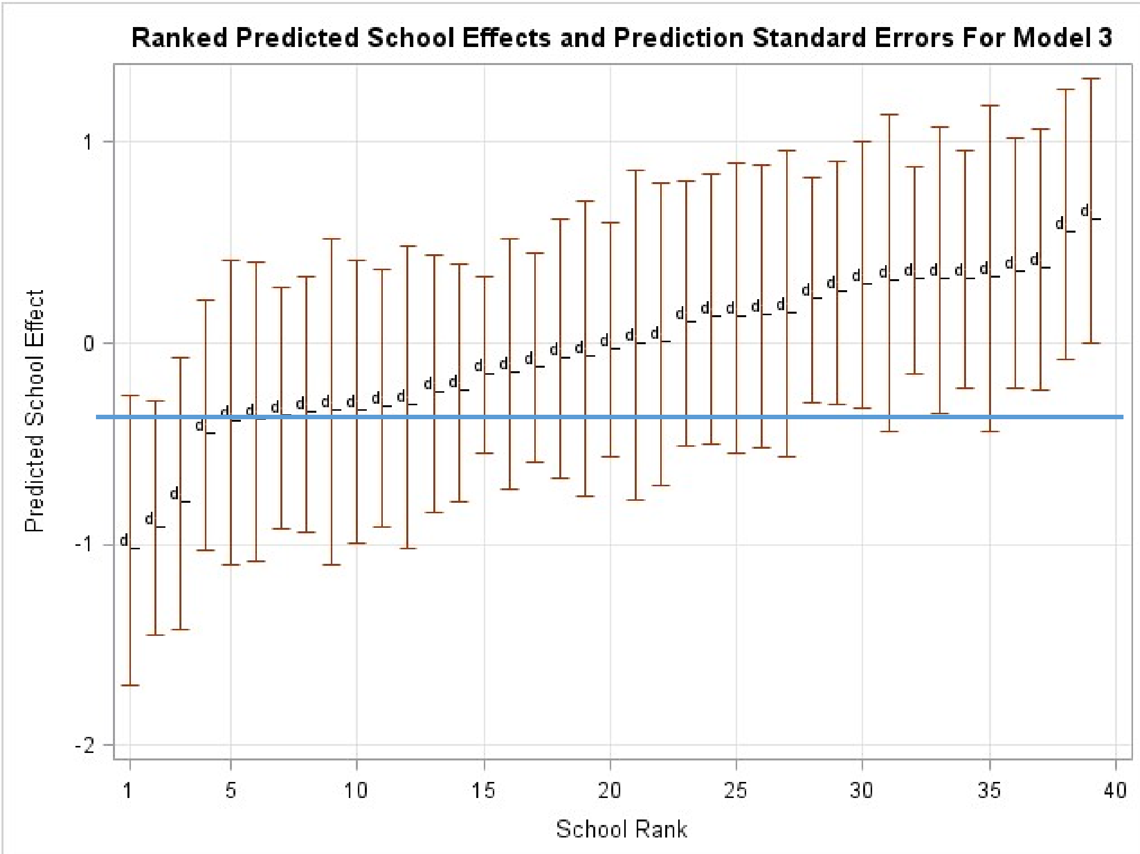


Figure 3.6 Illustration of the Random Intercept and Predicted Standard Errors for On-time Graduation for High Schools in the Sample After Controlling for Student-level and School Climate Factors (*k*=39)



Research Question 4. Do school climate factors mediate the relationship between the percent of students in each school who were promoted to the 10th at the end of the 2010-2011 school year and the odds of on-time graduation and persisting?

The preliminary analyses showed that the conditions for multilevel mediation were not met and thus could not be tested as part of this dissertation. Specifically, the level-2 measure of percent promoted was not significantly related to school exit type after controlling for student-level characteristics and other level-2 measures of school characteristics included in Model RQ2b (*p*=.528; See Appendix D). This result indicates that there was no effect to mediate and thus, the null hypothesis was accepted for research question 4 (Zhang et al., 2009). This is supported by the finding that the inclusion of the level-2 measures of school characteristics—inclusive of school-level rates of promotion—did not significantly improve the fit of the model predicting school exit type to the data (see Table 3.6 above)

Follow-up Analyses

Based on the results of the planned analyses some additional analyses were conducted with the goal of better informing our understanding of the characteristics and later outcomes of students that persisted through their fourth year of high school, but did not graduate. Descriptive statistics for selected year 4 enrollment characteristics by exit type are presented in Table 3.9. First, a variable, labeled *Year 4 School Match,* was constructed to determine whether a student was in the same school during their final enrollments for years one and four. About 30% of students in the sample were enrolled in different schools at the conclusion of years one and four. The rate of mismatch between years one and four was 32 points higher for persisters (55%) compared to on-time graduates (23%).

Table 3.9

Selected Enrollment Characteristics in Year 4 by Exit Type

		Total (N=4,190)		Persisters (n=926)		On-Time Graduates (n=3,264)	
		f	%	*f*	%	*f*	%
Year 4 School Match	Match	2,928	70	417	45	2,511	77
	No Match	1,262	30	509	55	753	23
Year 4 Grade Level	≤ 11th grade	1,053	25	700	77	353	11
	12th grade	3,081	75	207	23	2,874	89

Next, a variable was constructed, labeled *Year 4 Grade Level*, to determine whether a student had earned sufficient credits to advance to the 12th grade by the first day of year 4. Three quarters of students in the study sample were 12th graders by credit at the onset of year 4. However, just 23% of persisters were 12th graders on the first day of year 4 compared to 89% of on-time graduates.

Next, a series of variables were created to describe fifth year high school enrollment and achievements of the four-year persisters (Table 3.10). Two-thirds (66%) of persisters enrolled in, and attended, at least one day at a Baltimore City high school in year 5. One-fifth (19%) of the four-year persisters earned a regular high school diploma from a Baltimore City high school by the end of the fifth year and <5% of the four-year persisters earned a GED, leaving approximately three-quarters (~76%) who enrolled in year 5 without earning a diploma or GED that year.

Finally, a variable was created to assess whether students from the study sample participated in the workforce during the 2014-2015 school year (see Table 3.10). The variable was created using linked wage data provided to the MLDSC by the Maryland Department of Labor, Licensing and Regulation. These data include the wages for persons employed in Maryland who also attended a public Maryland secondary or postsecondary institution. The data do not include wages related to Military Service, Federal Government employment, or independent contractors. More than two-thirds (71%) of the students in the study sample were identified as having worked in Maryland in the fifth year; the rate of workforce participation was 20 points lower for persisters (56%) compared to on-time graduates (76%).

Table 3.10

Selected Descriptive Statistics for High School Enrollment, Achievements, and Workforce Participation in the Year 5 (SY 2014-2014)

	Persisters (n=926)		On-Time Graduates (n=3264)	
	f	%	*f*	%
Enrolled in BCPSS High School	609	66		
5-Year Graduate	174	19		
Earned GED**	*	<5		
Participated in Workforce	516	56	2,480	76

*To comply with MLDSC reporting standards cells that represent less than 5% of the relevant student groups were reported as <5 and frequencies were suppressed. **GED may have been earned in the 2014 or 2015 calendar year.

CHAPTER FOUR: DISCUSSION

The purpose of this dissertation was to identify and examine student- and school-level factors that are related to the odds of on-time graduation and persisting among students who persisted into and through their fourth year of high school. Administrative data sources were used to test the relationships between student- and school-level factors, including school characteristics and school climate factors, with the odds of on-time graduation and persisting. In this chapter key findings from this dissertation are discussed and compared to previous literature on student dropout and on-time graduation. This is followed by a discussion of the strengths and limitations of this dissertation. Finally, the practice, policy, and research implications of the findings are presented, followed by a brief conclusion. After the planned data analyses for this dissertation were complete a meta-analysis of the factors that contribute to on-time graduation was published (Zaff et al., 2016) that informed the discussion in this chapter.

Key Findings

This section begins with a discussion of the findings related to between-school variation in school exit type. This is followed by a discussion of the findings related to student-level factors, school characteristics, and school-climate factors. Finally, the fit of the findings to the study model are assessed.

Between School Variation in School Exit Type

This dissertation found that a quarter of the variation in on-time graduation versus persisting was due to differences between schools. This means that the likelihood that students in this sample would graduate on time differed by as much as 25% depending on the school they attended. This is supported by prior studies that have reported that 17% to

23% of the total variance in dropout was due to between-school differences (Goldschmidt & Wang, 1999; Li, 2007; Rumberger & Palardy, 2005). Taken together, these findings support the assertion that school-level factors should be considered when developing efforts to promote moving persisters toward on-time graduates (Rumberger & Lim, 2008).

Student-Level Factors and School Exit Type

Several key findings presented in this dissertation were consistent with prior research examining the relationship between student-level characteristics and dropout or on-time graduation. This includes the previously identified relationships between higher levels of ninth grade attendance (Carl et al., 2013; Mac Iver & Messel, 2012), promotion (Allensworth & Easton, 2007; Hartman et al., 2011; Norbury et al., 2012), and performance on standardized tests (Reardon et al., 2010; Rumberger & Lim, 2008) with reduced odds of non-graduation. In addition, students who were older when they entered their first-freshman year were less likely to graduate on time. This finding is consistent with prior studies that have used age as a proxy for retention in earlier grades (Rumberger & Lim, 2008; Saunders, Silver, Zarate & Team, 2008). One plausible explanation for this finding—but one that could not be tested here—is that many of the students in this sample who were at risk of not graduating on time had been retained in earlier grades.

De Witte and colleagues (2013) argued that many of the observed differences in academic outcomes associated with individual characteristics are likely artifacts of social inequity and economic imbalances. The finding that students who were eligible for the free and reduced priced meals program during their first-freshman year were less likely to graduate on time would seem to support this line of argument. Similarly, and consistent with prior research on the subject, special education status was not related to the odds of on-time graduation in this sample after controlling for other student-level factors (Zablocki & Krezmien, 2013).

Among the student-level factors examined in this dissertation, two factors produced findings that were discrepant with the prior literature. First, between-school mobility in the first-freshmen year was significantly related to decreased odds of on-time graduation in the student-level model (RQ2a), but was no longer significant after school-climate factors were included in the model (p = .063). This conflicts with prior research that has identified a robust relationship between mobility and higher rates of dropout and non-graduation (Metzger et al., 2015; Rumberger & Lim, 2008).

This may be related to how mobility was operationalized. In the current dissertation, a student was considered to have experienced mobility if they changed schools during their first-freshman year, whereas previous studies have considered longer periods of time or used residential changes to operationalize mobility (Metzger et al., 2015; Rumberger & Lim, 2008; Saunders et al., 2008). Students change schools for a multitude of reasons that were not captured in the data accessed for this dissertation, including residential mobility, student or parental concerns about school performance or safety, or student behavior. In addition, changes due to residential mobility may signal the presence of other intervening factors, such as changes in family structure or finances, as well as concerns about neighborhood-level factors, such as crime. The positive relationship between mobility and on-time graduation suggest the possibility, that for students in this sample, between-school mobility may be—at least partially—a function of students seeking a more favorable academic environment. It is also possible that the dissertation findings differ from prior research due to the focus on on-time graduation and persisting versus dropout.

Second, the finding that female students had higher odds of graduating on-time than males was discrepant with prior research, even after accounting for the mixed nature of such research. When taken at face value this finding seem to conflict with much of the previous research on gender and dropout, that have reported null results or that females were more likely to drop out than males (Rumberger & Lim, 2007). If, however, females drop out at a higher rate, then it may follow that the females who persist into and through their fourth year of high school were more resilient than their male counterparts, and therefore more likely to graduate on time.

School Characteristics and School Exit Type

Despite the fact that between-school differences accounted for 25% of the variance in school exit type, the inclusion of the available level-2 measures of characteristics of the schools that students attended in their first-freshmen year did not explain any additional variance in school exit type after controlling for student-level factors. This finding contradicts prior research that has reported direct relationships between school-level concentrations of student characteristics and dropout or on-time graduation (Subedi & Howard, 2013; Rumberger & Palardy, 2005; Saunders et al., 2008). Previous studies have included fewer individual and school-level factors or larger samples at both level-1 and -2 than were included in the current dissertation (Subedi & Howard, 2013; Saunders et al., 2008). It is necessary to consider the possibility—given the level-2 sample size of 40 for research question 2— that this dissertation did not have sufficient power to detect differences in school exit type stemming from school-level concentrations of student characteristics.

It is also possible that the null findings are related to methodological differences between prior studies and this dissertation. Most prior studies reporting significant effects assessed school characteristics of the school that the student was enrolled in at the time of dropout or graduation (e.g., Rumberger & Palardy, 2004; Subedi & Howard, 2013). In this dissertation, level-2 measures of school characteristics were calculated based on the school a student attended during their final enrollment of their first-freshman year. This decision was made in order to emulate the information that district staff would have available to assess a student's odds of on-time graduation at that point in time. It is important to note that thirty percent of the students in the study sample were not in the same school at the end of years one and four. In addition, (55%) of persisters changed schools between the end of years one and four, compared to just under a quarter (23%) of on-time graduates. Taken together, these findings suggest that school changes that occurred between the end of years one and four may have contributed to the differences between the dissertation results and prior findings.

School size was not significantly related to exit type in this dissertation. There has been a great deal of interest in the literature and among school reform advocates regarding the relationship between school size and student outcomes, however the evidence has presented a mixed picture (Bloom & Unterman, 2014). A recent statewide analysis conducted in Maryland found a small, but statistically significant relationship between smaller school size and higher standardized test scores, but did not address on-time graduation (Humann et al., 2015). Another recent study suggested that smaller school size may not be sufficient to produce improved graduation outcomes, but may impact continued enrollment and on-time graduation as part of holistic school reform efforts (Schwartz et al., 2013). The null finding for school size may also be related to the school changes that may have occurred between the time school size was measured (year 1) and the time the outcome was assessed (year 4).

School Climate Factors and School Exit Type

There were two key findings from this dissertation related to school climate factors. First, students who attended schools with higher levels of Family Involvement, as rated by the staff, had increased odds of on-time graduation. This is consistent with previous research that has reported that youth perform better academically and are more likely to graduate on-time when schools engage parents in the process of educating their children (Iver, Epstein, Sheldon, & Fonseca, 2015; Jeynes, 2012; Peguero & Bracy, 2015).

Second, the majority of school climate factors measured in the BCPSS Staff Survey were not significantly related to school exit type. This is consistent with the findings of a meta-analysis conducted by Zaff et al. (2016), which concluded that the existing evidence does not support a relationship between positive school climate and on-time graduation. In contrast, prior literature has consistently reported significant relationships between positive school climate and multiple positive academic and behavioral outcomes (Thapa et al., 2013). This may suggest that some school climate factors are related to academic factors, such as attendance or achievement, but do not relate directly to on-time graduation. However, null results related to school climate factors should be interpreted with caution given the limitations of the staff version of the BCPSS School Survey.

Fit to the Study Model

The findings presented here provide partial support for the relationships described in the Integrated Model of On-time Graduation. Multiple student-level factors had direct relationships with school exit type; however, the results did not support a direct relationship between school-level concentrations of student characteristics and school exit type. Consequently, the conditions were not met to test mediation of the relationship between school characteristics and school exit type by school climate factors. In addition to the student-level factors, there was support for a direct relationship between one of the school climate factors and school exit type. Overall, the dissertation findings provided some support for the study model, however the null results should be interpreted with caution due to the limitations of the study.

Limitations and Strengths

Multiple limitations that affected this dissertation should be addressed in future studies. The sample for this dissertation was limited to a single mid-sized urban school district, potentially limiting the generalizability of the results. Further, the individual student data collected by the Maryland Longitudinal Data System Center were provided by MSDE, that collected data from local education authorities (LEA) for students attending publicly funded schools, thus the results may not be generalizable to students attending private schools. In addition, in order to prevent the identification of individual schools, no information pertaining to school selectivity or specialization were included in the data for this dissertation. As such, it is not possible to know if differences between selective schools, generalist schools, and schools that explicitly cater to “at-risk” youth, would explain any between-school variance that is not captured by other level-2 factors included in the model.

The manner in which the data were collected and aggregated provided multiple opportunities for data to be lost or incorrectly coded. Each LEA is responsible for providing student-level data to MSDE. The data must be standardized into a uniform format that can accommodate data from all LEAs statewide. For example, attendance data were reported as total days present or absent per enrollment. This precluded any effort to identify within-year patterns of attendance that may influence distal outcomes. This also meant that if there were any overlapping enrollment dates due to a school change it was impossible to know which record contained the true value for those overlapping days.

Multiple potential explanatory variables or confounders that may influence on-time graduation are not regularly collected by schools and were therefore not available in the data used for this dissertation. The legislation that created the MLDSC explicitly excluded the collection of multiple relevant factors, such as school health records or behavior data. In addition, the data did not include information regarding student sexual orientation or gender identity. Other important factors such as parental income assistance, housing situation, and family structure were not available in the data. Consequently, it was not possible to ascertain whether students were related or shared a household, introducing a possible source of bias. The uneven distribution of students excluded from the full ninth grade sample across schools may signal the presence of between-school differences that are not captured by the data used for this dissertation.

No data was available for residential mobility or other factors that could provide insight into the reasons that students in the study sample changed schools. It is possible—depending on the precipitating factors—that a school change could have a positive or a negative relationship with student achievement. Without the ability to differentiate between positive and negative moves, the overall relationship between student mobility and achievement may be diminished. In addition, between-school changes that occurred after SY 2010-2011 (year 1)—which were not accounted for in the analyses—may have contributed to the null findings for level-2 measures of school characteristics. Thirty percent of the students in the sample were attending different schools at the end of years 1 and 4. For these students, the level-2 measures of school characteristics were assessed in a school other than the one they were attending at the end of the fourth year. In addition, the rate that students changed schools between year two and four was 22 points higher for persisters (55%) than for on-time graduates (23%), introducing a possible source of bias.

Psychometric data for the scale used by BCPSS to measure staff perceptions of school climate were not publicly available. As such the findings produced using those scales should be interpreted with caution. An unpublished confirmatory factor analysis of the student version of the BCPSS School Survey found that the hypothesized factor structure displayed inadequate fit to the data and many of the survey items had low factor loadings and cross loadings and poor theoretical coverage of the constructs within each domain (Van Eck, 2015). Raw data for the staff version of the BCPSS School Survey were not available in the files accessed for this dissertation, consequently it was not possible to conduct further psychometric tests. Finally, the school climate data used in this dissertation were collected in SY 2013-2014 and may not represent the school climate during SY 2010-2011, when other school-level predictors were measured.

This dissertation had a level-2 sample size of 40 schools for research questions 1 and 2, and 39 schools for research question 3. According to Maas and Hox (2005) a level-2 sample size greater than 30 is sufficient to produce unbiased estimates of regression coefficients, variance components, and standard errors of regression coefficients. Under these conditions, however, the standard errors of level-2 variances may be underestimated by as much as 15% (Maas & Hox, 2005). This was addressed in the unconditional model (Model RQ1)—where the level-2 covariance parameter intercept was used to calculate an ICC and justify the use of multi-level modeling— by adjusting the p-value required to reject the null hypothesis (α=.011). However, given the lack of prior literature specific to persisters—and scarcity of multilevel models examining on-time graduation—it was not possible to estimate the sample size required to detect effects for the level-2 covariates included in the model. As such null results for level-2 parameters should be interpreted with caution (McNeish & Stapleton, 2014).

Despite the limitations described above, this dissertation has several strengths. The phenomenon of persisting has been understudied in the existing literature. This is among the first studies to thoroughly examine the factors related to on-time graduation for students who persisted through their fourth year of high school but did not earn a diploma. In addition, previous studies examining factors associated with non-graduation have focused almost exclusively on student-level data. The inclusion of school-level factors contributes to the existing research knowledge by examining the influence of the educational context on the odds of on-time graduation. Finally, this dissertation was designed to focus on malleable factors using data that schools regularly collect. Using data that are routinely collected by the district provides important benefits for the implementation of any implications of this dissertation, as tests of changes that might result from an intervention would not require the collection of additional data.

Implications

The overarching goal of this dissertation was to explore the key elements related to persisting and on-time graduation among students who persisted into and through their fourth year of high school. This was done in order to help establish a foundation for further study and support the development of prevention and intervention programming. In this section, the implications of findings from this dissertation are discussed with a focus on practice, policy, and research.

Practice

Recent national trends indicate that more students are persisting through four years of high school without earning a diploma than are dropping out (Kena et al., 2015). However, many of the previous efforts to improve graduation rates have not considered persisters, but rather focused on addressing student dropout (Rumberger & Lim, 2008; Zaff et al., 2016). This omission signifies a missed opportunity to develop intervention strategies that explicitly account for the unique features of persisters, chiefly, their continued engagement with the school system. Two-thirds of the persisters in this sample enrolled for a fifth year of high school at BCPSS (66%), however less than a quarter of persisters earned a high school diploma or a GED by the end of the fifth year (~24%), suggesting that being a persister indicates a high risk of not graduating at all.

A renewed focus on promoting high school graduation–that is inclusive of persisters–should include efforts to cultivate a school environment and programming that leverages the continued engagement exemplified by persisters, and develop programming that strives to close the gap between persisting and graduating. The findings presented here suggest that future efforts to promote high school graduation should be inclusive of students persisting through their fourth year of high school without earning a diploma. Key findings that can inform the development of such programming are discussed below.

Student-level Factors. This dissertation identified several student-level factors, that contributed to the odds of persisting versus on-time graduation. School staff and policymakers could use indicators identified in this dissertation to craft a multi-tiered intervention approach to support graduation among persisters and students with increased odds of persisting. This could include the development of innovative school-wide policies, individualized academic supports, as well as case management and behavioral interventions. The findings from this dissertation suggest additional effort to identify and serve students at-risk of not graduating should be made at: (1) the end of a student's first-freshmen year, (2) on the first day of the fourth year, and (3) at the end of the fourth year of high school.

At the end of the first-freshmen year indicators—such as below average attendance or not passing an HSA—could be used to identify students who are at increased risk of poor outcomes. Such students should be provided with the opportunity to meet with a school social worker and receive additional academic supports and case management as needed. For example, on-time graduates attended about five more weeks of school in their first-freshman year than persisters, suggesting that interventions to support increased attendance early in a student’s high school career may be a particularly robust path to promoting on-time graduation. In addition, social workers should check-in with these students throughout their high school career to ensure they are making satisfactory progress towards graduation.

On the first day of the fourth year of high school, social workers should make contact with students who are behind in credits, have changed schools since their first-freshmen year, or have missing or failed HSAs. Identified students should be provided with appropriate resources including academic and social supports. Social workers and school counselors should assist students to develop credit recovery plans and match students with appropriate academic supports. In addition, students should meet with a social worker to identify and address any non-academic issues that are impeding their progress towards graduation.

It is also important to consider programs or policies that could encourage continued high school enrollment and graduation for persisters. School counselors and social workers should meet with students who are not on-track to graduate during the last semester of the fourth year to encourage continued enrollment and discuss options for earning a diploma in the fifth year. Social workers should assist students with developing an academic support plan, work with student to identify and address non-academic obstacles to success, and provide students with intensive case management throughout the remainder of the students’ academic career.

One in five (19%) 4-year persisters earned a high school diploma by the end of the fifth year. This highlights both the promise engendered by the continued behavioral engagement exemplified by persisters, as well as the need for targeted services to address the unmet needs of the more than three quarters of persisters (~76%) who did not earn a diploma or a GED by the end of their fifth year. The low rate at which persisters earned a GED (<5%) or participated in the workforce (56%) in the fifth year suggests that many of the persisters who do not go on to earn a diploma in the fifth year may also benefit from additional support. This could include partnering with state or community agencies to provide workforce training or internships that could help improve workforce participation for persisters who do not earn and high school diploma or GED.

School-level Factors. Previous research has not provided adequate guidance as to whether efforts meant to increase graduation rates should focus on the student or the school for intervention. This dissertation found that a quarter of the variance in school exit type was due to differences between schools. There was a clear pattern of performance across high schools with some performing above the district average and some underperforming. This calls for a multi-tiered approach to promoting on-time graduation that would include academic supports or behavioral interventions for students at increased risk of non-graduation, as well as efforts to shape the educational environment in a manner that promotes on-time graduation.

Students in the dissertation sample were more likely to graduate on time in schools where staff reported higher levels of family involvement. This finding is especially relevant considering the well-documented decline in family engagement that occurs as youth approach high school age (Simon, 2004; Spera, 2005). Families have reported feeling excluded or unwelcome at their children's schools (Crosnoe, 2009). However, the evidence suggests that when schools make organized efforts to engage caregivers, families respond with increased levels of involvement (Epstein, 2011; Green, Walker, Hoover-Dempsey, & Sandler, 2007; Iver, Epstein, Sheldon, & Fonseca, 2015). The findings support the development of school-wide programs and policies to encourage family participation in the educational process as a promising strategy for promoting on-time graduation among students who persist into and through their fourth year of school.

Policy

In December 2015 the Elementary and Secondary Education Act was reauthorized as the Every Student Succeeds Act (ESSA; P.L. 114-95). The passage of this new legislation, which replaced No Child Left Behind, signaled major shifts in education policy specific to school improvement (Dynarski, 2015). The findings from this dissertation directly inform current and ongoing modifications to school accountability and high school graduation policy driven by ESSA. For example, school turnaround is a critical piece of ESSA that requires states to develop a program of research and intervention strategies to address the needs of the lowest-performing 5% of schools. As evidenced by Figure 3.4 (above), which presented the ranked school effects relative to on-time graduation, findings from this or similar studies could help policy makers to identify schools that are both under- and over-performing in terms of promoting on-time graduation. This information could help policymakers identify practices that contribute to success in model schools. Such information may be useful in developing programs to support the schools that require intervention under ESSA.

In addition, ESSA introduced a new, more flexible framework for defining school success that will be operationalized at the state level. Under this framework states are encouraged to define school success using a wider range of concepts than were employed under No Child Left Behind, which relied almost singularly on standardized testing to operationalize school effectiveness (Dynarski, 2015). This may include student or educator engagement, type of coursework available to or completed by students, college or workforce readiness, and school climate factors. This more flexible approach to defining success, along with the devolution of authority to the states, presents an opportunity for researchers to inform the development of such indicators.

The theoretical model and analytic strategies employed in this dissertation provide a framework that could be adapted for use by researchers and policy makers seeking to understand the most relevant indicators of school success in their state. For example—among the adjusted cohort of first-time freshmen who began high school in the fall of 2010—BCPSS reported that about five percent of students dropped out in the first three years and an additional six percent of students dropped out in their fourth year (MSDE, 2015a). In comparison, this dissertation found that about 22% of students who enrolled in the fourth year, did not dropout or earn a high school diploma. The results of this dissertation suggest that including the phenomenon of persisting along with dropout would provide a more informed analysis of the factors that relate to on-time graduation.

Future studies informed by this dissertation could inform the debate about how to best implement school accountability measures. For example, an emerging literature suggests that school climate plays an important role in student performance and high school graduation, yet methods to measure, let alone intervene, are underdeveloped (Thapa et al., 2013). Investigations into the potential connections between school climate factors and on-time graduation have been sparse and have not yielded sufficient evidence to support the theorized relationships (Christle, Jolivette, & Nelson, 2007; Zaff et al., 2016). One barrier to the utility of school climate data has been the widespread use of unvalidated measures (Rumberger & Lim, 2007; Thapa et al., 2013). The psychometric evaluation, conducted by Van Eck (2015), of the student version of the school climate measure used in this dissertation, suggests that additional work is needed to refine the instrument and confirm the hypothesized factor structure.

The results of this dissertation provide some initial support for the predictive validity of the family involvement domain with on-time graduation. This affords some preliminary affirmation for policy makers who are interested in collecting and analyzing school climate data as it relates to on-time graduation. The finding that the remaining school climate factors were not significantly related to on-time graduation is directly relevant to policy in BCPSS, where the scale is administered on an annual basis and used to inform budgetary decisions, evaluate teachers and school leaders, develop school performance plans, and inform the contract renewal process for outside operators such as charter schools (BCPSS, 2016). More generally, the school climate findings highlight the importance of empirical evaluation for instruments meant to assess complex latent constructs such as school climate (Thapa et al., 2013).

Research

The extant research on high school graduation and dropout has not adequately addressed the phenomenon of persisting, wherein students persist into and through their fourth year of high school without earning a diploma. Instead, previous studies have mostly focused on exploring factors related to student dropout, and to a lesser extent on-time graduation. This gap in existing research highlights the need for additional study to replicate and expand on the findings presented in this dissertation. Specifically, there is a need for additional inquiry that endeavors to identify school-level factors that drive the between-school variation in student outcomes, including rigorous research on the theoretical conceptualization and measurement of such factors.

The finding that a large proportion (25%) of the student-level variation in school exit type was due to between-school differences suggests that future research examining on-time graduation would benefit from a consideration of institutional factors that may relate to academic success. This could include a more detailed study of the underlying mechanisms that drive school-level variance in school exit type. For example, a more detailed study of student transcripts could uncover between-school variation in process factors – such as course-specific credit accumulation and exit requirements – that are impeding student progress toward on-time graduation. Conversely, future studies could examine school-level variation in the percent of students that were able to catch up and graduate on time, despite being behind in credits when they began their fourth year.

The work of Wang and Eccles (2012) described three kinds of engagement (behavioral, emotional, and cognitive) that they considered central to academic success. Within this framework, the defining feature of persisters would be high levels of behavioral engagement. Future research should attempt to (1) measure the relationships between emotional and cognitive engagement with persisting and (2) identify ways that the school environment can be shaped to support these elements of engagement. This may require the use of survey methodology and qualitative methods to improve our understanding of how school climate and other environmental factors explain differences in student outcomes.

This dissertation identified a relationship between family involvement and increased odds of on-time graduation for students in their fourth year of high school.

Future research should examine practices and conditions that promote a school environment where families are actively engaged in their child's education. Additional effort should be put into further operationalizing the elements of family involvement that are most beneficial for promoting on-time graduation (Agronick, Clark, O'Donnell & Stueve, 2009). This may include qualitative case studies to aid in the development of measures that effectively operationalize key predictors of family involvement.

Given the high correlations among the dimensions included in the staff survey (see Appendix C), it is likely that the dimensions within the current factor structure do not represent well-differentiated latent variables. The overlapping variance among variables may have suppression effects, making it difficult to distinguish the contribution of individual school climate factors to the between-school variance in exit type. Consequently, the performance of the school climate factors, as measured by the staff version of BCPSS School Survey, may not be stable. This suggests the need for a psychometric analysis of the staff version of BCPSS School Survey to assess the adequacy of, and suggest modifications to, the existing factor structure.

In addition, future research should further examine factors from this dissertation that had a p-value of less than .01 in intermediate models, but did not meet the threshold for significance (α=.05). Specifically, school-level rates of mobility and staff perceptions of the distribution of resources among schools. Future studies should examine the changes in p-values across models in the level-1 measure of between-school mobility for indications of the presence of a mediated effect, suppressor variables, or possible cross-level interactions (Arah, 2008; Bickel, 2007).

Given the high percentage of persisters (55%) relative to on-time graduates (23%) who finished their fourth year in a school other than the school they were attending at the end of their first-freshman year, future studies exploring the relationship between school characteristics and on-time graduation should account for school changes that occur in the second, third, and fourth years of high school. This may include cross-classified longitudinal models that can partition the variance explained by differential exposure to school environments that result from between-school mobility. In addition, the counterintuitive result for the student-level measure of mobility in Model RQ2a suggests the need for a more detailed examination of the reasons that students are changing schools. It is plausible that in some cases mobility is a function of students, or their families, explicitly seeking out schools that provide a more supportive or academically enriching environment; suggesting the presence of a cross-level interaction between mobility and family involvement or other level-2 factors. However, changing school more than once in an academic year may signal the presence of other risk factors such as changes in family structure of economic instability. As such, an analysis that accounted for the frequency of school changes may identify an inverted u-shaped relationship between mobility and on-time graduation.

The ESSA legislation includes a section titled “Innovation Research” that allocates funding for developing and testing scalable interventions to address the needs of the lowest-performing 5% of schools in each state (Dynarski, 2015). At present, there is little evidence that could be used to endorse or support any of the school-level strategies currently employed to improve graduation rates in the lowest performing schools (Zaff et al., 2016). As such, researchers should continue to investigate factors that may present opportunities for school-level intervention, work to establish the relationships among student- and school-level factors as they relate to on-time graduation, and test for the presence of causal relationships.

Continued research should pay attention to how high school exit is defined and draw comparisons between dropouts, persisters, and on-time graduates when possible. For example, future studies could examine whether and how the timing and type of high school exit impact later outcomes across the life-course. Students who do not earn a high school diploma in four years are not a homogenous group. They may go on to earn a GED, graduate in their fifth year or earn a diploma through an adult education program. Although it is clear that students are less likely to earn a diploma after their fourth year of high school, it is not clear whether earning a diploma in the fifth year has any long term impact on distal outcomes, such as post-secondary success or engagement in the workforce. Thus, future research should examine if and how persisting impacts student outcomes as they transition into young adulthood.

Conclusion

On-time graduation should be understood as a function of students within their academic environments. There is a need for additional examination of the school-level factors that may provide an opportunity for intervention. Further study in this area should consider institutional practices that promote positive working alliances between families, and school-based staff. In particular, more information is needed to understand the mechanisms through which such relationships promote positive student outcomes.

This dissertation explored factors related to on-time graduation from an individual and organizational perspective for a population of students who have been largely overlooked in the literature. Using available administrative data, student- and school-level factors, drawn primarily from the literature on dropout, were entered into a succession of multilevel logit models to test their relationship with the odds of on-time graduation and persisting among students in their fourth year of high school. This dissertation identified student- and school-level factors that could be used to inform interventions that promote on-time graduation among students that might otherwise persist through their fourth year of high school without earning a diploma. This has important research, policy, and practice implications; chiefly that future efforts to promote high school graduation on time should be expanded to include persisters.

Appendix A. BCPSS School Climate Staff Survey Items for School Year 2013-2014

Item Name	Staff Survey School Year 2013-2014 Items
Administration Dimension	
Admin1	The school administration promptly responds to my concerns
Admin3	The school administration supports the staff in performing their duties
Admin4	Staff members know what is expected of them
Admin7	I have the opportunity to provide input into the school's programmatic decisions
Admin8	I have the opportunity to provide input into the school's budgetary decisions
Admin10	Feedback from the community influences the administrations' decision-making
Admin11	The school administration provides teachers actionable feedback on their instructional practices
Admin12	I feel valued by the administration at this school
Admin13	Collaboration among school staff is valued in this school
Admin14	The school mission is clearly communicated
Physical Environment Dimension	
Environ1	The school building is clean and well maintained
Environ5	Students have satisfying food options at this school
Environ6	This school is well lit
Environ8	It is often too hot at this school
Environ9	It is often too cold at this school
Learning Climate Dimension	
Learn3	This school has clear expectations for student behavior
Learn5	This school provides an orderly atmosphere for learning
Learn7	Students are rewarded for positive behavior
Learn11	Students respect each other
Learn12	Students respect school staff
Learn13	Teachers care about their students
Learn14	I feel like I belong at this school
Learn16	School staff respect the students
Learn17	School Staff respect each other
Learn18	This school prepares students for college or to have a career
Learn19	If students break rules, there are fair consequences
Family Involvement Dimension	
Parent1	Parents or guardians are welcome at this school
Parent3	When a student does something good at school, the parents are informed
Parent4	When a student does something bad at school, the parents are informed
Parent5	School staff work closely with parents to meet students' needs
Parent23	This school regularly communicates with parents about how they can help their children learn
School Resources Dimension	
Resource1	There is sufficient school-based professional development for staff regarding instructional practices
Resource2	There is sufficient school-based professional development for staff regarding classroom behavior management practices
Resource4	I have adequate supplies to do my job

Resource5	This school has programs/services to help students with suspected learning problems
Resource7	Teachers provide extra academic help to students who need it
Resource9	This school has programs to support students' emotional and social development
Resource10	This school has programs that address conflict and violence among students
Resource15	This school has an effective Student Support Team
Resource16	Teachers participate in weekly collaborative planning time at this school (includes N/A response option for non-teachers)
Resource17	Students have the opportunity to take books home from this school
Resource19	There are opportunities for teachers to serve in leadership roles at this school
Safety Dimension	
Safe2	Students fighting is NOT a problem at this school
Safe3	Vandalism of school property is NOT a problem at this school
Safe5	Student possession of weapons like knives and guns is NOT a problem at this school
Safe6	Students picking on/bullying other students is NOT a problem at this school
Safe7	Student drug/alcohol use is NOT a problem at this school
Safe11	I feel safe at this school
Safe12	Students feel safe at this school
Safe13	Students feel safe going to and from school
Safe15R	Students are NOT often roaming in the halls during class time at this school
Satisfaction with School Dimension	
Satisfy1	This school does a good job educating students
Satisfy6	The staff are willing to help each other out
Satisfy8	I like the classes I teach (includes N/A response option for non-teachers)
Satisfy12	I would recommend this school to others
The Teachers Dimension	
Teach2	Teachers regularly inform students about lesson objectives (includes N/A response option for non-teachers)
Teach5	Teachers encourage students to take challenging classes (includes N/A response option for non-teachers)
Teach7	I am well organized and prepared
Teach8	Teachers feel responsible for their students' academic success
Teach9	Teachers feel responsible for their students' social and emotional development
Creativity & the Arts Dimension*	
Creative2	Students have the chance to participate in music, art, dance, or plays at this school
Finding Meaning in Work Dimension*	
Meaning1	I view my work as contributing to student success in the district
Meaning2	I view my work as contributing to my professional growth

*Dimension not included in the analyses

Appendix B. Descriptive Statistics for School Climate Factors

Mean and Standard Deviation for School Climate Factors (k=39)

	M	*SD*
Administration	72.401	10.031
Family Involvement	82.222	8.453
Learning Climate	75.809	10.564
Physical Environment	64.396	12.024
Safety	65.843	16.123
Satisfaction	77.467	10.083
School Resources	76.277	8.543
Teachers	85.660	5.368

Appendix C. Correlation Matrix for School Climate Factors

Correlations Among School Climate Factors - Staff (k=39)

	Administration	Family Involvement	Learning Climate	Physical Environment	Safety	Satisfaction	School Resources
Administration	1						
Family Involvement	0.75	1					
Learning Climate	0.82	0.77	1				
Physical Environment	0.36	0.47	0.45	1			
Safety	0.57	0.67	0.83	0.54	1		
Satisfaction	0.79	0.79	0.88	0.37	0.73	1	
School Resources	0.75	0.78	0.81	0.44	0.57	0.79	1
Teachers	0.56	0.58	0.58	0.08	0.41	0.76	0.55

Appendix D. Results for Model RQ2b.

Model RQ2b. Results for the Multilevel Logit Model Fitted to Evaluate the Contributions of Student- and School-level Factors on Exit Type (N = 4190)

						95% CI [b]	
	β	*SE*	*t*	*p*	*OR*	Lower	Upper
Fixed Effects [a]							
Intercept	-.272	1.713	-0.16	.875			
Student Characteristics							
Age	-.182	.078	-2.33	.020	.833	.715	.972
Female	.662	.102	6.5	<.0001	1.938	1.587	2.366
Black	.019	.178	0.11	.916	1.019	.719	1.445
Special Education	-.034	.123	-0.28	.779	.966	.759	1.229
Free & Reduced Priced Meals	-.284	.131	-2.17	.030	.753	.582	.973
Weeks Attended	.162	.014	11.29	<.0001	1.175	1.143	1.209
Mobility	.368	.161	2.28	.023	1.445	1.053	1.982
Promoted	.758	.129	5.89	<.0001	2.134	1.658	2.746
Pass HSA	1.156	.109	10.65	<.0001	3.177	2.568	3.931
School Characteristics							
%Black	-.077	.059	-1.3	.195	.926	.825	1.040
%Female	.028	.044	0.63	.527	1.028	.943	1.122
%Promoted	-.041	.065	-0.63	.528	.960	.846	1.090
%Between-School Mobility	-.264	.138	-1.92	.055	.768	.586	1.006
%Passed HSA	-.080	.074	-1.08	.281	.923	.799	1.067
School Size	-.015	.014	-1.09	.276	.985	.958	1.012
Covariance Parameters							
Intercept	.357	.107	3.35[c]	.001			

a. The reference category is 2.00: On-time Graduate

b. Confidence Interval for the Odds Ratio

c. Z-score

Appendix E. Results for Model RQ3a.

Model RQ3a. Results for the Multilevel Logit Model Fitted to Evaluate the Contributions of Staff Perceptions of School Climate on Exit Type (n = 4077)

						95% CI [b]	
	β	*SE*	*t*	*p*	*OR*	Lower	Upper
Fixed Effects [a]							
Intercept	-3.206	2.710	-1.18	.246			
Student Characteristics							
Age	-.197	.079	-2.48	.013	.821	.703	.960
Female	.657	.104	6.34	<.0001	1.929	1.574	2.363
Black	.030	.178	0.17	.866	1.030	.727	1.461
Special Education	-.024	.126	-0.19	.846	.976	.763	1.248
Free & Reduced Priced Meals	-.314	.133	-2.35	.019	.731	.563	.949
Weeks Attended	.165	.015	11.27	<.0001	1.180	1.146	1.214
Mobility	.345	.166	2.08	.038	1.412	1.020	1.956
Promoted	.770	.130	5.9	<.0001	2.160	1.673	2.790
Passed HSA	1.170	.111	10.57	<.0001	3.221	2.593	4.001
School Characteristics							
%Black	-.077	.060	-1.29	.198	.926	.824	1.041
%Female	.066	.046	1.45	.148	1.068	.977	1.169
%Promoted	-.007	.067	-0.1	.918	.993	.871	1.132
%Between-school Mobility	-.240	.140	-1.72	.086	.787	.599	1.035
%Passed HSA	-.119	.076	-1.57	.117	.888	.765	1.030
School Size	-.007	.014	-0.46	.646	.993	.966	1.022
School Climate Factors							
Administration	-.153	.203	-0.76	.449	.858	.577	1.276
Family Involvement	.595	.249	2.39	.017	1.813	1.112	2.955
Learning Climate	-.007	.335	-0.02	.983	.993	.515	1.915
Physical Environment	-.006	.101	-0.06	.955	.994	.816	1.212
Safety	-.045	.142	-0.32	.749	.956	.724	1.262
Satisfaction	.094	.293	0.32	.748	1.099	.619	1.950
School Resources	-.493	.262	-1.88	.061	.611	.365	1.022
Teachers	.308	.341	0.9	.367	1.361	.697	2.656
Covariance Parameters							
Intercept	.229	.084	2.73[c]	.003			

a. The reference category is 2.00: On-time Graduate

b. Confidence Interval for the Odds Ratio

c. Z-score

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