Beyond Grades: Evaluating the Robustness of High School GPA as an Indicator of Success in the Wake of the COVID-19 Pandemic

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By

Lea L. Keith

Middle Tennessee State University

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Dissertation Committee:

Dr. Jim Rost, Chair

Dr. Kim Godwin

Dr. S. Jackie Vogel

DEDICATION

This dissertation is dedicated to my late grandfather, Clifford Smith Avrit, who lived with integrity, curiosity, and an unwavering commitment to doing what was right. I strive to stand tall for what is right, remain open to learning new things, embrace change when presented with new information, and set a positive example for others, not just through my words, but through my actions, just as he did throughout his life.

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ABSTRACT

As a result of the mitigating measures implemented to prevent further spread of COVID-19 in 2020, standardized testing practices were changed with little warning across the nation. The sudden shift which caused students to not have access to standardized tests created an issue in the admissions processes for colleges and universities as students would not be able to report standardized test scores on their admissions applications as normally requested or required.

Post-secondary institutions had to quickly change their admissions requirements to compensate for the absence of standardized test scores. Many institutions dropped the requirements for standardized test scores in favor of using high school grade point average (GPA) as the primary quantitative measure of future student success in the admissions requirements. Since standardized testing has become available to prospective students again, the question as to whether to return to requiring standardized testing scores has come up for discussion in the higher education community.

One approach to address this question would be to see if there was an association between high school GPAs and student success before and after the COVID-19 pandemic, so the faculty and staff at colleges and universities can make more informed decisions about whether to bring back the standardized test score requirements in the admissions process. This study was created to help understand if any associations exist between high school GPAs and student success, specifically as measured by first-time, first-year retention. An extensive literature review was conducted to understand how academic and non-academic factors might impact high school GPA and student retention rates, which could provide insight to associations that might be found as a result of this study.

This *ex post facto* study was conducted with pre-existing data from a local, public, four-year, university in Tennessee. Chi-square analyses were conducted to determine if there were associations between pre- and post-pandemic high school GPAs and successful student retention with additional analyses conducted to account for the confounding variables of biological sex (female or male) and student status at the time of enrollment whether traditional students (ages 18-24) or adult learners (ages 25 and older).

The findings indicate there is a significant moderate association between the independent variables of high school GPA and first-time, first-year retention both pre- and post-pandemic for the entire sample studied. For both the pre- and post-pandemic cohorts, female and male students had a moderately strong association for the independent variables as well. The results for pre- and post-pandemic traditional students (ages 18-24) showed a moderate association between independent variables. Adult learners showed a moderate association between high school GPA and student retention for the pre-pandemic cohort. However, there were not enough samples to complete a valid chi-square analysis on the post-pandemic cohort of adult learners. The overall findings from this study suggest that there is a moderate association between high school GPA and successful first-time, first-year retention, which provides support for the continued inclusion of high school GPA in admissions considerations for post-secondary institutions.

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CHAPTER I.

INTRODUCTION

Retention rates at the post-secondary level have been continually monitored and analyzed for colleges and universities to determine how to increase student success and completion rates best (Daffner et al., 2022). Before the COVID-19 pandemic student performance measures, such as high school grade point average (GPA) and standardized test scores from American College Testing (2024-a) or the SAT (The College Board, 2024), are reported to the institutions students are applying to attend after high school (Meeter, 2023). In an effort to mitigate the spread of the disease, social distancing safety measures were implemented, which prevented students from taking the standardized tests as normally administered (Camara & Mattern, 2022).

In light of many students in the United States not having access to standardized tests, colleges and universities began to no longer require scores to be reported during the application process (Arenas et al., 2021). Since one less traditional data point was available to use as a measurement of potential student success, more emphasis was given to other predictive measures such as high school GPA and past academic performance (Al Hazaa et al., 2021; Alotaibi, 2021; Meeter, 2023). As standardized testing has been able to return post-pandemic, colleges and universities are trying to decide whether to return to mandating standardized test scores for admission applications (Camara & Mattern, 2022).

This study investigated whether there is a relationship between high school GPA and student retention at post-secondary institutions. The findings contribute to the existing body of research concerning student retention at post-secondary institutions and help inform future institutional decisions regarding the requirement of standardized test scores in the admissions process to increase student retention and success rates.

Statement of the Problem

Colleges and universities consistently work to find ways to improve student success, and a significant factor impacting student success is retention rates (Tight, 2020; Willoughby et al., 2021). Student retention rates are the percentage of students who continue on to attend the same college or university from one year to the next, and this proposed study will look at first-year to second-year retention rates (York et al., 2019). On average 50% of the students who do not finish earning their degrees leave between their first year and second year (Theeuwes, 2013). High school grade point average (GPA) has been used as a measure of future academic success for post-secondary institutions before and after the COVID-19 pandemic (Camara & Mattern, 2022; Geiser & Santelices, 2007; Paris et al., 2023; Westrick et al., 2015).

Since the pandemic began, many institutions have relied almost solely on high school GPA as the primary quantitative measure to determine whether students should be admitted to the school (Arenas et al., 2021; Paris et al., 2023). The shift away from a combined quantitative view of quantitative data points of high school GPA and standardized tests scores gained popularity because of the COVID-19 pandemic (Allensworth & Clark, 2020; California State University, 2022). As colleges and universities are deciding whether to bring back standardized testing requirements for admission, it is important to investigate the existing relationship between high school GPA and student success (Meeter, 2023).

In addition to investigating the current and past relationship between high school GPA and first-year to second-year retention rates for all students, this study analyzed the subcategories within this data set for biological sex and student status at admission traditional and adult learner admission. Traditional students were categorized as less than 25 years old, and adult learners were grouped by 25 years or older at initial enrollment (Monahan & Shah, 2023). The addition of

analyzing subcategories for biological sex and student status may assist colleges and universities in understanding the additional factors that may have an impact on student retention rates (Caballero, 2020).

Background of the Problem

Student Success and Student Retention

For the purposes of this study, student success was measured by student retention rates, which is the percentage measurement of first-year students who continue on from the first to the second year of study at the same institution (Federal Student Aid, n.d.). Student success measures, including student retention rates, are vital for colleges and universities to continually monitor and improve instruction and student supports, as needed, to increase the percentage of students who successfully complete their degree programs (Nieuwoudt & Pedler, 2023). There has been a decline in post-secondary school enrollment, which has progressively worsened since the pandemic; colleges and universities must be more mindful on putting in the work to help students be successful by increasing retention and degree completion rates (Lawrence, 2023).

Academic factors impacting student success and retention rates include, but are not limited to, high school GPA, standardized test performance, first-year post-secondary performance, program of study chosen by the student, and the presence of any learning disabilities (Allen & Robbins, 2008; DaDeppo, 2009; Meeter, 2023; Paris et al., 2023). Non-academic factors impacting student retention rates can include biological sex, student status at the time of enrollment, relationships with others, ethnicity, and if the students have any disabilities, personal issues, or conflicts present outside of learning environment (Broom et al., 2024; Sommerfield, 2011, Tinto 2023; Schlossberg, 2011). In the wake of the COVID-19 pandemic, the colleges and universities that chose to eliminate the standardized testing

requirements in their admissions process began to rely on high school grade point average (GPA) to predict future student success for their academic programs (California State University, 2022).

Impact of COVID-19 on Admissions Practices

Admission standards are not standardized across colleges and universities. The differences in admission practices grew as a result of the difficulties created by social distancing practices during the COVID-19 pandemic (Stanford University et al., 2021). Many colleges and universities removed the requirement for students to submit standardized test scores, such as the American College Testing (ACT) and the modern-day SAT (formerly the Scholastic Aptitude Test), in their admissions applications (California State University, 2022).

Before the pandemic, standardized test scores, primarily from the ACT and SAT, were used to help evaluate student preparedness for post-secondary education (The College Board, 2024). The decision to eliminate standardized testing results in the admissions process was already being discussed and researched prior to the COVID-19 pandemic (Kulaendaer & Cohen, 2019). Kulaendaer and Cohen concluded high school GPA was associated with a higher "first-year GPA and second-year persistence" than the Smarter Balanced Assessment (SBAC) and SAT (California State University, 2022, p. 3).

As the practice of social distancing to prevent the spread of COVID-19 has decreased since 2020, colleges and universities have started to reconsider the decision to eliminate standardized test score requirements (Friedman et al., 2024). The shift away from a combined view of quantitative data points of high school GPA and standardized test scores gained popularity as a result of the COVID-19 pandemic's effect on students' ability to access standardized testing (Allensworth & Clark, 2020; California State University, 2022). The long-term impact of the changes in the admissions process needs to be investigated to determine if

there is a relationship between the changes that have been implemented and first-year retention rates.

Influences Affecting High School GPA

Due to the renewed focus on high school GPA for the college admissions process, the impacts of the pandemic on high school GPA must be acknowledged in order to have a more realistic interpretation about any relationship that may be found between GPA and college retention as a result of this study (Hampton et al, 2021; Sparks, 2022). The changes that impact high school GPA, as a result of the COVID-19 pandemic, could impact the results produced through this study since the factors contributing to the change act as confounding variables (Erguvan, 2021; Hampton, 2021; Steedle & Way, 2024).

Confounding variables are factors which cannot be controlled in data analysis (Prysby et al., 2013). Factors impacting high school GPA are remote learning practices, school board and individual teacher grading policies, high school courses taken, academic integrity, student motivation, student sense of belonging and support, and economic factors (Brookhart, 2016; Cavanaugh et al., 2023; Jones et al., 2023; Land, 2002; Maslow, 1943; Mutch & Peung, 2021; Soh, 2011; Sparks, 2022; Wehde-Roddiger et al., 2012).

District and school specific components which impact high school GPAs are remote learning practices, school board policies, and teacher grading policies (Arenas et al., 2021; Soh, 2011). Remote learning practices impact student interaction and assessment, while school board policies determine grading scales and influence teacher grading practices (Mutch & Peung, 2021). Individual teacher grading practices, within board policy guidelines, affect assignment and overall course grades (Neuhaus & Jacobsen, 2022). Additional factors impacting high school GPAs not specific to schools and districts are often demographical and sociological in nature.

Examples of these are family socio-economic status, student motivation, and student sense of belonging and support which all influence academic behaviors and outcomes (Wanzer et al., 2019).

Theoretical Framework

Research in student success within higher education covers areas such as retention rates, persistence, attrition, and performance (Bergman et al., 2014; Spann & Tinto, 2023; Weatherton & Schussler, 2021). Student success rates impact a college or university's ability to obtain and maintain accreditation from their governing body (Flores, 2018). Since the shift away from standardized test scores in college admissions due to the COVID-19 pandemic, further research is needed to determine if high school GPA, now a larger predictor of future student success, still has a relationship with first-year retention rates.

To better understand the existing relationship between high school GPA and first-year retention rates, attention must be given to the factors which impact both variables. The theories used in building the theoretical framework of this proposed study are based on Tinto's Model of Student Retention, Schlossberg's Transition Theory, and Maslow's Hierarchy of Needs (Tinto, 1982, 2006, 2017, 2023; Schlossberg, 2011; Schlossberg et al., 1989; Maslow, 1949).

Tinto's Model of Student Retention and Schlossberg's Transition Theory speaks to the challenges both traditional students and adult learners face, both at school and in their lives outside of school, during the pivotal first year at a college or university and how colleges and universities can provide academic and non-academic supports to help students navigate the challenges and continue their educational journey with the institution (Bergman et al., 2014; Jafar, 2023). Maslow's Hierarchy of Needs, Tinto's Model of Student Retention, and Schlossberg's Transition Theory are used to investigate how high school student grades, and

subsequent GPA, are impacted by academic and non-academic factors the students experience throughout high school (Maslow, 1943; Mensah et al., 2023; Sewell & Goings, 2020; Tinto, 2017).

This study also analyzed the relationship between high school GPA and first-year retention, specifically considering differences based on biological sex (female or male) and student type at enrollment (traditional students aged 24 years or younger versus adult learners ages 25 years or older). The additional information from this analysis can guide colleges and universities in supporting various types of students through their pivotal first year, increasing the likelihood of the students returning the following year and, ultimately, improving student success and retention rates.

Statement of Purpose

The purpose of the study was to investigate the relationship between high school GPA and student success rates as measured by first-year university retention rates, both before and after the COVID-19 pandemic. Higher education research concerning factors impacting student success and retention was conducted primarily before the COVID-19 pandemic. There is a need to conduct additional research to help determine the relationship between predictive factors to see if there is an association high school GPA and retention. More research needs to be completed in this area post-pandemic as students have, and will continue to change, and colleges and universities are deciding whether to go back to requiring standardized test scores for admission applications in addition to high school GPA (Babera et al., 2020; Bannister, 2021; Paris, 2023).

The data analyzed for this study was *ex post facto*, which is to say the data was already collected by the institution to be used for furthering future education research. Since the data

already exist, the findings from this proposed study will help post-secondary institutions replicate the study to help determine whether standardized test requirements should be reinstated in the admissions process or if high school GPA is reliable enough on its own as a predictor of academic success as measured by first-year retention rates. The non-academic factors impacting student retention such as biological success and student status at time of enrollment, traditional students versus adult learners, must be analyzed in addition to the academic factors to determine if any type of relationship exists within those subgroups so the post-secondary institutions can better plan how to increase student retention rates within the student population on campus (Sparkman et al., 2012).

Research Questions

1. How has the COVID-19 pandemic impacted the correlation between high school GPA and first-year student retention as an indicator of college success at the post-secondary level?
2. How has the COVID-19 pandemic impacted the correlation between high school GPA and first-year student retention as an indicator of success among first-year male and female students?
3. How has the COVID-19 pandemic impacted the correlation between high school GPA and first-year student retention as an indicator of student success level among traditional (18-24) and adult learners (25 and older) first-year students?

Research Hypotheses

$\boldsymbol{H_1}$**:** Post-pandemic high school GPAs are not associated with first-year student retention.

$\boldsymbol{H_2}$**:** Pre-pandemic high school GPAs are associated with first-year student retention.

$\boldsymbol{H_3}$**:** Post-pandemic high school GPAs are not associated with first-year student retention among first-year male and female students at the post-secondary level.

$\mathbf{H_4}$: Pre-pandemic high school GPAs are associated with first-year student retention among first-year male and female students at the post-secondary level.

$\boldsymbol{H_5}$**:** Post-pandemic first-year adult learners' (25 and older) and traditional, first-year students' (18-24) high school GPAs are not associated with first-year retention.

$\boldsymbol{H_6}$: Pre-pandemic first-year adult learners' (25 and older) and traditional, first-year students' (18-24) high school GPAs are associated with first-year retention.

Definitions of Terms

- ACT – the American College Testing is a college entrance exam that measures academic achievement in the areas of Math, Reading, English, Science, and occasionally writing (ACT, 2024-a).
- Adult Learner Enrollment – a term used for students who are usually over the age of twenty-five and may also be enrolled part time in higher education courses (Buerck et al., 2003).
- Advanced Placement (AP) Courses – courses that provide rigorous college-level classes to high school students who want to receive college credit (Fischer et al., 2023).
- Asynchronous Teaching - teaching method that allows students to work at their own pace while also meeting deadlines with assignments. Students are mostly in control of their learning and the instructor is more of a facilitator (Wells et al., 2022).
- Attrition – a rate given to the number of students who drop out of higher education courses and cannot complete their coursework (Adusei-Asante & Doh, 2016).
- Career and Technical Education (CTE) - coursework intended to teach specific career skills that help students prepare for the workforce (Salem Press Encyclopedia, 2022).

- Grade Point Average – a numerical value from zero to four that is given to students based on adding up all final grades and dividing that total by the number of credits. Grade point averages (GPAs) are used in class rankings, determining honors, and to assess student academic performance going into the post-secondary world (Glossary of Education Reform, 2013).
- Holistic Admissions Process – a process that allows higher education institutions to consider all aspects of student applicants, not just GPA or college entrance exam scores. Holistic approaches may look at leadership, personal statements, reference letters, and academic achievement (Snyder et al., 2024).
- Individuals with Disabilities in Education Act (IDEA) - an act dedicated to protecting the educational opportunities and rights of students with disabilities (Harmon, 2022).
- Information and Communications Technologies (ICT) – any technology that processes, transmits, or stores information specifically when used in distance learning or asynchronous learning, such as instructional software, online tools, and learning management systems (LMS) (Idaho Assistive Technology Project, n.d.).
- International Baccalaureate (IB) - a program based in Switzerland that introduces students to multiple disciplines and perspectives through their pre-school to senior years of high school with a goal of creating students that are interested in their impact beyond their own communities (International Baccalaureate, 2019).
- Learning Management System (LMS) - systems that help distribute course content, assess student work, and communicate with students throughout a course (Turnbull et al., 2023).

- Office of Disability Services - an office in higher education institutions that can help students acquire accommodations in their college coursework. This office is dependent upon the student asking for assistance (College for TN, 2024).
- Persistence – refers to continuous student enrollment; fall to fall enrollment (College Futures Foundation, 2015).
- Pre-Pandemic – refers to the time period before the Covid-19 pandemic in which most schools and higher education institutions used face to face instruction as their main method of teaching (Feng et al., 2021).
- Post-Pandemic – references the current years after the Covid-19 pandemic which utilizes more asynchronous, hybrid, or virtual instruction in schools and higher education institutions (Feng et al., 2021).
- Post-Secondary – "refers to the range of formal learning opportunities beyond high school, including those aimed at learning an occupation or earning an academic credential" (Institute of Education Sciences, n.d.).
- SAT – the SAT, formerly known as the Scholastic Aptitude Test, is a college entrance exam that assesses students in the areas of math, reading, and English (Department of Homeland Security, 2012).
- Secondary Education – is the education level that includes students through the ages of eleven to nineteen and is divided into lower and upper secondary or middle and high school levels (National Center for Education Statistics, n.d.).
- Synchronous Teaching - instruction either in person or online that happens at the same time (Constantinou, 2023).

- Retention Rate – is the measure, or percentage, of undergraduate students at a post-secondary institution, such as a college or university, who successfully continue from the first year to the second year at the same school (York et al., 2019). For the purposes of this study, retention is measured Fall to Fall.
- Standardized Testing – a form of testing that requires all students to take the same test and is "scored in a "standard" or consistent manner" that schools can then compare achievement levels (The Glossary of Education Reform, 2015).
- Student Success at the Post-Secondary Level – refers to assessing several factors of student retention such as enrollment, student academic achievements, and holistic developments at higher education institutions (Alabama Commission on Higher Education, n.d.).
- Student Success at the Secondary Level – a way of defining successful students by looking at a variety of measures such as ACT or SAT scores, graduation rates, and state and national standardized test scores (Rennie Center Education Research & Policy, 2020).
- Tennessee Comprehensive Assessment Program (TCAP)-the State of Tennessee's standardized test taken at the end of a course or end of the school year to assess student achievement and growth (Tennessee Department of Education, n.d.-b).
- Traditional Student Enrollment – a term used for students who are under the age of 25 and usually enrolled full-time (Buerck et al., 2003).

Limitations

The study used *ex post facto* data from a local public four-year university in Tennessee. It focused exclusively on first-time, first-year students at the university. The analysis considered

confounding variables such as biological sex and student status (traditional vs. adult learner) to explore additional relationships within these subcategories. Other confounding variables including socio-economic background, high school grading practices, remote learning experiences, and non-academic commitments, may also impact the relationship between high school GPA and student retention. The study's generalizability is limited by its focus on a single institution, the specific student cohorts, and the presence of unaccounted for confounding factors affecting student retention.

Delimitations

The study was delimited to first-year, first-time enrolled students at a local, public four-year university in Tennessee. The sample includes *ex post facto* data from traditional students and adult learners from three cohort years, both pre- and post-pandemic, in an effort to ensure enough data was analyzed over an equal and extended period of time to increase the reliability of the study. The cohort year 2019-2020 was not used for either pre- or post-pandemic data since the shift occurred mid-year. The analysis evaluated the differences in the relationship between high school GPA and post-secondary retention rates from before and after the pandemic.

Summary

This study was created to investigate what type of predictive relationship, if any, exists between high school GPA and post-secondary first-year retention, specifically pre- and post-pandemic. The study is anchored in the following theories that impact student performance and retention at both the secondary and post-secondary level: Tinto's Model of Student Retention (2006), Schlossberg's Transition Theory (1989), and Maslow's Hierarchy of Needs (1943). The results of this study are intended to inform the admission and retention practices at colleges and

universities to help improve student support, leading to increased retention and student success rates for first-year, first-time students of all types on their individual campuses.

CHAPTER II.

LITERATURE REVIEW

The purpose of this study was to investigate whether high school grade point average (GPA) is associated with student retention in post-secondary education in the United States post-COVID-19 pandemic. The data collected to measure success for this study included retention rates from first-year to second-year at a regional public four-year institution and high school GPA as reported to the institution upon undergraduate admission. The data analyses included further investigation to determine if there is a relationship between high school GPA and student retention for the subgroups based on biological sex and first-year student enrollment type (traditional versus adult learners). In an effort to gain a more thorough understanding of the variables in this research study, a comprehensive literature review was conducted, examining the theoretical perspectives impacting student success and retention at post-secondary institutions alongside the factors influencing student performance at the secondary level.

Theoretical Perspectives

This study was constructed around student success theories in higher education and secondary education. The choice to use student success theories was based on the focus on determining whether the predictability of student retention from the first to the second year at higher education institutions using the students' high school GPA is still a valid and reliable predictor post-COVID 19 pandemic as it was pre-COVID 19 pandemic. Since the focus of this study was determining what impact high school GPA has on retention, the higher education theories that were utilized in this study were Tinto's Model of Student Retention (2006) and

Schlossberg's Transition Theory (1989), and a secondary education theory used for the study is Maslow's Hierarchy of Needs (1943).

Tinto's Model of Student Retention and Schlossberg's Transition Theory

Tinto's Model of Student Retention focuses on how students integrate into the social and academic aspects of university life, while Schlossberg's Transition Theory considers how students cope with the changes which take place as students transition into university life (Tinto, 2023; Schlossberg et al., 1989). As students decide whether to continue their path in higher education from the first year to the second year, they take into account the experiences and supports that were utilized along the way to see if those same supports will be sufficient enough to continue on to another year (Tinto, 1983).

The supports and coping mechanisms students develop and use during the university experience align with the "four S's" described in Schlossberg's Transition Theory: Situation, Self, Supports, and Strategies (Schlossberg et al., 1989). The Situation describes the event that created the need for a transition. Self refers to the set of personal values and characteristics individuals use to handle changes and transitions. Supports, within the realm of Schlossberg's Transition Theory, comprise the network of individuals and communities that people rely on during periods of transition. Strategies are the tools and coping mechanisms used to help individuals deal with the challenges experienced during transitions (Jafar, 2023; Schlossberg et al.,, 1989). Every student has experienced life altering transitions by virtue of making the decision to apply and subsequently attend the first year of post-secondary education. Then the student eventually decides to either to continue with the second year of school, thus being successfully retained as a student, or the student chooses to withdraw or stop-out, which adds to the attrition rate (Bergman et al., 2014; Miller et al., 2022; Schlossberg et al., 1989).

Maslow's Hierarchy of Needs

In addition to higher education theories, this study will lean on secondary education theories since the predictive factor being analyzed for its impact on higher education retention is high school GPA. Since the measure is taken from a time when the students are in adolescence, it is a natural progression to look at high school GPA from a perspective of theories based on the K-12 education experiences. A common saying in the field of education is "Maslow before Bloom". Elementary teachers, secondary teachers, and administrators use "Maslow before Bloom" to emphasize the need to meet student social and educational needs by prioritizing the social needs to be able to address the educational goals properly later (Mutch & Peung, 2021).

Maslow's (1949) hierarchy of needs is a theoretical framework which outlines how needs should be prioritized for people to reach their full potential. According to Maslow, the five types of needs that must be met for people to be free to reach their full potential are: physiological, safety and security, belongingness, esteem, and self-actualization (Shi & Lin, 2021). Physiological needs are biological needs required by people for basic survival. Safety and security address the need for physical and emotional well-being. The need for belongingness, or love, can be addressed by friendship, acceptance, and trust. Esteem addresses the need for status created by experiencing success, confidence, and respect from others. Self-actualization is a need based on people working towards their personal goals and aspirations (Benti & Stadtmann, 2021; Maslow, 1943, pp. 372-382).

Maslow's hierarchy of needs also applies to faculty and students within higher education, since faculty and students must have at least the most basic needs met in order to be effective at

teaching and learning respectively (Frei-Landau and Levin, 2023). In the same thought process, Tinto's Model of Student Retention and Schlossberg's Transition Theory applies to students in the K-12 learning environment, since students who are more connected and supported during elementary, middle, and high school are more likely to have their basic needs met and be more open to learning the content of the curriculum being taught (Fletcher & Tienda, 2009; Sewell & Goings, 2020; Tinto, 2017)

Since Maslow's theory begins with a focus on physiological needs followed by a focus on safety and security, it bridges the gap between high school and university life for students. Students attend high school in preparation for life outside of school whether that life will involve vocational training or continued education (Mensah et al., 2023). Students who continue on to post-secondary education are working towards the same goal to ensure safety and security through completion of a degree program at a college, university, or similar post-secondary institution (Shi & Lin, 2021).

Once a person decides to attend a college or university, they enter into an unfamiliar environment, which creates the situational transition mentioned by Schlossberg (Miller et al., 2022). During the transition period, it's crucial to inform students about the support systems and programs offered on campus, as outlined in Tinto's Model of Student Retention. Additionally, students should develop their own strategies, as proposed by Schlossberg's Transition Theory, to address basic needs, as highlighted in Maslow's hierarchy of needs (Maslow, 1949; Schlossberg et al., 1989; Tinto, 2023).

Defining Student Success

Student success has varying definitions based on the lens in which it is being viewed. From the perspective of secondary schools and institutions such as high schools, student success

is measured by various factors, including graduation rates, standardized test achievement scores, growth rates, average ACT or SAT scores, average high school GPA rates, and industry certification rates (Chu & Waite, 2023; Waite & Pangelinan, 2023; Waite & Sims, 2024). High schools and teachers are held accountable for the various measures of student success as a part of the whole school effectiveness evaluation and individual teacher effectiveness evaluations (Tennessee Department of Education, n.d.). This study examined high school GPA rates both before and after the COVID-19 pandemic, along with the factors that impact these GPA rates.

Similarly to high schools and other secondary schools, post-secondary institutions have multiple types of data which can be collected and measured to determine student success as noted by York et al. (2019). Examples of some of the data used to assess student success are: GPA rates, student retention rates, persistence rates, graduation rates, career placement, and exam scores (Weatherton & Schussler, 2021). Colleges and universities generally focus on student retention, persistence, and completion as measures of student success (Bergman et al., 2014; Tinto, 2006). Weatherton and Schussler (2021) analyzed 52 academic journal articles to attempt to find a common measurement or definition of student success, and 20 out of the 52 articles measure student success as persistence, retention, attrition, or a combination of two or more of those three examples. For the purpose of this study, student success was defined as student retention from the first year to the second year at a regional public four-year institution.

Retention Rates

Definition and Significance of Student Retention Rates

The focus of this study was first-time student retention rates, which is the measurement of the percentage of students who return to the same institution from their first to second year, in comparison to persistence rates which measures how many students return to any institution for

their sophomore year (National Student Clearinghouse Research Center, 2023). Academic and non-academic variables which have an impact on student persistence rates are also discussed due to the connection between student retention and success rates, where greater student retention leads to greater student success through measures such as four- and six-year completion rates (Barbera et al., 2020).

Academic Factors Influencing Student Retention Rates

Understanding and addressing the various academic factors influencing student retention rates at the post-secondary level is necessary for colleges and universities working to increase academic performance and retention (Anderson et al., 2020; Daffner et al., 2022). High school GPA and overall student performance, standardized test scores like the SAT or ACT, the chosen field of study, and the instructional setting are key components impacting first-year student retention rates (Bordes-Edgar et al., 2011; Brecht & Burnett, 2019; Clovis & Chang, 2021; Sparkman et al., 2012). These factors are not one-size fits all predictors. Each one of the academic influencers affects students different based on their backgrounds, experiences, and personal circumstances, influencing their academic performance and decisions to continue working towards their degrees (Westrick et al., 2015; Westrick et al., 2021).

High School GPA and Previous Student Performance. High school grade point average (GPA) has been used to predict future student success in post-secondary education institutions, since there is a correlation between high school GPA and college completion rates (Bordes-Edgar et al., 2011; Brecht & Burnett, 2019). High school GPA and overall student performance have been found to have a relationship with retention rates at the collegiate level through increased student engagement levels for students who experienced academic success at the high school level (Williams et al., 2018).

Considering the COVID-19 pandemic, researchers are working to find what is the most accurate measure of student success. Meeter (2023) suggests secondary, or high school, GPA is "a better predictor of University first-year-retention than national exams" (Arenas et al., 2021). This is similar to the analysis of data performed by Bannister (2021) for Vassar College and Williams et al. (2018) findings, especially for minority students and students with lower socio-economic status.

Daffner et al. (2022) discussed existing research consensus which notes a positive relationship between majority general education students' high school GPA and their first-year college GPA, especially for female students. According to Wilson et al., high school GPA is related to persistence and retention by being "predictive of both delaying and withdrawing from university education" (2022, p. 7). The most impactful variable on persistence rates, and in turn possibly impact retention rates, found by Mendez et al. (2008) was high school and freshman year GPA for Science, Technology, Engineering (STEM) majors.

The significance of the relationship between high school student performance and GPA and future student success has increased since colleges and universities began relying more heavily on those factors as admissions criteria before the pandemic, and changes were ushered in even faster due to the lack of standardized test scores for students in the cohort years most directly impacted by the COVID-19 pandemic (Arenas et al., 2021; Cai, 2020; Kamssu & Kouam, 2021). Caution should be taken when relying too heavily on high school GPA as a predictor of success, as it has been found to have a lesser relationship with predicting retention and completion for male students (Wilson et al., 2022).

Standardized Test Scores. A traditional predictive measure of student success for post-secondary education is high-stakes, or standardized, testing. According to the College Board,

42% of academic success can be predicted by the use of standardized testing like the SAT and ACT, as noted by Smith and Zagurski (2013). Standardized test scores have long impacted students by being used as a predictive measure of future academic success, as early as their elementary school years, through the use of state mandated achievement assessments (Tennessee State Department of Education, n.d.-b; 2022). Later in this literature review, the history of the creation and implementation of standardized testing in the educational field is discussed. This section is dedicated to investigating the current research concerning the use of standardized test scores, such as the SAT and ACT to predict future academic performance and success in post-secondary programs. Research is continually being completed on the reliability of using standardized test scores to predict student success as measured by student retention and completion (Barbera et al., 2020; Cai, 2020; Sparkman et al., 2012).

Evidence from multiple researchers state the most effective academic measure of future student success is a combination of high school GPA and standardized test scores (Korbin et al., 2008; Kurlaender & Cohen, 2019; Westrick, 2015). In contrast, some research has shown the effect of mixing high school GPAs with standardized test scores does little to improve the predictability of future academic performance over the use of standardized test scores alone (Alotaibi, 2021; Westrick et al., 2021). More research needs to be conducted as to whether the use of standardized testing to predict future academic performance is reliable and equitable. Out of the current body of research available, multiple researchers have come to a shared stance that standardized testing practices are more of an obstacle for under-represented students and are not adequate predictors of true student success (Geiser & Santelices, 2007; Radasanu & Barker, 2021).

Selected Field of Study. A less commonly studied variable, which research suggests has an impact on student retention rates, is the field of study, vocational interest, or major selected by students (Snyder et al., 2022). In the research conducted by Allen and Robbins (2008) concerning the relationship between student selected field of study, also discussed as vocational interest, and the likelihood of academic success at the post-secondary level, previous student performance in high school courses specifically pertaining to a student's vocational interest had a significant impact on a student's ability to continue with their educational experience within their selected institution. Mendez et al. (2008) found STEM and engineering majors had lower retention rates than students with other majors. The findings by Mendez et al. were consistent with predictors of success also noted by Allen and Robbins (2008), Geiser and Santelices (2007), and Snyder et al. (2022).

As students begin working with peers and faculty members with shared interests, specifically those in the same industry and concentration areas, a community network is built for the students. The network of people serve as an additional support group for students during the transitional period at the beginning of the college and university experience, and the importance of these support networks been repeatedly noted by Schlossberg (2011) and Tinto (1975, 2023).

Colleges and universities have used the existing body of research to develop and implement programs as a way to increase student success and retention rates on individual campuses by leveraging the shared interest support networks intentionally at the beginning of a student's journey through the selected degree program. One such program is Austin Peay State University's (APSU) University Success class, coded as "UNIV 1000, UNIV 1010, and HON 1000 and PELP 1000 for students in the Honors Program and President's Emerging Leaders Program" (Austin Peay State University, n.d.). The students registering for the University

Success class are split into separate sections by specific academic characteristics, such as students in the Honors Program and the President's Emerging Leaders Program listed above, specific colleges within the university campus, majors within those colleges, and concentration areas within the major area as needed (Austin Peay State University, n.d.). Through how the courses are created and structured, students have built-in support until they have demonstrated the ability to experience success in the new academic setting by earning a grade of a "C" or higher in the course (Austin Peay State University, n.d.).

Instructional Setting. Instructional setting, especially during the sudden shift during the COVID-19 pandemic, has been shown to have an impact on student academic performance at the collegiate level, which in turn affects student retention and completion rates (El Refae et al., 2021; Guo, 2020). Student performance in online classes under normal conditions produce similar performance results as face-to-face classes, and significant differences found in online versus in-person classes are primarily associated with sudden and unexpected shifts to online learning as experienced during the COVID-19 pandemic mitigation measures implemented by schools across the world (Shim & Lee, 2020).

The benefits reported by students to taking online classes, which were self-reported to increase learning and academic performance, were smoother interactions with each other and the faculty teaching the courses and increased ease of access to course and supplemental materials (Shim & Lee, 2020). Tinto (2023) notes the importance of positive engagement between faculty members and students in the classroom setting as a significant predictor of student retention. Whether the instructional environment is online or face-to-face, instructors can increase the quantity and quality of the interactions with their students by removing communication barriers and providing academic supports within the class (Akram et al., 2021; Engelhart et al., 2022).

Similarly to the way major specific support networks, made up of peers and faculty interested in the same field specific areas, can help support students through the transitional first-year college and university experience, instructors of general education courses can also build safe and supportive relationships with students who do not share the same academic interests as the instructor or faculty member. The more positive relationships students build with people on campus, whether those people are peers, instructors, staff, or faculty members, the more like they are to successfully navigate through the first-year and on to the second-year of their studies (Tinto, 2023).

Non-Academic Factors Impacting Retention Rates

Other variables to consider as potential factors impacting college retention rates include demographic factors such as age, race, gender, financial need, obligations outside of school, and relationships with others (Clovis & Chang, 2021; Shim & Less, 2020; Tinto, 1982; Westrick et al., 2021). The effects of these non-academic variables are not isolated. While each factor is discussed independently in this literature review, the overlaps in their effects will also be examined. The discussion will highlight the existing connections and how the combined effects influence student retention and success at the post-secondary level.

While not all research findings support the idea of non-academic factors impacting future success, such as the study completed by Anderson et al. (2020) specific to special admissions students, who are described as students who experience unique requirements that create the additional transitional burden for these first-year students", found there was a lack of sufficient evidence to suggest a relationship between demographical factors which usually impact future student success. Other research provides evidence that students with disabilities, racial minorities, socio-economically struggling households, and newly enrolled veterans are less likely

to be successful in the post-secondary academic setting without additional supports according to Daffner et al. (2022) and Bramack et al. (2023).

Adult Learners Ages 25 and Older. Student status at the time of post-secondary enrollment has been found to have an impact on student retention and completion rates (Bergman et al., 2014; Williams et al., 2018). Traditional students are categorized as 24 years-old or younger, while adult learners are 25 years-old and older (Buerck et al., 2003). As the population of adult learners continues to increase on college and university campuses nationwide, schools need to be more prepared to provide additional support to help meet the unique needs of the ever growing subgroup of students (Rausch & Buning, 2024).

Adult learners face additional obstacles compared to traditionally enrolled students during their college and university experience which impacts their ability to stay continuously enrolled to degree completion, such as balancing home life, work obligations, and financial challenges, along with managing the workload from coursework and homework (Jafar, 2023). The study conducted by Shim & Lee (2020) found students reported feeling more satisfied when taking online classes as the nature of the classes allowed for additional time to be spent on coursework and outside obligations since commuting to campus was no longer a necessity.

The ability to take online courses has been found to be an additional support for adult learners, especially for the increasing amount of veterans enrolling in institutions using the post-9/11 GI benefit, as it removes one of the barriers to their ability to access higher education opportunities while being able to balance the additional responsibilities such as full-time jobs and other outside obligations unrelated to coursework or school (Barmak, 2023; Jafar, 2023; Rausch & Buning, 2024). During the transition period created by returning to school later in life versus starting at a college or university straight away after high school graduation, poses

additional challenges to adult learners as they have to readjust to being back in an educational setting (Jafar, 2023). In contrast to research about adult learners, students who enroll within a short time period after graduation are more likely to be retained at the end of the first academic year and are more likely to stay enrolled until degree completion (Clovis & Chang, 2021).

Non-Academic Obligations. Tinto (1982) began examining student attrition from a financial need perspective. Students who experience short-term or long-term financial need while attending a college or university are less likely to complete their degree programs, especially when they are farther from degree completion. Most students face additional outside obligations while pursuing higher education, which impacts their academic performance (Barbera et al., 2020). One of the main obligations outside of coursework and school responsibilities is employment, whether part-time or full-time (Caballero, 2020).

While both traditional students and adult learners can experience financial need and strain while working towards degree completion, the ability to successfully balance educational and work responsibilities has a greater impact on student retention for adult learners. Students from economically disadvantaged backgrounds often cannot participate in the support programs and activities provided to students at the post-secondary level due to the additional responsibilities created by their unique financial situations (Bergman et al., 2014; Lock & Shirley, 2022). The task of overcoming economic struggles is even more difficult, considering the students also must make it past the economic challenge of enrolling and attending a college or university first (Morris & McKenzie, 2024).

Relationships with Others. The greatest contributor to a student's decision to continue with the same college or university from the first year to the second year is whether the other students they have close relationships with stay for the next year, too (Tinto, 2023).

Schlossberg's Transition Theory supports the claim by Tinto, since shared experiences between close peers leads to a stronger support system, which would lead to better coping skills to persist even through difficult circumstances (Schlossberg et al., 1989). The relationship between students and faculty members on campus is another example of relationships impacting a student's sense of belonging on campus. Positive relationships with faculty members, which serve as a type of support system, can help students in their academic progress and drive to push through challenges they may encounter in the pivotal first-year experience (Broom et al., 2024; Schlossberg, 2011).

The importance of students having the ability to rely on systems of support cannot be emphasized enough when it comes to increasing student retention and completion rates, especially when it comes to students with additional needs, such as veterans and students with disabilities (Anderson et al., 2020; Daffner et al., 2022; Barmak et al., 2023). The study completed by Miller and Chun (2022) emphasized the effect of having peer mentors and a supportive community, such as a church group or family, and self-support and advocacy had on first-year students with disabilities attending a post-secondary program. Benefits of non-academic supports, whether supplied by the college or university or not, has been demonstrated through multiple studies to be a largely positive experience for students going through the transitions that come with becoming a post-secondary student for the first time (Lightfoot et al., 2021)

Race and Gender. There is limited research readily available specifically addressing race and socio-economic status factors and how those non-academic factors relate to academic performance (Wanzer et al., 2019). Research in the area of completion and graduation rates has found female students are significantly more likely to complete post-secondary programs within

the recommended amount of time as compared to males in the same cohort (Clovis & Chang, 2021; Wilson et al., 2022). The same study conducted by Clovis & Chang (2021) noted "Black and Hispanic students were less likely to complete a degree", while there was not sufficient evidence to support a correlation between Asian students and likelihood of degree completion. Kurlaender & Cohen found the combined use of high school GPA and standardized test scores as the predictive measures of student success resulted in a more racially and economically diverse student population on campus which has an increased retention rate over using only one of the two predictors of success (2019).

Historical Grading Practices and High School GPA

Overview of Historical Grading Practices

At the inception of secondary and post-secondary educational institutions, students would prove their understanding of their lessons and completed their studies by oral or written exams. The exams sometimes served as admission requirements for institutions. When the exams were used to determine student competency, they were usually administered at the end of a year of study or completion of the program. The earliest forms of educational testing to prove student competency was in China around 2200 B.C. (McArthur, 1987). Since assessment of skills in education exists to ensure the examinee being assessed has learned enough to be able to obtain their certification the student was seeking an oral or written examination was enough to be sufficient to prove mastery.

In 1785 Yale created their own system of ranking their students on a scale from zero to four, where students who earned between a two and a four on their oral examinations passed the examination process (Schneider & Hutt, 2013). The students who scored a four were the highest performing students in the examination. By 1837 this system included half and quarter points to

distinguish between students even further, and these marks were later recorded similarly to how grades are recorded in education in the "Book of Averages" as quoted by Pierson (1983, p. 310) in Schneider and Hutt (2013, p. 4).

The five point grading scale utilized by Yale during the early 1800s would later transition to become a similar scale used to calculate grade point average (GPA) for students in their elementary years through graduation in the United States. In K-12 schools that measure student GPA, many of them use a zero to four point scale where a one is the lowest passing mark, which correlates with a D on the A, B, C, D, and F marking scale (The Nation's Report Card, n.d.).

Grades have not always been reported as A, B, C, D, or F in the American education system. As noted by Brookhart et al. (2016), the practice of sending home written narratives of student performance was the standard for the 19th century. Eventually the task of writing narrative progress reports became too cumbersome and time consuming for teachers to complete as public education grew in the United States to include an increasing number of students and subjects being taught in schools after the transition towards compulsory public education at a broader scale after the industrial revolution (Brookhart et al., 2016; Laska & Juarez, 1992; Schneider & Hutt, 2013).

Once the shift towards standardized marks on the five point alphabetical scale was consistently implemented, a need arose for schools to be able to give a standardized measure or data point to represent a student's overall performance in high school. Student grade point average (GPA) became the default measurement to meet the need for a standardized way to summarize student performance in high school. GPA is an arithmetic mean, or average, where each course is worth a specified number of credits and the earned grades ranging from A to F are correlated with a value from 4 to 0 respectively (Soh, 2011).

There are exceptions to the four point scale being used to calculate high school student GPAs, and one of those is by taking Advanced Placement (AP) Courses, honors classes, and any other more rigorous course which qualifies for calculating a weighted course average (Wehde-Roddiger et al., 2012). A weighted course average is designed to reflect the additional effort required to successfully master the more difficult course content and material (Uribe & Garcia, 2012). Students who attend schools that utilize the weighted grade point averages could earn a GPA higher than 4.0. Institutions sometimes require GPAs which are not calculated in the traditional manner, such as ones including additional points for AP classes or irregular scales, be converted to the traditional scale using formulas provided by the institution (The University of Kansas, n.d.). For the purposes of this study, the student GPA will be based on the four point scale.

One use of the standardized marks was introduced, during the late 1700s, was intended to motivate students to compete with one another and to make transferring between educational institutions an easier process for students (Neuhaus & Jacobsen, 2022). With the new standardized marking system, incoming students would be able to begin their studies at their new institutions as a continuation of their educational pursuits from their previous schools. This was one of the first instances of what would later become transfer credits as they are used in post-secondary education currently. While the connection between standardized marks is interesting, it is not the focus of this study.

Evolution of Educational Structure in the United States

As education became more accessible, and even compulsory in some instances, there was a need to evaluate student progress to determine which students would be allowed to continue to higher education institutions and which ones would not be continuing their studies. There was a

great emphasis on compulsory education led by Prussia in the 1800s which was similar, albeit more extreme in its inexcusability for truancy, to what exists today in the United States (Kaestle, 1983). Supporters of compulsory education in the United States viewed public education as a way to benefit society by reducing the additional cost associated in dealing with increased poverty and crime. The schools created as a result of the increased focus on public education were common schools (Center on Education Policy, 2020; Spring, 1997).

At their inception in the United States in smaller primary and common schools, formal grades and marks earned by students in school represented students' current mastery of the topics that were taught and subsequently assessed (Kaestle, 1983; Laska & Juarez, 1992). An early version of this was class ranking, but it is not class ranking quite the same as what is used today to determine Valedictorian and Salutatorian. Those honors are traditionally reserved for the top two highest academically performing students in the school respectively, with some policies that create exceptions in individual districts (Jett, 2019). Valedictorian and Salutatorian are calculated for students who are graduating by comparing the GPAs, standardized test scores, and courses taken to see which two students have the highest achievements compared to the rest of the graduating class. In some cases schools will have multiple Valedictorians and Salutatorians since some schools do not have a tie-breaker process (Uribe & Garcia, 2012).

In contrast to how class ranking is usually used currently in the K-12 system, the class ranking of the Lancasterian model was a continuously occurring process similar to keep students competing with one another. Before schools were organized by grade levels determined by age bands, the students were ranked based on their academic performance alone. The idea of rank based on academic performance was based on the Lancasterian Model as described by Kaestle (1983) and Neuhaus & Jacobsen (2022).

At its roots the Lancasterian model of instruction was created to develop students' moral character and reasoning skills (Center on Education Policy, 2020; Spring, 2001, pp. 66-67). One notable part of the Lancasterian model of schools was as students moved up the ranks in the academic performance, the students would then assist the teachers in teaching the younger pupils in the schools. (Schneider & Hutt, 2013). Academic performance was measured by a student's ability to recite the learned curriculum in front of the entire student body. The practice of utilizing higher performing students as assistants to the teacher benefited schools at the time as public schools and some private schools were generally underfunded (Bailyn, 1972, pp. 108-109).

As the United States entered the Industrial Revolution, there was a shift in what was expected of public education. At the onset of the Industrial Revolution, primary and common schools shifted to elementary schools in the United States, and there was an overall shift that led to a more organized school structure, led by Horace Mann. The reform led by Mann involved standardized content to be taught, regular assessments, and age based grade levels (Neuhaus & Jacobsen, 2022; Schneider & Hutt, 2013). The change to age based grade levels and assessment practices from the Lancasterian model of education in the United States required a shift in the public perception of what a quality education looked like at the time (Laska & Juarez, 1992).

With the introduction of standardized content and regular assessments in public schools, textbooks were also introduced to ensure students were receiving the quality education decided on by the local and state school boards. The addition of textbooks within grade levels also made it easier to provide teachers the necessary materials to teach the required curriculum since teachers often were transient and less well trained in rural areas of the United States (Center on Education Policy, 2020). The introduction of standardized textbooks and standards in

educational practice eventually led to an attempt at standardization of assessments and grading (Neuhaus & Jacobsen, 2022).

Introduction of Standardized Assessment in the United States

Written examinations first appeared in the United States in 1845, and they quickly spread through the existing school systems and districts. An example of these written exams is the Common Test created by Horace Mann (Gallagher, 2003). These first forms of standardized testing were used to measure whether students were prepared enough to pass to the next grade level in school or graduate (McArthur, 1987). The emphasis on passing standardized tests is still present for students in Tennessee with the new third grade retention law which outlines the requirement for third grade students to pass the Tennessee Comprehensive Assessment Program (TCAP) test to matriculate to fourth grade. (Tennessee Department of Education, 2022). The written examinations rewarded memorization of facts which did not lead to long term learning as much as it led to students cramming to perform well enough to earn the needed marks to pass the exam or course (Ebel, 1980).

As more students were attending school on a regular basis, schools and newly created school boards needed a way to streamline the feedback and assessment processes used to note a student's progress through their schooling experience (Neuhaus & Jacobsen, 2022). School boards were created with the purpose of creating consistency and accountability at a state and local level through the creation of educational policies for the area or district the boards serve, including setting grading scales and procedures (Land, 2002). Not all schools adopted the standardized testing as their measurement of student success; many began using traditional numerical and letter grades to communicate student progress between the faculty members and eventually with families. Eventually grades had to become more standardized throughout

different schools and school systems to communicate student progress in a common format between institutions such as from elementary to secondary or transferring between institutions as needed when students and families move to new school zones (Schneider & Hutt, 2013).

In 1923 the Stanford Achievement Test, not to be confused with the modern day SAT, was created to determine student abilities and drive the creation of curriculum which would best help the variety of student performance levels as indicated by the series of tests which collectively compose the assessment (Gallagher, 2003). The idea of using a standard test to measure elementary and secondary school student progress caught on quickly throughout the United States. The first example of a state mandated standardized assessment was implemented in 1935 with the creation of Iowa Test of Basic Skills which have since been renamed as the Iowa Assessments (The University of Iowa College of Education, 2024).

Statewide standardized testing is still prevalent across the United States, and in Tennessee the state testing is called the Tennessee Comprehensive Assessment Program (TCAP) or TNReady (Tennessee Department of Education, n.d.-b). TCAP became the official state testing program for Tennessee in 1988, and it includes the core content areas of math, reading, social studies, and science for third through eighth grade. At the high school level the subset of TCAP tests are called End of Course exams or EOCs. The EOCs cover Algebra I/Integrated Math I, Geometry/Integrated Math II, Algebra II/Integrated Math III, English I, English II, Biology, and US History. TCAP also has versions of the test for students with significant cognitive learning disabilities which must be administered for each student even if the student is not working towards earning a traditional diploma (Tennessee Department of Education, n.d.-b).

In addition to measuring student preparedness for attending colleges and universities through traditional grade calculations such as the GPA, standardized tests became popular tools

to determine if students were ready for post-secondary education (Meeter, 2023). Standardized assessments like the American College Testing (ACT) and SAT, formerly known as the Scholastic Aptitude Test and the Scholastic Achievement Test, are most recently used to gauge students' readiness for post-secondary education (Berger, 2012). In some states, including Tennessee, standardized tests are now graduation requirements. All high school juniors pursuing a traditional or honors diploma are required to take the ACT during their junior year of high school (Tennessee Department of Education, n.d.-b).

Educational assessments, like the SAT, have evolved significantly. Initially the SAT was designed with the assumption students would not finish within the given time constraints (Lawrence et al., 2002; Lawrence et al., 2003). Additionally sections of the test have been modified such as the addition and later removal of the analogies portion, and the removal of the optional writing exam in an effort to level the playing field to help students have equal opportunities for success (Hoover, 2021; The College Board, 2021). The ACT has more recently made changes to the structure of the assessment in an effort to more accurately represent student readiness. The new changes are intended to reduce the amount of questions in the reading subtest; thereby, students will be able to use the unchanged time allotments to spend more time per question for the student score to represent more of what students know and less how quickly they can answer correctly. The science portion will now be optional, as the writing portion has been for quite some time (ACT, 2024-b).

Factors Impacting High School GPA

High school GPAs are impacted by multiple factors for each student. These factors can be academic and non-academic in nature. The academic factors impacting high school GPA are similar to academic factors impacting student success and retention at the post-secondary level,

such as overall student performance in high school courses, standardized test scores, high school pathway selected by students, and instructional practices and policies (Hampton, 2021).

Non-academic factors impacting high school GPA also share5- similarities with non-academic factors that affect student success at the college and university level (Mutch & Peung, 2021; Sparks, 2022) Parental and community support, attendance, student mental health, and availability to work on assignments outside of school hours are examples of factors which can adversely impact a student's high school performance and, by extension, GPA (Yukdakul & Arar, 2023).

Similar to the non-academic factors impacting student success at the post-secondary level, students must have basic needs met to perform at a high academic level in high school courses as described by the foundational educational research completed by Maslow (1943). When a student's family faces periods of hardship, whether it be economical, environmental, or emotional in nature, the student will often carry a physical or psychological burden which likely impacts their ability to perform academically at school, similarly to how more adult learners at college and university deal with compared to the traditional students within the same cohort (Yurdakul & Arar, 2023). Students will sometimes take on part-time employment or additional responsibilities around the household to compensate for whatever hardship the family is experiencing. Often additional mental and physical responsibilities impact a student's schoolwork and performance, eventually culminating in a single measurement point of high school GPA (Hampton et al., 2021).

Unlike transfer students in the higher education system, students in secondary schools have little to no control over what school they attend. This is most frequently determined by the school zone in which their family lives. There are exceptions to requiring students to attend the

school in which their physical address is zoned, such as open enrollment policies within districts, out of zone requests offered and approved by districts, private schools, charter schools, magnet schools, and unhoused protection laws such as the McKinney-Vento Homeless Assistance Act of 1987, which allows students to continue attending their previous school of zone at the time they become unhoused (National Center for Homeless Education, n.d.). As all people need time and support to adjust to life changes, students who move to new schools and school systems need additional support like what is mentioned in Schlossnerg's Transition Theory to help them be successful in their new educational environment (Schlossberg et al., 1989).

Variability in Grading Practices Across Teachers, Schools, and Districts

While there is a standardized practice of using the five-point grading scale ranging from A-F in the United States, there is a lack of completely standardized grading practices across schools, districts, and individual states in the United States (Soh, 2011). Since there is variability in how students are graded or assessed for their overall performance in classes, there is also variability in how their grade point averages (GPAs) are calculated (Arenas et al., 2021). There is debate on whether GPA is a good way to determine how much a student has learned (Cavanaugh et al., 2023).

Even within the same schools and districts, there are discrepancies in how teachers assess their students. The differences in assessment practices have been present since standardized grading practices were first introduced at the higher education institutions in the United States. Some schools and districts have regulated the grading practices in order to alleviate the chance of an individual teacher's professional practices from negatively impacting a student in their class, when they might have performed better in another teacher's class purely by chance of their grading practices (Neuhaus & Jacobsen, 2022). An example of this is when teachers count non-

academic skills in their grading calculations, such as behavior in class (Arenas et al., 2021; Lavy & Sand, 2018; Terrier, 2020). Student GPAs will remain an imperfect measure of student ability as long as there is subjectivity in how grades are calculated and reported at the state, district, school, and teacher level (Brookhart et al., 2016).

High School Course Pathways and GPA

High school students are expected to select their pathway or focus area at the beginning of their high school career in Tennessee. The pathways or focus areas available to the students in Tennessee are "Math and Science, Career and Technical Education, Fine Arts, Humanities, Advanced Placement (AP) or International Baccalaureate (IB)" (Tennessee State Government, n.d.). The pathways, created and approved by the State of Tennessee and the Department of Education, were created to ensure high school students have an understanding of how their educational experiences prepare them for life after high school. At the end of their high school career, students have had the opportunity to experience "relevant coursework, Early Postsecondary Opportunities (EPSOs) and Work Based Learning (WBL), Cross-Sector Partnerships, and Culminating Credentials", as applicable (Tennessee Department of Education, n.d-c).

Even within the six major pathways, there are multiple concentrations within some of the pathways, such as the Career and Technical Education programs. The classes taken by students vary based on which pathway students choose to pursue while in high school (CTE Tennessee, 2024; Robertson County Schools, 2023). Students planning to attend traditional post-secondary institutions, whether it is a community college, a traditional college, or university, are expected to fulfill certain graduation requirements specific to students attending a degree awarding institution (Tennessee State Government, n.d.). The requirements for subsets of college bound

pathways are more rigorous and specific for students working towards the Advanced Placement and International Baccalaureate concentrations (Tennessee State Government, n.d.).

Career and Technical Education (CTE) bound students have multiple concentrations to choose from to meet their graduation requirements. The following programs are offered throughout the State of Tennessee: Advanced Manufacturing; Agriculture, Food, and Natural Resources; Architecture & Construction; Arts, Audio/Visual Technology, & Communications; Business Management & Administration; Education and Training; Finance; Government & Public Administration; Health Science; Hospitality & Tourism; Human Services; Information Technology; Law, Public Safety, Corrections, & Security; Marketing, Distribution, & Logistics; STEM; and Transportation (Tennessee State Government, 2024-a).

Even though not all high school students will go on to attend formal post-secondary education in the form of a college or university, it is important to acknowledge the courses students take in high school, especially the ones they choose to take based on their plans after high school graduation, will have a significant impact on their high school grades and GPA. When students place more value on what they are learning, they are more likely to work harder to master the concepts and perform better academically than in classes that are the high school equivalent of general education courses (Fletcher & Tienda, 2009).

Students also have the shared benefit of having the ability to develop a network of people who have shared interests within the specific shared pathways in their content specialty courses (Fletcher & Tienda, 2009). The networks students build through their course pathways can include faculty members from their schools, classmates, faculty and staff from other schools who work in the same pathway area, and outside members of the community with experiences in the specific area through associated school and club events (DaDeppo, 2009). A few examples of

this are connections formed by honor societies, clubs, and organizations such as the National Beta Club, the National Honor Society, Mu Alpha Theta, Future Teachers of America, and local university faculty and staff for Dual Enrollment courses, to name just a few (Robertson County Schools, 2024).

Career and Technical Education pathways specific to certain industries also have access to additional organizations and connections while also including some of the same clubs and organizations as traditional college bound pathways. A list of industry specific organizations and clubs include, but are not limited to, the Future Farmers of America, Future Business Leaders of America, Health Occupations Students of America, and Future Teachers of America (Robertson County Schools, 2024).

Admission Practices, High School GPA, and the COVID-19 Pandemic

Changes to the Higher Education Admission Practices

Some larger institutions offer early admission and decisions more often than the smaller sized post-secondary institutions (Wofford, 2022). The students who are accepted in the early admissions and decisions process have an advantage over other students since they do not rely as heavily on scholarships and grants since those students are applying for an honors program or are from a more affluent background (Wofford, 2022). Early admission and early decision students have a quantifiable benefit which is equivalent to a 100 point increase on their SAT scores according to Avery et al., (2003). Since students who are granted early admissions and decisions do not necessarily end up attending the college or university that provided the benefit of early admission or decision, the proposed study will not delineate between admission types for the purposes of this research (Steadman, 2022).

Shift to Using High School GPA for College Admissions

Up until the beginning of the COVID-19 pandemic, colleges and universities relied on the results of standardized testing to help determine if students will be successful once they transition into the first year of post-secondary education and continue on to be retained into the second year (Kiser & Price, 2008). Due to the COVID-19 outbreak impacting the ability to administer traditional standardized testing for college admissions, post-secondary schools reverted to using prospective students' high school grade point averages to determine if the students will be accepted to the institution. Predicting whether students would be successful in post-secondary education had to shift away from standardized testing results due to the pandemic outbreak reducing the ability to administer high-stakes testing due to social-distancing mitigation measures (Arenas et al., 2021).

The inability to administer standardized tests safely prompted institutions to adopt a more holistic admissions process, which can mitigate the impacts of student inequities created from factors like learning disabilities, low-income backgrounds, single-parent households, or attending underperforming high schools, all of which can negatively affect performance on high-stakes standardized testing (Arenas et al., 2021; Bannister, 2021; Lightfoot et al., 2018). Colleges and universities recognized the need to change admission criteria to reflect students' inability to take the usual standardized tests to meet the special circumstances created by the pandemic (California State University, 2022). The faculty and staff had to move quickly as there was not sufficient time to roll out a well-researched plan in such a short time-period as guidance for best practices to prevent the spread of the virus changed almost daily (U.S. Department of Defense, 2023).

Some post-secondary institutions were already attempting to find a more equitable way to determine admission requirements by eliminating the requirement for students to submit the standardized test scores in college applications, and the pandemic ushered these changes in at a faster pace (Cai, 2020; Bannister, 2021, Snyder et al., 2024). In the search for finding a more holistic admission criteria, colleges and universities had to look at which predictors of success could be used in lieu of standardized tests scores (Bannister, 2021; California State University, 2022).

Existing research on student retention rates often mentions not just standardized testing as the predictor of student success, but also includes discussion on how previous performance such as high school GPA correlates with student persistence and retention (Al Hazaa et al., 2021; Bordes-Edgar et al., 2011; Brecht & Burnett, 2019; Hammerlie & Montgomery, 2012; Kizer & Price, 2008). High school GPA has a positive correlation with student retention and persistence rates for all genders, student athletes, and minority students, so colleges and universities began placing a higher emphasis on high school performance as measured by the students' high school GPAs (Bordes-Edgar et al., 2011; Brecht & Burnett, 2019; Hammerlie & Montgomery, 2012).

The practice of using high school GPA instead of standardized test scores continued after social distancing practices ended. As of the Spring of 2022, "10% of 4-year colleges were test-blind, 71% were test-optional, 13% were test-optional with exceptions, and 6% required admissions tests for 2021" (Camara & Mattern, 2022). Test-blind means students have the opportunity to submit the standardized test scores, but the institution did not look at the test scores as a part of the admissions evaluation process. Test-optional means students have to opportunity, but are not required, to submit their test scores for consideration as a part of the application process (Radasanu & Barker, 2021).

Challenges Faced by Educators and Institutions During COVID-19

Online instruction in the K-12 and higher education systems is sometimes perceived as creating better access to a comparable in person education for students who were unable to access on campus instruction, but other times it is viewed as a lower quality alternative by critics who argue that the instructional quality is lacking the appropriate amount of rigor to be equivalent to in person instruction (Webster, 2023).

Colleges, universities, and other post-secondary institutions' faculty members were already using learning management systems (LMS) on a more regular basis than teachers in a K-12 setting. K-12 school systems have LMS more often now than they did pre-pandemic, but that did not translate to them being used on a regular basis. They were even more rarely used to provide all the instruction and support for a class without face-to-face interaction. Learning management systems are primarily used to supplement in person instruction by acting as a student portal which houses frequently used programs, class notebooks, and assignments (Doringin et al., 2023). The sudden change to all instruction being completed remotely certainly had an impact on student success in their coursework. One example of this is students and teachers did not always have the resources to complete online synchronous, or even asynchronous instruction (Mutch & Peung, 2021).

The mixed perceptions of online instruction, especially when the shift was as sudden as it was with the pandemic, leads to the importance of school technology and curriculum staff supporting teachers as instruction changed to either asynchronous or synchronous teaching online (Webster, 2023). Even though teachers use technology effectively to enhance their instructional practices, that does not necessarily mean they are able to shift to a completely online instruction format with the same effectiveness (Akram et al., 2021).

A teacher's ability to shift to online learning depends on their experience using Information and Communications Technologies (ICT) in a meaningful way to deliver instruction and assess student progress (Idaho Assistive Technology Project, n.d.). If teachers lacked the experience using the types of ICT tools needed to teach online, it would be up to the school or institution they were at to provide adequate training and support to help the teachers be more successful when implementing these for fully online instruction for the first time (Akram et al., 2021).

The tools the students and institution or school had available for teachers and students to use at the time of the sudden shift would determine what type of instruction teachers could shift to during the COVID-19 pandemic. An example of the basic necessities for students and teachers to be successful when shifting to online learning is the ability for teachers and the students to access internet that was powerful enough to run the online learning tools supplied by the school district. Not only did students need access to the programs used for online instruction, they need to be able to use them successfully without additional supports from adults (Hampton et al, 2021). Whether teachers felt supported during this sudden shift to online teaching contributed to teachers' job satisfaction and possible decision to leave the school or the teaching profession (Shim et al., 2021).

The 2020-2021 academic year began with a significant increase in teacher resignations and retirements due to how the teaching environment changed as a result of the COVID-19 pandemic (Bastian & Fuller, 2023). An increase in teacher attrition rates and a decrease in new teacher candidates in colleges and universities has led to an increase in class sizes and classrooms without certified teachers, which leads to negative learning outcomes for students

and exacerbated the already existing teacher shortage in the United States (Aeschlimann et al., 2019; Glazer, 2018).

Impact of the Pandemic on Grading Practices and Student Performance

The COVID-19 pandemic created a need for all levels of school, from colleges and universities to high school, to shift to online learning in an effort to curb the spread of the virus through social distancing. This shift to online learning utilized e-learning with traditional laptop computers or Chromebook devices or m-learning with mobile devices. M-learning is the same concept as e-learning, except all the e-learning materials can be easily and adequately accessed with mobile devices (Sitar-Taut & Mican, 2021). During the shift to online based learning, parents and teachers had to come to terms with how traditional education had to change to accommodate the need to social distance while still focusing on student learning.

Mutch and Peung (2021) found a pattern in their study where teachers realized it would be unattainable to continue to teach and expect students to learn and master skills without a significant shift in how instruction was being delivered. M-learning, short for mobile learning, became an important tool for teachers to use to meet the learning needs of the students, and the practice of m-learning is more than simply accessing course materials and content on a mobile device. The teachers had to adapt the curriculum and how it is accessed to be meaningful and beneficial for student learning (Sitra-Taut & Mican, 2021).

The data analysis completed by Cavanaugh et al. resulted in “an overall increase of 0.10 (out of 4.0) grade point average” for the participants in their study who had teachers that were new to teaching online at the onset of the COVID-19 pandemic (2023, p. 37). This distinction for teachers who were new to online teaching at the beginning of the pandemic is significant since their previous teaching methods and strategies would have had to be adjusted quickly based on

the urgent need to discontinue in person classes (Cavanaugh et al., 2023). Mutch and Peung (2021) discuss the impact of the sudden shift to online learning for educators at length. While Cavanaugh et al. (2023) found student grades did not suffer as a result of the sudden shift to online learning during the pandemic, the researchers did note student performance may have increased slightly during that time period.

Academic Integrity in the Wake of the COVID-19 Pandemic

The foundation of support traditionally provided by familial, social, and school based networks was drastically changed in wake of the COVID-19 pandemic in the spring semester of 2020 (Mutch & Peung, 2021). The change in how supported students felt during the sudden transition to their new environment during the pandemic had an impact on how students interacted with the learning process. Students began to rely on coping mechanisms as mentioned in Schlossberg's Transition Theory (Schlossberg et al., 1989).One of the coping mechanisms used by a fair number of students was academic dishonesty (Yazcici et al., 2022).

As students were submitting their work during the pandemic, there was an increase in incidents of plagiarism and academic dishonesty (Erguvan, 2021; Jenkins, 2023; Zerkina et al, 2021). Teachers without the access to tools used to detect plagiarism were at a disadvantage compared to their better equipped peers to detect contract cheating, where students would turn in work completed by someone other than themselves as their own original work (Erguvan, 2021; Zerkina et al., 2021).

Digital forms of contract cheating, such as having an online service write a paper or assignment for the student, having another person take an online assessment, or having someone contracted through an online service complete discussion posts or other formative assignments (Daly & Ryan, 2024), was only one of the methods of cheating utilized by students during the

pandemic. Students also had private tutors, family members, and friends complete their work for them when they were home during the pandemic. This was not a new occurrence, but some researchers suggest there was an increase of academic dishonesty in the form of contract cheating during the COVID-19 pandemic (Erguvan, 2021; Jenkins, 2023).

The study conducted by Yazici et al. (2022) provided clarification that while instances of academic dishonesty and cheating did increase during the pandemic, the largest predictor for students cheating in online classes was the students' self-reporting on if they had previously cheated during a face-to-face class. Zerkina et al. (2021) and Newton and Essex (2023) researchers both found students were more willing to justify the academic dishonesty due to the pressure of completing the work in an asynchronous environment unexpectedly and the ease at which the cheating could be done with less risk of being caught and reported to the Office of Academic Integrity.

The rise in academic dishonesty amid the COVID-19 pandemic was expected to boost students' average GPAs (Erguvan, 2021; Fass-Holmes, 2022; Jenkins, 2023; Yazici et al., 2022). A study conducted by Fass-Holmes (2022) revealed a general decline in the GPAs of international students at a west coast university in the United States. The author suggests this decline could be attributed to the stressors stemming from the pandemic and the lack of adequate support for international students at the university (Fass-Holmes, 2022).

A Discussion of Best Practices in Predicting Post-Secondary Success

Comparison of GPA and Standardized Testing as Predictors of Success

A unique approach was taken to analyze whether high-stakes exams were aligned with high school GPA performance. Arenas et al. (2021) analyzed predicted high-stakes exams scores for students who were admitted to post-secondary institutions to determine if high school

performance was a quality indicator of future academic success alongside the students' predicted scores. The results of the study concluded predictive models of high-stakes test scores alone was not sufficient to predict future academic performance. In a situation like the COVID-19 pandemic, Arenas et al. (2021) recommended a "combination of high-stakes exams, high school grades, and potentially other characteristics" as a way to possibly determine future academic performance of perspective students.

Geiser and Santelices (2007) argued high school GPAs are the better predictor for student retention than standardized testing alone, but the best combination for predicting success and retention is the high school GPA recalculated based on only the college preparatory courses taken in high school alongside standardized testing performance. Brecht and Burnett have also found "high school GPA and standardized tests correlated with the academic success of the student athlete population" (2019, p. 50).

Holistic Approach in Predicting Future Academic Performance

A significant factor in the predicted success rates, and future college GPA, for general education students, and students with disabilities, are the relationships students build with the faculty members at the colleges and universities outside of the traditional classroom setting (DaDeppo, 2009; Tinto, 2023). Students are provided with special education services in the high school setting to assist in overcoming the challenges presented by the qualifying disabilities. With the additional support provided by the special education services, students sometimes can perform at a higher level in high school than in post-secondary institutions (Daffner et al., 2022). At the high school level students have their parents and case-managers as advocates to ensure they receive the necessary accommodations as required by the Individuals with Disabilities in Education Act (IDEA).

When students transition to higher education institutions, it is up to them to enroll with the Office of Disability Services for their school. Then the students must submit all the supporting documents and request the specific accommodations they need to be successful in their coursework. Students with disabilities are less likely to understand the full impact their disability has on their education and how to adequately self-advocate for their needs, which can lead to greater chance of attrition from the student's freshman to sophomore year of college or university (DaDeppo, 2009; Daffner et al., 2022).

Summary

This literature review has outlined the past and current post-secondary admissions standards used to help determine possible future student success as measured by first-time, first-year student retention rates. Since the return to relatively normal social conditions post-pandemic, some colleges and universities have changed back to requiring standardized test scores for incoming students (Crimson Education Strategists, 2024; Harvard College, n.d.). The test scores are used, alongside other factors, including high school GPA to predict a student's chance at successfully staying at the college or university year over year, until completion Zagurski (2013). This review contributes to ongoing research as colleges and universities consider whether to return to requiring standardized test scores in the admissions process to increase student retention and completion (Bannister, 2021).

Beyond determining the necessity of standardized test scores, institutions need to understand other factors impacting student retention (Lock & Shirley, 2022; Westrick et al., 2021). The theoretical framework constructed for this study includes Tinto's Theory of Student Retention, Schlossberg's Transition Theory, and Maslow's Hierarchy of Needs. These frameworks highlight the importance of academic and social integration, supports during times

of transition, and meeting basic physical and emotional needs to help increase student success and retention (Caballero, 2020; Maslow, 1943; Mutch & Peung, 2021; Schlossberg et al., 1989; Tinto, 2023).

This chapter has laid the framework for this study, which was used to see if a relationship exists between high school GPA, post-pandemic, and first-year retention rates for students at a local, public four-year university. Additional analyses were completed to determine if relationships exist between the subgroups of biological sex and traditional students versus adult learners at the time of enrollment. The following chapter outlines the methodology and procedures used to test the hypotheses within this study.

Chapter III

METHODOLOGY

Colleges and universities strive to improve student retention rates in an effort to increase overall student success, which is frequently measured by four- and six-year completion rates (National Center for Education Statistics, 2022; York et al., 2019). Since high school GPA has increasingly been used as the primary quantitative measure to evaluate the likelihood of a first-time, first-year student's return to the same college or university, more research needs to be conducted to see if a relationship exists between high school GPA and student retention rates at the post-secondary level (Cai, 2020; Steedle & Way, 2024).

Additionally, research conducted on data sets existing before the COVID-19 pandemic has found first-time female and traditional students are more likely to be retained and continue on to degree completion than male and adult learners (Barbera et al., 2020; National Center for Education Statistics, 2022; Institute of Education Sciences, 2020). This study was intended to add to the current body of knowledge concerning the post-pandemic association between high school GPA and retention rates, with special attention given to the analysis of traditional students versus adult learners and biological sex (Steedle & Way, 2024).

Data Collection and Subjects

This longitudinal, *ex post facto* study used data from a pre-existing data set at a local, public four-year university in Tennessee. Due to the need for additional research concerning the potential relationship between high school GPA and student retention rates since the COVID-19 pandemic, the data for this study needed to include cohorts of students from before and after the pandemic (Paris, 2023). The sample of students consisted of six different cohort years: three pre-pandemic years (2016-2017, 2017-2018, 2018-2019) and three post-pandemic years (2020-2021,

2021-2022, 2022-2023). The 2019-2020 cohort year was specifically excluded since the data was neither strictly pre- nor post-pandemic.

The data used from the existing data set included high school GPA, whether the student was retained at the end of their first year, biological sex, and student status at the time of enrollment (traditional students versus adult learners). Traditional student status were defined as ages 24 years old or younger, and adult learner status will be for students ages 25 years old or older (Buerck et al., 2003).

The specific subgroups selected for additional analysis in this study were selected due to their prevalence and significance in pre-pandemic research on student retention (Wanzer et al., 2019). This allowed for a more reliable comparison between the results of this study and previous research on post-secondary student retention rates. Colleges and universities can use the findings to plan and implement policies to increase student support and retention rates (Barbera et al., 2020; Hammerlie et al., 2012; Tight, 2020; Tinto, 2006). The study was limited to first-time, first-year students at a local, public four-year university in Tennessee.

Research Design and Procedures

The study was an *ex post facto*, non-experimental, longitudinal design since the data already existed in a database with the reasonable expectation from participants that the data would be used for the purposes of higher education research (Giuffre, 1997; Johnson & Christensen, 2020, p. 384; Parkin & Baldwin, 2009). This study looked at the relationship between high school grade point average (GPA) and first-year student retention at a local public four-year university pre- and post-COVID. Since colleges and universities are in the midst of deciding whether to continue the practice of eliminating the requirement for standardized testing as a part of the admissions process post-COVID pandemic, there is a need to find out more about

the previous and existing relationships between high school GPA as a potential predictor of first-year student retention at post-secondary institutions (California State University, 2022; Weatherton & Schussler, 2021).

The data used for this study was existing data from a local four-year university that included: high school GPA, whether the student was retained successfully, biological sex, and age at initial attendance for participants in the study (Caballlero, 2020). A chi-square test was completed to determine if any relationships found between high school GPA and student retention are statistically significant (Johnson & Christensen, 2020, p. 531). Since the study has additional factors which impact student retention, a definitive causal relationship between high school GPA and student retention cannot be stated even if the data analysis identifies a relationship between the two variables (Johnson & Christensen, 2020, p. 374). Non-experimental designs can only suggest probabilities and associations rather than cause-and-effect relationships (Johnson & Christensen, 2020, p. 368).

To help eliminate the impact of possible confounding factors, four additional research hypotheses were created for this study to investigate the potential relationships that may exist between high school GPA and college retention, pre- and post-COVID, by biological sex and student status at time of enrollment as sorted into traditional students versus adult learners (Morris & McKenzie, 2024). The additional information included in the literature review about all the potential factors impacting both high school GPA and post-secondary retention helped provide context to relationships found between the two main variables and the subgroups being analyzed (Johnson & Christensen, 2020, p. 375). When the results of the analyses are combined with the context provided for each of the confounding variables, the effects of the third variable problem can be reduced in this non-experimental study (Johnson & Christensen, 2020, p. 375).

Analysis of the Data

This study utilized chi-square tests, *Cramer's V*, and odds ratios to examine the relationship between high school GPA and retention. The chi-square tests assessed whether a statistically significant relationship exists between the variables, while *Cramer's V* and odds ratios measure the effect size, or strength, of the relationship (Johnson & Christensen, 2020, p.524). Cramer's V is the square root of Chi Square over the total times the minimum of the row or column minus one (Field, 2018). Together, these analyses determined whether the observed relationships were strong or statistically significant.

The contingency table was created with the independent variable of high school GPA for the rows of data. The cutoffs that were used for high school GPA were created by finding the mean and standard deviation of the pre-pandemic sample of high school GPAs. Mean and the first standard deviation cut points were selected to find the relationship between high school GPA and retention for groups of students that might have more variability in whether or not they would return the following fall based on having high school GPAs that are more representative of a larger sample, approximately 68% of the population according to the Empirical Rule (Larson, 2023, p. 88). The dependent variable of retention was used for the columns of the contingency table, with yes notating successful retention and no representing unsuccessful retention.

The first two hypotheses for the study are:

$\boldsymbol{H_1}$**:** Post-pandemic high school GPAs are not associated with first-year student retention.

$\boldsymbol{H_2}$**:** Pre-pandemic high school GPAs are associated with first-year student retention.

For the data analysis, the independent variable of high school GPAs were coded as follows: 1 = below one standard deviation below the mean, 2 = between one standard deviation

of the mean and the mean, 3 = between the mean and the first standard deviation above the mean, and 4 = above one standard deviation above the mean. For the dependent variable of successful retention, the data will be coded as 0 = unsuccessfully retained and 1 = successfully retained.

The odds ratio was calculated by dividing the number of students successfully retained in the selected high school GPA category by the number of unsuccessful students retained within the same category. This was completed for each of the GPA categories, and then between the categories as well as to see how likely each group of students are more likely to be retained as compared to the other GPA categories.

$$\text{Odds Ratio for Retention Based on GPA Category} = \frac{\text{Number of Students Successfully Retained}}{\text{Number of Students Unsuccessfully Retained}}$$

$$\text{Odds Ratio for Retention} = \frac{\text{Odds Ratio for Group 1}}{\text{Odds Ratio for Group 2}}$$

Chi-square tests are used to determine if a relationship exists between two variables, but since it can only analyze two variables at a time, additional tests must be run to help determine if additional variables impact any association found. The confounding variables analyzed in this proposed study are biological sex and student status as either traditional or adult learners at the time of enrollment. The following hypotheses were analyzed using the layered crosstabs functions available within chi-square tests. *Cramer's V* and odds ratios were also calculated to determine the effect size of any significant correlations found within the possible confounding variables.

$\boldsymbol{H_3}$**:** Post-pandemic high school GPAs are not associated with first-year student retention among first-year male and female students at the post-secondary level.

$\mathbf{H_4}$: Pre-pandemic high school GPAs are associated with first-year student retention among first-year male and female students at the post-secondary level.

$\boldsymbol{H_5}$**:** Post-pandemic first-year adult learners' (25 and older) and traditional, first-year students' (18-24) high school GPAs are not associated with first-year retention.

$\boldsymbol{H_6}$: *P*re-pandemic first-year adult learners' (25 and older) and traditional, first-year students' (18-24) high school GPAs are associated with first-year retention.

Assumptions

There are two primary assumptions a chi-square test must meet to provide valid results. The first is that each person from the data set must fall into only one contingency table cell (Field, 2018, p. 849). In this study that would be each person in the data set will be represented in the corresponding GPA category and either successfully or unsuccessfully retained for each pre- and post-pandemic data set and then again in each of the analyses for the biological sex and student enrollment status subgroups. The second assumption for a valid chi-square test is that each cell in the contingency table must have expected counts of more than one, and not more than 20% of the expected counts will be less than five since the contingency tables for this study are larger than a traditional 2 x 2 table (Field, 2018, p. 849).

Summary

This chapter includes the detailed methodology utilized for this longitudinal, *ex post facto* study which was conducted to determine if there was a relationship between high school GPA and first-time, first-year student retention at a local four-year university in Tennessee. The study was limited to first-time, first-year students from cohort years beginning in 2016-2018 and 2020-2022 in order to have pre- and post-pandemic high school GPA and college retention data. There were 8205 total first-time, first-year students in the six selected cohorts which were used as cases for this study.

The independent variable was high school GPA, which was split into four categories using the pre-pandemic GPA mean and standard deviations to create the cutoff for each group. The lowest high school GPA category was more than one standard deviation below the mean, the second category was between one standard deviation below the mean and the mean, the third category was between the mean and one standard deviation above the mean, and the final category was greater than one standard deviation above the mean. The dependent variable for each contingency table was retention, where successfully retained was coded as a Yes or unsuccessfully retained and was coded as a No.

A total of six chi-square analyses were completed and analyzed using the contingency tables, *Cramer's V*, and odds ratios analyses. The last four of the six chi-square analyses were performed as layer analyses to account for confounding variables of biological sex and student status at the time of enrollment. Chapter IV is a discussion of the results of the chi-square tests, *Cramer's V* test statistics, and odds ratios analyses.

Chapter IV

RESULTS

The purpose of this study was to find if there was a relationship between high school GPA and first-time, first-year college student retention for pre- and post-pandemic students at a local public four-year university in Tennessee. This study arose from the need to determine if high school GPA is a significant factor correlated with student success as measured by student retention in the wake of the COVID-19 pandemic as standardized testing measures were removed as social-distancing practices prevented students from taking the tests as they would in an otherwise normal year. Additional analyses were completed by layering the data set to determine how biological sex and traditional versus adult learner status might impact the correlation between high school GPA and successful retention.

The data set used for this study was requested from the local public four-year university in Tennessee, and it included the information from the cohorts beginning in the Fall of 2016 until the Fall of 2022, which also included initial enrollment term, high school GPA, age, and retention status for the year following initial enrollment. The data set arrived from the university with all enrollment terms from the Fall of 2016 through the Fall of 2022. The data set included the high school GPA, biological sex, age at the time of enrollment, and the term the student returned to the university.

Some students, or cases, were removed based on the criteria and limitations of the study. Students under the age of 18 were excluded from the data set since some students younger than 18 at the time of enrollment could be dual enrollment students or middle college students, who do not qualify as traditional students. Students who did not return the following fall term were marked as NULL in the data set. First, students from the cohort year beginning in the Fall of

2019 were removed from the data set, as they were purposely excluded from this study since that group was not strictly pre- nor post-pandemic first-time, first-year students. Students with a high school GPA of NULL or zero were removed from the data set. A high school GPA of zero could be interpreted as no high school GPA, such as when students enroll in higher education after completing a non-traditional certification program instead of a traditional high school diploma where the students do not have a high school GPA to report on the admissions application, or the students may have attended a secondary school where high school GPA is not reported in a traditional manner as mentioned by Meeter (2023). After the cases that were not going to be analyzed were removed from the data set, the remaining 8205 cases were uploaded as a data set into SPSS for further coding.

To perform a chi-square analysis, the independent variable, high school GPA, was divided into four categories based on the mean and standard deviation of pre-pandemic high school GPAs. This approach was selected because approximately 68% of the population lies within one standard deviation of the mean, according to the Empirical Rule (Larson, 2023, p.88). Pre-pandemic data was selected for this measure to ensure that if any statistically significant results were found in the study, a comparison could be made between pre- and post-pandemic data results.

The enrollment term variable was coded to represent pre- and post-pandemic terms. Terms from 20168 to 20188 were coded as 0 (labeled as “pre-pandemic”) and terms from 20208 to 20228 were coded as 1 (labeled as “post-pandemic”). Confounding variables were also coded to allow for additional chi-square analyses. For biological sex, female students were coded as 0 (labeled as “female”), and males were coded as 1 (labeled as “male”). For student status at the time of enrollment, traditional students (ages 18-24) were coded as 0 (labeled as traditional), and

adult learners (ages 25 and older) were coded as 1 (labeled as “adult”). Lastly, the dependent variable, retention, was coded. Students who returned in the following fall terms (20178-20198 and 20218-20238) were coded as 0 (labeled as “yes”). Students who did not return (NULL values) were coded as 1 (labeled as “no”).

Category one was GPAs more than one standard deviation below the mean (coded as 1 and labeled as “<=2.78371”). Category two was GPAs between one standard deviation below the mean and the mean (coded as 2 and labeled as “2.78372-3.27433”). Category three was GPAs between the mean and one standard deviation above the mean (coded as 3 and labeled as “3.27434-3.76495”). Category four was GPAs greater than one standard deviation above the mean (coded as 4 and labeled as “3.76496+”).

The descriptive statistics and results of the chi-square analyses will be presented in this chapter, along with the statistical methods used on the dataset in the study.

Descriptive Statistics

Table 1 represents the characteristics of the 8205 students who met the criteria for first-time, first-year students, ages 18 and older, and also reported a non-zero high school GPA at the time of enrollment within the 2016-2018 or 2020-2022 cohort years. The total number of students represented in the population of the study was 8205, (N = 8205). The data was further categorized as students who enrolled at the university in one of the three pre-pandemic cohort years 57.7% (n = 4737) or students who enrolled at the university in one of the three post-pandemic cohort years 42.3% (n = 3468).

The second category for the data set was high school GPAs for each of the students in the study, as noted by the four categories created based on the mean and standard deviation from the pre-pandemic data set. For the first high school GPA category, which was less than or equal to

one standard deviation below the mean (<= 2.78371), there was a total of 15.1% (*n* = 1236) students. In the second GPA category, which was between one standard deviation below the mean and the mean (2.78372 – 3.27433), there was a total of 28.6% (*n* = 2346) students. The third GPA category included students between the mean and one standard deviation above the mean (3.27434 – 3.76495), and there was a total of 35.1% (*n* = 2883) students within those values. The final GPA category represents greater than one standard deviation above the mean (3.76496+), and 21.2% (*n* = 1740) of the students were included in this category.

The organized data also included a breakdown by retention status: yes 65.4% (*n* = 5366) or no 34.6% (*n* = 2839), biological sex: Female 59.5% (*n* = 4880) or Male 40.5% (*n* = 3325), student status at the time of enrollment: Traditional Student (18-24) 98.1% (*n* = 9051) or Adult Learner (25+) 1.9% (*n* = 154).

Table 1

Characteristics of First-Time, First-Year Students in Cohort Years 2016-2018 and 2020-2022 Who Were Successfully or Unsuccessfully Retained (N = 8205)

Characteristic	*N*	*%*
Enrollment Period		
Pre-Pandemic	4737	57.7%
Post-Pandemic	3468	42.3%
High School GPA		
<= 2.78371	1236	15.1%
2.78372 – 3.27433	2346	28.6%
3.27434 – 3.76495	2883	35.1%
3.76496+	1740	21.2%
Retained		
Yes	5366	65.4%
No	2839	34.6%

Table 1 Continued

Characteristics of First-Time, First-Year Students in Cohort Years 2016-2018 and 2020-2022 Who Were Successfully or Unsuccessfully Retained (N = 8205)

Characteristic	*N*	*%*
Biological Sex		
Female	4880	59.5%
Male	3325	40.5%
Student Status at Time of Enrollment		
Traditional	9051	98.1%
Adult Learner	154	1.9%

Chi-Square of Independence

Research Question 1

1. How has the COVID-19 pandemic impacted the correlation between high school GPA and first-year student retention as an indicator of college success at the post-secondary level?

H_1: Post-pandemic high school GPAs are not associated with first-year student retention.

H_2: Pre-pandemic high school GPAs are associated with first-year student retention.

Tables 2 and 3 show the results of the contingency tables used to understand the frequences between high school GPA and retention variables for all first-time, first-year pre-pandemic and post-pandemic students, respectively. The contingency tables meet the chi-square assumptions, since each participant is only represented in one cell of the contingency table, and there were fewer than 20% of the cells with expected counts of less than five.

The results from Table 2 demonstrate a significant association between high school GPA and successful retention for pre-pandemic students $X^2(1) = 375.850$, $p < .001$. *Cramer's V* =

.282, $p < .001$ indicated a significant and moderate association between the independent and dependent variables. The odds ratios showed the odds of the pre-pandemic students being successfully retained in the four categories for high school GPA. Pre-pandemic students with a 3.76496+ high school GPA (85.4%) were 2.24 times more likely to be retained than their peers with GPAs ranging from 3.27434 – 3.76495 (72.3%), they were 4.37 times more likely to be retained than their peers with GPAs ranging from 2.78372 – 3.27433 (57.2%), and 7.25 times more likely to be retain than their peers with a 2.78371 or lower GPA (44.6%).

Pre-pandemic students with GPAs ranging from 3.27434 – 3.76495 (72.3%) were 1.95 times more likely to be successfully retained than their peers with GPAs ranging from 2.78372 – 3.27433 (57.2%), and they were 3.24 times more likely to be retained than their peers with a 2.78372 or lower GPA (44.6%). The pre-pandemic students with GPAs ranging from 2.78372 – 3.27433 (57.2%) were 1.66 times more likely to be successfully retained than their peers with GPAs of 2.78371 or lower (44.6%).

Table 2.

Frequencies of HS GPA and Retention Pre-Pandemic First-Time, First-Year Students (N = 4737)

			Retained		
			Yes	No	Total
GPA	3.76496 +	Count	719	123	842
		Expected Count	551.7	290.3	842.0
		% within Pre-Pandemic HS GPA	85.40%	14.6%	100.0%
		% within Retained	23.20%	7.5%	17.8%
		% of Total	25.80%	9.9%	17.8%
		Standardized Residuals	7.1	-9.8	
	3.27434 - 3.76495	Count	1221	468	1689
		Expected Count	1106.7	582.3	1689.0
		% within Pre-Pandemic HS GPA	72.3%	27.7%	100.0%
		% within Retained	39.3%	28.7%	35.7%
		% of Total	25.8%	9.9%	35.7%
		Standardized Residuals	3.4	-4.7	

Table 2 Continued

Frequencies of HS GPA and Retention Pre-Pandemic First-Time, First-Year Students (N = 4737)

			Retained		
			Yes	No	Total
GPA	2.78372 - 3.27433	Count	815	609	1424
		Expected Count	933.1	490.9	1424.0
		% within Pre-Pandemic HS GPA	57.2%	42.8%	100.0%
		% within Retained	26.3%	37.3%	30.1%
		% of Total	17.2%	12.9%	30.1%
		Standardized Residuals	-3.9	5.3	
	<= 2.78371	Count	349	433	782
		Expected Count	512.4	269.6	782
		% within Pre-Pandemic HS GPA	44.6%	55.4%	100.0%
		% within Retained	11.2%	26.5%	16.5%
		% of Total	7.4%	9.1%	16.5%
		Standardized Residuals	-7.2	10	
Total		Count	3104	1633	4737
		Expected Count	3104.0	1633.0	4737.0
		% within Pre-Pandemic HS GPA	65.5%	34.5%	100.0%
		% within Retained	100.0%	100.0%	100.0%
		% of Total	65.5%	34.5%	100.0%

Pearson Chi Square: $X2(1) = 375.850$, $p < .001$
Cramer's V = .282, $p < .001$

The results from Table 3 demonstrate a significant association between high school GPA and successful retention for post-pandemic students $X^2(1) = 257.751$, $p < .001$. *Cramer's V* = .273, $p < .001$ indicated a significant and moderate association between the independent and dependent variables. The odds ratios showed the odds of the post-pandemic students being successfully retained in the four categories for high school GPA. Post-pandemic students with a 3.76496+ high school GPA (83.6%) were 2.48 times more likely to be retained than their peers with GPAs ranging from 3.27434 – 3.76495 (67.3%), they were 4.47 times more likely to be retained than their peers with GPAs ranging from 2.78372 – 3.27433 (53.4%), and 5.68 times more likely to be retained than their peers with a 2.78371 or lower GPA (47.4%).

Post-pandemic students with GPAs ranging from 3.27434 – 3.76495 (67.3%) were 1.80 times more likely to be successfully retained than their peers with GPAs ranging from 2.78372 – 3.27433 (53.4%), and they were 3.24 times more likely to be retained than their peers with a 2.78372 or lower GPA (44.6%). The pre-pandemic students with GPAs ranging from 2.78372 – 3.27433 (53.4%) were 1.27 times more likely to be successfully retained than their peers with GPAs of 2.78371 or lower (65.2%).

Table 3.

Frequencies of HS GPA and Retention Post-Pandemic First-Time, First-Year Students (N = 3468)

			Retained		
			Yes	No	Total
GPA	3.76496 +	Count	751	147	898
		Expected Count	585.7	312.3	898.0
		% within Post-Pandemic HS GPA	83.60%	16.4%	100.0%
		% within Retained	33.20%	12.2%	25.9%
		% of Total	21.70%	4.2%	25.9%
		Standardized Residuals	6.8	-9.4	
	3.27434 - 3.76495	Count	804	390	1194
		Expected Count	778.8	415.2	1194.0
		% within Post-Pandemic HS GPA	67.3%	32.7%	100.0%
		% within Retained	35.5%	32.3%	34.4%
		% of Total	23.2%	11.2%	34.4%
		Standardized Residuals	0.9	-1.2	
	2.78372 - 3.27433	Count	492	430	922
		Expected Count	601.4	320.6	922.0
		% within Post-Pandemic HS GPA	53.4%	46.6%	100.0%
		% within Retained	21.8%	35.7%	26.6%
		% of Total	14.2%	12.4%	26.6%
		Standardized Residuals	-4.5	6.1	

Table 3 Continued

Frequencies of HS GPA and Retention Post-Pandemic First-Time, First-Year Students (N = 3468)

			Retained		
			Yes	No	Total
GPA	<= 2.78371	Count	215	239	454
		Expected Count	296.1	157.9	454
		% within Post-Pandemic HS GPA	47.4%	52.5%	100.0%
		% within Retained	9.5%	19.8%	13.1%
		% of Total	6.2%	6.9%	13.1%
		Standardized Residuals	-4.7	6.5	
Total		Count	2262	1206	3468
		Expected Count	2262.0	1206.0	3468.0
		% within Post-Pandemic HS GPA	65.2%	34.8%	100.0%
		% within Retained	100.0%	100.0%	100.0%
		% of Total	65.2%	34.8%	100.0%

Pearson Chi Square: $X^2(1) = 257.751$, $p < .001$
Cramer's V = .273, $p < .001$

***Research* Question 2**

2. How has the COVID-19 pandemic impacted the correlation between high school GPA and first-year student retention as an indicator of success among first-year male and female students?

H_3: Post-pandemic high school GPAs are not associated with first-year student retention among first-year male and female students at the post-secondary level.

H_4: Pre-pandemic high school GPAs are associated with first-year student retention among first-year male and female students at the post-secondary level.

Tables 4 through 7 show the results of the contingency tables used to understand the frequences between high school GPA and retention variables for all first-time, first-year pre-pandemic and post-pandemic female and male students, respectively. The contingency tables meet the chi-square assumptions, since each participant is only represented in one cell of the

contingency table, and there were fewer than 20% of the cells with expected counts of less than five.

The results from Table 4 demonstrate a significant association between high school GPA and successful retention for female pre-pandemic students $X^2(1) = 222.014$, $p < .001$. *Cramer's* $V = .283$, $p < .001$ indicated a significant and moderate association between the independent and dependent variables. The odds ratios showed the odds of the female pre-pandemic students being successfully retained in the four categories for high school GPA. Pre-pandemic female students with a 3.76496+ high school GPA (84.3%) were 2.00 times more likely to be retained than their peers with GPAs ranging from 3.27434 – 3.76495 (72.8%), they were 4.02 times more likely to be retained than their peers with GPAs ranging from 2.78372 – 3.27433 (57.1%), and 7.43 times more likely to be retained than their peers with a 2.78371 or lower GPA (41.9%).

Female pre-pandemic students with GPAs ranging from 3.27434 – 3.76495 (72.8%) were 2.01 times more likely to be successfully retained than their peers with GPAs ranging from 2.78372 – 3.27433 (57.1%), and they were 3.72 times more likely to be retained than their peers with a 2.78372 or lower GPA (41.9%). The female pre-pandemic students with GPAs ranging from 2.78372 – 3.27433 (57.1%) were 1.85 times more likely to be successfully retained than their peers with GPAs of 2.78371 or lower (41.9%).

Table 4.

Frequencies of HS GPA and Retention Pre-Pandemic First-Time, First-Year Female Students (N = 2780)

			Retained		
			Yes	No	Total
GPA	3.76496 +	Count	503	94	597
		Expected Count	402	195	597.0
		% within Pre-Pandemic HS GPA	84.30%	15.7%	100.0%
		% within Retained	26.90%	10.4%	21.5%
		% of Total	28.40%	3.4%	21.5%
		Standardized Residuals	5	-7.2	
	3.27434 - 3.76495	Count	789	295	1084
		Expected Count	729.9	354.1	1084.0
		% within Pre-Pandemic HS GPA	72.8%	27.2%	100.0%
		% within Retained	42.1%	32.5%	39.0%
		% of Total	28.4%	10.6%	39.0%
		Standardized Residuals	2.2	-3.1	
	2.78372 - 3.27433	Count	449	337	786
		Expected Count	529.3	256.7	786.0
		% within Pre-Pandemic HS GPA	57.1%	42.0%	100.0%
		% within Retained	24.0%	37.1%	28.3%
		% of Total	16.2%	12.1%	28.3%
		Standardized Residuals	-3.5	5.0	
	<= 2.78371	Count	79	106	185
		Expected Count	123.9	61.1	185
		% within Pre-Pandemic HS GPA	42.7%	57.3%	100.0%
		% within Retained	5.6%	15.3%	8.8%
		% of Total	3.8%	5.0%	8.8%
		Standardized Residuals	-4	5.7	
Total		Count	1406	694	2100
		Expected Count	1406.0	694.0	2100.0
		% within Pre-Pandemic HS GPA	67.0%	33.0%	100.0%
		% within Retained	100.0%	100.0%	100.0%
		% of Total	67.0%	33.0%	100.0%

Pearson Chi Square: X2(1) = 181.504, p < .001
Cramer's V = .283, p < .001

The results from Table 5 demonstrate a significant association between high school GPA and successful retention for female post-pandemic students $X^2(1) = 181.504$, $p < .001$. *Cramer's* $V = .293$, $p < .001$ indicated a significant and moderate association between the independent and dependent variables. The odds ratios showed the odds of the female post-pandemic students being successfully retained in the four categories for high school GPA. Female post-pandemic students with a 3.76496+ high school GPA (83.5%) were 2.24 times more likely to be retained than their peers with GPAs ranging from 3.27434 – 3.76495 (69.3%), they were 4.71 times more likely to be retained than their peers with GPAs ranging from 2.78372 – 3.27433 (51.8%), and 6.79 times more likely to be retained than their peers with a 2.78371 or lower GPA (47.4%).

Female post-pandemic students with GPAs ranging from 3.27434 – 3.76495 (69.3%) were 2.09 times more likely to be successfully retained than their peers with GPAs ranging from 2.78372 – 3.27433 (51.8%), and they were 3.03 times more likely to be retained than their peers with a 2.78372 or lower GPA (47.4%). The female post-pandemic students with GPAs ranging from 2.78372 – 3.27433 (51.8%) were 1.44 times more likely to be successfully retained than their peers with GPAs of 2.78371 or lower (47.4%).

Table 5.

Frequencies of HS GPA and Retention Post-Pandemic First-Time, First-Year Female Students (N = 2100)

			Retained		
			Yes	No	Total
GPA					
	3.76496 +	Count	525	104	629
		Expected Count	421.1	207.9	629.0
		% within Post-Pandemic HS GPA	83.50%	16.5%	100.0%
		% within Retained	37.30%	15.0%	30.0%
		% of Total	25.00%	5.0%	30.0%
		Standardized Residuals	5.1	-7.2	

Table 5 Continued

Frequencies of HS GPA and Retention Post-Pandemic First-Time, First-Year Female Students (N = 2100)

			Retained		
			Yes	No	Total
GPA	3.27434 - 3.76495	Count	539	239	778
		Expected Count	520.9	257.1	778.0
		% within Post-Pandemic HS GPA	69.3%	30.7%	100.0%
		% within Retained	38.3%	34.4%	37.0%
		% of Total	25.7%	11.4%	37.0%
		Standardized Residuals	0.8	-1.1	
	2.78372 - 3.27433	Count	263	245	508
		Expected Count	340.01	167.9	508.0
		% within Post-Pandemic HS GPA	51.8%	48.2%	100.0%
		% within Retained	18.7%	35.3%	24.2%
		% of Total	1250.0%	11.7%	24.2%
		Standardized Residuals	-4.2	6.0	
	<= 2.78371	Count	79	106	185
		Expected Count	123.9	61.1	185
		% within Post-Pandemic HS GPA	42.7%	57.3%	100.0%
		% within Retained	5.6%	15.3%	8.8%
		% of Total	3.8%	5.0%	8.8%
		Standardized Residuals	-4	5.7	
Total		Count	1406	694	2100
		Expected Count	1406.0	694.0	2100.0
		% within Post-Pandemic HS GPA	67.0%	33.0%	100.0%
		% within Retained	100.0%	100.0%	100.0%
		% of Total	67.0%	33.0%	100.0%

Pearson Chi Square: $X2(1) = 181.504$, $p < .001$
Cramer's V = .294, $p < .001$

The results from Table 6 demonstrate a significant association between high school GPA and successful retention for male pre-pandemic students $X^2(1) = 148.391$, $p < .001$. *Cramer's V* = .275, $p < .001$ indicated a significant and moderate association between the independent and dependent variables. The odds ratios showed the odds of the male pre-pandemic students being successfully retained in the four categories for high school GPA. Pre-pandemic male students with a 3.76496+ high school GPA (88.2%) were 2.98 times more likely to be retained than their

peers with GPAs ranging from 3.27434 – 3.76495 (71.4%), they were 5.54 times more likely to be retained than their peers with GPAs ranging from 2.78372 – 3.27433 (57.4%), and 8.58 times more likely to be retained than their peers with a 2.78371 or lower GPA (46.5%).

Male pre-pandemic students with GPAs ranging from 3.27434 – 3.76495 (71.4%) were 1.86 times more likely to be successfully retained than their peers with GPAs ranging from 2.78372 – 3.27433 (57.4%), and they were 2.88 times more likely to be retained than their peers with a 2.78372 or lower GPA (46.5%). The male pre-pandemic students with GPAs ranging from 2.78372 – 3.27433 (57.1%) were 1.555 times more likely to be successfully retained than their peers with GPAs of 2.78371 or lower (46.5%).

Table 6.

Frequencies of HS GPA and Retention Pre-Pandemic First-Time, First-Year Male Students (N = 1957)

			Retained		
			Yes	No	Total
GPA	3.76496 +	Count	216	29	245
		Expected Count	154.2	90.8	245.0
		% within Pre-Pandemic HS GPA	88.2%	11.8%	100.0%
		% within Retained	17.5%	4.0%	12.5%
		% of Total	11.0%	1.5%	12.5%
		Standardized Residuals	5.0	-6.5	
	2.78372 - 3.27433	Count	366	272	638
		Expected Count	401.6	236.4	638.0
		% within Pre-Pandemic HS GPA	57.4%	42.6%	100.0%
		% within Retained	29.7%	37.5%	32.6%
		% of Total	18.7%	13.9%	32.6%
		Standardized Residuals	-1.8	2.3	
			Yes	No	Total
GPA	<= 2.78371	Count	218	251	469
		Expected Count	295.3	173.7	469
		% within Pre-Pandemic HS GPA	46.5%	53.5%	100.0%
		% within Retained	17.7%	34.6%	24.0%
		% of Total	11.1%	12.8%	24.0%
		Standardized Residuals	-4.5	5.9	

Table 6 Continued

Frequencies of HS GPA and Retention Pre-Pandemic
First-Time, First-Year Male Students (N = 1957)

		Retained		
		Yes	No	Total
Total	Count	1232	725	1957
	Expected Count	1232.0	725.0	1957.0
	% within Pre-Pandemic HS GPA	63.0%	37.0%	100.0%
	% within Retained	11.2%	26.2%	16.5%
	% of Total	63.0%	37.0%	100.0%

Pearson Chi Square: $X^2(1) = 148.391$, $p < .001$
Cramer's V = .275, $p < .001$

The results from Table 7 demonstrate a significant association between high school GPA and successful retention for male post-pandemic students $X^2(1) = 78.933$ $p < .001$. *Cramer's V* = .240, $p < .001$ indicated a significant and moderate association between the independent and dependent variables. The odds ratios showed the odds of the male post-pandemic students being successfully retained in the four categories for high school GPA. Male post-pandemic students with a 3.76496+ high school GPA (84.0%) were 2.24 times more likely to be retained than their peers with GPAs ranging from 3.27434 – 3.76495 (63.7%), they were 4.37 times more likely to be retained than their peers with GPAs ranging from 2.78372 – 3.27433 (55.3%), and 7.25 times more likely to be retained than their peers with a 2.78371 or lower GPA (50.6%).

Male post-pandemic students with GPAs ranging from 3.27434 – 3.76495 (63.7%) were 1.95 times more likely to be successfully retained than their peers with GPAs ranging from 2.78372 – 3.27433 (51.8%), and they were 3.24 times more likely to be retained than their peers with a 2.78372 or lower GPA (50.6%). The post-pandemic students with GPAs ranging from 2.78372 – 3.27433 (51.8%) were 1.66 times more likely to be successfully retained than their peers with GPAs of 2.78371 or lower (50.6%).

Table 7.

Frequencies of HS GPA and Retention Post-Pandemic First-Time, First-Year Male Students (N = 1368)

			Retained		
			Yes	No	Total
GPA	3.76496 +	Count	226	43	269
		Expected Count	168.3	100.7	269.0
		% within Post-Pandemic HS GPA	84.00%	16.0%	100.0%
		% within Retained	26.40%	8.4%	19.7%
		% of Total	16.50%	3.1%	19.7%
		Standardized Residuals	4.4	-5.7	
	3.27434 - 3.76495	Count	265	151	416
		Expected Count	260.3	155.7	416.0
		% within Post-Pandemic HS GPA	63.7%	36.3%	100.0%
		% within Retained	31.0%	29.5%	30.4%
		% of Total	19.4%	11.0%	30.4%
		Standardized Residuals	0.3	-0.4	
	2.78372 - 3.27433	Count	229	185	414
		Expected Count	259.1	154.9	414.0
		% within Post-Pandemic HS GPA	55.3%	44.7%	100.0%
		% within Retained	26.8%	36.1%	30.3%
		% of Total	16.7%	13.5%	30.3%
		Standardized Residuals	-1.9	2.4	
	<= 2.78371	Count	136	133	269
		Expected Count	168.3	100.7	269
		% within Post-Pandemic HS GPA	50.6%	49.4%	100.0%
		% within Retained	15.9%	26.0%	19.7%
		% of Total	9.9%	9.7%	19.7%
		Standardized Residuals	-2.5	3.2	
Total		Count	856	512	1368
		Expected Count	856.0	512.0	1368.0
		% within Post-Pandemic HS GPA	62.6%	37.4%	100.0%
		% within Retained	100.0%	100.0%	100.0%
		% of Total	62.6%	37.4%	100.0%

Pearson Chi Square: $X^2(1) = 78.933$, $p < .001$
Cramer's $V = .240$, $p < .001$

***Research* Question 3**

3. How has the COVID-19 pandemic impacted the correlation between high school GPA and first-year student retention as an indicator of student success level among traditional (18-24) and adult learners (25 and older) first-year students?

H_5: Post-pandemic first-year adult learners (25 and older) and traditional first-year students (18-24) high school GPAs are not associated with first-year retention.

H_6: Pre-pandemic first-year adult learners' (25 and older) and traditional, first-year students' (18-24) high school GPAs are associated with first-year retention.

Tables 8 through 11 show the results of the contingency tables used to understand the frequences between high school GPA and retention variables for all first-time, first-year pre-pandemic and post-pandemic traditional and adult learners respectively. Tables 8 through 10 meet the chi-square assumptions, since each participant is only represented in one cell of the contingency table, and there were fewer than 20% of the cells with expected counts of less than five. Table 11 partially met the chi-square assumptions, since each participant is only represented in one cell of the contingency table, but there were more than 20% of the cells which have an expected count less than five.

The results from Table 8 demonstrate a significant association between high school GPA and successful retention for traditional pre-pandemic students $X^2(1) = 385.320$, $p < .001$. *Cramer's V* = .287, $p < .001$ indicated a significant and moderate association between the independent and dependent variables. The odds ratios showed the odds of the traditional pre-pandemic students being successfully retained in the four categories for high school GPA. Pre-pandemic female students with a 3.76496+ high school GPA (85.4%) were 2.24 times more likely to be retained than their peers with GPAs ranging from 3.27434 – 3.76495 (72.3%), they

were 4.37 times more likely to be retained than their peers with GPAs ranging from 2.78372 – 3.27433 (57.2%), and 7.37 times more likely to be retained than their peers with a 2.78371 or lower GPA (43.2%).

Traditional pre-pandemic students with GPAs ranging from 3.27434 – 3.76495 (72.3%) were 1.95 times more likely to be successfully retained than their peers with GPAs ranging from 2.78372 – 3.27433 (57.2%), and they were 3.42 times more likely to be retained than their peers with a 2.78372 or lower GPA (65.5%). The traditional pre-pandemic students with GPAs ranging from 2.78372 – 3.27433 (57.2%) were 1.75 times more likely to be successfully retained than their peers with GPAs of 2.78371 or lower (43.2%).

Table 8.

Frequencies of HS GPA and Retention Pre-Pandemic First-Time, First-Year Traditional Students (N = 4665)

			Retained		
			Yes	No	Total
GPA	3.76496 +	Count	719	123	842
		Expected Count	551.8	290.2	842.0
		% within Pre-Pandemic HS GPA	85.4%	14.6%	100.0%
		% within Retained	23.5%	7.6%	18.0%
		% of Total	15.40%	2.6%	18.0%
		Standardized Residuals	7.1	-9.8	
	3.27434 - 3.76495	Count	1215	466	1681
		Expected Count	1101.6	579.4	1681.0
		% within Pre-Pandemic HS GPA	72.3%	27.7%	100.0%
		% within Retained	39.7%	29.0%	36.0%
		% of Total	26.0%	10.0%	36.0%
		Standardized Residuals	3.4	-4.7	

Table 8 Continued

Frequencies of HS GPA and Retention Pre-Pandemic First-Time, First-Year Traditional Students (N = 4665)

			Retained		
			Yes	No	Total
GPA	2.78372 - 3.27433	Count	806	603	1409
		Expected Count	923.3	485.7	1409.0
		% within Pre-Pandemic HS GPA	57.2%	42.8%	100.0%
		% within Retained	26.4%	37.5%	30.2%
		% of Total	17.3%	12.9%	30.2%
		Standardized Residuals	-3.9	5.3	
	<= 2.78371	Count	317	416	733
		Expected Count	480.3	252.7	733
		% within Pre-Pandemic HS GPA	43.2%	56.8%	100.0%
		% within Retained	10.4%	25.9%	15.7%
		% of Total	6.8%	8.9%	15.7%
		Standardized Residuals	-7.5	10.3	
Total		Count	3057	1608	4665
		Expected Count	3057.0	1608.0	4665.0
		% within Pre-Pandemic HS GPA	65.5%	34.5%	100.0%
		% within Retained	100.0%	100.0%	100.0%
		% of Total	65.5%	34.5%	100.0%

Pearson Chi Square: $X^2(1) = 385.320$, $p < .001$
Cramer's $V = .287$, $p < .001$

The results from Table 9 demonstrate a significant association between high school GPA and successful retention for traditional post-pandemic students $X^2(1) = 255.128$, $p < .001$. *Cramer's* $V = .274$, $p < .001$ indicated a significant and very strong association between the independent and dependent variables. The odds ratios showed the odds of the traditional post-pandemic students being successfully retained in the four categories for high school GPA. Traditional post-pandemic students with a 3.76496+ high school GPA (83.7%) were 2.49 times more likely to be retained than their peers with GPAs ranging from 3.27434 – 3.76495 (67.3%), they were 4.60 times more likely to be retained than their peers with GPAs ranging from 2.78372

– 3.27433 (52.8%), and 5.69 times more likely to be retain than their peers with a 2.78371 or lower GPA (47.5%).

Traditional post-pandemic students with GPAs ranging from 3.27434 – 3.76495 (67.3%) were 1.84 times more likely to be successfully retained than their peers with GPAs ranging from 2.78372 – 3.27433 (52.8%), and they were 2.28 times more likely to be retained than their peers with a 2.78372 or lower GPA (47.5%). The traditional post-pandemic students with GPAs ranging from 2.78372 – 3.27433 (52.8%) were 1.24 times more likely to be successfully retained than their peers with GPAs of 2.78371 or lower (47.5%).

Table 9.

Frequencies of HS GPA and Retention Post-Pandemic First-Time, First-Year Traditional Students (N = 3386)

			Retained		
			Yes	No	Total
GPA	3.76496 +	Count	751	146	897
		Expected Count	587.3	309.7	897.0
		% within Post-Pandemic HS GPA	83.7%	16.3%	100.0%
		% within Retained	33.9%	12.5%	26.5%
		% of Total	22.20%	4.3%	26.5%
		Standardized Residuals	6.8	-9.3	
	3.27434 - 3.76495	Count	802	389	1191
		Expected Count	779.8	411.2	1191.0
		% within Post-Pandemic HS GPA	67.3%	32.7%	100.0%
		% within Retained	36.2%	33.3%	35.2%
		% of Total	23.7%	11.5%	35.2%
		Standardized Residuals	0.8	-1.1	

Table 9 Continued

Frequencies of HS GPA and Retention Post-Pandemic First-Time, First-Year Traditional Students (N = 3386)

			Retained		
			Yes	No	Total
GPA	2.78372 - 3.27433	Count	474	424	898
		Expected Count	588.0	310.0	898.0
		% within Post-Pandemic HS GPA	52.8%	47.2%	100.0%
		% within Retained	21.4%	36.3%	26.5%
		% of Total	14.0%	12.5%	26.5%
		Standardized Residuals	-4.7	6.5	
	<= 2.78371	Count	190	210	400
		Expected Count	261.9	138.1	400
		% within Post-Pandemic HS GPA	47.5%	52.5%	100.0%
		% within Retained	8.6%	18.0%	11.8%
		% of Total	5.6%	6.2%	11.8%
		Standardized Residuals	-4.4	6.1	
Total		Count	2217	1169	3386
		Expected Count	2217.0	1169.0	2286.0
		% within Post-Pandemic HS GPA	65.5%	34.5%	100.0%
		% within Retained	100.0%	100.0%	100.0%
		% of Total	65.50%	34.5%	100.0%

Pearson Chi Square: $X2(1) = 255.128$, $p < .001$
Cramer's V = .274, $p < .001$

The results from Table 10 demonstrate a significant association between high school GPA and successful retention for adult learners pre-pandemic students $X^2(1) = 375.850$, $p < .001$. *Cramer's V* = .085, $p = .772$ indicated a not significant, but very weak association, between the independent and dependent variables.

Table 10.

Frequencies of HS GPA and Retention Pre-Pandemic First-Time, First-Year Adult Learners (N = 72)

			Retained		
			Yes	No	Total
GPA	3.76496 +	Count			
		Expected Count			
		% within Post-Pandemic HS GPA			
		% within Retained			
		% of Total			
		Standardized Residuals			
	3.27434 - 3.76495	Count	6	2	8
		Expected Count	5.2	2.8	8.0
		% within Post-Pandemic HS GPA	75.0%	25.0%	100.0%
		% within Retained	12.8%	8.0%	11.1%
		% of Total	8.3%	2.8%	11.1%
		Standardized Residuals	0.3	-0.5	
	2.78372 - 3.27433	Count	9	6	15
		Expected Count	9.8	5.2	15.0
		% within Post-Pandemic HS GPA	60.0%	40.0%	100.0%
		% within Retained	19.1%	24.0%	20.8%
		% of Total	12.5%	8.3%	20.8%
		Standardized Residuals	-0.3	0.3	
			Yes	No	Total
	<= 2.78371	Count	32	17	49
		Expected Count	32	17.0	49
		% within Post-Pandemic HS GPA	65.3%	34.7%	100.0%
		% within Retained	68.1%	68.0%	68.1%
		% of Total	44.4%	23.6%	68.1%
		Standardized Residuals	0.0	0.0	
Total		Count	47	25	72
		Expected Count	47.0	25.0	72.0
		% within Post-Pandemic HS GPA	65.3%	34.7%	100.0%
		% within Retained	100.0%	100.0%	100.0%
		% of Total	65.3%	34.7%	100.0%

Pearson Chi Square: $X^2(1) = 375.850$, $p < .001$
Cramer's V = .085, *p* = .772

The results from Table 11 partially meets the assumptions for a valid chi-square test, since each participant is only represented in one cell of the contingency table, but there were more than 20% of the cells which have an expected count less than five. The results, while not valid for statistical analysis, did demonstrate a significant association between high school GPA and successful retention for adult learners post-pandemic students $X^2(1) = 6.815,\ p < .001$. *Cramer's V* = .290, $p = .075$ indicated a not significant, but moderate, association between the independent and dependent variables.

Table 11.

Frequencies of HS GPA and Retention Post-Pandemic First-Time, First-Year Adult Learners (N = 82)

			Retained		
			Yes	No	Total
GPA	3.76496 +	Count	0	1	1
		Expected Count	0.5	0.5	1.0
		% within Post-Pandemic HS GPA	0.0%	100.0%	100.0%
		% within Retained	0.0%	2.7%	1.2%
		% of Total	0.0%	1.2%	1.2%
		Standardized Residuals	-0.7	0.8	
	3.27434 - 3.76495	Count	2	1	3
		Expected Count	1.6	1.4	3.0
		% within Post-Pandemic HS GPA	66.7%	33.3%	100.0%
		% within Retained	4.4%	2.7%	3.7%
		% of Total	2.4%	1.2%	3.7%
		Standardized Residuals	0.3	-0.3	
	2.78372 - 3.27433	Count	18	6	24
		Expected Count	13.2	10.8	24.0
		% within Post-Pandemic HS GPA	75.0%	25.0%	100.0%
		% within Retained	40.0%	16.2%	29.3%
		% of Total	22.0%	7.3%	29.3%
		Standardized Residuals	1.3	-1.5	

Table 11 Continued

Frequencies of HS GPA and Retention Post-Pandemic First-Time, First-Year Adult Learners (N = 82)

			Retained		
			Yes	No	Total
GPA	<= 2.78371	Count	25	29	54
		Expected Count	29.6	24.4	54.0
		% within Post-Pandemic HS GPA	46.3%	53.7%	100.0%
		% within Retained	55.6%	78.4%	65.9%
		% of Total	30.5%	35.4%	65.9%
		Standardized Residuals	-0.9	0.9	
Total		Count	45	37	82
		Expected Count	45.0	37.0	82.0
		% within Post-Pandemic HS GPA	54.9%	45.1%	100.0%
		% within Retained			
		% of Total			

Pearson Chi Square: $X^2(1) = 6.915$, $p < .001$
Cramer's V = .290, *p* = .075

Summary

This chapter provided the results of chi-square tests performed to determine the association between high school GPA and retention for first-time, first-year students at a local public university in Tennessee. The additional chi-square tests were performed to help account for the confounding factors of biological sex and student status at the time of enrollment. All but one of the tests met both the required assumptions for a valid chi-square test. The test for first-time, first-year, post-pandemic adult learners had more than 20% of the cells with an expected count of less than five, which resulted in an invalid test. Findings from the results are listed for each hypothesis below.

H_1: Post-pandemic high school GPAs are not associated with first-year student retention.

Result: A significant result was found; the research hypothesis was rejected.

H_2: Pre-pandemic high school GPAs are associated with first-year student retention.

Result: A significant result was found; the research hypothesis failed to be rejected.

H_3: Post-pandemic high school GPAs are not associated with first-year student retention among first-year male and female students at the post-secondary level.

Result: A significant result was found; the research hypothesis was rejected.

H_4: Pre-pandemic high school GPAs are associated with first-year student retention among first-year male and female students at the post-secondary level.

Result: A significant result was found; the research hypothesis failed to be rejected.

H_5: Post-pandemic first-year adult learners (25 and older) and traditional first-year students (18-24) high school GPAs are not associated with first-year retention.

Result: A significant result was found; the research hypothesis was rejected.

H_6: Pre-pandemic first-year adult learners' (25 and older) and traditional, first-year students' (18-24) high school GPAs are associated with first-year retention.

Result: The chi-square test did not meet both required assumptions, so the results are not from a valid test. As the assumptions for the Chi Square were not met, no conclusions could be made regarding this hypothesis.

Chapter five will include further review of these results and provide recommendations for further research. For the purposes of real-world applications, when a hypothesis has failed to be rejected, this can be interpreted as accepting the research hypothesis in social sciences and educational research (Frick, 1995).

Chapter V

DISCUSSION & RECOMMENDATIONS

The longitudinal, *ex post facto* study was created to determine if there was a relationship between pre- and post-pandemic high school GPA and first-time, first-year retention at a local public university in Tennessee. Additional chi-square tests were completed to determine if biological sex and traditional or adult learner student status might impact any existing relationships between high school GPA and successful retention.

Standardized test results and high school GPA have been the primary quantitative measures used to help post-secondary institutions make decisions regarding student admissions (The College Board, 2024; Westrick et al., 2015). The COVID-19 pandemic began impacting students' ability to take standardized testing due to social distancing measures to prevent further disease spread in 2020 (Camara & Mattern, 2022). In response to the sudden loss of standardized testing, colleges and universities had to quickly decide on how to proceed with determining new admissions criteria based on the lack of availability of student test scores, which resulted in an increased reliance on high school GPA as the primary quantitative measure in admissions decisions (Arenas et al., 2021; Paris et al., 2023). More research is needed on the shift to using high school GPA in lieu of standard test scores as an effective indicator of future student success, as measured by retention, as a post-pandemic admissions criterion (Meeter, 2023). This study was intended to contribute to the existing body of research to determine if high school GPA is related to first-time, first-year student retention pre- and post-pandemic. The findings from this study can help colleges and universities determine if high school GPA is a sufficient measure to help indicate possible future student success as measured through successful retention or if

standardized test scores should be required again in the post-pandemic environment (Friedman et al., 2024).

Analysis of the Findings

The study included three questions with six hypotheses, which were tested with chi-square analyses with a .05 significance level. The first research question was whether the COVID-19 pandemic impacted the correlation between high school GPA and first-year student retention as an indicator of college success at the post-secondary level. The first hypothesis tested whether post-pandemic high school GPAs are not associated with first-year student retention. The corresponding contingency table resulted in a significant association between post-pandemic high school GPAs and first-year student retention ($p < .001$). The *Cramer's V* test statistic indicated a moderate association between the two variables (0.282). Therefore, the research hypothesis was rejected.

The odds ratio showed that students who enrolled in post-pandemic terms with a high school GPA of 3.76496 or higher were 7.25 times more likely to be successfully retained than their peers with a high school GPA of 2.78371 or lower. The findings concerning the relationship between high school GPA and successful retention align with previous research conducted on the impact of high school GPA and post-secondary success as measured by retention and graduation rates (Arenas et al., 2021; Meeter, 2023).

A second hypothesis tested whether pre-pandemic high school GPAs are associated with first-year student retention. The corresponding contingency table for the second hypothesis indicated the results of chi-square tests were significant ($p < .001$). The *Cramer's V* indicated a moderate association (.282) between pre-pandemic high school GPAs and successful first-year retention. Since the results were found to be significant and indicated an association between

post-pandemic high school GPA and student retention, the research hypothesis failed to be rejected. The odds ratio indicated that pre-pandemic students with a high school GPA of 3.76496 or higher were 5.68 times more likely to be successfully retained than their peers with a high school GPA of 2.78371 or lower. These results align with previous research conducted on the relationship between high school GPA and first-year student retention (Brecht & Burnett, 2019; Williams et al., 2018).

Since non-academic factors, such as biological sex and student status at the time of enrollment, have an influence on student performance in both high school and post-secondary education, two additional research questions and four research hypotheses were developed (Bergman et al., 2014; Clovis & Change, 2021; Jafar, 2023). These questions investigate what impact the confounding factors of biological sex and whether the student was a traditional student or an adult learner at the time of enrollment had on the relationship between high school GPA and successful first-year retention.

The second research question for this study was created to see how the COVID-19 pandemic impacted the association between high school GPA and retention as an indicator of success among first-year male and female students. The third and fourth hypotheses were created to address how biological sex impacted the relationship between high school GPA and first-year retention.

The third research hypothesis was that post-pandemic high school GPAs are not associated with first-year student retention among first-year male and female students at the post-secondary level. A layered chi-square analysis was completed to test for controlling effects that biological sex may have on the association between high school GPA and student retention. Results from the analysis show that there was a significant association between the two variables

for post-pandemic female ($p < .001$) and male students ($p < .001$). The *Cramer's V* for post-pandemic female and male students indicated a moderate association (.293) and (.240) between high school GPA and successful student retention. The research hypothesis must be rejected since the results for both post-pandemic biological sexes resulted in a significant and moderate effect between high school GPA and student retention.

The odds ratios for post-pandemic students indicated females with a GPA of 3.76496 or higher were 6.79 times more likely to be retained than females with a high school GPA of 2.78371 or lower. Males from the same post-pandemic enrollment period with a high school GPA of 3.76496 or higher were 7.25 times more likely to be successfully retained than those with a high school GPA of 2.78371 or lower.

The fourth research hypothesis was that pre-pandemic high school GPAs are associated with first-year student retention among first-year male and female students at the post-secondary level. The layered chi-square analysis showed a significant ($p < .001$) and moderate association (.283 and .275), respectively, between high school GPA and student retention for both female and male students who enrolled in the pre-pandemic terms. The fourth research hypothesis failed to be rejected since significant results were found.

Based on the calculated odds ratios, female students who enrolled in pre-pandemic terms with a GPA of 3.76496 or higher were 7.43 times more likely to be successfully retained than female students with GPAs of 2.78371 or lower. Similarly, male students who enrolled in pre-pandemic terms with high school GPAs of 3.76496 or higher were 8.58 times more likely to be retained than those with a GPA of 2.78371 or lower. The layered chi-square results from both pre- and post-pandemic students, as it relates biological sex, align with previous research results

that indicate female students are more likely to be successful in post-secondary endeavors than their male counterparts (Clovis & Chang, 2021; Daffner et al., 2022; Wilson et al., 2022).

The final research question for this study was created to look at how the COVID-19 pandemic impacted the association between high school GPA and first-year student retention as an indicator of student success level among traditional (18-24) and adult learners (25 and older) first-year students. The fourth and fifth research hypotheses were created to address how student status at the time of enrollment, whether traditional students (18-24) or adult learners (25 and older), impacted the association between high school GPA and student retention.

The fifth research hypothesis was that post-pandemic first-year adult learners' (25 and older) and traditional first-year students' (18-24) high school GPAs are not associated with first-year retention. The results of the layered chi-square analysis show that within the variable of student status at the time of enrollment, traditional students' high school GPA, who enrolled in a post-pandemic term is moderately associated with successful student retention ($p < .001$) with a *Cramer's V* (.274).

For adult learners who enrolled in a post-pandemic term, the chi-square analysis resulted in a not significant association (p = .075) for the *Cramer's V,* between high school GPA and successful first-year retention. Since a not significant result was found, the research hypothesis was rejected. A partial moderate association exists between high school GPA and student retention for traditional (18-24) students who enrolled in the post-pandemic terms. Students who were 18-24 at the time of enrollment, who enrolled in post-pandemic terms with a high school GPA of 3.76496 or higher were 4.6 times more likely to be retained than peers within the same group that had high school GPAs of 2.78371 or lower.

The sixth research hypothesis was that pre-pandemic first-year adult learners' (25 and older) and traditional, first-year students' (18-24) high school GPAs are associated with first-year retention. Traditional students (18-24) who enrolled in pre-pandemic terms had high school GPAs that were significantly ($p < .001$) and moderately associated with student retention as measured by the *Cramer's V* test statistic (.287). Students who were 18-24 at the time of enrollment, who enrolled in pre-pandemic terms with a high school GPA of 3.76496 or higher were 4.37 times more likely to be retained than peers within the same group that had high school GPAs of 2.78371 or lower. The results for successful retention of pre- and post-pandemic students who enrolled as traditional students (18-24) align with previous research findings (Bergman et al., 2014; Clovis & Chang, 2021; Williams et al., 2018).

In contrast, the chi-square test used to measure the impact of pre-pandemic adult learner (25 and older) student status at the time of enrollment did not meet the assumptions for a valid chi-square analysis, so the sixth research hypothesis was rejected. The results from the layered chi-square test used to measure the impact of student status at the time of enrollment were impacted by the small sample sizes for adult learners in this study ($n = 154$), which resulted in invalid test results. More research needs to be conducted with larger sample sizes of adult learners to determine what impact adult learner status (25 and older) has on student retention since there is a growing percentage of students in this age bracket attending post-secondary education (Rausch & Buning, 2024).

Discussion

The results from this study concluded the following: (a) high school GPAs are moderately associated with successful student retention for students who enrolled in a post-pandemic term, (b) high school GPAs are moderately associated with retention for students who

enrolled in a pre-pandemic term, (c) high school GPAs are moderately associated with student retention for both female and male students who enrolled in a post-pandemic term, (d) high school GPAs are moderately associated with student retention for both female and male students who enrolled in a pre-pandemic term, (e) high school GPAs are moderately associated with student retention for traditional students (18-24) who enrolled in a pre-pandemic term, and (f) high school GPAs are not significantly associated with student retention for adult learners (24 and older) who enrolled in a post-pandemic term.

Overall, students with greater high school GPAs were associated with higher rates of first-time, first-year student retention, and the findings from these studies align with existing research concerning the relationship between high school GPA and student success which primarily supports the presence of an association between the overall findings of the relationship between the two variables, as was found for four of the six cases tested as a part of this study (Arenas et al., 2021; Bannister, 2021; Bordes-Edgar et al., 2011; Brecht & Burnett, 2019; Meeter, 2023; Wilson et al., 2022). The foundation of the theoretical framework for this study was built on Tinto's Model of Student Retention (2006), Schlossberg's Transition Theory (1989), and Maslow's Hierarchy of Needs (1943). Those particular theoretical frameworks were selected due to the impact that non-academic factors have on a student's ability to be successful in high school and post-secondary educational pursuits (Locke & Shirley, 2022; Williams et al., 2018; Yurdakul & Arar, 2023).

While the results of this study do not prove a causal relationship between high school GPA and successful first-time, first-year retention, the results provide evidence of a moderate association between the two independent variables. Specifically, this study shows that both female and male students enrolled in pre- or post-pandemic terms with a high school GPA of

3.76496 or higher are significantly more likely to be successfully retained than their peers with high school GPAs of 2.78371 or lower. This finding is consistent with other research studies conducted which found a positive association between students with higher high school GPAs that were more likely to be successful at the post-secondary level, for both male and female students (Barbera et al., 2020; Geiser & Santelices, 2007; Hammerlie & Montgomery, 2012; Wilson et al., 2022).

Within multiple studies mentioning the positive association between high school GPAs and student retention, the authors mention the importance of student self-efficacy, motivation, and non-academic supports (Paris et al., 2021; Shi & Lin, 2021; Yurdakul & Arar, 2023). As students tap into their own self-efficacy and motivation, they are building on an existing core belief within themselves that has been created over an extended period of time based an existing foundation where their basic physiological, safety, and sense of belonging needs have already been met (Ansorger, 2021; Mensah et al., 2023; Tinto, 1990). Students who transition to a post-secondary institution with an existing high level of self-efficacy and motivation are more likely to have a successful transition to college or university life based on level of security and support that has been developed over time through experiences and external support systems (Arenas et al., 2021; Morris & McKenzie, 2024; Sewell & Goings, 2020; Tinto, 2017).

When looking at the differences in the likelihood of increased student retention based on high school GPA for this study, both pre- and post-pandemic, female students were more likely to be successfully retained than their male counterparts, which aligns with existing research on the topic (Barbera et al., 2020; Clovis & Chang, 2021). One study on gender differences and academic performance found that female students were more likely to have increased levels of self-determination and academic achievement than their male peers, but the authors did not

provide any possible root causes for the greater association between increased levels of self-determination and academic achievements for female students (Hammerlie & Montgomery, 2012). Yurdakul & Arar (2023) note that higher societal expectations tend to be placed on women to create their own sense of self-worth and accomplishment as compared to men, which could be a contributing factor to the increased levels of self-determination and academic achievements found by Hammerlie and Montgomery (2012).

When comparing the associations between high school GPA and successful student retention for traditional (18-24 years old) and adult learners (25 years old and above) for the post-pandemic enrollment terms, the traditional learners had a higher association between the two variables. The greater association between high school GPA and successful retention for traditional learners is consistent with the findings of other studies (Barmak et al., 2023; Jafar, 2023). A contributing factor to the lower association between adult learners and successful first-year, first-time retention are the non-academic factors which impact adult learners at a higher rate than traditional learners (Bergman et al., 2014; Shi & Lin, 2021).

Barbera et al. (2020) emphasize the association between high school GPA and persistence for students entering a college or university with a 3.0 GPA or higher, which is supported by the overall results of this study, but they also specifically mention that same association did not hold true for Black students, adult learners, and students who utilized income-based financial aid. These results represent the impact of non-academic factors related to student retention, which are related to the theoretical background of this study, as students who have additional obstacles to overcome such as adult learners who have additional responsibilities, which are unrelated to their degree program, need more support than their peers who enrolled with traditional student status (Barbera et al., 2020; Tinto, 2017).

The research conducted on adult learners, including the previously mentioned studies, often use Schlossberg's Transition Theory (1989) or Tinto's Model of Student Retention (1993) as the foundation for the theoretical framework since both address the unique needs adult learners have that must be accounted for when creating action steps to increase student success and retention rates. If the needs specific to adult learners are not met, such as flexible scheduling and transition support services are not met, then the adult learners are more likely to discontinue their degree program (Tight, 2020).

Students who successfully obtain a General Educational Development (GED) high school equivalency credential can go on to attend a post-secondary institution, but those students do not have a high school GPA to report on their admissions applications (Seattle Colleges International Programs, n.d.). Since the GED was initially created as a way for adults in the armed services to earn the equivalent of a high school diploma, there could be an association between the number of samples removed from the data set before analysis based on the GPA criteria and the increased population of the military, and former military, students attending this particular university (Military Spouse Education and Career Opportunities, n.d.).

There was not a large enough sample of adult learners to meet the assumptions of the chi-square analysis to test whether there was an association between high school GPAs and student retention for adult learners (24 and older) or for traditional students (18-24) that enrolled in a pre-pandemic term. Based on existing literature concerning military veterans pursing higher education, there is likely a need for additional support for adult learners at the university where this research was conducted due to the higher incidences of adult learners who are also active or veteran members of the military. The additional support would help ensure unique student needs are met by assisting veterans and active duty soldiers in navigating the usual academic

challenges students face alongside the non-academic challenges traditional students are less likely to experience while working on their post-secondary education (Barmark et al., 2023; Rausch & Buning, 2024)

Recommendations for Practice

As colleges and universities are focusing on trying to increase student success, it is important to look at all the factors that can impact measures such as student retention (Lawrence, 2023). The presence of a significant, albeit moderate, association between high school GPA and successful retention, for both pre- and post-pandemic enrollment terms, is relevant information for colleges and universities to have as post-secondary institutions are in the process of deciding whether or not to bring back the standardized testing requirements to the admissions process in the new post-pandemic environment (Bannister, 2021; Meeter, 2023).

The moderate association between high school GPA and student retention is not strong enough to recommend relying on it as the sole quantitative measure to predict future student success in the form of first-year retention. However, the consistent association between high-school GPA and successful retention should not be ignored completely in favor of high stakes standardized testing. The results from this study support the overall movement towards holistic admissions processes, which should include a way to evaluate the likelihood of future student retention which includes using high school GPA and standardized test scores, as similarly suggested by other researchers (Barbera et al., 2020; Paris et al., 2021; Synder et al., 2024). As the number of adult learners enrolling in post-secondary institutions continues to increase, colleges and universities must look at more academic and non-academic factors to help determine which applicants are most likely to be successful at the institution (Bergman et al., 2014; Camara & Mattern, 2022).

Schlossberg's Transition Theory and Maslow's Hierarchy of Needs serves as a way to look at the entire process from the initial decision students make to enroll in higher education, the journey students go through while actively moving through their degree program, what happens after the students leave the college or university, and how students successfully or unsuccessfully navigate all the steps and challenges in between enrolling and departing (Barmark et al., 2023). Identifying which students to accept to a college or university is only the first of many steps to implement on the path to increased student retention rates. Once the students are enrolled in an institution, the focus should shift towards how the college or university will support the student throughout their tenure, especially during the pivotal first year (Willoughby et al., 2023).

The results of this study highlight the importance of reaching the adult learners subgroup since that population of students is a growing group of students enrolling in higher education, and adult learners have the lowest association between high school GPA and successful student retention in this study (Bergman et al., 2014). Post-secondary institutions must find out what type of transitions and life events students are encountering and which ones of those are a greater obstacle to the students that are less likely to successfully retain such as adult learners. Then the appropriate supports can be developed and implemented to help students overcome the challenges associated with the more negatively impactful transitions and life events, which would then create a better sense of belonging that Tinto's Model of Student Retention is based on that impacts a student's decision on whether or not to persist in their educational endeavors (Sparkman et al., 2012).

Recommendations for Future Research

This study was limited by its one source of data and its small sample size. The sample was further limited by the exclusion of individuals in the dataset that had either a zero reported for the high school GPA or where no high school GPA was reported. The exclusion of that data resulted in the adult learner subgroup being too small to run a valid chi-square analysis to determine if any associations were present for the high school GPAs and successful retention for post-pandemic adult learners.

Similar research from multiple institutions could result in more reliable results that would better represent any present associations between high school GPA and first-time, first-year student retention rates at other four year colleges or universities. It would be especially interesting to explore any possible associations between veterans and active duty military members and retention rates since they are a special case that includes students that could be traditional student or adult learners that have more unique needs than either of their counterparts.

The findings that relate to a greater association between high school GPA and successful retention for female students should be investigated further to find what other contributing factors could be impacting the greater association between females being academically successful as compared to their male counterparts. The phenomenon is not unique to this study, but there is a gap in existing literature as to what drives this association that could be explored further, including student perceptions of barriers impacting their own retention.

Lastly, there was a subgroup this study did not include that are of particular interest to explore further which is students with disabilities. Students with disabilities have lower enrollment rates overall as compared to their non-disabled peers, but enrollment has increased over the past decade (Lightfoot et al., 2021). Students with disabilities are likely to need

additional support as they go through the post-secondary educational system similarly to how adult learners need additional support navigating the unique challenges they face that traditional students do not always have to navigate. The combination of further research in these areas would help the faculty and staff of post-secondary institutions make more informed decisions about how best to support students once they are enrolled at the college or university in an effort to increase student success and retention rates.

Summary

The purpose of this study was to determine if there was an association between high school GPA and successful first-time, first-year retention rates pre- and post-COVID-19 pandemic. Efforts to prevent the spread of COVID-19 resulted in students being unable to take the traditional standardized tests used to help make admission decisions at post-secondary institutions, which resulted in a more widespread usage of high school GPA as the primary quantitative measure to predict future student success. The same question was posed for the specific subgroups analyzed which were biological sex (female or male) and student status at the time of enrollment as traditional students (ages 18-24) and adult learners (ages 25 and older).

Based on the results of the chi-square analysis for this specific study, there exists a moderate association between high school GPA and successful first-year retention rates as a whole for both pre- and post-pandemic students. For the biological sex subgroup analyzed, there was a moderate association for male and female students both pre- and post-pandemic. Female students were more likely to be successfully retained than their male peers. When the data was analyzed based on student status at the time of enrollment, there was a moderate association between high school GPA and successful retention for both post-pandemic traditional and adult learners. However, the sample size for adult learners who enrolled in a pre-pandemic term was

too small for a valid chi-square analysis to be completed, so no association between high school GPA and successful retention could be determined for the pre-pandemic traditional and adult learners.

Since there is evidence that there is an association between high school GPA and successful retention, colleges and universities can make a more informed decision regarding whether or not to add back standardized testing requirements that were lifted due to mitigating measures used to prevent the spread of the disease. The findings from each of the groups were discussed within the context of the theoretical foundation that was based on Tinto's Model of Student Retention, Maslow's Hierarchy of Needs, and Schlossberg's Transition Theory in an effort to determine how non-academic factors could impact the findings of each analysis performed.

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APPENDIX A

IRB Approval

Office of Research Compliance
2269 Middle Tennessee Blvd.
Sam H. Ingram Bldg (ING) Room 010A
Box 124
Murfreesboro, TN 37132
www.mtsu.edu/irb

Date: November 5, 2024
PI: Lea Keith
Department: Middle Tennessee State University, Womack Educational Leadership
Re: Initial - IRB-FY2025-69
Beyond Grades: Evaluating the Robustness of High School GPA as an Indicator of Success in the Wake of the COVID-19 Pandemic

The Middle Tennessee State University Institutional Review Board has rendered the decision below for the above referenced study.

Decision: Rely on External IRB
Category:
Findings:
Research Notes:

Please note that even though your proposed study is deemed exempt from further IRB review, the following apply to your approved study:

1. In accordance with 45 CFR 46.110, expiration dates do not apply to research eligible for Exempt Review under the Common Rule, and continuing review is not required by the IRB.
2. Any unanticipated harm to participants or adverse events must be reported to the Office of Compliance.
3. All modifications to the approved study must be submitted for review through Cayuse IRB for approval before their implementation. Adding new researchers constitutes a modification to the protocol. Per MTSU Policy, a researcher is defined as anyone who handles the data or interacts with participants. Everyone meeting this definition for this project must have completed the required CITI training and received IRB approval prior to becoming actively involved in the project.
4. Closure of the study must be submitted within Cayuse when the study ends or when personal identifiers are removed from the data and all codes and keys are destroyed.
5. All research materials must be retained by the PI for at least three (3) years after study completion and then destroyed in a manner that maintains confidentiality and anonymity.

Sincerely,

The Middle Tennessee State University Institutional Review Board

Austin Peay State University
CLARKSVILLE TENNESSEE

Institutional Review Board

October 21, 2024

IRB 24-054:

Dear Dr. Vogel & Ms. Keith:

We appreciate your cooperation with the human research review process. This letter is to inform you that the IRB application 24-054 was reviewed. It is my pleasure to inform you that your IRB application has been approved.

This approval is subject to APSU Policies and Procedures governing human subject research. The IRB reserves the right to withdraw approval if unresolved issues are raised during the review period. Any changes or deviations from the approved protocol must be submitted in writing to the IRB for further review and approval before continuing.

This approval is for one calendar year and a closed study report or request for continuing review is required on or before the expiration date, 10/21/2025. If you have any questions or require further information, please contact me by phone (931) 221-7075 or email dipaolob@apsu.edu.

Sincerely,

Dr. Brandon M. Di Paolo Harrison
Chairperson

Cc: Dr. Robin Reed, Co-chairperson

Kelly Pitts, M.A., Assistant Director – Office of Research and Sponsored Programs