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"The Effect of Students' Place of Residence, Length of Time in a District, Race, and SES on Academic and Behavioral Success"

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"The Effect of Students' Place of Residence, Length of Time in a District, Race, and SES on Academic and Behavioral Success"

A Thesis

By

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The thesis entitled '**The Effect of Students' Place of Residence, Length of Time in a District, Race, and SES on Academic and Behavioral Success**' presented by **ANDREW KING**, a candidate for the degree of **Master of Science in Mathematics,** has been approved and is worthy of acceptance.

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ABSTRACT

This study intended to determine if place of residence, length of time in a district, race, and socioeconomic status were statistically significant predictors of academic success and disciplinary issues. The study took place in the Mississinawa Valley School District, a small district in western Ohio consisting of a mix of students from both rural and urban/suburban areas. Existing literature on districts comprising rural and urban portions was missing, allowing this study to fill a gap in research. A sample of 2,002 students from the school from 2008 to 2023 was analyzed to answer two primary research questions. Three separate multiple regression models were created to inspect academic success, which was measured by GPA, Ohio State Test average scores, and ACT composite scores. A logistic regression was used to study disciplinary status, which was dichotomized as no recorded incidents or at least one recorded incident. Place of residence significantly predicted GPA and state test scores, where rural students scored higher than in-town students. The number of years in the district significantly predicted GPA and disciplinary incidents, with more years leading to a higher GPA and greater odds of having at least one disciplinary incident. Race only significantly predicted discipline, with non-White students being found more likely to have no incidents than White students. Socioeconomic status, as determined by free / reduced lunch status, was a significant predictor for all four models, where students on free lunch performed significantly worse academically and behaviorally than students on full price lunch. These results imply that teachers need to be made aware of students on free lunch in their classes and

offer them more attention and support. Extra resources should also be directed to students living in town, such as establishing a local tutoring center. Finally, the lack of significance of the race variable may be encouraging to the district in its efforts to be racially inclusive and unbiased.

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TABLE OF CONTENTS

Chapter Page

LIST OF TABLES

LIST OF FIGURES

CHAPTER I: Introduction

Chapter 1 will set the stage for determining if place of residence, length of time spent in a district, race, and socioeconomic status (SES, determined by free/reduced lunch status) lead to statistically significant differences in academic achievement (measured by GPA, state test scores, and ACT scores) and behavioral outcomes (measured by number of disciplinary incidents). The study will closely examine students who live in either rural in-town parts of a small Ohio school district as well as compare those who have spent more time in the district with those who are newer. This chapter will briefly touch on existing literature concerning differences between rural and urban schools, both in the US and other countries. Among the topics discussed in this chapter are the study's significance, theoretical framework, primary research questions, ethical considerations, limitations, and scope. A few of the relevant terms will also be defined near the end of the chapter.

Introduction

This study was commissioned by the superintendent of the Mississinawa Valley School District, a small district in western Ohio. The district consisted of a very rural portion of mostly farmland and an in-town portion considered to be more suburban or urban. Informally, teachers and administrators suspected a meaningful difference in academic achievement (and student discipline) between students who lived in these contrasting neighborhoods. The district also wanted to see if the students who had been in the district the longest had a significantly

better academic outlook than those who were newer to the district. The goal of conducting this research was to give the district a better idea of which groups of students would need more targeted intervention.

Background of the Problem

A study of existing research revealed a gap in literature on schools that could classify themselves as an equal mix of both rural and urban. However, there was plenty of information about separate rural and urban schools that served as a good starting point. In a 2010 study of rural Kenyan students, several home environmental factors (parents' occupation, parents' education, family size, learning facilities at home, etc.) were found to be significant positive predictors of student achievement (Muola). A 2008 South African study found that rural communities often have more pressing concerns and interests that come before schooling. Teachers may expect rural students to prioritize their education and studies above other tasks, but these rural students and their families typically prioritize their responsibilities at home as more urgent and pressing than tasks at school (Gardiner, 2008).

Though a bit dated by now, a study contrasting rural and urban students from Ohio in 1991 revealed the following (McCracken):

- Rural schools had a higher percentage of white students (94.1% vs. 72.1% for urban).
- Rural schools had a slightly higher GPA (2.64 vs. 2.54 for urban).

- Rural students' parents were slightly less likely to expect their kids to attend secondary education (61% vs. 74% for urban).

A 1998 study looked at the difference between rural/urban schooling in the US and in Korea. Korea had higher scores in the urban settings than the US, but the US was found to have a larger gap between its urban and suburban settings (Uekawa).

While these sources were helpful in informing and explaining some of the rural/urban gaps in education, there seemed to be fewer resources for districts that can be considered both rural and urban. The majority of schools in the United States can likely classify themselves as urban, suburban, or rural, or at least somewhere along this continuum. Fewer schools can say they educate an equal number of students from both ends of this spectrum.

Statement of the Problem and Significance of the Study

This research sought to uncover any statistically significant differences in academic achievement (measured by state test scores, ACT scores, and GPA) and student discipline (measured by disciplinary occurrences) across four different predictors: students' places of residence (rural or town), length of time spent in the district (in years), race, and SES (measured by paid lunch status). This study set out to focus on the smaller, poorer schools that have tended to fall through the cracks. These schools have often lacked some of the attention and funding that larger, wealthier schools receive. When a certain group of students

falls behind academically or behaviorally, the district has an obligation to provide these students with the resources they need to be successful. This research intended to shed light on any discrepancies in these areas and provide a model for schools in similar situations.

Purpose of the Study

By determining if any of the predictors are statistically significant, our school district can plan a more effective and intentional approach to students of a certain group. These students can be identified earlier and therefore given additional resources to help them succeed. There is a tricky balance between segregating students based on factors that may be out of their control and genuinely desiring to help them based on possible risk factors. If length of time spent in the district is found to be a significant positive predictor, the school could choose to use this as a type of marketing tool to the public. This would also be helpful for families as they weigh the pros and cons of changing schools due to a number of factors (family, parents' work, academics, extracurricular activities, etc.) or remaining in the current district.

Primary Research Questions

The primary research questions were:

1. "Are a student's place of residence (urban or rural), race, SES, and time in the district (in years) significant predictors of academic success as measured by GPA, state test, and ACT scores?"

2. "Are a student's place of residence (urban or rural), race, SES, and time in the district (in years) significant predictors of behavioral success as measured by number of disciplinary incidents?"

Research Design

The study used pre-existing data about students at the school, including Ohio state test ("End of Course Exam") scores. The data covered students from the 2008-2009 school year up until the 2022-2023 school year. The school's guidance department provided the following data (see below):

- students' places of residence
- students' admission and withdrawal dates from the district
- race
- SES (measured by lunch status - free, reduced, none)
- GPA at the time of graduation
- state test scores
- disciplinary incidents

According to the Ohio Department of Education's data from 2023, each of Ohio's 23 state tests had a reliability value of at least 0.88. ODE also provided guidelines to ensure that any "practice related to a test is consistent with … the reliability and validity of any inference made from any result of a test". No surveys were conducted in this study.

The data was collected from the guidance department at Mississinawa Valley via the Education Management Information System (EMIS) of Ohio. Students' Ohio state test scores reached as far back as third grade. The results from this study can be generalized for similar school districts composed of rural and urban/suburban portions.

Multiple regression techniques will be used to analyze the data and determine if the independent variables (place of residence, length of time in district, race, and SES) are significant predictors of academic achievement. The behavioral data will be dichotomized into two groups (no disciplinary incidents and at least one disciplinary incident) and analyzed via logistic regression techniques. Data analysis will be conducted using the R and G*Power statistical packages.

Ethical Considerations

To ensure anonymity, all data was purged of any identifiers. Student ID numbers were received with the data but will not be presented; they were only used to match students' different information across multiple spreadsheets worth of data. Students' addresses were also received with the data but only for the purpose of converting to either a "Rural", "Urban", or "Open Enrollment" classification. The large sample size of students dated back to 2008, making it difficult to identify specific students.

The study received Exempt status from the Institutional Review Board (IRB) since the data collection was “not likely to adversely impact students’ opportunity to learn required educational content.” The IRB Approval is included in Appendix A. The information was presented “in such a manner that the identity of the human subjects cannot readily be ascertained, directly or through identifiers linked to the subjects” (U.S. Department of Health and Human Services, 2018).

Theoretical Framework

The theoretical framework for this study came from the idea of Cumulative Risk Theory. Students and children may be affected in their health by many individual risk factors, such as poverty, home environment, physical abuse, moving between homes, etc. Taken one at a time, each factor can have a negative impact on a child’s well-being. Taken together, or cumulatively, these factors can have an exponentially harmful impact on a child (Evans, 2013).

As mentioned previously, this study investigated students’ places of residence, length of time spent in the district, race, and SES, as factors/predictors. Cumulative Risk Theory would suggest that a combination of some factors (such as an urban place of residence, short amount of time in the district, and low SES classification) could have an adverse effect on a students’ academic performance or disciplinary history. As discussed in the Background of the Problem section, students with an urban place of residence may have an academic disadvantage compared to their rural peers. Similarly, students that

bounce around school districts typically score lower than those who have attended the same district for their entire life. While plenty of research on these topics exist, this study's unique contribution comes from combining these factors. Therefore, Cumulative Risk Theory was appropriate for the study.

Assumptions, Limitations, and Scope

In determining whether place of residence, length of time in the district, race, and SES are meaningful predictors of academic and behavioral success, it is important to remember that this study is not necessarily applicable to every school in the US. The results are primarily intended for similar schools made up of rural and urban portions that see many of its students come in and out of the district.

During the data collection phase, one assumption was that most students' places of residence could, in fact, be classified as either urban or rural. However, some students attending the schools of the district were open enrollment students who lived in a neighboring town. Similarly, students' SES status was determined by their lunch status (free lunch, reduced price lunch, or paid lunch). However, some statuses changed over the years (e.g. a student was initially classified as paid lunch for his/her first two years before being classified as reduced price for the next three years).

One possible issue with representation and generalizability was with GPA data. The school provided assessment, demographic, and disciplinary data for

every student, but the GPA data provided was only for graduates. Since the length of time a student has been in the district was tracked, students who left the district before graduating will not have their GPA data available. Depending on how many students are like this, they may need to be left out of the final data.

Definition of Terms

Free / reduced / none: Classification of students' school lunch status (free lunch, reduced price, or paying full price)

Years in district: Number of years (partial or full) that a student attended the schools of the district

Summary

Chapter 1 gave the background information for determining if place of residence, length of time in a school district, race, and SES (determined by lunch status) were significant predictors of academic and behavioral success. The study looked at student data from the Mississinawa Valley School District in Ohio spanning fifteen school years to determine if there was a significant difference between students from rural portions of the district and those from a more urban or suburban portion. Existing research has focused on trends within primarily "rural schools" or "urban schools" (separately), but more research was needed on schools consisting of both demographics. The goal of this study was for other small, mixed districts to understand what kind of differences and trends may exist between these students in their schools. If significant differences exist, these

districts can form a plan to bridge these gaps and provide necessary resources for students from disadvantaged groups.

Student data was provided from the school, with identifiers such as student names and/or ID numbers cleansed before delivery. Multiple regression techniques will be used to determine the significance level of each predictor variable with academics, and logistic regression techniques will be used to analyze discipline status. Cumulative Risk Theory served as the underlying theoretical framework for this study, suggesting that students with multiple risk factors have an exponentially greater risk to their well-being. This study will build on this theory by examining the specific combinations of some of these factors (place of residence, length of time spent in the district, race, and SES). While possible limitations may exist (such as imperfect place of residence classifications, lunch statuses changing over the years, etc.), the sample size is large enough to overcome such concerns.

CHAPTER II: Literature Review

Overview

This chapter aims to thoroughly explore the relevant literature of the study. Existing research on the four main predictors described in Chapter 1 (rural or urban place of residence, student mobility, race, and socioeconomic status) was carefully examined to set up the results of this study. Relevant articles were found primarily by searching Google Scholar, EBSCO Discovery Service (via the Shawnee State Library), and by frequently browsing the References section of selected articles. Some of the search terms used included “rural urban schools”, “academic achievement”, “rural urban differences”, “student mobility”, “race academic achievement”, “socioeconomic status academic achievement”, and “student discipline”.

Comparison of Rural and Urban Schools

As discussed in Chapter 1, much has been written about both rural and urban schools separately. Less has been written about schools that consist of both types, where neither one adequately represents the makeup of the school on its own. While the student population in this district is a good mix of rural and urban students (sometimes referred to as “country” and “town” students, respectively, by the district’s administrators), it should be noted that the vast majority of the district’s geography consists of rural portions. The town portion consists of about 1 square mile, while the country portion consists of miles and

miles of farmland. To that extent, neighboring communities to the district typically view the school as more on the rural side. Therefore, much of the pre-existing research for this study focuses on rural schools. Studies of urban (or even suburban) schools likely have much larger student populations in mind.

Chapter 1 briefly mentioned some results from Gardiner concerning the priority (or lack thereof) rural communities give to schools. Gardiner also mentioned that modern research has found it no longer “appropriate or useful to define urban in terms of rural or the other way around”, since this leads to a competitive disadvantage for rural locations (2008). He found that parents of rural students value practical skills over academic subjects (like Math or History), and rural students have a higher chance of leaving school before graduation compared to urban students (Gardiner, 2008). A 2022 study examined how rural identity contributes to an attitude of anti-intellectualism (Lunz Trujillo), which may be a factor in rural communities’ placing lower importance on schools. Compared to their urban peers, rural students typically have lower ambitions for their schooling and career plans (Irvin et al., 2016; McCracken, 1991) while also facing disadvantages in entering postsecondary education (Sowl & Crain, 2021). In 2018, the National Student Clearinghouse reported that 59% of rural high school graduates immediately enrolled in some postsecondary institution (compared with 62% and 67% of urban and suburban students, respectively). While lower college attendance rates may not seem important to some, the national drop-off in rural industries (such as farming or millwork) has placed a greater emphasis on postsecondary education for career advancements (Marcus

& Krupnick, 2017). Many rural communities lack close proximity to colleges and place a higher value on keeping family members close to home over moving away to college (Irvin et al., 2016).

At the same time, this is not to say that rural communities do not value school and some of its benefits. Smaller rural schools can often give better individual attention to students and promote a close knit, familial feeling that larger urban or suburban schools cannot (Dunne, 1983). While urban schools may have larger populations and more resources at their disposal, they are not without their own struggles. A 1998 study showed that US urban schools performed significantly worse than suburban schools on the Third International Mathematics and Science Study (TIMSS) and that urban schools had lower scores among eighth graders (Uekawa & Lange). Since the beginning of the 21st century, Theobald argues that suburban schools have surpassed both urban and rural schools as the leader in US school settings. Schools that are predominantly rural or urban both struggle mightily on their own and need to work together to find success (2005).

Student Mobility

In addition to geographical location, student mobility also plays a part in determining students' academic outlooks. Student mobility refers to students moving from one school to another (Welsh, 2016). Russell Rumberger's 2015 study of the causes and consequences of student mobility is helpful here; he found that changing schools just once had a negative impact on elementary

reading and math while increasing the chance of dropping out of high school. The impacts were more severe with each additional move. In fact, a higher rate of student mobility schoolwide was found to have a startlingly negative effect on the academic performance of *all* students in the school. A 2005 study from Rumberger found that schools with teachers confident in their teaching abilities actually had higher student transfer rates and did not necessarily see lower dropout rates. Rumberger concluded that schools have a low impact on dropout rates compared to students' individual factors and that schools should be responsible for any student entering their district, not simply those who stay (2005). Student mobility has been shown to lead to lower test scores and higher chances at dropping out of high school (South et al., 2007). The negative effects of student mobility are more pronounced when students change schools during the school year as opposed to during the summer (Wright, 1999). Possible reasons for students changing schools include not having certain athletic programs, special services for students, and issues with school climate (such as bullying) (Potter et al., 2019).

Student mobility is also related to misbehavior and discipline problems (Rumberger 2003), particularly during the last two years of high school (Swanson & Schneider, 1999). A 2000 study of over 4,500 students from California and Oregon showed that frequent moves during elementary school led to a 20% increase in violent behavior risks (Ellickson & McGuigan). It is important to note, though, that district-specific data is not necessarily applicable to other districts, and individual personal/family factors should be considered for each situation

(Rumberger, 2003). In some cases, students' academic prospects can lead to changing schools, rather than the other way around. Students who sense they can reach greater academic heights at a different school may decide to transfer. Because of this, the influence of mobility on high school test scores is mixed. However, Rumberger states that there are "overwhelming" indications that mobility has a strong, negative impact on graduation (2003).

Race and Academic Achievement

Countless studies have investigated the impact of race on academic achievement. Research focused primarily on studies of White, Hispanic, and Mixed races, the predominant ethnicities at the school for this study. The majority of these studies suggest that ethnic minorities face some sort of educational disadvantages compared to white students. A 2011 study of 73 rural US high schools illustrated that students from African American and Hispanic/Latino/Latina backgrounds acknowledged more educational hurdles, particularly for those whose first language was not English (Irvin et al.). A similar study from 2000 showed that low-income and ethnic minority homes are significant predictors of lower academic achievement compared to high-income, White homes (Rumberger & Thomas). The largest group of students who qualify for free or reduced-price lunches are those from ethnic minority backgrounds. Compared to White peers, Hispanic/Latino students also reported more economic hardship, a stronger desire to live in another state, and less involvement and/or achievement in college preparation classes (Irvin et al.,

2016). This is not to say, however, that Hispanic/Latino students are academically doomed. A 2012 study of Mexican immigrant children living in mainly White neighborhoods indicated a positive correlation between strong, positive ethnic identities and performance in school (Brown & Chu), which aligns with similar results for adolescents (Green et al., 2006). A strong positive view of one's ethnicity is essential for these students from minority backgrounds to perform well in school.

Socioeconomic Status

In addition to school location, student mobility, and race/ethnicity, socioeconomic status (SES) has been a commonly studied predictor of academic success. While Free and Reduced Lunch status is not a perfect indicator of one's SES level (Harwell & LeBeau, 2010; Nicholson et al., 2014), it is often the most easily accessible form of data at small school districts. Lunch statuses have also been shown to align more strongly with test scores than with household income data (Domina et al., 2017). Stanford Sociology Professor Sean F. Reardon has conducted numerous studies on the gaps in academic achievement between groups of people, especially with regards to income. Looking at standardized test scores in math and reading across the US over the last 50 years, Reardon chronicled a gap in scores between low-income and high-income learners while also noting that this gap is increasing (2013). Higher incomes are more typical among urban areas, where 39% of students in Ohio anticipated an income above $25,000 compared to 27% from rural areas (McCracken, 1991). Rumberger's

aforementioned 2005 study found that SES had a small but significant positive impact on academic achievement; a large, negative, and significant impact on dropout rates; and an insignificant impact on changing schools.

As discussed in the Limitations section of Chapter 1, a separate issue with SES and the use of free-reduced lunch is that of students' lunch status changing from year to year. Many of the students in the data received from the school saw multiple changes to their lunch status (free, reduced, or none) over their time attending the school. This is often due to families experiencing changes in their income (Gordanier et al., 2020) and has been demonstrated to negatively affect academic outcomes (Gennatian et al., 2018). Looking through existing literature on this phenomenon over the span of several weeks was ultimately futile; no helpful research was found on how to classify these kinds of students. Students whose lunch status remained stable over the years were categorized accordingly; those whose statuses changed were noted, and the number of years in each category (free, reduced, or none) was also recorded.

Student Discipline

Much of the research to this point has centered on how academic achievement is affected by school location, student mobility, race, and SES. These four factors also influence student discipline incidents, primarily with school suspensions. US schools have seen an increase in the number of suspensions or "punitive disciplinary methods" (Iselin, 2010, p.1). Higher suspension rates were associated with having more students with low SES

backgrounds, multiple school changes, and even attending an urban school. Non-white ethnic groups reported disproportionate numbers of suspensions relative to their percentage in the overall school population, although the treatment towards African Americans is much harsher than for Hispanic/Latino students (Iselin, 2010). A study on a group of students in central Florida from 1989-2002 revealed similar, more specific trends. The study (Raffaele, 2003) found that:

> 66.27 percent of all black males receiving free or reduced-price lunch and special education services were suspended at least once in sixth grade. In comparison, 44.12 percent of all white males receiving free or reduced-price lunch and special education services received at least one suspension. When the reduced-lunch variable was removed, the numbers changed considerably: 13.60 percent of black males who paid for their lunch and were in special education were suspended; 54.29 percent of white males who paid for their lunch and were in special education were suspended (p.21).

These staggering figures clearly point to some sort of relationship among race, SES, and suspension. However, just as individual factors must be considered with instances of student mobility, the same can be said here. Any attempt to extrapolate suspension data from central Florida in the late 20th century to twenty years later in western Ohio must be done with care. Additional studies, though, suggest that handing out suspensions to pre-high school

students leads to future suspensions, lower academic achievement, and failure to graduate from high school on time (Raffaele, 2003). As the study of this thesis will attempt to identify groups of students in need of targeted interventions, Raffaele's study suggests that intervention should begin before entering middle school and focus on past suspensions and teachers' ratings of students' behaviors (2003). Iselin (2010) found that schools employing teachers with "consistent, positive, clear, and high behavioral and academic expectations of students" (p.5) correlated with lower suspension rates.

Summary

This chapter inspected and summarized existing research on the factors of this study. Much of the discussion focused on the effect of rural or urban geography on students and schools as a whole, with rural schools and students generally lagging behind their urban counterparts in terms of academic achievement. The unique portion of this study will be its examination of a school that can be considered both rural and urban, where a noticeable gap in present research exists. Scholars found that student mobility typically has a negative on students' academic achievement and can even affect entire classrooms and schools as a whole. Those who come from ethnic minority backgrounds have historically been at a disadvantage compared to White students in their performance at school. The research also showed that gaps in socioeconomic status have played a part in these same academic gaps, with lower SES commonly being associated with lower test scores. Finally, those four

aforementioned factors were also analyzed from a student discipline perspective, where urban schools, high student mobility, ethnic minorities, and low SES have all appeared to be positive indicators of school suspensions. Research was conducted primarily through Google Scholar, EBSCO Discovery Service (via the Shawnee State Library), and by extensive use of the References of pertinent articles.

CHAPTER III: METHODOLOGY

Introduction

The purpose of Chapter 3 is to discuss the procedures and techniques used in setting up the data to answer the primary research questions. An overview of the setting and participants will be given along with a brief explanation of instrumentation and procedures. Careful explanation of the independent (location, length of time in district, race, and socioeconomic status/SES) and dependent (academic and behavioral achievement) variables will be given with an explanation of how these variables were treated and categorized.

Setting and Participants

As discussed in Chapter 1, the setting of this study is Union City, Ohio, a community of under 4,000 people (National Center for Education Statistics, n.d.) consisting of a rural and urban portion. Union City, Ohio actually shares a name with its twin city Union City, Indiana. State Line Road serves as the dividing line between the two states; anyone living on the west side of the street lives in Indiana, and anyone on the east side is in Ohio. About one-third of Union City's inhabitants live on the Ohio side, where Union City's urban or "in town" portion is made up of less than one square mile. Outside the village limits, the students of Union City (Ohio) attend the Mississinawa Valley School District, consisting of an elementary school and junior/senior high school that share the same building.

The district comprises 80 square miles, with the vast majority amounting to rural farmland. From the 2008-09 school year through the 2022-23 school year, the average number of students in the district (kindergarten through 12th grade) was 645.47 with an average graduating class size of 47.47 students. According to the American Community Survey – Education Tabulation (ACS-ED) from the National Center for Education Statistics (NCES), 31.4% of families in the district reported an income below the poverty level (compared with 15.7% of the state and 14.5% nationally), and 37.4% of families were on Food Stamp/SNAP benefits (compared with 20.4% of the state and 19.3% nationally). Race/ethnicity in the district consists of 87% white, 3% Black or African American, 9% Hispanic or Latino, 1% Asian, and 1% two or more races.

Like any school district, Mississinawa Valley has also had plenty of students transfer into and out of the district. The district recorded 128 entries and 95 withdrawals in the 2022-23 school year and 114 entries and 95 withdrawals in the 2023-24 school year. Several families in the district are migrant workers that temporarily move into and out of the district for a few months at a time.

Data was obtained through the district's guidance department by way of the Education Management Information System (EMIS) of Ohio. All data was collected anonymously without any identifiers so that subjects could not be identified. The sample included the 2,002 students that were enrolled in the district at some point from the beginning of the 2008-09 school year until the end of the 2022-23 school year. The demographic information collected consisted of

place of residence, race, district admission and withdrawal (if applicable) dates, and free/reduced lunch status. The academic information collected consisted of students' GPA at time of graduation and individual scores from any standardized state test taken. Finally, all recorded disciplinary incidents were collected.

The results of this study may be generalized for future students in the Mississinawa Valley School District and potentially for other small school districts with a mixed rural and urban/suburban population. The sample adequately represented the population since it includes data on every student in the district since 2008. One possible issue with representation/generalizability was that GPA data was recorded only for graduates. While students who left the district may have academic assessment data from state tests, they will not have any GPA data on file if they left the school before graduating.

The sample size of 2,002 students provided more than enough statistical power. Using the statistical software G*Power, a moderate, standard effect size of .15 with the F Test for linear multiple regressions was used. The alpha level was set to .05, and desired power was set to 0.8. With four predictors, G*Power computed a priori power requiring a sample size of at least 85, meaning sample size and power were not a concern.

Instrumentation

While no tests or surveys were created for this study, students' individual scores from Ohio state tests were used as a measure of academic achievement.

These tests included exams in mathematics, science, English, and social studies. According to the Ohio Department of Education, each of Ohio's 23 state tests had a reliability value of at least 0.86 in 2022 and at least 0.88 in 2023. ODE also provided guidelines to ensure that any "practice related to a test is consistent with … the reliability and validity of any inference made from any result of a test". As mentioned above, this data was collected from the guidance department at the school via the Education Management Information System (EMIS) of Ohio. Students' Ohio state test scores reached as far back as third grade. The data was received in the fall of 2023.

Procedure

To ensure anonymity, all data was purged of any identifiers; no names of any students were received. While student ID numbers were received with the data, they were used solely for matching students' different information across multiple spreadsheets worth of data and are nowhere presented in this study. Students' addresses were also received with the data and converted to either a "Rural", "Urban", or "Open Enrollment" classification; no specific addresses are presented anywhere in this study. Any attempt to identify students would be extremely difficult, with over two thousand students spanning fifteen years. Any confidentiality of recovered data will be maintained at all times, and identification of participants will not be available during or after the study.

The study received Exempt status from the Institutional Review Board (IRB) since the data collection was "not likely to adversely impact students'

opportunity to learn required educational content." The information was presented "in such a manner that the identity of the human subjects cannot readily be ascertained, directly or through identifiers linked to the subjects" (U.S. Department of Health and Human Services, 2018). There was minimal to no risk to the participants, and the likelihood of any harm or discomfort is no greater than any ordinarily encountered in daily life.

Data Processing and Analysis

The goal of this study was to predict two different dependent variables from a set of four predictor variables. The primary research questions of this study were:

1. "Are a student's place of residence (urban or rural), race, SES, and time in the district (in years) significant predictors of academic success as measured by GPA, state test, and ACT scores?"
2. "Are a student's place of residence (urban or rural), race, SES, and time in the district (in years) significant predictors of behavioral success as measured by number of disciplinary incidents?"

The data needed for these questions were organized and categorized in several important ways. First, each student's address was classified as "Rural", "Town", or "Open Enrollment" (for students not living within the boundaries of the Mississinawa Valley School District). Families choosing to enroll their children in a district outside their own residence often believe this new school better meets

the needs of their children (Ledwith, 2010). Open Enrollment addresses were determined using the established district boundary lines on Google Maps and Google Earth. Any address found to be outside the district boundaries was classified as Open Enrollment. Any address within the Union City (Ohio) “city limits” using Google Maps was classified as Town. Any other address within the district limits was classified as Rural. The only exception to this was a small mobile home park just outside the city limits. Because of the mobile homes’ close proximity to each other in a small, confined space (40 lots in approximately 20,000 square meters), the superintendent (who commissioned the study) wished to classify the 49 students in these mobile homes as Town students. Seven other students had a PO Box number as their address and could not be classified Rural or Town. While they likely were Open Enrollment addresses, they were excluded from having their address classified due to a lack of certainty.

Second, each student’s length of time spent in the district was categorized by their given District Admission Date and District Withdrawal Date. For students with a single admission date and single withdrawal date (or no withdrawal date if they were still currently enrolled at the time of the study), their length of time in the district was simply the number of consecutive years from their admission date until their withdrawal date (or until 2023 if they had no withdrawal date). Many students in the sample, though, had more than one admission date and/or withdrawal date. For these students, the number of times they left and returned to the district was tracked along with the number of full years they spent out of the district. As discussed in the literature review, the number of times a student

leaves and re-enters the district is of particular importance (Rumberger, 2015). If a student spent part of a year at Mississinawa Valley but changed schools before the end of the school year, this was counted as a full year. Thus these students' length of time in the district was determined by counting the number of years from their admission date until their final withdrawal date (or 2023) and subtracting the number of full years out of the district.

Third, students' socioeconomic status in this study was classified by their free/reduced lunch status (None, Reduced, or Free). As discussed earlier in Chapter 2, lunch status is not a perfect indicator of one's socioeconomic status, but it remains a practical tool for determining SES. Over 500 students in the sample, however, received multiple lunch statuses across their time in the district, making their SES difficult to definitively classify. Searching the existing research did not provide much help; few results were found on students with multiple lunch statuses over time. Several options were considered, but each had its own flaws. The students with multiple lunch statuses could have been excluded due to a lack of clarity, a practice that is not at all uncommon in a regression analysis (Raghunathan, 2004). However, excluding one fourth of the sample was undesirable, especially if it was avoidable. Another option would have been to include a fourth "Changed" option in addition to "Free", "Reduced", and "None." No existing research was found on this, though. This category also seemed too broad; for example, including a student with 12 years of paid lunch/1 year of reduced price with another student with 12 years of free lunch/1 year of reduced price in the same group seemed problematic. As a result of these less

desirable options, each student's number of years with each lunch status (Free, Reduced, and/or None) was recorded separately. This served as a form of "weighting" the existing data as a means to address missing or compromised data (Raghunathan, 2004). However, this caused the Lunch Status variable to be highly correlated with the Years in the District variable since the sum of the separate lunch statuses often added to the total years in the district. So, for the sake of simplicity (and due to the lack of existing research), each student was instead classified by the lunch status (Free, Reduced, or None) that they had for the most number of years. When there was a tie between two (or all three) of the options, preference was given to Free lunch status followed by Reduced. Having, for example, a student with 13 years of Free Lunch receive the same classification as a student with 4 years of None, 4 years of Reduced, and 5 years of Free is slightly problematic, but this approach was deemed the best of the available options. The final predictor variable, race, was classified for each student as White (1,768 students), or Non-White (234 students), due to small sample size. The specific totals of Non-White students consisted of Hispanic (159 students), Multiple Races (56), Black (14), Native Hawaiian or Other Pacific Islander (4), or American Indian or Alaska Native (1).

As discussed previously, grade point averages (GPAs) were only available for students at the time of graduation, meaning the majority of the sample (1,307 students out of 2,002) could not have their academic achievement measured by GPA. Thankfully, the district tracked individual scores for any state and/or national assessment, such as Ohio State Tests, Ohio End of Course Exams, and

the ACT. This data also included scores for each individual component of a test, such as with the ACT (Composite Score, English Score, Math Score, etc.). These individual components can, at times, be of equal or greater interest than the overall composite score (Mullen, 2021). Other state test scores recorded include English (Grades 3-8, along with ELA 1 and ELA 2 in high school), Math (Grades 3-8, along with Algebra I and Geometry in high school), Social Studies (Grades 4 and 6, along with US History and US Government in high school), and Science (Grade 5 and 8, along with Biology in high school). If a student took a single test more than once (in order to get a higher score the second or third time), the student's highest score was counted (Faulconer et al., 2019).

Student discipline incidents were also measured. Throughout the years of data collected, all discipline incidents were recorded and classified as one of the following: Infraction (4,904 instances), Bus Write Up (597 instances), Out of School Suspension (539), Detention (340), Administrative Detention (332), Bus Suspension (264), Teacher Detention (190), Warning (176), Saturday School (130), In School Alternative (27), In School Detention (14), Expulsion (12), In School Suspension (11), Truancy Filing (8), Mental Health Assessment (5), or Community Service (3). Each student also received a total number of discipline incidents, regardless of type, to allow for both a broad and narrow analysis on discipline incidents.

Summary

This chapter reviewed the setting and students of the study, providing important background information on the Mississinawa Valley School District and community. Instrumentation and Procedures were briefly discussed. The primary research questions were reviewed, and the collection of data pertaining to the study was analyzed. Specific details on the contents of the independent and dependent variables were given, leading the way for the results of the study in Chapter 4.

CHAPTER IV: RESULTS

In Chapter 4, the results of the research will be presented. The purpose of the study was to determine if four different independent variables (place of residence, length of time spent in the district, race, and socioeconomic status) were significant predictors of academic success and of behavioral success. The research questions were:

1. “Are a student's place of residence (urban or rural), race, SES, and time in the district (in years) significant predictors of academic success as measured by GPA, state test, and ACT scores?”
2. “Are a student's place of residence (urban or rural), race, SES, and time in the district (in years) significant predictors of behavioral success as measured by number of disciplinary incidents?”

Descriptive Statistics

As discussed in Chapter 3, each student in the sample had a home address listed that was then classified as Rural (“R”), Town (“T”), or Open Enrollment (“O”) using the established Mississinawa Valley School District boundary lines on Google Maps. There were seven students with a PO Box number as their address, making it difficult to determine where their exact place of residence was. While they likely were Open Enrollment addresses, their address was classified with an asterisk (*). Due to small sample size, these seven students were excluded from the models for Average Test Scores and ACT Composite Scores. The descriptive statistics for students’ places of

residence are shown in Table 1. Table 2 shows the mean and standard deviation for GPA, Average Test Score, ACT Composite Score, and Disciplinary Incidents by residence type.

Table 1. Number of students by Residence Type

Residence Type	Total Students	Percent of Sample
Town	932	46.55%
Rural	869	43.41%
Open Enrollment	194	9.69%
Other (PO Box #'s)	7	0.35%

Table 2. Means and Standard Deviation by Residence Type for GPA, Average Test Score, ACT Composite Score, and Disciplinary Incidents

	GPA		Avg Test Score		ACT Composite		Disc. Incidents	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Town	2.69	0.73	704.57	33.76	16.04	4.01	4.39	11.47
Rural	3.02	0.65	724.36	34.89	17.50	4.16	3.62	9.35
Open Enroll	3.01	0.67	722.46	28.19	18.63	3.38	1.57	4.10
Other	3.32	0.63	—	—	—	—	1.00	1.83

Each student's number of years in the school district was also tracked, as were the number of times (if any) that they left and came back to the district. For students that left the district and returned again later, their number of years spent

outside of the district was also tracked. Out of the 2,002 students in the sample, 194 left and re-entered the district at least once; 163 (8.14%) moved once, 25 moved twice, four students left three times, one student had six moves, and one student had ten moves. The descriptive statistics for students' number of years in the district are shown in Table 3.

Table 3. Students' lengths of time (in years) in the district

Years spent in the district	Total Students	Percent of Sample
1-2	620	30.97%
3-4	306	15.28%
5-6	251	12.54%
7-8	199	9.94%
9-10	149	7.44%
11-12	137	6.84%
13-14	340	16.98%

Race was classified for each student as White (1,768 students), Hispanic (159 students), Multi-Racial (56), Black (14), Native Hawaiian or Other Pacific Islander (4), or American Indian or Alaska Native (1). Due to small sample sizes, races were then reclassified to White (n = 1768, 88.31% of the total sample) and Not White (n = 234, 11.69%). Table 4 shows the mean and standard deviation for GPA, Average Test Score, ACT Composite Score, and Disciplinary Incidents by Race.

Table 4. Means and Standard Deviation by Race for GPA, Average Test Score, ACT Composite Score, and Disciplinary Incidents

	GPA		Avg Test Score		ACT composite		Disc. Incidents	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
White	2.91	0.69	716.72	35.87	17.44	4.17	3.82	10.19
non-White	2.72	0.78	711.57	30.40	15.54	3.28	3.38	9.16

Students' socioeconomic status in this study was classified by their free/reduced lunch status (Free, Reduced, or None). Originally, the intention of this portion of the study was to separately record each student's number of years with each lunch status (Free, Reduced, and/or None). However, this caused a multicollinearity issue with the Years in the District variable. Because the sum of the Free, Reduced, and/or None years usually coincided with the number of Years in the District, this caused the two predictors to be highly correlated. So, despite over 500 students in the sample receiving multiple lunch statuses during their time in the district, each student was classified by the lunch status (Free, Reduced, or None) that he/she had for the most number of years. In the case of an equal number of years for each category, preference was given to Free Lunch, then Reduced Lunch. For example, a student classified with 4 years of Free, 4 years of Reduced, and 4 years of None would be considered a Free Lunch student. The descriptive statistics for lunch status are shown in Table 5. The percentages of White and non-White students represented across lunch

statuses are presented in Table 6. Table 7 shows the mean and standard deviation for GPA, Average Test Score, ACT Composite Score, and Disciplinary Incidents by lunch status.

Table 5. Number of students by paid lunch status

Lunch Status	Total Students	Percent of Sample
Free	1021	51.00%
Reduced	181	9.04%
None	800	39.96%

Table 6. Number of students by paid lunch status across race

Lunch Status	White Students (% of total White students)	non-White Students (% of total non-White students)
Free	846 (47.85%)	175 (74.79%)
Reduced	165 (9.33%)	16 (6.84%)
None	757 (42.82%)	43 (18.38%)

Table 7. Means and Standard Deviation by Lunch Status for GPA, Average Test Score, ACT Composite Score, and Disciplinary Incidents

	GPA		Avg Test Score		ACT composite		Disc. Incidents	
Lunch	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Free	2.65	0.68	706.34	33.37	15.16	2.84	5.02	11.97
Reduced	2.82	0.69	711.03	39.52	14.67	1.53	3.20	7.43
None	3.04	0.68	727.65	32.38	18.74	4.29	2.31	7.37

The four primary dependent variables in this study were GPA's, average state test scores, ACT composite scores, and total disciplinary incidents. GPAs were recorded on a 4 point scale. Two students with multiple disabilities had a recorded GPA of 0.00 due to heavily adjusted curriculum; they were excluded from the GPA statistics. Ohio State Test scores typically range from approximately 600 to 800, where a score of 700 or above is considered proficient (Ohio Department of Education, 2017). Students' scores from 23 different Ohio State Tests were recorded. ACT composite scores are the average of four separate subject scores (English, mathematics, reading, and science) and range from 1 to 36, where a score of 17 or above is considered "average". Every student who had an ACT score on file also had at least one Ohio State Test score on file. Descriptive statistics for the dependent variables are presented in Table 8.

Table 8. Descriptive statistics of dependent variables

	Number of students recorded	% of all students in the sample	Mean	Median	SD	Min	Max
GPA at time of graduation	n = 695	34.72%	2.89	2.95	0.70	1.18	4.00
average Ohio State Test score	n = 444	22.18%	716.05	716	35.06	602.50	818.67
ACT composite score	n = 76	3.80%	17.12	16	4.08	11	28
Total disciplinary incidents	n = 2002	100%	3.77	0	10.07	0	107

The final dependent variable, number of discipline incidents, was largely skewed, which is not uncommon in disciplinary research (Rocque et al., 2011). Out of the 2,002 students in the sample, 1,036 students (51.75%) had no discipline incidents, 679 (33.92%) had between 1 and 6 incidents (representing the 50th-85th percentiles outlined by Rusby's 2007 study), and 287 (14.34%) had 7 or more. Furthermore, 40 students (2.00%) had 34 or more total incidents (three standard deviations from the mean), and 18 students (0.90%) had 55 or more (five standard deviations from the mean). Sixteen discipline categories were recorded by the school, including (but not limited to) Infractions, Bus Write

Ups, Out of School Suspension, Detentions, Administrative Detentions, Bus Suspensions, Teacher Detentions, Warnings, and Saturday Schools. While the standard deviation for Infractions was 8.29, the individual standard deviations for every other discipline category were each less than 1.06, suggesting that teachers in the school gave out infractions far more often than any other disciplinary referral. The highly skewed nature of disciplinary data leads away from multiple regression techniques because of its violation of the normality assumption. A logistic regression is more appropriate and common, where the amount of disciplinary incidents is dichotomized into either zero incidents or at least one incident (Wallace et al., 2008).

Data Analysis

Research Question 1: "Are a student's place of residence (urban or rural), race, SES, and time in the district (in years) significant predictors of academic success as measured by GPA, state test, and ACT scores?"

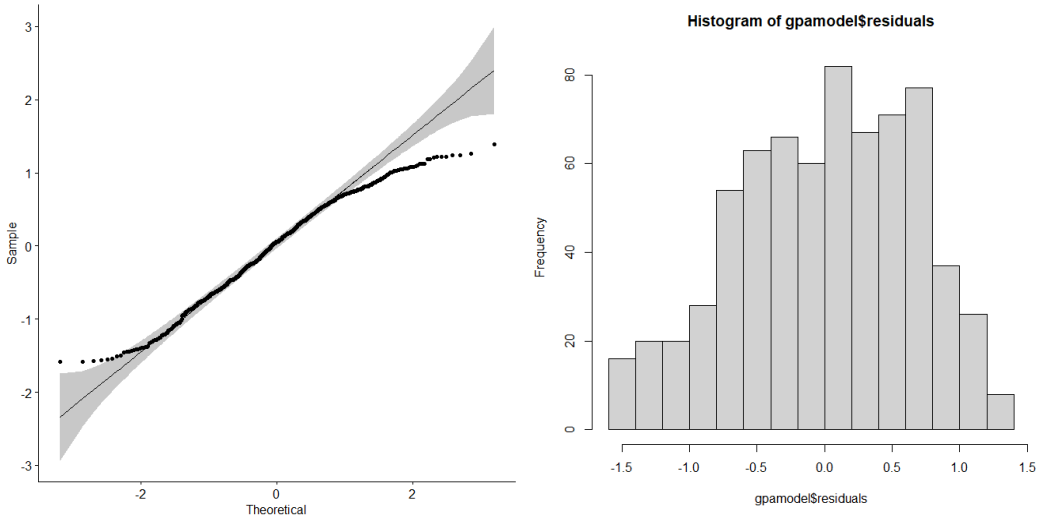
GPA

Three standard multiple regressions were performed for three different dependent variables with the same set of independent variables. The first was performed between GPA's (mean = 2.89, SD = 0.70) as the dependent variable and Residence, Years in the District, Race, and Lunch Status as the independent variables. Out of the 2,002 total students in the sample, 695 had a GPA on file. Since the number of cases per predictor easily exceeded 15 (Field, 2012), there

were no concerns with adequate sample size. Analysis was performed using R (R Core Team, 2022).

Multiple regression model assumptions include testing for independence, multicollinearity, normality of error terms, and equal error variances. Independence was not a concern with the Durbin-Watson Test Statistic = 1.75. Shapiro's test for normality revealed concerns, W = 0.98, p < .001. Figure 1 shows many cases outside the desired band, but a histogram of the model residuals in Figure 1 appears to be somewhat normal with a slight left skew. Multicollinearity was not a concern as no Variance Inflation Factors were above 1.04. Equal variance was not a concern as seen in Figure 1.

Figure 1. Plots for Normality and Equal Variance Assumptions (GPA model)



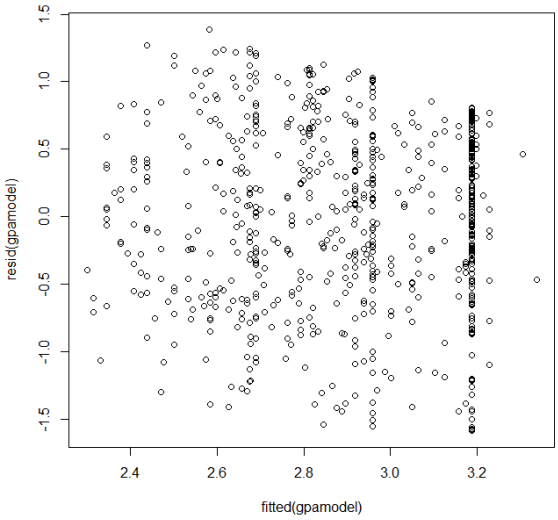


Table 9 displays the unstandardized regression coefficients. A test of the full model against the intercept only model was significant; $F(7,687) = 14.58$, $p < .001$. The set of predictors in combination contributed to 12.05% of the variance in GPA. For the categorical predictors, the reference categories were Rural (Residence), White (Race), and None (Lunch Status). Three regression coefficients included in the model emerged significant, so test-statistic values and confidence intervals are presented for each: Town Residence ($t = -4.139$, (-0.338, -0.121)), Years in the District ($t = 5.196$, (0.019, 0.043)), and Free Lunch ($t = -4.698$, (-0.383, -0.157)). Examination of outlier cases, high standardized residuals, and influential cases led to the deletion of no cases. While 25 out of 695 cases had standard residuals with an absolute value greater than 2, none were above 2.42.

Table 9. Regression estimates, standard errors, test statistics, and p-values for each predictor of GPA

Variables	*B*	SE	t value	p value
Town (Residence)	-0.229	0.055	-4.139	< .001
Open Enrollment (Residence)	0.040	0.105	0.380	.704
Other (Residence)	0.180	0.467	0.386	.700
Years in the District	0.031	0.006	5.196	< .001
Not White (Race)	-0.014	0.092	-0.155	.877
Free (Lunch)	-0.270	0.058	-4.698	< .001
Reduced (Lunch)	-0.139	0.100	-1.385	.167
(Constant)	2.782	0.073	38.043	< .001

The table above states that when controlling for the other predictors, students who lived in town had a GPA of approximately 0.23 points lower than those who lived in the country. When controlling for the other predictors, students on free lunch had a GPA of approximately 0.27 points lower than students who paid full price for lunch. Again, controlling for the other predictors, students on reduced lunch had a GPA of approximately 0.14 points lower than students on full price lunch, but this result was not statistically significant (p = .167). Lastly,

each additional year spent in the district saw the predicted GPA score increase by approximately 0.03 units, when controlling for the other predictors.

State Test Scores

The second multiple regression was performed between Average State Test Scores (mean = 716.05, SD = 35.06) as the dependent variable and Residence, Years in the District, Race, and Lunch Status as the independent variables. Out of the 2,002 total students in the sample, 444 had at least one Ohio State Test score on file. Since the number of cases per predictor easily exceeded 15 (Field, 2012), there were no concerns with adequate sample size. Analysis was performed using R (R Core Team, 2022).

Independence was not a concern with the Durbin-Watson Test Statistic = 1.54. Shapiro's test for normality revealed no concerns, W = 0.995, p = .162. Figure 2 shows around 19 cases outside the desired band. Multicollinearity was not a concern as no Variance Inflation Factors were above 1.12. Equal variance was not a concern as seen in Figure 2.

Figure 2. Plots for Normality and Equal Variance Assumptions (Test Average model)

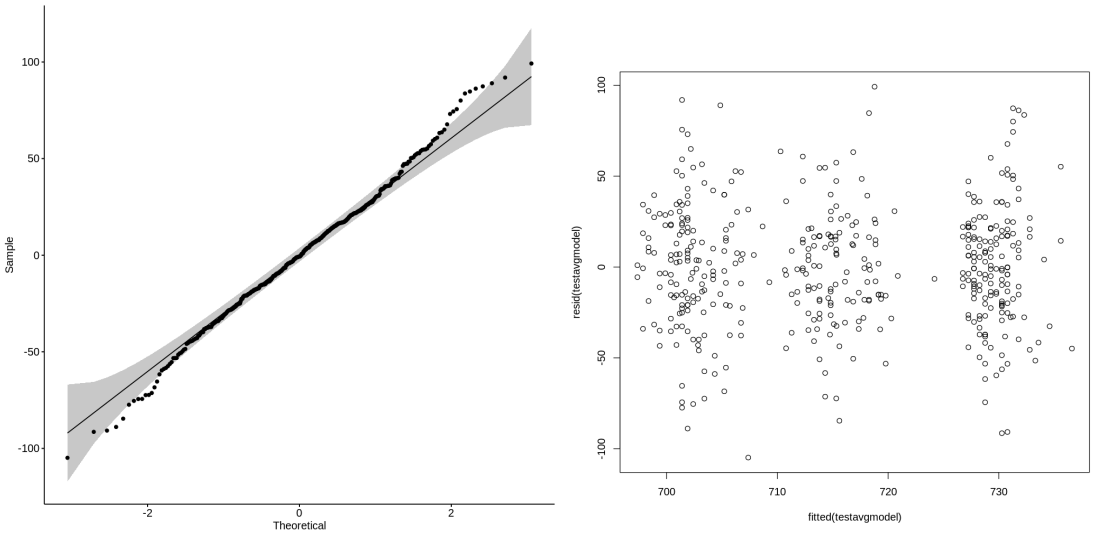


Table 10 displays the unstandardized regression coefficients. A test of the full model against the intercept only model was significant; $F(6,437) = 9.307$, $p < .001$. The set of predictors in combination contributed to 10.11% of the variance in Average Test Score. For the categorical predictors, the reference categories were Rural (Residence), White (Race), and Free (Lunch Status). Two regression coefficients included in the model emerged significant, so test-statistic values and confidence intervals are presented for each: Town Residence (t = -3.280, (-19.853, -4.977)), and None Lunch (t = 4.307, (9.498, 25.446)). Examination of outlier cases, high standardized residuals, and influential cases led to the deletion of no cases. There were 25 out of 444 cases with standard residuals with an absolute value greater than 2, and two were above 3. One possible

concern is that the maximum of the model's fitted values was just 736.602; 116 students (26.07% of the sample) had a test average above this.

Table 10. Regression estimates, standard errors, test statistics, and p-values for each predictor of Average State Test Score

Variables	*B*	SE	t value	p value
Town (Residence)	-12.415	3.785	-3.280	< .01
Open Enrollment (Residence)	-1.003	5.422	-0.185	.853
Years in the District	-0.504	0.501	-1.006	.315
Not White (Race)	3.308	4.599	0.719	.472
None (Lunch)	17.472	4.057	4.307	< .001
Reduced (Lunch)	4.467	5.471	0.813	.415
Constant	716.325	4.656	153.855	< .001

The table above states that when controlling for the other predictors, students who lived in town had an average state test score of approximately 12.42 points lower than those who lived in the country. When controlling for the other predictors, students who paid full price for lunch had an average state test score of approximately 17.47 points higher than students on free lunch. Again, controlling for the other predictors, non-White students had an average state test

score of approximately 3.31 points higher than White students, but this result was not statistically significant (p = .472). Lastly, each additional year spent in the district saw the predicted state test score decrease by approximately 0.50 units when controlling for the other predictors, but this was also not significant (p = .315).

ACT Composite Scores

The third multiple regression was performed between ACT Composite Scores (mean = 17.12, SD = 4.08) as the dependent variable and Residence, Years in the District, Race, and Lunch Status as the independent variables. Out of the 2,002 total students in the sample, 76 had an ACT score on file. Since the number of cases per predictor exceeded 15 (Field, 2012), there were no concerns with adequate sample size. Analysis was performed using R (R Core Team, 2022).

Independence was not a concern with the Durbin-Watson Test Statistic = 1.85, p = .45. Shapiro's test for normality revealed no concerns, W = 0.971, p = .080. Figure 3 shows 12 cases outside the desired band. Multicollinearity was not a concern as no Variance Inflation Factors were above 1.22. Equal variance was not a concern as seen in Figure 3.

Figure 3. Plots for Normality and Equal Variance Assumptions (ACT model)

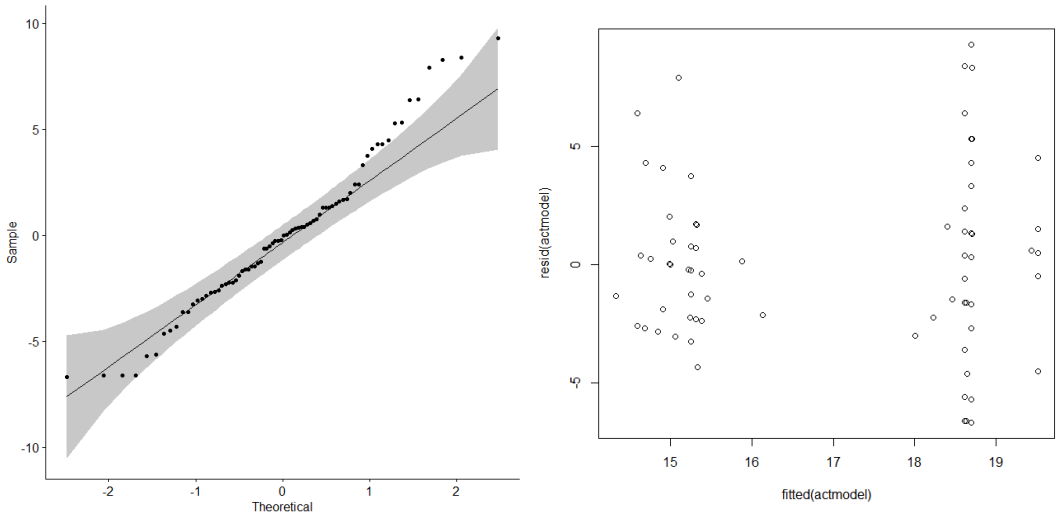


Table 11 displays the unstandardized regression coefficients. A test of the full model against the intercept only model was significant; $F(6,69) = 2.958$, $p < .05$. The set of predictors in combination contributed to 13.54% of the variance in ACT Composite Score. For the categorical predictors, the reference categories were Rural (Residence), White (Race), and None (Lunch Status). The only regression coefficient included in the model that emerged significant was Free Lunch ($t = -2.705$, (-5.764, -0.871)). Examination of outlier cases, high standardized residuals, and influential cases led to the deletion of no cases. There were 4 out of 76 cases with standard residuals with an absolute value greater than 2, but all were less than 2.5. One possible concern is that the maximum of the model's fitted values was just 19.51; 21 students (27.63% of the sample) had a test average above this.

Table 11. Regression estimates, standard errors, test statistics, and p-values for each predictor of ACT Composite Score

Variables	*B*	SE	t value	p value
Town (Residence)	0.012	1.073	0.011	.991
Open Enrollment (Residence)	0.893	1.466	0.609	.545
Years in the District	0.078	0.184	0.421	.675
Not White (Race)	-0.057	1.409	-0.040	.968
Free (Lunch)	-3.318	1.226	-2.705	< .01
Reduced (Lunch)	-3.601	2.601	-1.384	.171
Constant	17.686	2.555	7.841	< .001

The table above states that when controlling for the other predictors, students who lived out of the district (Open Enrollment) scored approximately 0.89 points higher on the ACT than those who lived in the country, but this result was not statistically significant (p = .545). When controlling for the other predictors, students on free lunch scored approximately 3.32 points lower than students who paid full price for lunch. Again, controlling for the other predictors, students on reduced lunch scored approximately 3.60 points lower than students on full price lunch, but this result was not statistically significant (p = .171).

Research Question 2: "Are a student's place of residence (urban or rural), race, SES, and time in the district (in years) significant predictors of behavioral success as measured by number of disciplinary incidents?"

Discipline

A direct logistic regression analysis was performed on discipline status as outcome and the four predictors: residence, number of years in the district, race, and free/reduced lunch status. Data from N = 2002 students were available for analysis: 1,036 (51.7%) students had no disciplinary incidents, and 966 (48.3%) students had at least one disciplinary incident. Analysis was performed using R (R Core Team, 2022).

A test of the full model with four predictors against a constant-only model was statistically reliable, χ^2 (7, N = 2002) = 224.09, p < .001, indicating that the set of predictors reliably distinguished between students with no discipline issues and those with at least one. The variance in discipline status accounted for is small with McFadden's rho = 0.081, df = 7. AIC for the full model (2564.8) was lower than for the constant-only model (2772.9), indicating a slightly better fit.

Prediction success (using 0.5 as the threshold) was unimpressive with 1,274 of 2,002 cases (63.6%) accurately classified or predicted correctly. Sensitivity and specificity values were 0.590 and 0.680, respectively.

Table 12 displays the regression coefficients, Wald statistics, odds ratios, and 95% confidence intervals for odds ratios for the seven predictors. For the

categorical predictors, the reference categories were Town (Residence), White (Race), and Free (Lunch Status). According to the Wald criterion, the significant predictors of discipline status were Years in the District ($z = 12.002$, $p < .001$), Race ($z = -2.335$, $p < .05$), “None” Lunch Status ($z = -9.920$, $p < .001$), and Reduced Lunch Status ($z = -3.157$, $p < .01$). The odds ratio of 0.310 for Full Price Lunch Status indicates that when controlling for the other predictors, students on Full Price Lunch Status are 3.226 (1 / 0.310) times more likely to have zero disciplinary incidents than those on Free Lunch. The odds ratio of 0.700 for non-White students indicates that when controlling for the other predictors, non-White students are 1.429 (1 / 0.700) times more likely to have zero disciplinary incidents than White students. The odds ratio of 1.156 for Years in the District indicates that when controlling for the other predictors, the odds of having at least 1 discipline incident increase 1.156 times for each additional year spent in the district.

Table 12. Logistic regression analysis of discipline status as a function of student information.

Variables	*B*	Wald (z-ratio)	p-value	Odds Ratio (OR)	95% CI Lower, OR	95% CI Upper, OR
Rural (Residence)	-0.125	-1.157	.247	0.883	0.714	1.091
Open Enrollment (Residence)	-0.315	-1.839	.066	0.730	0.520	1.019
Other (Residence)	-0.007	-0.010	.992	0.992	0.188	4.722
Years in the District	0.145	12.002	< .001	1.156	1.130	1.185
Not White (Race)	-0.357	-2.335	< .05	0.700	0.518	0.943
None (Lunch)	-1.173	-9.920	< .001	0.310	0.245	0.389
Reduced (Lunch)	-0.540	-3.157	< .01	0.583	0.416	0.814
(Constant)	-0.322	-3.338	< .001	0.725	0.600	0.875

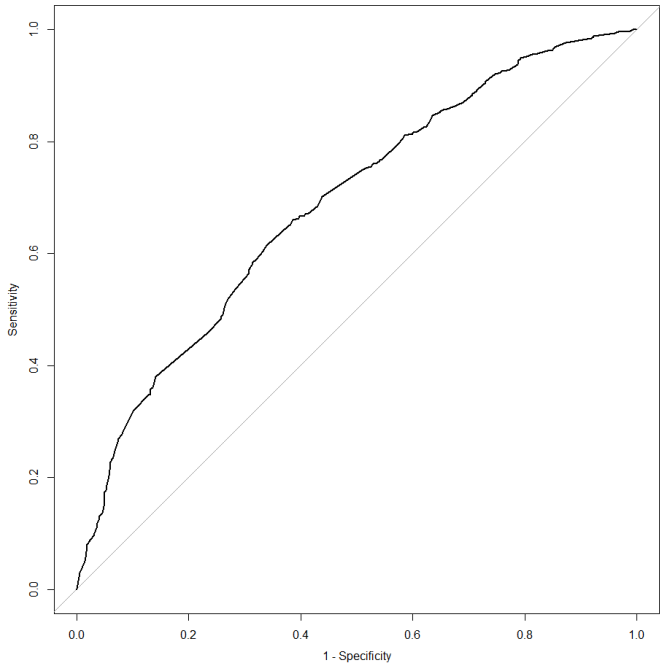
Variance Inflation Factors (VIF) values ranged from 1.026 (Race) to 1.112 (Years in the District), indicating that multicollinearity is not a problem. Examination of the significance levels of the additional predictors created by examining the interaction between each predictor and the log of itself (Hosmer & Lemeshow, 1989) showed statistical significance with the interaction of the Years in the District predictor, which indicates that the assumption of the linearity of the logit has been violated. In “Applied Logistic Regression” (3rd Edition), Hosmer, Lemeshow, and Sturdivant argue that interaction terms that violate the linearity of

the logit may be retained if they are significant to the study (Hosmer et al., 2013). Hence the Years in the District predictor will be retained in the model due to its importance in the study.

A backward elimination logistic regression was performed off of the full model. The backward model retained each predictor except for Residence but was not statistically significant from the full model, χ^2 (3, N = 2002) = 3.7946, p = .285. Prediction success for the backward model (using 0.5 as the threshold) was unimpressive with 1,261 of 2,002 cases (63.0%) accurately classified or predicted correctly, 13 fewer than the full model. Sensitivity and specificity values were 0.611 and 0.648, respectively. A series of logistic models was created by removing each predictor separately, and the full model was a statistically significant improvement over each model with one missing predictor, indicating that the full model is reliable.

A receiver operating characteristic curve (ROC) is presented in Figure 4. Receiver operating characteristics graphs (ROC) have been shown to be a reliable technique for visualizing, organizing, and selecting classifications. Swets (1988) found that ROC analysis could be extended for use in visualizing and analyzing behavior of diagnostic systems and for determining accuracy of a test using the area under the curve (AUC). The AUC was found to be .686, which indicates a poor accuracy classification (Tape, 2015).

Figure 4. ROC Curve, Discipline Status (None or At Least 1)



Summary

Chapter 4 revealed the results of the statistical analyses for each research question. The goal of the study was to determine if four predictors (place of residence, length of time spent in the district, race, and socioeconomic status) had a significant relationship with academic success and disciplinary incidents. In analyzing academic achievement, three different multiple regression models were created for GPA scores, average state test scores, and ACT Composite scores. Students' SES (determined by their free/reduced lunch status) was a significant predictor in each of the three models, place of residence was significant in predicting GPA and average test scores, and the length of time spent in the district was significant in predicting GPA. In analyzing disciplinary issues, a logistic regression model was created to distinguish between students

with no incidents or at least one incident. The model had three significant predictors: length of time in the district, race, and SES. Chapter 5 will discuss these results and connect them to existing literature while also addressing the limitations of the study.

CHAPTER V: SUMMARY

Introduction

The purpose of this study was to identify if place of residence, length of time spent in a district, race, and socioeconomic status (SES) lead to statistically significant differences in academic achievement (measured by GPA, state test scores, and ACT composite scores) and disciplinary incidents in the Mississinawa Valley School District. This final chapter includes a summary and discussion of the results from Chapter 4 along with their implications. Limitations of the study will also be discussed, as will possible improvements.

Three different multiple regression models were created for GPA scores, average state test scores, and ACT Composite scores (one model for each score). Socioeconomic status, determined by free/reduced lunch status, was a significant predictor in each of the three models. Place of residence was significant in predicting GPA and average test scores, with students living in the rural portion of the district scoring higher than those in the town portion. The number of years spent in the district was significant in predicting GPA, with each additional year spent in the district contributing to 0.03 additional GPA points. A logistic regression model was created to distinguish between students with or without at least one disciplinary incident. Length of time in the district, race, and SES, were significant predictors here: students with more time in the district were more likely to experience at least one incident, White students were 1.428 times more likely to have at least one disciplinary incident than non-White students,

and students on free lunch were 3.226 times more likely to have at least one disciplinary incident than those with no financial assistance.

Interpretation of the Results and Implications

Research Question 1: "Are a student's place of residence (urban or rural), race, SES, and time in the district (in years) significant predictors of academic success as measured by GPA, state test, and ACT scores?"

In analyzing the academic data, three of the four predictors were statistically significant in at least one of the three models. Socioeconomic status (measured by paid lunch status) was significant in all three models, where students receiving free lunch fared significantly worse than students receiving no financial assistance. Reduced lunch status never achieved statistical significance, but they did have lower average scores in all three models. This confirms existing research as discussed in Chapter 2. Students who receive financial assistance towards school lunches may lack some of the resources or infrastructure at home that students with higher SES typically have. Teachers would clearly benefit from being informed of the students in their classes who receive free lunch. From there, teachers can direct more of their individual attention to these students or assign peer tutoring in schools with such a program.

Place of residence was a significant predictor of academic success in two of the models (GPA and average state test scores). While there was no impactful

relationship between residence and ACT composite scores, the in-town students of the district performed significantly worse on Ohio state tests and in GPA than those living in the rural portion of the district. Compared to rural students, the open enrollment students living outside the district had higher ACT composite scores, higher GPAs, and lower state test scores, but none of these results were statistically significant. While the literature review in Chapter 2 indicated that urban and suburban schools are typically higher-performing academically than rural schools, the students considered to be more urban/suburban in this district had inferior academic scores than their rural peers. Many of the students living in the rural portion of the district come from a farming background and likely have a more stable home/family life that places a higher emphasis on education. There is certainly some correlation here with SES, with in-town students generally having more free lunches (68.89% of 932 town students) and rural students having more full price lunches (56.73% of 869 country students). However, it is worth noting that lunch status was a significant predictor for ACT scores; residence was not.

Establishing a tutoring center in town is one possible solution to address this discrepancy. With a higher population density in town than in the rural portion, a tutoring center would be much closer to these families and more centrally located than the physical school building. After school tutoring sessions at the school would likely receive little interest from the community, but sessions within walking distance from these in-town homes may be more attractive to students and parents, especially if transportation is not necessarily required. The

Mississinawa Valley School District established a tutoring program during school hours in the 2023-2024 school year, where students from the Junior High/High School tutor students in the district's elementary school. This program could potentially be extended to the in-town tutoring center described here.

Race was insignificant in each of the three academic models. Non-White students had slightly lower GPA and ACT Scores than White students, but with relatively larger standard errors, no conclusions were drawn from this. Non-White students, on average, scored higher on Ohio State Tests than White students, but this result was also not statistically significant. Race has been well-researched in terms of academic achievement and discipline, with studies typically showing that students from ethnic minority backgrounds do not perform as well academically. This was not the case in Mississinawa Valley. While many students who move to an unfamiliar area may feel overwhelmed and struggle academically, this district also has plenty of diverse families who may have been more motivated than some of their White peers to do well in school. Teachers in the district can take comfort knowing that their teaching methods are fair and equitable to White and non-White students alike.

Lastly, length of time spent in the district was only significant in predicting GPA. Students who spent more years in the district consistently had higher GPAs at the time of graduation than those who were newer to the district. ACT scores were higher for students spending more time in the district, but this result was not statistically significant. Length of time was negatively correlated with average

state test scores, but this result was also not statistically significant. One possible explanation for this is that younger students at the time of this study performed very well on state tests in third grade, fourth grade, etc. without having a chance to accrue as many years in the district. This is unique to the state test scores since they begin as early as third grade; GPAs are taken at the end of 12th grade, and ACT scores are taken in 11th or 12th grade.

Research Question 2: "Are a student's place of residence (urban or rural), race, SES, and time in the district (in years) significant predictors of behavioral success as measured by number of disciplinary incidents?"

In analyzing the disciplinary data, three of the four variables were significant predictors of whether or not students had at least one disciplinary incident during their time in the district. Although rural students were 1.133 times less likely to record at least one disciplinary incident (compared to town students and controlling for other predictors), this result was not statistically significant ($p = .247$). Open enrollment students were 1.370 times less likely to record at least one disciplinary incident (compared to town students and controlling for other predictors). However, this result also did not achieve statistical significance, although it was closer ($p = .066$). Urban schools are traditionally associated with more disciplinary problems (briefly discussed in Chapter 2), but the mixed urban/rural nature of the Mississinawa Valley district did not lead to a clear distinction between place of residence and disciplinary issues.

The logistic regression model indicated that more years spent in the district increased the likelihood of a student receiving at least one disciplinary incident. On one hand, this is to be expected. The longer a student stays in any district, the more chances they have to experience a lapse in judgment or make at least one behavioral mistake. On the other hand, the opposite could also be true; the longer a student stays in the same district, the more they may adapt to the culture of the school and continue to avoid discipline problems (assuming they had none initially). The results of this study suggest that the former may have been in play here slightly more than the latter.

It's also important to note that this model did not analyze the frequency of disciplinary incidents students may have had. As discussed in Chapter 4, more than half of the students in the sample had no disciplinary issues, but two percent of the students had 34 or more incidents (with one student recording 107 incidents). This highly skewed nature of the data lent itself to a more dichotomous representation with the logistic regression model. Other models may have been more appropriate for this issue and will be discussed accordingly in the limitations section.

Race emerged as a significant predictor of discipline in an unexpected way; White students were 1.429 times more likely to record at least one disciplinary incident compared to non-White students (controlling for other predictors). This is contrary to much of the established research on race and discipline, with students from ethnic minority backgrounds typically having

disproportionately more suspensions than White students. However, race was also not a significant predictor in models created for out of school suspensions and for bus suspensions. This finding is particularly encouraging to dispel the notion that ethnic minority students universally experience more disciplinary problems than White students. While the overall discipline numbers for the school may be higher than preferred, the district can at least be assured that its behavioral policies and practices do not target or show negative prejudice toward non-White students.

As described with the academic models, free/reduced lunch status was once again a strong predictor of disciplinary success or lack thereof. Students not receiving any assistance toward school lunch (or even paying a reduced price) had far fewer disciplinary problems than those receiving free lunch. This confirms the findings on discipline (particularly suspensions) found in Chapter 2; students with a lower socioeconomic status may lack the structure at home needed to prepare them to practice appropriate behavior at school. Informing teachers of the students in their classes on free lunch could be very beneficial, allowing teachers to anticipate possible issues before they arise and focus their efforts on these particular students.

Connection to Theoretical Framework

Chapter 1 discussed the idea of Cumulative Risk Theory, the theoretical framework for this study. Students are often affected physically and/or educationally by individual risk factors, such as poverty, family life, abuse, moving

between homes, etc. While each factor can individually hurt a student's well-being, these factors can compound and cause greater damage when considered together or cumulatively (Evans, 2013). This concept is maybe most prominently seen in the overlap between place of residence and lunch status in the academic models. Students living in the town and receiving free lunch recorded lower GPAs and average state test scores, with free lunch students also going on to have lower ACT scores and more disciplinary problems.

However, with the exception of SES and lunch statuses, the lack of consistency in statistical significance across the predictor variables may actually be in opposition to Cumulative Risk Theory. For example, with length of time in the district found to be a positive predictor of GPA, Cumulative Risk Theory would suggest that fewer years spent in the district may lead to more behavioral problems, but this was not the case. Students living in town reported lower GPA and average state test scores, but no significant correlation was found between residence and discipline status. Those from ethnic minority backgrounds are often considered "at risk" for lower academic performances and more pronounced behavioral issues, but neither of these came to fruition; race was not a significant predictor in any of the academic models, and non-White students were actually more likely to have zero disciplinary incidents than White students. These findings do not necessarily discredit Cumulative Risk Theory's relevance to a larger population, but in a small district like Mississinawa Valley, multiple risk factors may not necessarily imply negative effects.

Limitations / Recommendations

Several limitations should be addressed in this study. First, the heavily skewed nature of the discipline data made a multiple regression analysis inappropriate, so a logistic regression model was used by categorizing discipline status with either zero incidents or more than one incidents. This is helpful for more of a qualitative approach, categorizing students into one of two groups. A quantitative approach could have been more interesting here, predicting the specific number of disciplines for each student based on their attributes. A zero-inflated Poisson model may have been more appropriate. A zero-inflated Poisson model is a mixture model "in which the complete distribution of the outcome is represented by two separate components, a first part modelling the probability of excess zeros and a second part accounting for the nonexcess zeros and non-zero counts" (Loeys et al., 2012). Such a model may have been more helpful in separating students with only a handful of discipline incidents from those with several dozen incidents.

A few adjustments were also made in setting up the data. Due to a small number of students in non-White ethnicities collectively, only two groups were included for race (White and non-White). A more robust study would certainly feature far more categories. Next, the study's sample of 2,002 students included students from as far back as the 2008-09 school year, but most of these earlier students had information from 2007-08 and earlier that was not tracked. This meant that the length of years in the district and lunch status could have been

different. For example, students whose final year in the district was 2008-09 had their lunch status classified according to that final year. If a student had, for example, ten years of full price lunch before becoming eligible for free lunch in their final year, he/she would have been incorrectly classified as a free lunch student due to the missing information for those first ten years.

A similar issue existed in determining the number of years in the district for these students. Some students had a district admission date as far back as 1999, so their number of years in the district was calculated accordingly. Some of these students may have left the district and come back without this information being made available, thus giving them more years in the district than they may have actually had. The fact that many of the students had not yet graduated also may have affected the Years in the District variable. Finally, the data provided by the school listed students' first year in the district as their kindergarten year, but plenty of these students may have also spent a year in the district's preschool program. This extra year in the district for some students may have affected the Years in the District variable in some of the models. Due to lack of data on students' preschool enrollments, however, this factor was not included in the study.

While the results of this study may not be appropriate for districts that are predominantly urban, suburban, or rural, they may be useful for similar districts with a mix of students coming from in town and from the country. Extra consideration and attention should be given to students on free lunch and those

that live in town. An interesting extension of this study would be to duplicate this study with nearby schools that may be considered only rural or only suburban and compare the results with this sample of students from Mississinawa Valley.

This study focused on the broad categories of academic achievement and disciplinary incidents, but several interesting studies could be performed with more specific dependent variables. For example, these same analyses could be narrowed down to state test scores for one specific subject, state test scores for one specific grade, or ACT subscores for one specific component. A similar study could also focus on one specific type of discipline, such as suspensions or bus write ups. Another possible improvement to the study would be to limit the sample to graduates and remove any current students. While this would shrink the sample size, it may give more stability to the Years in the District variable. Finally, the Years in the District variable could also be replaced by the number of times a student moved or the grade level at which each student entered the district.

Conclusion

The objective of this study was to determine if place of residence, length of time in a district, race, and socioeconomic status were significant predictors of academic achievement and disciplinary issues. Existing literature suggested that frequent moves, little time spent in a district, ethnic minorities, and low socioeconomic status led to poor academic scores and frequent discipline problems. Research on districts consisting of rural and urban sections was

scarce, allowing this study to fill a gap in the literature. A sample of 2,002 students from the Mississinawa Valley School District in western Ohio from 2008 to 2023 was used to answer the two primary research questions. Academic achievement was measured by GPA at the time of graduation, students' average scores on Ohio State Tests, and composite ACT scores. Disciplinary status was categorized into two categories (no recorded incidents or at least one recorded incident). Place of residence was a significant predictor of GPA and state test scores, with rural students scoring significantly higher than in-town students. The number of years in the district was a significant predictor of GPA and disciplinary incidents, where more years led to a higher GPA and greater odds of having at least one disciplinary incident. Race was a significant predictor only for discipline, where non-White students were more likely to have no incidents than White students. Socioeconomic status, as determined by free / reduced lunch status, was a significant predictor in each of the four models, with students on free lunch performing significantly worse academically and behaviorally than those with no financial assistance.

An interpretation of the findings summarized the main takeaways of the study and offered insight as to how the results can be used. Chapter 5 discussed possible implications and ways to apply this research. These include making teachers aware of students on free lunch in their classes and offering them further attention and resources. Additional support could also be given to students living in town, possibly through creating a local tutoring center. Finally, the lack of statistical significance in Race is encouraging to the district in its

efforts to be racially inclusive and unbiased. The chapter also acknowledged limitations of the study and offered potential solutions. Finally, suggestions for future research and similar studies were given.

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Appendix A

IRB Approval from Shawnee State University granted 10/31/2023.

DocuSign Envelope ID: 601F15BC-427B-4F81-86F8-0F8FC3C58066

SSU IRB Approved BR 10/31/2023 | 11:11

Shawnee State University

Study # 2023-42

In submitting this form and the corresponding documents, I acknowledge that I have completed Human Research Participants training and that I understand and will uphold the rights of human participants. I also verify that all information contained in this form and any other corresponding documentation is correct based on my knowledge. I understand that I may not have contact with any research participants until the Shawnee State University IRB has given me their approval. I also understand that I must file an ***Amendment/Modification Form*** if my project extends beyond a year from my approval date and I must file a ***Final Study Form*** with all consent forms once the study is complete.

DocuSigned by:

Signature of Principal Investigator 1

DocuSigned by:

Signature of Co-Investigator 2

Signature of Co-Investigator 3

Signature of Co-Investigator 4

Signature of Co-Investigator 5

Signature of Co-Investigator 6

Date of Submission: 10/27/2023 | 7:34 AM EDT

Please compile attachments into one document for each category. If any forms below are not applicable, please attach reasons why.

Human Research Training Certificates:

Data Collection Questions and Forms:

Research Summary:

Consent Forms:

Assent Forms:

Advertisements:

Revisions Requested Yes No X IRB Chair Signature

Date sent for revision (if applicable): _____

Please attach revisions requested with changes clearly marked Changes marked

Final copy

Rev. 9/3/2013;1/24/22 4

BIBLIOGRAPHY

Andrew Thomas King

Candidate for the Degree of

Master of Science Mathematics

Thesis: THE EFFECT OF STUDENTS' PLACE OF RESIDENCE, LENGTH OF TIME IN A DISTRICT, RACE, AND SES ON ACADEMIC AND BEHAVIORAL SUCCESS

Major Field: Mathematics

Education: Bachelor of Arts in Mathematics Education

Completed the requirements for the Master of Science in Mathematics, Portsmouth, Ohio in July 2024.

ADVISER'S APPROVAL: Dr. Douglas Darbro