OUT-OF-SCHOOL SUSPENSIONS BY HOME NEIGHBORHOOD: A SPATIAL ANALYSIS OF STUDENT SUSPENSIONS IN THE SAN BERNARDINO CITY UNIFIED SCHOOL DISTRICT

by

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Abstract

Student out-of-school suspensions have been an ongoing problem in US schools for many years. Current methods of analysis have not yielded new insights into this problem. The purpose of this thesis is to consider student suspension incidents from a spatial perspective. Using student level data provided by SBCUSD, a large urban school district in southern California, suspension incidents were geocoded and mapped to student home neighborhoods within the district for the purpose of identifying whether or not suspensions incidents are clustered and, if so, to determine by neighborhood where the clusters are located. Spatial analysis indicated that suspension incident clustering does exist. Hotspot analysis showed variations in the suspension incident clustering pattern when disaggregating results by significant student subgroups and incident types. Neighborhoods were classified by these patterns and the results visualized in a choropleth map. As a final step in the analysis, a geographically weighted regression model predicting districtwide suspension incidents by census block group was developed. The model, based on the total number of days previously suspended and the number of students identified as having a low socioeconomic status, had an adjusted R^2 greater than 0.90. Additional research needs to be conducted to verify that the patterns noted within this thesis hold steady. If so, discipline issues within SBCUSD may in part be influenced by local neighborhood factors. This becomes an opportunity for the school district to act at a local level and identify strategies to reduce suspensions and improve student outcomes.

Chapter 1

Introduction

1.1 The Problem of Out-of-School Suspensions

Student discipline has been an ongoing problem in US schools for many years. In the past 60 years since formal records have been kept, student discipline has been a top problem continually reported by educators (Brodbelt 1978; Wu et al. 1982; Bowditch 1993; Mendez and Knoff 2003; Krezmien et al. 2006).

At first glance, the issue seems simple. Schools and school districts must establish rules for behavior to maintain an orderly education environment and to ensure the safety of all students. When a student is caught breaking the rules, the student is punished. Simple infractions may result in a phone call to a student's parents or guardians while more extreme violations of the rules can result in out-of-school suspension and, in some cases, expulsion. The focus of this thesis is on those extreme violations by students which result in an out-of-school suspension of one or more days of school.

According to the US Department of Education (Planty et al. 2009) during the period 2000 - 2006, male students were suspended at a rate more than twice that of females. African American students were suspended at a rate more than twice Hispanic students and more than three times that of White students. Table 1 details suspension rates over this time period by gender and race/ethnicity.

Table 1: US suspension rates by gender and race/ethnicity, 2000 - 2006

	2000	2002	2004	2006
Gender				
Male	9.2%	9.0%	9.2%	9.1%
Female	3.9%	4.0%	4.3%	4.5%
Race/Ethnicity				
African Am	13.3%	13.9%	15.0%	15.0%
Hispanic	6.1%	6.0%	6.5%	6.8%
White	5.1%	4.9%	4.8%	4.8%
All Students	6.6%	6.6%	6.8%	6.8%

Critics of suspension policies point to the disparity between the suspensions of African American, Hispanic, and White students and ask two significant questions: (1) are these suspension policies being fairly implemented?; and (2) are repeated suspensions from school for these students the root cause of the achievement gap between African American, Hispanic and White students? (Skiba 2000b; Drakeford 2006; Gregory et al. 2010). These questions have prompted recent investigations into suspension disparities by the Office of Civil Rights (US Department of Education 2010).

School districts are caught in the middle between requirements for implementing state and federal suspension policies and the concerns by their community stakeholders that these students are being treated unfairly. The suspension gap remains despite extensive review of suspension policies and the development of specific training and intervention procedures for addressing students at risk. Current methods used for the analysis of suspensions typically group students by school and have not yielded new insights into the problem.

The purpose of this thesis is to consider out-of-school student suspensions from a spatial perspective. Using data provided by the San Bernardino City Unified School District (SBCUSD), a large urban school district in southern California, suspension incidents will be mapped to student home neighborhoods within the district. The following set of null hypotheses will be tested:

1) Suspension incidents for all students are evenly distributed geographically over neighborhoods throughout the entire school district.
2) Suspension incidents for significant student subgroups (African American, Hispanic, White, and Low Socioeconomic Status) are evenly distributed geographically over neighborhoods throughout the entire school district.
3) Suspension incidents by significant violation type (defiance, acts of violence, drugs/alcohol related) are evenly distributed geographically over neighborhoods throughout the entire school district.

If student suspension incidents are found to be clustered, a hot-spot analysis will be used to determine where incident clustering is most intense and a model will be developed, based on well-defined local factors, in order to predict overall neighborhood suspension incidents.

The following multi-step procedure was used to test these hypotheses. First, a map of the SBCUSD area was prepared, including map layers identifying the 2010 US Census Block Groups and layers detailing SBCUSD elementary, middle, and high school boundaries. Second, a dataset for the study was prepared by combining a complete K-12

student enrollment dataset from the SBCUSD 2009-10 school year with a suspension incident summary dataset from the same school year. Third, student records from the dataset were geocoded, mapped into the district boundaries, and filtered to define an appropriate study area. Fourth, for all students and for each significant subgroup to be studied, neighborhood enrollment and suspension incident rate choropleth maps of the study area were constructed by block group. Fifth, spatial analysis techniques were applied to identify the degree and location of any neighborhood suspension incident clustering, thereby confirming or disproving the above hypotheses.

1.2 Description of Study Area

San Bernardino City Unified School District (SBCUSD) is a large California urban school district serving K-12 students in the western portion of San Bernardino County. The district is bounded by the San Bernardino Mountains to the north, the Santa Ana River along the south and lower eastern portions of the district, and the cities of Colton and Rialto on the west (Figure 1). Although the district extends all the way to the high desert, few students live north beyond the junction of the I-15 and I-215 freeways.

As of the 2009-10 school year, the district was comprised of 45 elementary schools, 10 middle schools, five comprehensive high schools, eight alternative programs serving various district populations, and four independent charter schools. With some exceptions (i.e. charter, magnet and alternative schools), SBCUSD school boundaries within the district are generally constructed so that elementary schools feed specific middle schools and middle schools feed specific high schools.

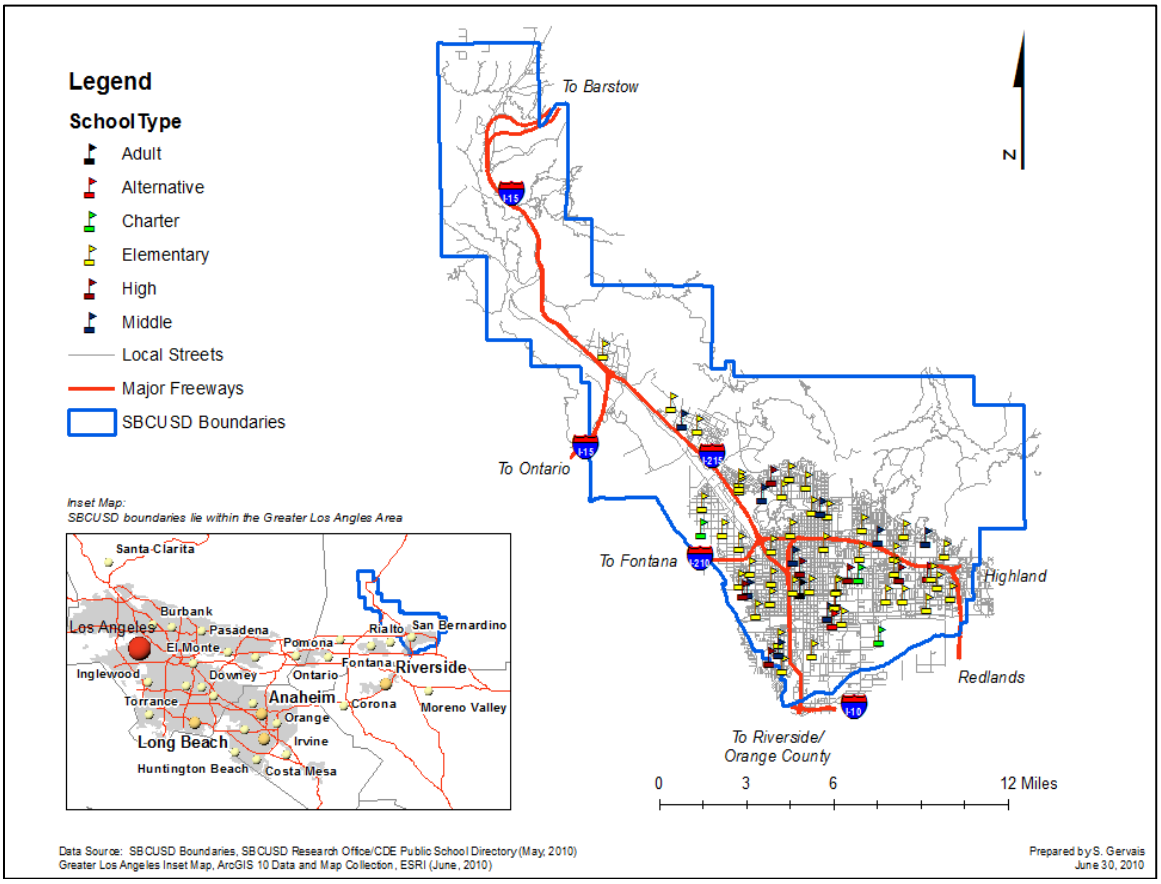


Figure 1: San Bernardino City USD, schools and boundaries

Based on annual census enrollment information from the California Department of Education (CDE), SBCUSD has regularly been among the 10 largest school districts in the state. Enrollment reached a peak of 59,105 students in the 2004-05 school year and, similar to many school districts in California, has since been in decline (Figure 2). In the 2009-10 school year, SBCUSD enrollment was 53,837 students (CDE 2011).

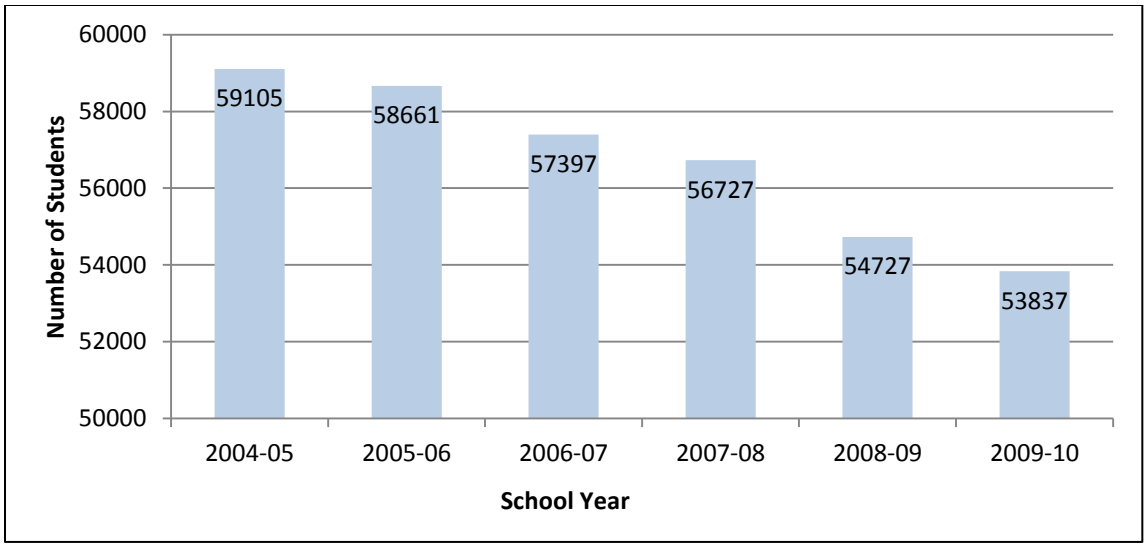


Figure 2: SBCUSD student enrollment (October census)

Over the same period, CDE records show that enrollment by race and ethnicity has significantly changed in SBCUSD (Figure 3). African American enrollment in the district decreased from 11,098 students (18.8% of the total enrollment) in 2004-05 to 8,256 students (15.3% of the total enrollment) in 2009-10. White enrollment in the

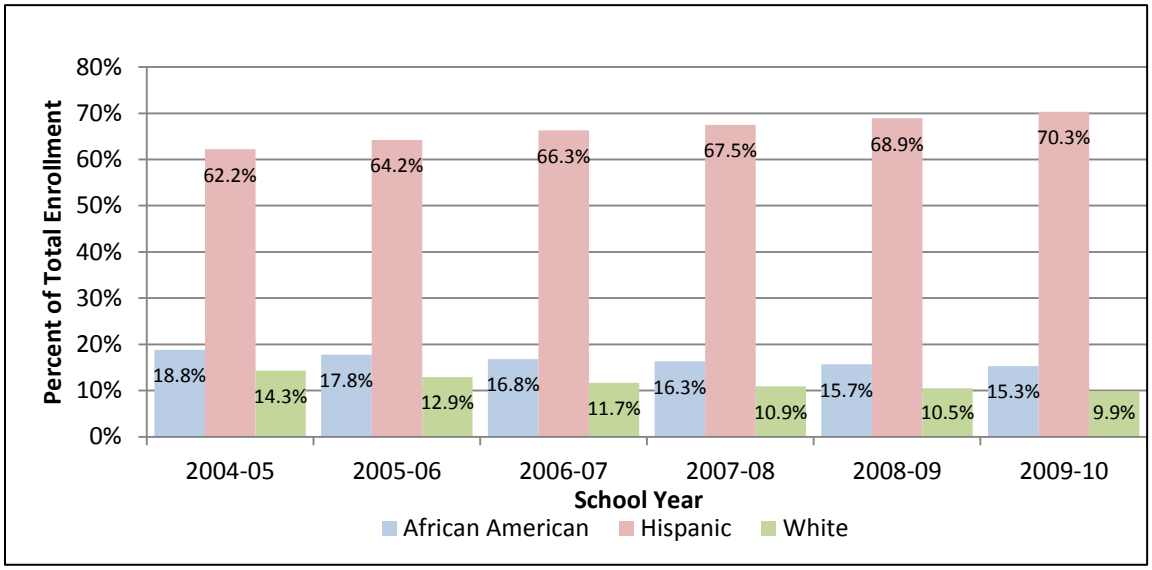


Figure 3: SBCUSD enrollment by ethnicity (October census)

district decreased from 8,425 students (14.3% of the total enrollment) in 2004-05 to 5,306 students (9.9% of the total enrollment) in 2009-10. Hispanic enrollment in the district has increased from 36,782 students (62.2% of the total enrollment) in 2004-05 to 37,858 students (70.3% of the total enrollment) in 2009-10 (CDE 2011).

Federal desegregation policies designed to address inequalities against minority enrollment have significantly shaped SBCUSD schools and programs over the past 35 years. In the early 1970s, the district enrollment was comprised of more than 60 percent White students. A decision by the California Supreme Court against the district in a lawsuit brought by the NAACP (NAACP v San Bernardino City USD, 1974) resulted in a voluntary desegregation plan that altered school boundary lines and established a number of district magnet schools, drawing students from throughout the district. The ruling also mandated the busing of students to increase the minority presence at schools throughout the district (Summers 1979). Policies and programs developed as part of the desegregation significantly changed the district and their effects are still visible today.

Student mobility in the district increases the total number of students served in any given year by a significant amount. For example, in the 2009-10 school year, the SBCUSD Research Office determined that a total of 58,523 students were served during the school year. Of these, 39,950 students (76.6%) were stable, arriving within the first two weeks of school and remaining at that school through the entire school year. The remaining 18,573 students (23.4%) were mobile, enrolling late and/or exiting early with possible transfers to other schools in the district (SBCUSD Research Office, 2010).

Many students in SBCUSD live in poverty (Table 2). The 2010 one-year American Community Survey (US Census Bureau 2011b) indicates that San Bernardino families with children under 18 years have a poverty rate more than twice the national average.

Table 2: A comparison of 2010 national, state and local poverty rates

Percentage of families in 2010 with children under 18 whose income in the past 12 Months is below the poverty level				
	United States	California	San Bernardino County	San Bernardino City
Poverty Rate	17.9%	17.6%	19.3%	36.5%

The CDE classifies a student as socio-economically disadvantaged (SED) if their parents qualify for free or reduced meals under the National School Lunch Program (NSLP) or if neither parent is a high school graduate. Based on the number of identified SED students, school districts can qualify for Title I, Part A federal funds to help meet the educational needs of low-achieving students in California's highest-poverty schools (Table 3). Virtually all schools in the district receive Title I funds, many qualifying with more than 90 percent of students identified as SED (CDE 2011).

Table 3: SBCUSD students receiving free or reduced price meals

	School Year					
	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
N	48446	46429	44857	45335	45559	46006
%	82.0%	79.1%	78.2%	79.9%	82.7%	85.4%

SBCUSD has a large number of students who are English Learners (EL) accounting for more than 30 percent of the students enrolled in the district (Table 4). While the predominant home language spoken by EL students is Spanish, the district provides

language support for more than 37 different spoken languages (CDE 2011). Those EL students who have demonstrated sufficient mastery of academic English are reclassified as fully English proficient (RFEP) students.

Table 4: SBCUSD English Learner enrollment

	School Year					
	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
N	17913	19071	19321	18955	18131	17587
%	30.3%	32.5%	33.7%	33.4%	33.1%	32.7%

Under the No Child Left Behind Act of 2001 (NCLB), the primary method for measuring the academic achievement of schools and school districts is Adequate Yearly Progress (AYP). A component of AYP includes the annual report of the percent students who have achieved proficiency in English Language Arts (ELA) and Mathematics (MATH). Under NCLB, all students are expected to be 100% proficient in ELA and MATH by the year 2014. Students within SBCUSD are showing growth on AYP although they lag behind their peers within San Bernardino County and the state (Tables 5 and 6). A review of the data also shows that significant gaps exist between the academic performances of major subgroups within the district. Tables 5 and 6 summarize the differences in student academic performance in ELA and MATH for SBCUSD and California students (CDE 2011). The various metrics show a 5-10% gap between SBCUSD and California students as a whole.

Table 5: Percent of tested students scoring proficient in ELA

	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
SBCUSD						
All Students	24.6%	26.3%	26.3%	30.0%	34.4%	37.4%
African Am	20.4%	22.0%	22.9%	26.2%	31.0%	33.9%
Hispanic	21.1%	23.1%	23.2%	26.9%	31.5%	34.9%
White	41.2%	43.5%	43.8%	48.2%	52.9%	55.5%
SED	20.3%	22.6%	22.5%	26.5%	31.4%	34.9%
EL	15.8%	18.4%	18.7%	22.6%	27.8%	30.7%
California						
All Students	41.9%	44.8%	45.5%	48.2%	52.0%	53.9%
African Am	28.9%	31.7%	32.7%	35.5%	39.7%	41.3%
Hispanic	26.9%	29.9%	31.1%	34.6%	38.9%	41.7%
White	60.8%	63.8%	64.3%	66.2%	69.9%	70.9%
SED	26.5%	29.4%	30.4%	33.8%	38.4%	41.1%
EL	21.9%	24.8%	25.8%	29.0%	33.3%	35.6%

Table 6: Percent of tested students scoring proficient in MATH

	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
SBCUSD						
All Students	28.5%	30.6%	30.4%	33.4%	40.3%	44.0%
African Am	20.0%	21.7%	23.4%	25.3%	31.9%	35.4%
Hispanic	26.8%	29.0%	28.9%	31.9%	39.4%	43.3%
White	42.0%	44.7%	42.7%	47.0%	52.4%	57.2%
SED	25.1%	27.7%	27.6%	30.8%	38.2%	42.3%
EL	24.4%	27.6%	27.2%	30.6%	38.3%	42.5%
California						
All Students	45.0%	48.0%	48.5%	51.0%	54.2%	56.3%
African Am	27.4%	30.2%	31.1%	34.0%	37.6%	39.6%
Hispanic	32.6%	35.9%	37.0%	40.0%	43.8%	46.7%
White	59.6%	62.8%	62.8%	64.8%	67.4%	69.0%
SED	32.8%	35.8%	36.7%	39.7%	43.6%	46.3%
EL	31.9%	34.9%	35.8%	38.6%	42.8%	45.6%

Despite significant efforts that are made each year to retain students within the district, a number of students drop out of SBCUSD schools (Table 7). The CDE reports dropouts in secondary schools only and calculates annual dropout rates for students in grades 9 through 12 by grade and ethnicity. The rate varies from year to year with African

American students in SBCUSD having the highest rate of dropouts while White students have the lowest. Overall, statewide dropout rates are lower than in SBCUSD although the same dropout trend exists between ethnic groups. Socioeconomic status is not considered in the reported rates and may account for the some of the overall differences between SBCUSD and the state.

Table 7: Percent of annual student dropouts, grades 9-12

	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
SBCUSD						
All Students	5.7%	8.0%	8.3%	5.9%	7.7%	7.0%
African Am	6.4%	9.8%	9.5%	6.9%	9.9%	8.6%
Hispanic	6.0%	8.1%	8.3%	5.7%	7.3%	7.1%
White	4.5%	6.2%	7.1%	5.6%	7.6%	5.1%
California						
All Students	3.0%	3.3%	5.5%	4.9%	5.7%	4.6%
African Am	5.2%	6.0%	9.8%	9.0%	10.3%	8.4%
Hispanic	3.9%	4.3%	6.7%	6.0%	7.0%	5.8%
White	1.9%	2.0%	3.5%	3.1%	3.7%	2.8%

Student discipline issues in SBCUSD are addressed through a framework of multiple intervention levels. Certain events can be addressed by teachers within a classroom or by contacting parents. More disruptive but still minor incidents can be addressed through on-campus intervention coordinated through a counselor or vice-principal. Incidents deemed serious that fall under the California Education Code (EC) sections 48900 or 48915 are addressed through out-of-school suspension. Each reported suspension incident is categorized by a primary incident type having the most serious ranking as determined by SBCUSD. Incident types include causing serious physical injury (rank 1), possession or

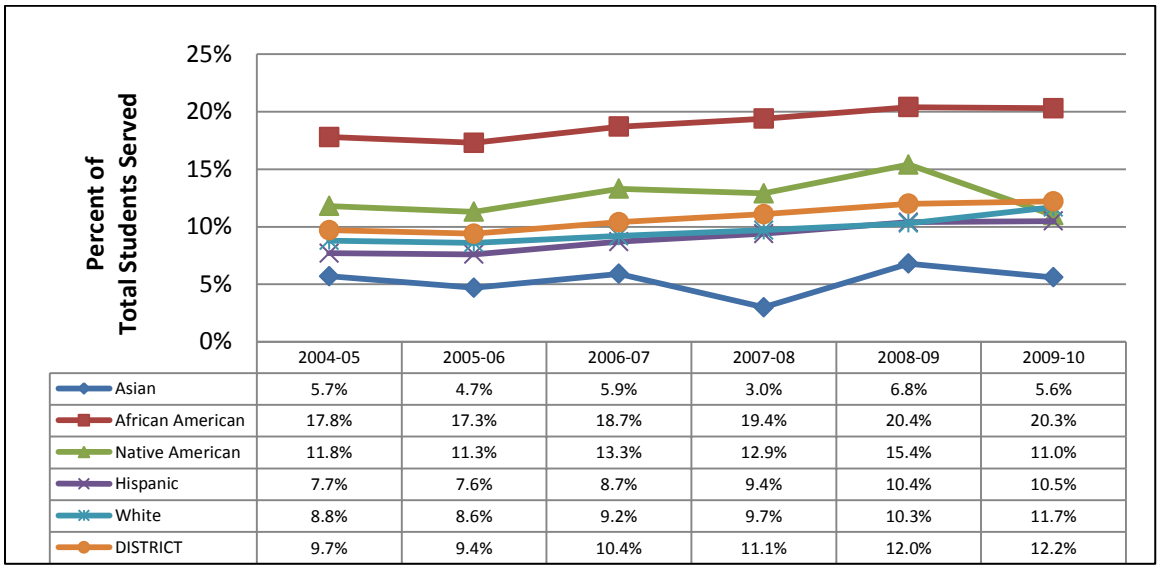
sale of a controlled substance (rank 15), verbal and physical harassment (rank 26), hazing (rank 29), and bullying (rank 34). For details, see Appendix 1 – SBCUSD Notice of Suspension and Appendix 2 – SBCUSD Suspension Incident Rank Reporting Plan.

While the education code list is comprehensive, a majority of suspension incidents are filed for defiance under EC. 48900 (k) [student] *disrupted school activities or otherwise willfully defied the valid authority of supervisors, teachers, administrators, school officials, or other school personnel engaged in the performance of their duties.* In the 2009-10 school year, EC. 48900 (k) incidents accounted for 54 percent of the 17,223 incidents reported to the CDE (Table 8). Over this same period, a total of 11 incident types accounted for more than 95 percent of all suspension incidents.

The SBCUSD Research Department is responsible for the analysis and reporting of district suspension data to the school board and superintendent's cabinet. As shown in Figure 4, the reported district rates have been slightly increasing the past six years. The reported 2009-10 SBCUSD student suspension rate (number of distinct students/total students served) of 12.2 percent, based on the suspension of 7,119 distinct students, indicates that more than 12 students per 100 total students served have been involved in a suspension incident. Hispanic students (majority subgroup) have a rate of 10.5 percent, which is slightly below the district average. Most significant is the fact that African American students have a 20.3 percent suspension rate, which is more than 1.5 times that of all students.

Table 8: SBCUSD 2009-10 suspension incident types by frequency

Primary Incident		2009-10			
		Af Am	Hisp	White	Total
Ed Code #	Description	% N	% N	% N	% N
EC 48900 (k)	Disrupted School Activities or Willfully Defied Valid Authority	51% 2573	56% 5687	52% 837	54% 9296
EC 48900 (a)(1)	Caused, Attempted, Threatened Physical Injury to Another Person	16% 830	12% 1198	12% 189	13% 2282
EC 48900 (i)	Committed Obscene Act, Engaged in Profanity or Vulgarity	10% 493	8% 841	12% 190	9% 1569
EC 48900 (c)	Possessed, Used, Sold Controlled Substance/Alcohol/Intoxicant	2% 125	5% 523	4% 64	4% 722
EC 48915 (a)(1)	Causing Serious Physical Injury to Another Person	8% 424	6% 633	8% 130	7% 1214
EC 48900.4 (r)	Intentionally Engaged in Harassment Against Pupil(s) or Staff	1% 70	1% 144	1% 20	1% 241
EC 48900 (f)	Caused or Attempted to Cause Damage to School/Private Property	1% 66	2% 246	2% 30	2% 348
EC 48900.2 (p)	Sexual Harassment	2% 79	1% 88	1% 18	1% 187
EC 48900 (a)(2)	Possession of Knife, Explosive, Other Dangerous Object	2% 120	1% 139	1% 22	2% 290
EC 48900 (g)	Stole or Attempted to Steal School/Private Property	2% 91	1% 121	1% 22	1% 239
EC 48900 (b)	Possessed, Sold, Furnished Firearm, Knife, Other Dangerous Object	1% 43	2% 161	2% 27	1% 235
All Other	- - - - -	3% 164	3% 344	5% 75	3% 600
Totals		**5078**	**10125**	**1624**	**17223**



	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
Asian	5.7%	4.7%	5.9%	3.0%	6.8%	5.6%
African American	17.8%	17.3%	18.7%	19.4%	20.4%	20.3%
Native American	11.8%	11.3%	13.3%	12.9%	15.4%	11.0%
Hispanic	7.7%	7.6%	8.7%	9.4%	10.4%	10.5%
White	8.8%	8.6%	9.2%	9.7%	10.3%	11.7%
DISTRICT	9.7%	9.4%	10.4%	11.1%	12.0%	12.2%

Figure 4: SBCUSD student suspension rate history
(number of distinct students/total students served)

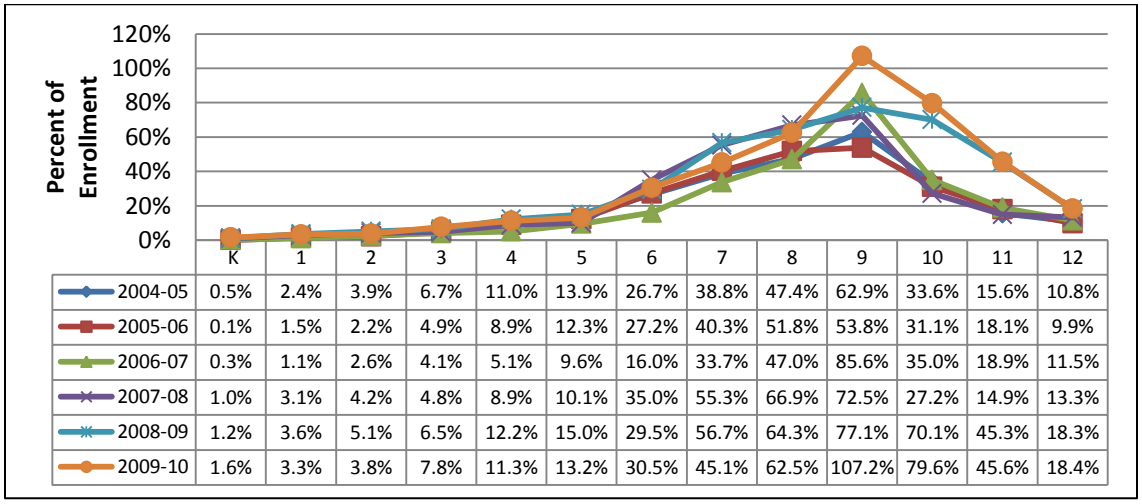
As previously noted in Table 8, the actual number of suspension incidents reported is more than double the number of students reported who have been suspended. Corresponding incident suspension rates (number of incidents/total students served) are significantly higher and demonstrate that many individual students are being suspended multiple times. In the 2009-10 school year, the overall incident suspension rate was 29.8 percent. The incident rate for Hispanics was 25.5 percent; African Americans had an incident rate of 52.0 percent. Disaggregating the data by grade level, elementary school students had an overall incident rate of 6.6 percent, with Hispanics having had an incident rate of 4.8 percent and African American students an incident rate of 15.1 percent (Table 9). In middle school, the overall incident rate for students was 49.6 percent, with Hispanics students having had an incident rate of 42.0 percent and African American students an incident rate of 87.3 percent. In high school, the overall student incident rate

was 58.9 percent, with Hispanic students having a rate of 53.6 percent and African American students an incident rate of 91.9 percent.

Table 9: SBCUSD 2009-10 suspension incident rates by level and ethnicity

	Ethnicity Group			
Student Level	All Students	African American	Hispanic	White
Elementary School	6.6%	15.1%	4.8%	7.3%
Middle School	49.6%	87.3%	42.0%	44.8%
High School	58.9%	91.9%	53.6%	49.2%
All Schools	29.8%	52.0%	25.5%	27.8%

One significant finding of the suspension analysis by SBCUSD has been that student suspensions in the period between the sixth and ninth grades account for more than half of the total suspension incidents in any given school year. Figure 5 summarizes suspension incidents by grade. In 2009-10, for example, the reported grade 8 incident suspension rate of 62.5 percent indicates that the total number of grade 8 incident suspensions is equal to 62.5 percent of the October CBEDS census enrollment, approximately 2,673 incidents.



	K	1	2	3	4	5	6	7	8	9	10	11	12
2004-05	0.5%	2.4%	3.9%	6.7%	11.0%	13.9%	26.7%	38.8%	47.4%	62.9%	33.6%	15.6%	10.8%
2005-06	0.1%	1.5%	2.2%	4.9%	8.9%	12.3%	27.2%	40.3%	51.8%	53.8%	31.1%	18.1%	9.9%
2006-07	0.3%	1.1%	2.6%	4.1%	5.1%	9.6%	16.0%	33.7%	47.0%	85.6%	35.0%	18.9%	11.5%
2007-08	1.0%	3.1%	4.2%	4.8%	8.9%	10.1%	35.0%	55.3%	66.9%	72.5%	27.2%	14.9%	13.3%
2008-09	1.2%	3.6%	5.1%	6.5%	12.2%	15.0%	29.5%	56.7%	64.3%	77.1%	70.1%	45.3%	18.3%
2009-10	1.6%	3.3%	3.8%	7.8%	11.3%	13.2%	30.5%	45.1%	62.5%	107.2%	79.6%	45.6%	18.4%

Figure 5: SBCUSD incident rates by CBEDS grade
(number of suspension incidents/reported CBEDS enrollment by grade)

The rate of suspension incidents is observed to peak at grade 9 (Figure 5). An extreme peak is reported in 2009-10 for grade 9 with an incident suspension rate of 107.2 percent. This indicates that the total number of grade 9 suspension incidents (4,191 incidents) is greater than the reported CBEDS enrollment at grade 9 (3,911 students) by slightly more than seven percent.

Research within SBCUSD has focused on a number of factors to help explain the increase in suspension incidents between grades 6 and 9. In grade 6, students are transitioning from elementary school to middle school. In grade 9, the students have to transition again to high school. District performance indicators such as standardized test scores, course grades, attendance and dropouts as well as discipline records indicate that many of these suspended students are struggling. The suspension gap between significant groups of SBCUSD students by ethnicity has yet to be adequately explained by these factors alone.

1.3 Organization of Thesis

The remainder of the thesis is divided into four chapters. Chapter 2 provides relevant background information. Chapter 3 reviews the methods and data sources used in the hot spot analysis and regression analysis while chapter 4 presents the results of the analysis. Chapter 5 summarizes the major findings, considers how the results might be used to shape district administrative policy for reducing the number of out-of-school suspensions, and offers several conclusions about the results and methodology used in this research.

Chapter 2

Literature Review

2.1 Suspensions: Definition and Policies

A *suspension*, in the context of this study, specifically refers to those out-of-school suspensions during which a student is excluded from school for disciplinary reasons for one or more school days (Planty et al. 2009). In the case of extreme behavior, suspension incidents may result in student expulsions.

While maintaining student discipline has been a long-time problem in schools, it was not until the mid-1970s that school discipline policies began to receive significant national focus. In *The Epidemic of School Violence*, Brodbelt (1978) reviews the problems of student discipline and school violence and the challenges faced by large urban districts. Troubled schools were reported as having chronic student discipline problems. Important factors identified as influencing the problems included middle and high school aged students from inner-city schools with low socioeconomic status.

Modern suspension policies can be traced back to the United States Supreme Court case of Goss v. Lopez (419 USC 565 1975), a class action law suit that was brought against Ohio school officials for suspending students without a hearing. The court held that the students were denied due process of the law in violation of the 14th Amendment. Suspensions of 10 or more days were deemed to require due process procedures. Suspension of less than 10 days were permissible and required that the student be given

oral or written notice of the charges against them. Formal notice and an expulsion hearing should precede the removal of a student from school.

With the decision of the court in Goss v. Lopez, each state's education code and local school district policies began to be revised, codifying the rules under which students were to be suspended. Typical issues addressed include the prohibition of the use of alcohol and drugs, violence against students and school staff, and student behavior such as bullying or hazing.

Analysis of data from a national safe school study by Wu et al. (1982) considered student misbehavior as well as teacher judgments and attitudes, administrative structures, effects of perceived academic potential and racial bias. Their conclusion was that "suspension rates cannot be regarded as a simple reflection of student misbehavior in school, but rather as the result of a complex of factors grounded in the ways schools operate." Research by Bowditch (1993) supports the notion that how a school operates can influence the suspension rate and details how disciplinarians are reported to use suspensions "to get rid of troublemakers."

On a national level, public concerns over safety in schools have also shaped school policy. A series of school shootings lead to the Gun Free Schools Act (GFSA) of 1994, 20 USC 8921, which requires that all school districts receiving federal education funding have mandatory one-year expulsion policies in place for students caught bringing a firearm to school (Feinstein 2010). In response to federal policy, California and many other states implemented what are now known as *Zero Tolerance* suspension policies,

where any student incident involving weapons or potential weapons would be punished with an expulsion and a referral to law enforcement (CDE 2009).

While the goal of Zero Tolerance policies is to ensure that the school environment remains safe for students, these policies have become quite controversial in application at the district and school level. There are many documented cases where the policy is misused and minor infractions are given harsh punishments (Skiba et al. 1999; Skiba 2000a; Martin 2001; Martinez 2009). The American Academy of Pediatrics (AAP) policy statement on suspensions and expulsions expresses concern that such incidents "may exacerbate academic deterioration, and when students are provided with no immediate educational alternative, student alienation, delinquency, crime and substance abuse may ensue" (Taras 2003).

2.2 Who Gets Suspended?

Researchers have identified two important trends over time in the statistics reported by the US Department of Education National Center for Educational Statistics (NCES) in terms of who gets suspended from school: (1) males are more likely to be suspended than females; and (2) minority students, especially African Americans, are more likely to be suspended than White students (Planty et al. 2009). These official statistics confirm the results of numerous suspension studies that investigated who was being suspended in US schools. Many of these studies also indicate that a significant correlation exists between the rate of student suspensions to grade level and poverty status. Representative studies that discuss these trends include the following:

Tobin et al. (1999) found that frequency of grade 6 suspensions was useful as a screening device for predicting the frequency of suspensions in grade 9. Referrals for violence in grade 6 indicated that students were likely to receive referrals for similar infractions in the future. Boys referred for fighting more than twice and girls for harassment once in grade 6 were unlikely to be on track for graduation in high school. Three suspensions in grade 9 predicted school failure.

Mendez et al. (2003) studied how suspensions differed by race and gender in a large Florida school district. Their findings showed that over-representation of African American students for suspensions begins in elementary schools. Suspension rates for all students in all demographic groups increased through elementary and middle school and dropped off in high school. African Americans, both males and females, had significantly higher student incident rates (males: 57 incidents per 100 students; females: 27 incidents per 100 students) than White students (males: 23 incidents per 100 students; females: 8 incidents per 100 students). Disobedience accounted for 20 percent of all incidents.

Arcia (2007) studied some of the student, school and community factors that may explain the variability in suspension rates within the African American community at the secondary level. Included in the study were factors measuring academic achievement, non-African American suspension rates, African American enrollment rates, poverty measures (free and reduced lunch participation), teacher experience, and teacher race and gender. Suspensions of African American students were found to significantly correlate to

achievement (negatively), years of teacher experience (negatively), an African American teaching staff (positively) and free and reduced lunch participation (positively) .

Jordan et al. (2009) tested the hypothesis that the odds of a student being referred for disciplinary action in the middle school setting (8th grade) increases if the student is male, black, in special education classes, or is poor. They concluded that, with the exception of students assigned to special education classes, low income students are up to eight times more likely to be sent for disciplinary referrals than others.

Gregory et al. (2010) in a synthesis of research from over 30 years consider how the disproportionate suspension of minority students might contribute to the gap in achievement among racial and ethnic students. In particular, they note that educational research has shown that a strong link exists for students between time engaged in learning and achievement. Students with frequent suspensions appear to be at significant risk for academic underperformance. In addition to race and ethnicity, other factors that appear related to suspensions include socioeconomic status and neighborhood characteristics for crime and violence.

2.3 Neighborhoods and Suspensions

Few scholars and practitioners have explored the link between neighborhoods and suspensions. One immediate challenge involves the delineation of neighborhoods. Two examples demonstrate the challenges:

Guest and Lee (1984) explore the ways that residents of the Seattle metropolitan region define "neighborhood" in the abstract and their own neighborhoods in particular.

On the whole, the neighborhood is regarded as a relatively limited unit, both in terms of areal size and functional relevance. Individuals surveyed in the study were found to define neighborhood in terms of social or spatial factors with variation according to patterns of local activity, social-demographic characteristics, and the physical environment. They also differed in their views on its geographic size and institutional development. While only a small proportion of the variation in responses is explained, the results suggest that "neighborhood definitions are rational responses to the social and physical position of the respondent within urban society".

Tatalovich et al. (2006) examined three methods to define contextual units (neighborhoods) for a sample of children enrolled in a respiratory health study. The estimates of contextual variables were found to vary significantly depending on the method used for choosing neighborhood boundaries and weights. Their conclusion was that the choice of boundaries therefore shapes the community profile and the relationships between its variables.

A second challenge is discerning the relationship between neighborhoods and suspensions from the available literature. Suspensions themselves are generally not mentioned by the researchers. Much of the relevant research, though informative, focuses on outcomes that might be classified as a "suspendable" event or stem from the same root causes, such as juvenile delinquency, the use of alcohol or tobacco by minors, or school dropouts. Participants in these studies are often characterized simply as "youth" rather than as students and may in fact be considerably older than high school students.

Peeples and Loeber (1994), for example, used census data to classify neighborhoods as underclass or not underclass. When African American and White youth were compared without regard to neighborhood, the African Americans were more frequently and more seriously delinquent than White youth. In those neighborhoods that were not underclass, African Americans were found to be no more delinquent than White youth. Overall, ethnicity, single-parent status, and welfare use were not found to be related to delinquent behavior.

Ennett et al. (1997) measured neighborhood and school characteristics using student, parent, and archival data. Their findings show substantial variation across schools in substance use. Lifetime alcohol and cigarette use rates were found higher in schools located in neighborhoods having greater social advantages as indicated by the perceptions of residents and archival data.

Leventhal and Brooks-Gun (2000) performed a comprehensive review of neighborhood residence and the effects on childhood and adolescent well-being. They found important connections between high socioeconomic status and achievement on the one hand and low socioeconomic status and residential instability and behavioral/emotional outcomes on the other hand.

Crowder and South (2003), in their research, focused on whom and under what conditions do neighborhood characteristics matter most. For African Americans, they showed that increased socioeconomic distress has resulted in an increase in high school dropouts, particularly for students in single-parent households. In highly disadvantaged

neighborhoods, the risk of dropping out was twice as high for males as for females. For both African Americans and Whites, their results indicate that the impact of neighborhood distress on school dropout is stronger for recent in-movers than for long-term residents.

2.4 Social Disorder Theory

If there is a spatial link that explains the relationship between neighborhoods and student suspensions, it might be found in Social Disorganization Theory (SDT) research. From a spatial perspective, SDT is one of the most influential explanations for neighborhood differences in crime and delinquency. The theory focuses on the effects of "kinds of places"— specifically, different types of neighborhoods—in creating conditions favorable or unfavorable to crime and delinquency (Kubrin and Weitzer 2003).

With a specific focus on schools, Laub and Lauritsen (1998) have reviewed more than 60 years of SDT research. They cite three key factors to understanding neighborhood crime: (1) low socioeconomic status; (2) high population turnover; and (3) racial and ethnic heterogeneity. These factors impact on the ability of a community to organize and achieve common goals. Neighborhoods with high levels of these factors are considered socially disorganized. They are characterized by physical deterioration, large numbers of rental properties, low levels of home ownership, residents in the low SES group, high turnover rates, and high percentages of immigrants and ethnic minorities. Social disorganization leads to lack of connections among neighbors, which in turn discourages those "guardianship" behaviors important to maintaining a sense of community.

Ultimately, neighborhoods send their children to neighborhood schools and this lack of connection potentially shapes the school environment.

Williams et al. (2002) investigated the academic outcomes of youth in an urban setting. They collected data on living arrangements, relatives and friends' religiosity, exposure to academic success, and neighborhood perceptions in order to assess their impact on intention of youth in the study to complete school, grade point average (GPA), and number of suspensions. Their findings indicated that gender, church attendance by peers, and percentage of relatives completing high school were significant in predicting positive academic outcomes. Perception of neighborhood deterioration was inversely related to intention for school completion and GPA. School suspensions were positively related to perception of neighborhood deterioration.

Cantillon et al. (2003) reviews and extends SDT with a focus on the concept of Sense of Community (SOC). SOC can be defined by four distinct aspects: membership, influence, sharing of values with an integration and fulfillment of needs, and a shared emotional connection. As it relates to schools, their work showed that students who came from neighborhoods with a high SOC were more likely to participate in school activities than students from neighborhoods with low SOC. Participation in activities was strongly correlated to high GPA and academic success.

Chapter 3

Methods and Data Sources

This chapter describes the methods and data sources used to perform the spatial analysis on the study area and identify the location of suspension incident hotspots.

The following multi-step procedure was used to test the previously stated hypotheses. First, a map of the SBCUSD area was prepared, including map layers identifying the 2010 US Census Block Groups and layers detailing SBCUSD elementary, middle, and high school boundaries. Second, a dataset for the study was prepared by combining a complete K-12 student enrollment dataset from the SBCUSD 2009-10 school year with a suspension incident summary dataset from the same school year. Third, student records from the dataset were geocoded, mapped into the district boundaries, and filtered to define an appropriate study area. Fourth, for all students and for each significant subgroup to be studied, neighborhood enrollment and suspension incident rate choropleth maps of the study area were constructed by block group. Fifth, spatial analysis techniques were applied to identify the degree and location of any neighborhood suspension incident clustering, thereby confirming or disproving the hypotheses. Sixth, regression modeling techniques were used in order to predict overall neighborhood suspension incidents.

3.1 Preparation of SBCUSD Map

A map of the SBCUSD area was prepared for this project by combining data from several sources. First, a set of feature classes with SBCUSD boundaries for district elementary, middle and high schools was obtained from the SBCUSD Facilities Office (2009). Second, a TIGER/Line shapefile with the 2010 Census Block Groups for San Bernardino County was downloaded from the US Census Bureau (2010). Using ArcGIS (Esri 2011a), these features were projected using the California V FIPS 0405 State Plane Coordinate System based on the NAD 1983 datum with readjustment using the National Spatial Reference System (NSRS) of 2007 (Esri 2011b).

SBCUSD itself does not have any formally defined neighborhoods. Several choices for a neighborhood proxy were considered based on geographic size, human interactions and institutional development. In terms of size, census block groups are the smallest reported division in the US Census Bureau's American Community Survey with between 600 and 3,000 residents. With the exception of the sparsely inhabited northern zone, census block groups in SBCUSD are generally less than half a square mile in area. In terms of human interaction, elementary school boundaries are the smallest district-level administrative area to which a student in SBCUSD can be assigned. They are generally recognized throughout the district by name and location.

For the purpose of this thesis, a neighborhood was defined as a collection of census block groups (in whole or part) organized by elementary school boundaries. Analysis was performed at the block group level. Summary and reporting was made at the elementary

school boundary level. In Figure 6 below, for example, the Lincoln Elementary School Neighborhood includes parts of six block groups contained within the Lincoln Elementary School boundaries.

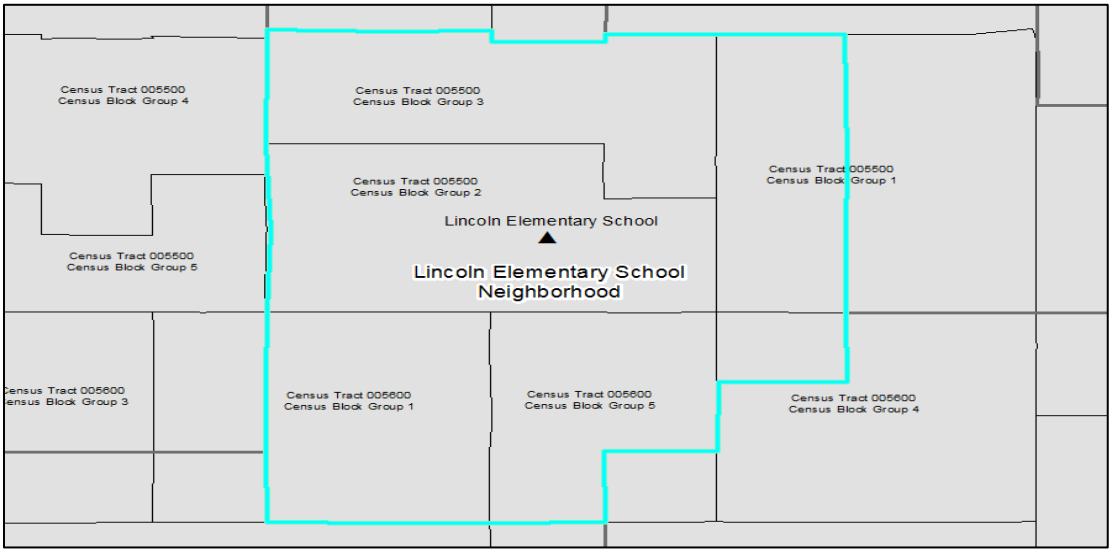


Figure 6: Lincoln Elementary School neighborhood boundaries

3.2 Preparation of the SBCUSD Student Dataset

A dataset for the study cohort with 58,523 student records was prepared by combining a complete K-12 student enrollment dataset from the SBCUSD 2009-10 school year with a suspension incident summary dataset from the same school year. Data was exported from the SBCUSD Research Office SQL Server 2005 database as a text file and imported into an ArcGIS file geodatabase. Records were joined by student ID so that all enrollment records were matched to suspension incident summaries.

Table 10 details the record layout of the student enrollment dataset and, for each student served in the 2009-10 school year, includes fields indicating final enrollment status and school of enrollment, student ID, grade level, expected and projected graduating

class (high school only), demographics, socioeconomic status, English learner status and language proficiency level, and residence address. On export from the student database, binary counting fields were added to simplify the later summarizing of enrollment.

Table 10: SBCUSD 2009-10 enrollment record layout

Field Name	Data Type	Field Description	Notes
All Students			
unique_id	Integer	unique record id	
stu_status_code	Text	Final Enrollment Status Code	Indicates final enrollment status:
stu_status_description	Text	Final Enrollment Status Description	<<BLANK>> = Enrolled; Drop; Transfer
sch_type	Text	School Type	Elementary, Middle, High
sch_name	Text	School Name	
sch_id	Integer	School ID	
stu_trk	Text	School Track	
stu_id	Integer	Student Local ID	
stu_grade	Text	Student Grade	K - 12
stu_class_of	Text	Student Class Of	ie. 2010
stu_grad_year	Text	Student Expected Grad Year	ie. 2011
stu_sex	Text	Student Gender	M= Male; F = Female
stu_dob	Text	Student Date of Birth	yyyymmdd
stu_ethnicity_code	Integer	Student Primary Ethnicity Code	State codes indicating primary Race and Ethnicity
stu_ethnicity_group_code	Integer	Student Primary Ethnicity Group Code	Ex. 500 = Hispanic, 600 = African American, 700 = White
stu_lowses_status	Text	Student Socioeconomic Disadvantaged	Reported as Yes/No
stu_lep_status	Text	Student English Learner Type	State codes indicating English Learner Type
stu_lang_proficiency_level	Text	Student English Language Fluency	State codes indicating English Language Fluency
stu_residence_address	Text	Student Residence Address	For Geocoding Purposes
stu_residence_city	Text		
stu_residence_state	Text		
stu_residence_zip_code	Text		
stu_residence_zip_plus4	Text		
CNT	Integer	Enrolled 2009-10	1 = Yes; 0 = No
CNT_B	Integer	African American Enrolled 2009-10	1 = Yes; 0 = No
CNT_H	Integer	Hispanic Enrolled 2009-10	1 = Yes; 0 = No
CNT_W	Integer	White Enrolled 2009-10	1 = Yes; 0 = No
CNT_LowSES	Integer	SED Enrolled 2009-10	1 = Yes; 0 = No
CBEDS Enrolled Students Only			
CBEDS_Enrolled	Integer	Enrolled on CBEDS Day, Oct 2009	1 = Yes; 0 = No
CBEDS_GPA	Decimal	Overall GPA as of CBEDS Day	
CBEDS_ABS	Integer	Number of Days Absent for 2009-10 on CBEDS Day	
CBEDS_sch_elm	Integer	Enrolled in Elementary School on CBEDS Day	1 = Yes; 0 = No
CBEDS_sch_ms	Integer	Enrolled in Middle School on CBEDS Day	1 = Yes; 0 = No
CBEDS_sch_hs	Integer	Enrolled in High School on CBEDS Day	1 = Yes; 0 = No
sx_male	Integer	Student is Male	1 = Yes; 0 = No
stable_0809	Integer	Student was stable in 2008-09	1 = Yes; 0 = No
atrisk_gpa	Integer	Is CBEDS_GPA < 2.0*	1 = Yes; 0 = No *Select Grades Only
atrisk_abs	Integer	Is CBEDS_ABS > 4	1 = Yes; 0 = No
atrisk_mob	Integer	Was student Mobile in 2008-09	1 = Yes; 0 = No
atrisk_1_susp0809	Integer	Was student suspended in 2008-09	1 = Yes; 0 = No
atrisk_n_susp0809	Integer	Number of suspension incidents in 2008-09	
atrisk_days_susp0809	Integer	Number of Days Suspended in 2008-09	

For those students who were also present on the October CBEDS Census Day, the layout included additional fields indicating cumulative grade point average (GPA),

number of days absent from school as of CBEDS Day, a student stability indicator for the previous 2008-09 school year, a summary of suspensions from 2008-09, and additional counting fields for summarizing the CBEDS indicators.

Table 11 details the record layout of the student suspension incident summary and, for each suspended student in the 2009-10 school year, includes fields indicating student ID and incident(s) school year, a count of the total number of suspension incidents, a count of the total number of days suspended, the number of incidents involving drugs and alcohol, the number of incidents involving violent physical assaults, the number of expulsions from district schools, and the number of incidents of certain frequently occurring incident types.

Table 11: SBCUSD 2009-10 suspension incident summary record layout

Field Name	Data Type	Field Description	Notes
2009-10 Suspended Students Only			
stu_id	integer	Student Local ID	
schyear	Text	School year	All Records Marked 2009-10
2009-10 Suspension Incident Summary			
N_incidents	integer	Number of Suspension Incidents	Total Number of Incidents
N_days_suspended	integer	Number of Days Suspended	Total Number of Days Suspended
N_drug_alcohol_incidents	integer	Number of Incidents Marked Drugs/Alcohol	Includes Incidents marked EC 48915 (a3)/(c3) and Incidents marked EC 48900 (c)/(d)/(j)
N_violent_incidents	integer	Number of Incidents Marked as Violent	Includes Incidents marked EC 48915 (a1)/(c4)/(a5) and Incidents marked EC 48900 (a2)/(q)
N_expulsions	integer	Number of Incidents Indicating Expulsions	Incidents indicating Full or Stipulated Expulsion
2009-10 Frequency of Select Incidents			
rsn_k	integer	Number of EC 48900 (k) Incidents	Defiance
rsn_a	integer	Number of EC 48900 (a) Incidents	Attempt to Cause Physical Injury to Another
rsn_i	integer	Number of EC 48900 (i) Incidents	Obscene Act, Profanity or Vulgarity
pds_a1	integer	Number of EC 48915 (a1) Incidents	Causing Serious Physical Injury to Another
rsn_c	integer	Number of EC 48900 (c) Incidents	Possessed, Used, Sold Controlled Substance/Alcohol
rsn_f	integer	Number of EC 48900 (f) Incidents	Attempt or Causing Damage to School/Private Property
rsn_a2	integer	Number of EC 48900 (a2) Incidents	Possession of Knife, Explosive or Other Dangerous Object
rsn_p	integer	Number of EC 48900 (p) Incidents	Sexual Harrassment
rsn_b	integer	Number of EC 48900 (b) Incidents	Possessed, Sold, Furnished Firearm, Knife, or Other Dangerous Object
rsn_r	integer	Number of EC 48900 (r) Incidents	Intentionally Engaged in Harrassment Against Pupil(s) or Staff
rsn_h	integer	Number of EC 48900 (h) Incidents	Possessed or Used Tobacco or Tobacco Products
pds_a2	integer	Number of EC 48915 (a2) Incidents	Possession of Knife, Explosive or Other Dangerous Object of No Reasonable Use to the Student
rsn_g	integer	Number of EC 48900 (g) Incidents	Stole/Attempted to Steal School/Private Property
rsn_j	integer	Number of EC 48900 (j) Incidents	Possessed, Offered, Arranged or Negotiated to Sell Drug Paraphernalia

3.3 Geocoding the Dataset and Defining an Appropriate Study Area

The student data prepared in Section 3.2 included primary residence address. The data were geocoded using the geocoding tools available in ArcGIS and added as a point feature class into the map prepared in Section 3.1.

Previous analysis by the SBCUSD Research Office indicated that a small number of students, less than 0.5 percent of the total enrollment served, lived outside the regular district boundaries or in the sparsely populated northern margins of the district. In order to avoid skewing the proposed analysis, these students were identified and excluded from the study cohort. The final 58,246 student records remaining in the dataset represent slightly more than 99.5 percent of the total student enrollment served in the 2009-10 school year. Of the 7,119 unique students who were suspended in SBCUSD over the same period, the study cohort was found to include 7,043 of the students, more than 98.9 percent of those students suspended.

Once the final student cohort was identified, a study area for the analysis was defined that bounded the point feature class of the filtered student cohort. Student residences were observed to run from the northwest to the southeast and were roughly bounded by a triangle formed by the San Bernardino Mountains to the north, the Santa Ana River to the southeast, and Interstate 215 along the west. An ArcGIS extension, X-Tools Pro (DataEast 2011), was used to generate a convex hull, a minimal bounding polygon, containing all the points of the feature set (Buckley 2008). As a final step, in order to reduce the risk of edge effects in the planned analysis, a 3,000 foot buffer was

applied to the convex hull. Elementary school boundaries and census block group feature class layers were clipped to the study area. The final study area showing school locations and clipped census block groups is shown in Figure 7.

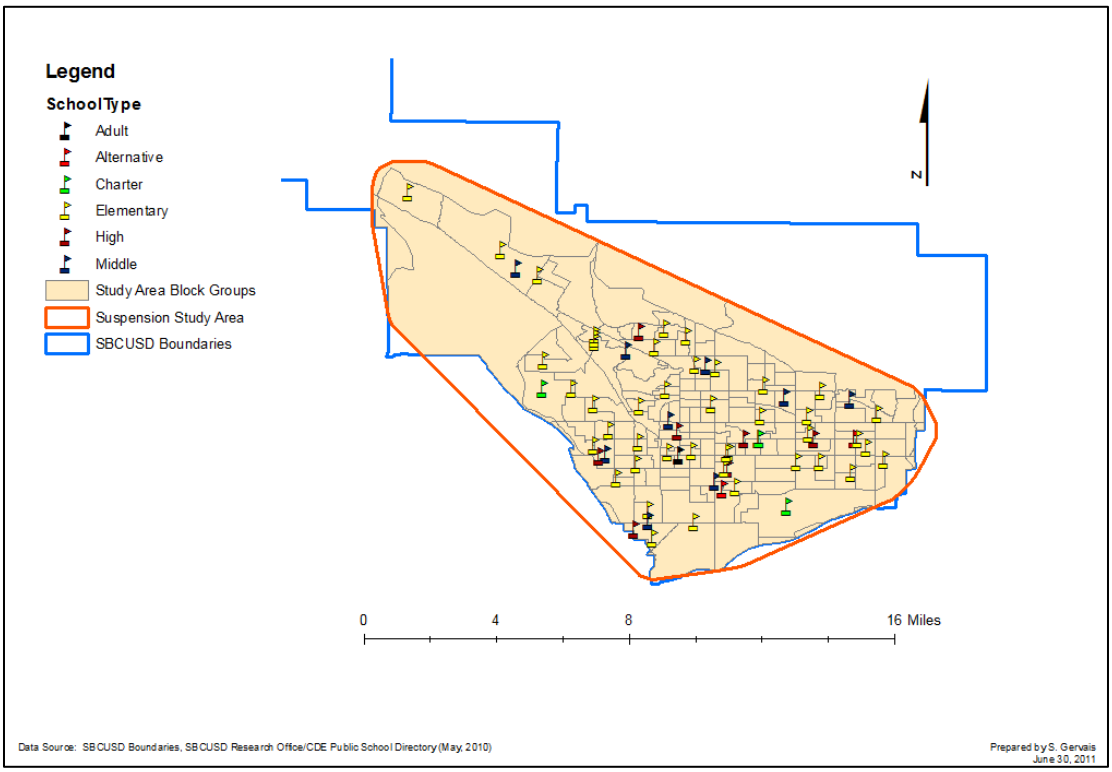


Figure 7: SBCUSD suspension study area

3.4 Visualizing SBCUSD Enrollment and Suspension Incident Rates

SBCUSD enrollment and suspension incidents were summarized by census block group and by elementary school neighborhood. In order to identify any resultant patterns, the data was visualized using choropleth maps.

First, a spatial join was performed matching the attributes of the geocoded student cohort prepared in Section 3.3 to the clipped census block groups. For each block group, the spatial join summarized the integer fields detailed in Tables 10 and 11, including total enrollment served, number of suspension incidents, and number of suspensions by incident type.

In a similar manner, using select subgroups of the geocoded student cohort, spatial joins were performed summarizing enrollment and suspensions by significant SBCUSD ethnicities (African American, Hispanic, White) and socioeconomic disadvantaged status.

The resultant polygon feature classes were used to prepare choropleth maps visualizing enrollment numbers and suspension incident rates for all students, significant ethnic subgroups of students, socioeconomically disadvantaged students and those students with primary suspension incidents indicating defiance, drug and alcohol use, and violent acts. For the purpose of this thesis, suspension incident rates were defined as the number of suspension incidents in a given block group divided by the total number of students served within the block group. The final prepared maps used seven classes to visualize enrollment and incidents, with the classification scheme determined for each map using a Jenks Natural Breaks methodology.

The same basic procedure was repeated in order to match students to elementary school neighborhoods and prepare neighborhood summary tables of enrollment and suspension incidents. This step was taken as a cross-check to ensure that enrollment and suspension incident counts totals closely matched the expected totals for the district.

3.5 Spatial Analysis of the SBCUSD Suspension Incidents

Spatial analysis techniques were applied to the polygon feature classes prepared in Section 3.4 in order to identify the degree and location of any neighborhood suspension incident clustering, thereby confirming or disproving the thesis hypotheses.

3.5.1 Measuring Spatial Autocorrelation using Moran's Global I

As an initial test to disprove the hypotheses, Moran's Global I was used to determine the degree of spatial autocorrelation of suspension incidents within the study area census block group features for all students and subgroups. Moran's Global I is a ratio that compares the difference in values of neighboring features to the difference in values between all features in the study area. In the numerator, for each pair of neighboring features, the mean value for all features in the study area is subtracted from the value of each feature and its neighbor and the product of these differences is calculated and multiplied by the weight for that pair and then summed. In the denominator, the variance from the mean value for all pairs is calculated and multiplied by the sum of all weights. The complete formula for determining the statistic is shown in Equation (1) below (Mitchell 2009):

$$I = \frac{n \sum_i \sum_j w_{ij}(x_i - \bar{x})(x_j - \bar{x})}{\sum_i \sum_j w_{ij} \sum_i (x_i - \bar{x})^2} \qquad (1)$$

where I measures the spatial autocorrelation of *x* in each *i* and *j* neighboring features with spatial weight *w* in the study area having a total of *n* features.

In a random distribution, Moran's Global I will be close to 0 because there will be nearly the same number of positive products summed with negative products in the numerator. In a clustered distribution, where neighboring features are more similar, Moran's Global I will be greater than 0 because the overall sum of products in the numerator will be positive. In a dispersed distribution, where neighboring features are dissimilar, Moran's Global I will be less than 0 because the sum of products in the numerator will be negative. As implemented within ArcGIS, along with the Moran's Global I statistic, the statistic is compared to its expected value and a normally distributed Z-score is produced to indicate the likelihood that the clustering pattern is due to chance.

A key component to the planned hot-spot analysis was determining the neighborhood distance band where influence of incidents upon clustering is most pronounced. To do this, an incremental spatial autocorrelation analysis of the study area suspension incidents by census block groups was made where Moran's Global I was calculated for a neighborhood distance band beginning at 1,000 feet and then repeated incrementally with neighborhood size increasing by 500 feet. Reported Z-scores were recorded and graphed as a function of distance. A peak in Z-scores indicates the distance where clustering is significant. For all students and subgroups, a distance band was identified where Z-scores indicated effects upon clustering were most pronounced. In Figure 8 below, for example, Z-scores for Moran's Global I were calculated for suspension incidents classified as defiance (EC 48900(k)) and graphed at varying distances. Peaks in the graph at 1,500 feet, 5,000 feet, and 6,500 feet indicate significant

distance bands for clustering. Clustering was determined to be most pronounced at a distance of 6,500 feet.

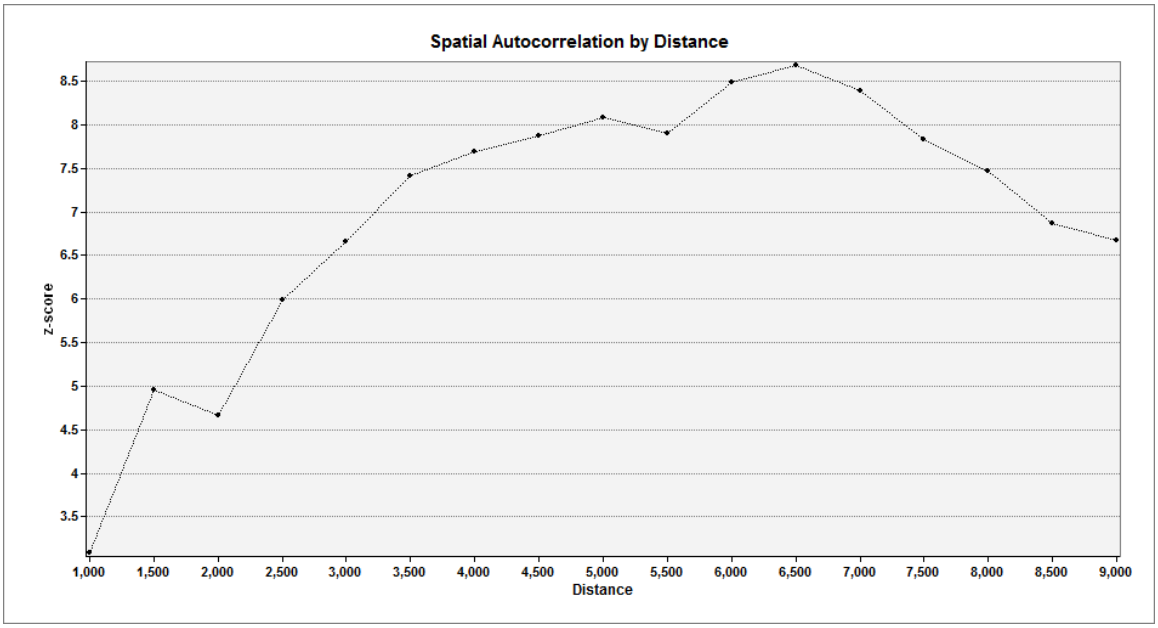


Figure 8: Moran's Global I for suspensions incidents classified as defiance - EC 48900(k)

3.5.2 Getis-Ord Gi*(d) Hot-Spot Analysis

In order to determine where clustering of suspension incidents occurs within the study area and estimate its magnitude, a Getis-Ord Gi*(d) Hot-Spot Analysis was performed within the study area census block features for all students and subgroups. For each feature in the study area, the Gi*(d) statistic compares the value of neighboring features within a specified distance (d) and indicates the extent to which each feature is surrounded by similarly high or low values. The statistic is calculated by summing the value of each neighbor within a specified distance (where each $w_{ij} = 1$) and dividing by the sum of all

neighbor values within the study area. The complete formula for determining the statistic is shown in the following equation (Mitchell 2009):

$$G_i^*(d) = \frac{\sum_j w_{ij}(d)x_j}{\sum_j x_j} \qquad (2)$$

where Gi*(d) measures the intensity of clustering of *x* for each *i* feature at a distance no more than *d* units from neighboring *j* features with spatial weight *w* in the study area.

A group of features with high Gi*(d) values indicates a hot-spot or concentrated clustering of neighboring features with high values. Similarly, a group of features with low Gi*(d) values indicates a cold-spot or concentrated clustering of neighboring features with low values. As implemented within ArcGIS, along with the Gi*(d) statistic, the statistic is compared to its expected value and a normally distributed Z-score is produced to indicate the likelihood that the clustering pattern is due to chance.

Using the neighborhood distance bands determined in Section 3.5.1 where the clustering effects were most pronounced, clusters of suspension incidents for all students and subgroups were visualized by mapping Gi*(d) Z-scores of census block group features. Suspension incident hot-spots were identified where census block groups had Gi*(d) Z-scores greater than 2.58, indicating that the clustering pattern had a less than 1 percent likelihood ($p<.01$) that the observed pattern was due to random chance.

3.5.3 Hot-Spot Summary Using Spatial Intersection

In Section 3.5.2, suspension incident hot-spots were identified by census block group. A programmatic model, depicted below in Figure 9, was built within ArcGIS to summarize and report the results of the hot-spot analysis as a percentage of the elementary school neighborhoods with census block groups having Gi*(d) incident clustering with a Z-score greater than 2.58 ($p<0.01$).

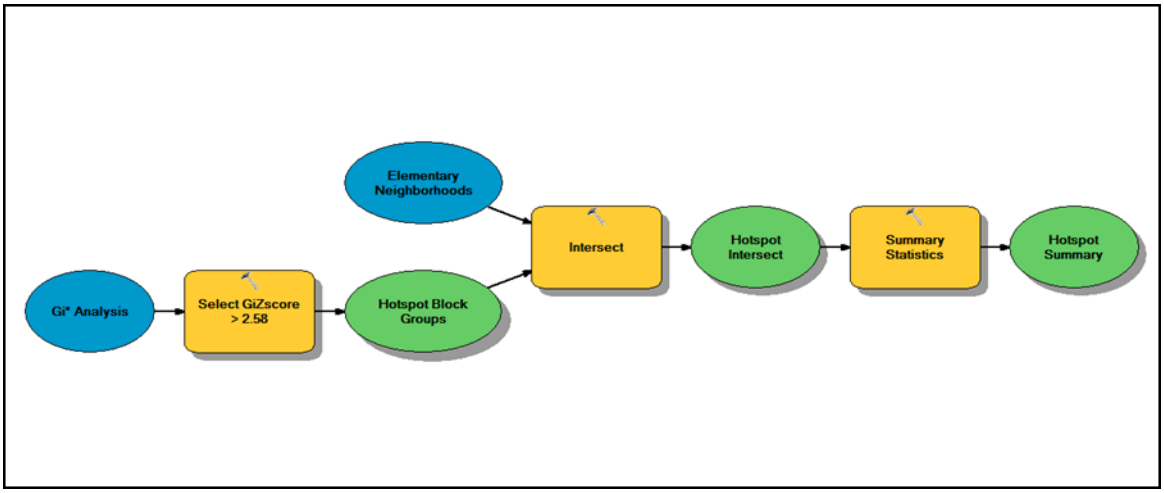


Figure 9: Hot-spot summary model using spatial intersection

For all students and each subgroup analyzed for hot-spots, the model automated the following steps: (1) select those census block groups having Gi*(d) analysis results with a Z-score greater than 2.58; (2) perform a spatial intersection between the elementary school neighborhoods defined in Section 3.1 and the selected census block groups; (3) summarize the results of the spatial intersection within the neighborhood as both a count of intersected census block groups and the sum of the total area of the census block groups; and (4) output the results as a DBF file. The final DBF file was prepared

by joining each of the DBFs to a master list of elementary school neighborhoods. For all students and each significant subgroup, a table was prepared reporting the percentage of each elementary school neighborhood having Gi*(d) incident clustering with a Z-score greater than 2.58 ($p<0.01$).

3.5.4 Neighborhood Hot-Spot Grouping Patterns

As a final step in the hot-spot analysis, the table prepared in Section 3.5.3 detailing suspension incident clustering in elementary school neighborhoods was sorted and organized to identify patterns among the grouped neighborhoods.

Hierarchical clustering software routines were used to order suspension incident clustering by neighborhood (SAS 2012a). Using this method, each neighborhood starts as its own cluster. At each step in the process, the two neighborhood clusters that were closest together by a given distance measure were combined into a single cluster (SAS 2012b). This process was repeated until only a single cluster remained. A dendrogram was used to visualize the clustered output.

Final grouping of the hierarchically ordered clusters was determined using a focus on suspension incident clustering within subgroups. Several classes of suspension incident clustering patterns were identified among the elementary school neighborhoods. To complete the analysis, a choropleth map and a table organized to show the grouping patterns were prepared.

3.6 Suspension Modeling Using Regression

In order to better understand the relationship between various factors contributing to student suspensions and to identify those neighborhoods where students are most at risk at being suspended, a model was developed using regression analysis.

3.6.1 Exploratory Regression Analysis

As a first step in developing a suspension model, an exploratory regression analysis was performed using the records of those students in the dataset who were identified as present on CBEDS day. The record layout detailed in Table 10 included attributes that previous research by the SBCUSD Research Office has shown to be significant indicators of students at risk including: (1) cumulative grade point average (GPA); (2) number of days absent from school as of CBEDS Day; (3) a student stability indicator for the previous 2008-09 school year; (4) a summary of suspensions from 2008-09; and (5) additional counting fields for summarizing student CBEDS day demographic and program indicators.

In the spatial join procedure described in Section 3.4, these CBEDS attributes were summarized by census block group. Summary attributes for each census block group were compared to the total number of census block group suspension incidents recorded in the 2009-10 school year.

Scatterplot matrices of the results were prepared and used, along with correlation coefficients, to identify a list of likely candidates as explanatory factors in the model being developed. Points were colorized according to the rate of suspension incidents within

each census block group. Analysis of the scatterplot matrices indicated that several of these factors showed a cone-shaped scattering of the x-y points characteristic of heteroscedasticity, indicating that the variance in the relationship between x-y points increased as the magnitude of the x-y points increased. The scatterplot matrix presented in Figure 10 was generated as part of this process.

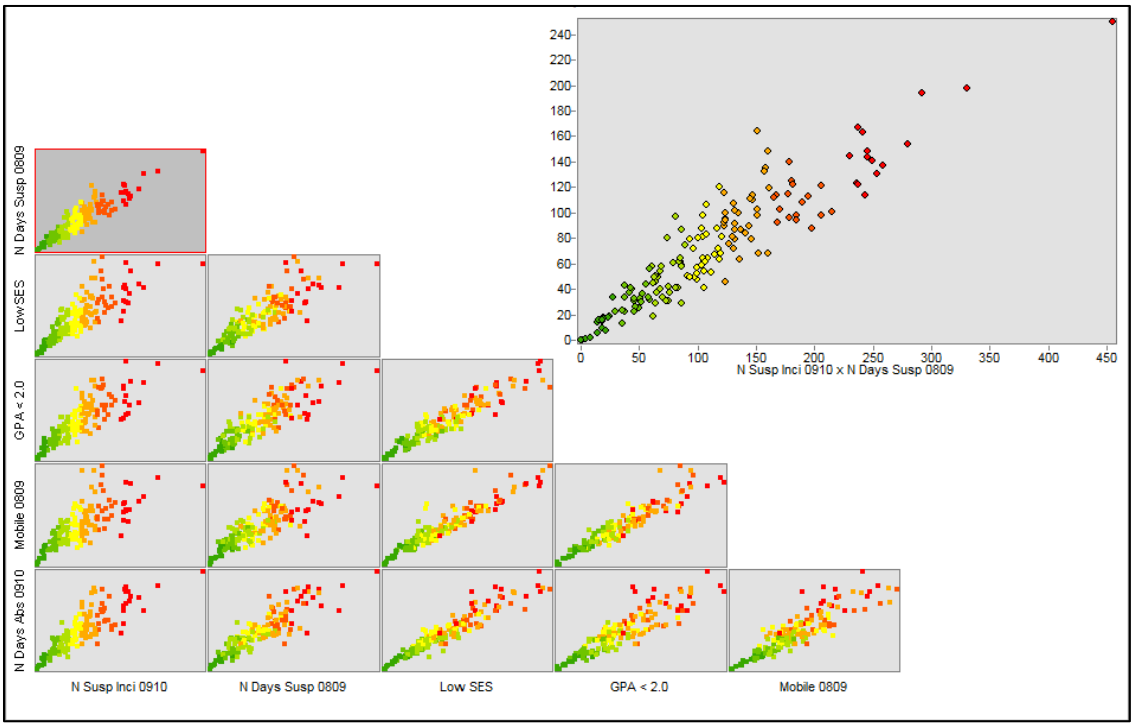


Figure 10: Scatterplot matrix: suspension model factors

As a final step in the review, using the exploratory data analysis module within ArcGIS, combinations of attributes were used to build and identify candidate regression models chosen to maximize the explanatory power of the model as measured by the adjusted R2 value, reduce the redundancy of variables as measured by the Variance Inflation Factor (VIF), and minimize geographic variation as measured by the Koenker

(BP) p-value. Redundant variables and those that, on closer examination, indicated a vagueness of definition were excluded from the model.

3.6.2 Ordinary Least Squares (OLS) Regression

Once attributes for a candidate suspension model were identified, an ordinary least-squares (OLS) analysis was performed using a two variable model. In an OLS analysis, a regression line is fitted to the data by minimizing error as measured by the square of the differences between the actual and predicted values of the model (residuals). Best modeling practice as suggested by Mitchell (2009) was used to review and determine if the model was fully specified. Review of the best fitting OLS regression model output showed some variation of residuals due to heteroscedasticity and the Jarque-Bera statistic was significant ($p<0.01$), confirming that the residuals deviated from a normal distribution. This indicated that the OLS model was not fully specified and should not be considered despite the model's high adjusted R^2 value. Using the model's residuals to calculate Moran's I, a Z-score of 7.67 indicated the presence of clustering ($p < 0.01$) in the residuals and it was determined that a geographically weighted regression (GWR) model should be considered.

3.6.3 Geographically Weighted Regression

In a geographically weighted regression (GWR), the model coefficients are allowed to vary across the study area (Mitchell 2009). Using the GWR module in ArcGIS, the OLS regression model for predicting the number of suspension incidents developed in Section 3.6.2 was extended. Output from the GWR module produced raster layers for the study

area by census block group visualizing how the coefficients were allowed to vary, the distribution of the GWR model residuals, and a local R^2 indicating GWR model fit.

Review of the GWR model indicated an improved fit with residuals more randomly distributed across the study area. Overall, the adjusted R^2 for the model increased to 0.901387 with local R^2 values varying from a low of 0.573631 to a high of 0.999422. Final plots comparing the observed and predicted number of suspension incidents were prepared.

Chapter 4

Results

4.1 Patterns in Student Enrollment

Enrollment by residence in census block groups of the more than 58,000 students served by SBCUSD in the 2009-10 school year has been visualized in the map displayed in Figure 11. The district has sparsely inhabited regions along the northern mountains, southern Santa Ana River basin and in the west along the Cajon Pass (Figure 1).

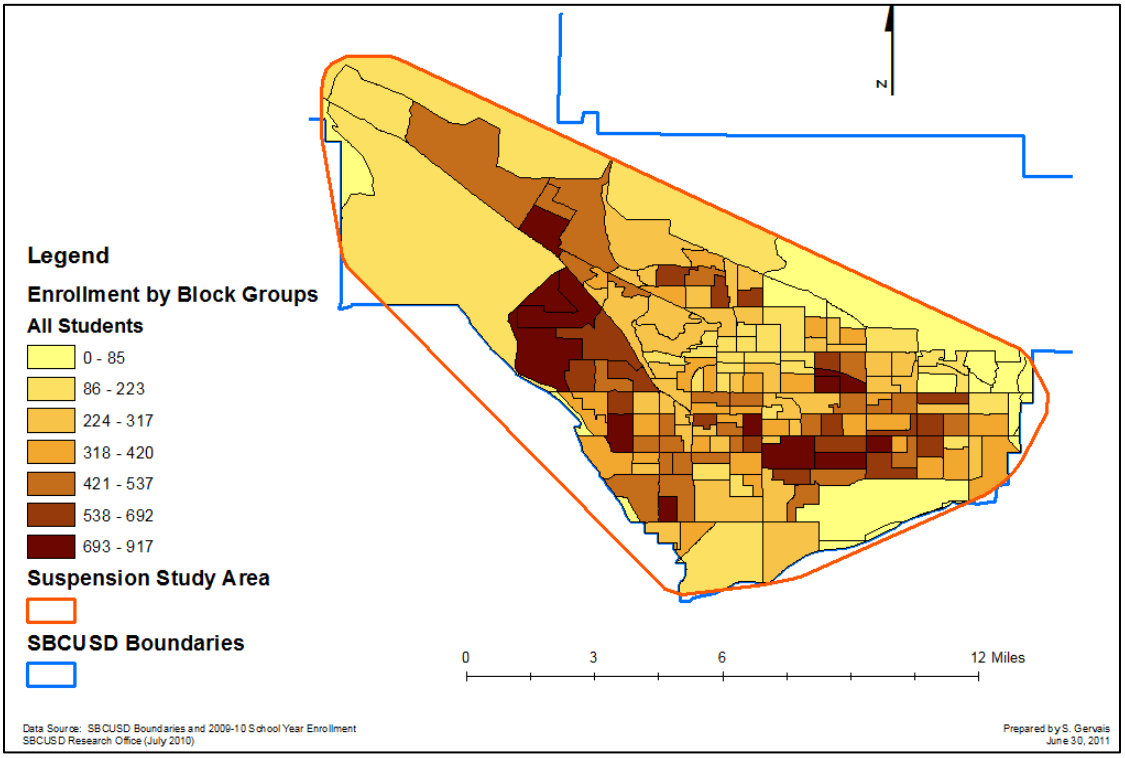


Figure 11: SBCUSD 2009-10 enrollment by census block groups

There are regions within the city where highly populated census block groups, each having more than 700 students in residence, are interspersed with regions where fewer than 200 students are in residence within a census block group. This can be

explained by observing the many apartment complexes and subdivisions that coexist alongside land used for industrial warehouses, farming, or left as empty lots. San Bernardino International Airport (SBX) in the southern portion of the district was once the site of Norton Air Force Base. In an effort to reduce neighborhood blight, base housing was razed in the late 1990s and the land has stood empty since that time.

Analysis of the 2009-10 school year enrollment by elementary school neighborhood shows that enrollment varies greatly across the city. In Table 12 below, enrollment within the district has been summarized for all students and by significant subgroup in each elementary school neighborhood. Records are sorted by decreasing total enrollment. The final column of the table indicates enrollment density per square mile. It can be easily seen that the Emmerton-Rodriguez neighborhood (N = 2,594 students; density = 1,942 students/sq. mile), while having the highest number of enrolled students, has an enrollment density much less than that of other smaller urban neighborhoods such as Lincoln (N = 1,839 students; density = 3,444 students/sq. mile). In the north of the city, the Kimbark neighborhood (N = 329 students; density = 21 students/sq. mile) is the least populated and has the largest areal size (15.48 sq. miles).

Neighborhoods were found to vary by subgroup as well. Hispanic student enrollment by neighborhood averaged 67.1 percent and ranged from 29.8 percent to 91.9 percent. African American student enrollment by neighborhood averaged 16.7 percent with a minimum of 3 percent and a maximum of 31.9 percent.

Table 12: SBCUSD 2009-10 enrollment by elementary school neighborhood

	Area	Enrollment					
ELM Neighborhood	(SqMiles)	Total N	% African Am	% Hispanic	% White	% Low SES	Enrolled/SqMi
EMMERTON-RODRIGUEZ	1.34	2594	22.5%	63.0%	8.2%	84.3%	1942.0
VERMONT	3.55	2146	5.1%	86.9%	5.8%	89.4%	604.9
RIO VISTA	1.37	2010	27.5%	64.2%	1.6%	88.0%	1462.3
DEL ROSA	2.99	1996	23.5%	58.6%	13.8%	80.7%	666.6
WILSON	1.19	1872	14.5%	74.6%	8.0%	84.9%	1572.7
LINCOLN	0.53	1839	18.1%	73.5%	4.3%	88.1%	3444.3
RILEY	0.64	1804	13.1%	81.2%	4.0%	92.2%	2828.1
LANKERSHIM	2.53	1770	17.9%	67.7%	6.8%	89.6%	698.2
HUNT	0.85	1716	28.4%	60.1%	8.5%	85.0%	2008.9
ROBERTS	0.89	1710	15.8%	76.9%	3.5%	90.8%	1924.2
NORTH PARK	6.05	1658	20.8%	50.2%	22.1%	63.1%	273.9
LYTLE CREEK	1.54	1615	3.2%	91.9%	2.5%	91.3%	1048.0
MT VERNON	0.75	1561	8.8%	87.1%	2.1%	91.2%	2083.2
BRADLEY	0.57	1557	14.7%	76.4%	5.8%	88.4%	2753.2
MUSCOY	2.05	1490	5.6%	87.4%	3.5%	91.5%	726.5
NEWMARK	1.67	1477	20.8%	57.0%	16.5%	78.5%	885.5
WONG	3.53	1451	17.8%	71.5%	6.3%	90.8%	411.1
MONTEREY	1.42	1426	15.5%	75.4%	3.7%	88.8%	1005.5
KENDALL	1.32	1410	23.0%	53.9%	18.1%	72.9%	1070.6
WARM SPRINGS	0.44	1378	16.9%	70.5%	5.2%	91.0%	3136.6
HILLSIDE	0.70	1377	14.1%	59.8%	22.3%	74.7%	1980.0
MARSHALL	1.11	1325	15.9%	69.8%	11.2%	80.2%	1192.3
PALM	2.96	1290	17.2%	44.2%	32.9%	52.2%	436.5
ROOSEVELT	0.49	1231	6.4%	89.3%	1.8%	92.5%	2537.2
CYPRESS	1.79	1197	20.6%	64.4%	9.9%	86.2%	669.3
ANTON	0.82	1160	13.4%	73.4%	8.4%	88.3%	1416.6
PARKSIDE	2.94	1133	14.2%	64.1%	18.9%	73.7%	385.3
DAVIDSON	1.44	1115	16.1%	70.8%	11.0%	81.9%	774.4
INGHRAM	0.98	1105	31.9%	61.4%	3.7%	85.9%	1126.3
SALINAS	0.71	1096	10.6%	82.5%	2.8%	92.5%	1542.7
RAMONA-ALESSANDRO	0.93	1091	12.6%	82.5%	2.1%	89.0%	1177.4
THOMPSON	1.45	1033	8.7%	53.6%	27.0%	69.6%	712.2
COLE	0.44	1006	20.6%	65.6%	10.5%	86.9%	2293.9
BARTON	0.85	1006	26.7%	55.3%	11.9%	81.5%	1184.5
JONES	0.65	924	21.5%	70.2%	4.3%	87.1%	1420.7
NORTH VERDEMONT	4.44	918	16.7%	49.2%	25.9%	53.3%	206.6
HIGHLAND-PACIFIC	0.68	899	20.6%	58.4%	14.2%	80.9%	1316.3
FAIRFAX	0.51	861	16.4%	72.8%	7.0%	89.8%	1701.6
ARROWHEAD	0.49	832	30.8%	52.2%	14.7%	80.6%	1696.0
BELVEDERE	3.00	827	17.8%	47.3%	27.2%	58.5%	275.7
BURBANK	2.29	730	12.2%	76.4%	7.3%	91.1%	319.3
URBITA	1.21	662	3.0%	91.1%	3.5%	86.6%	546.1
OEHL	2.65	619	30.7%	38.1%	24.1%	70.6%	233.8
KIMBARK	15.48	329	4.6%	29.8%	58.4%	45.9%	21.3
SBCUSD Study Area	84.21	58246	16.9%	68.6%	10.1%	83.3%	691.7

White student enrollment averaged 11.6 percent and ranged from 1.6 percent to 58.4 percent. Students identified as having a low socioeconomic status (LowSES) had an average neighborhood enrollment of 81.8 percent with a minimum of 45.9 percent and a maximum of 92.5 percent.

Analysis of distribution patterns of student residence by subgroup using a one standard deviation distribution ellipse (Figure 12 below) shows no discernible pattern with the exception of the White subgroup. Most student subgroups in the city live inter-mixed in the southern and central regions of the city. White student residences show a slight variation with more of these students living along the mountains in the northern edge of the district. This area includes the more affluent neighborhoods of the city.

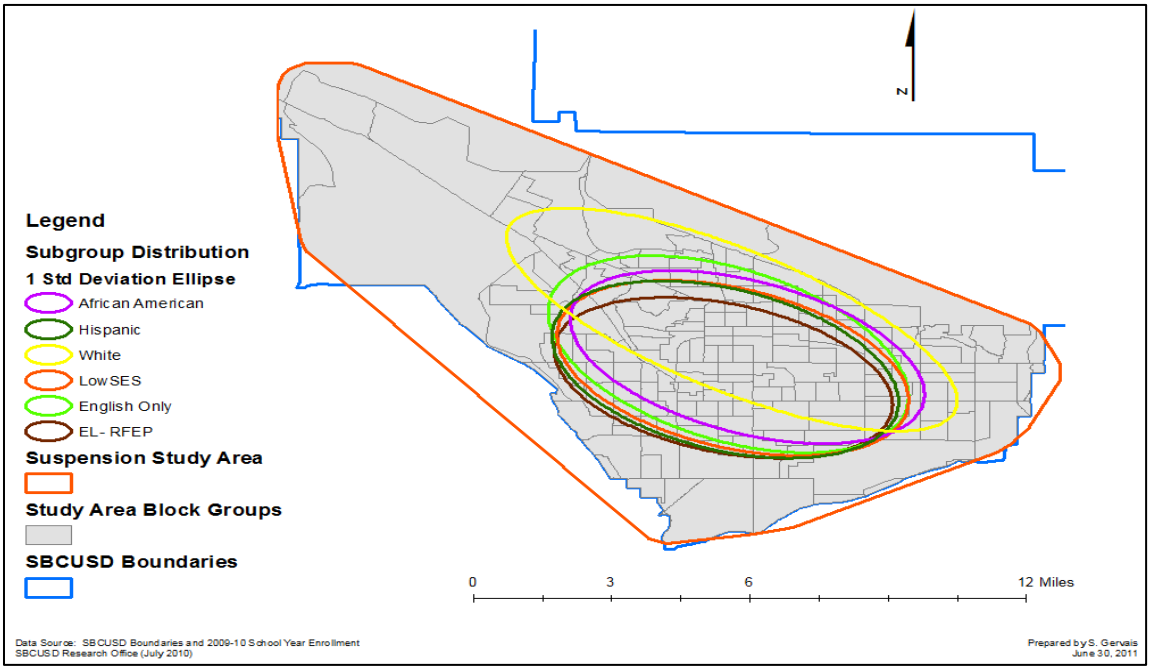


Figure 12: **Enrollment by subgroup - 1 standard deviation distribution from center**

4.2 Analysis of Student Suspensions

Student suspensions incidents were found to have the highest rate of occurrence in the south-central portion of the district in the census blocks located in the downtown region of San Bernardino City. In Figure 13 below, the red colored census block groups in the center of study area indicate that more than 50 suspension incidents are occurring per 100 students.

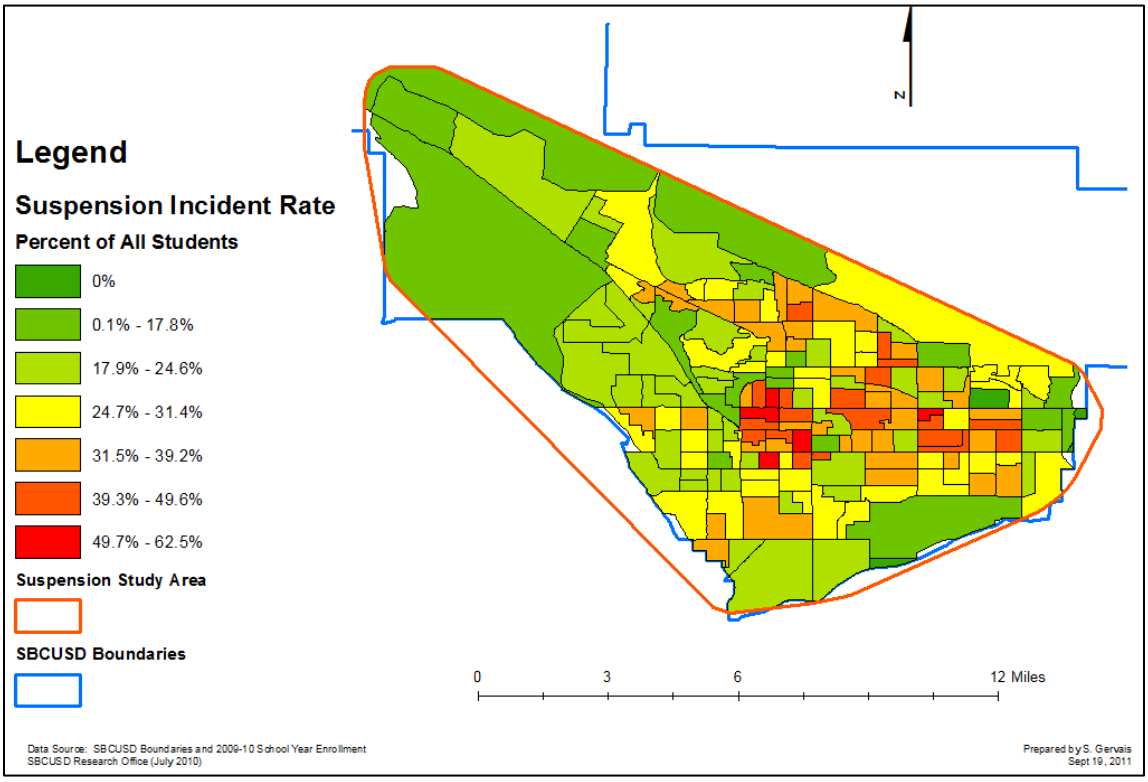


Figure 13: SBCUSD 2009-10 incident rate by census block groups

Comparing the enrollment by census block group map in Figure 11 to the suspension incident rate map shows only a partial correspondence of high enrollment to high rates of suspensions. Enrolled students living along the western edge of the district

have a much lower rate of suspensions than those students with residences in census block groups with similar enrollment numbers near the central portion of the district.

4.2.1 Spatial Autocorrelation of Suspension Incidents

Moran's Global I was used to measure spatial autocorrelation of suspension incidents for all students and significant subgroups at various distance bands. Results were normalized and expressed as Z-scores with a mean of 0 and standard deviation of 1. Distance bands with Z-scores greater than 2.58 indicate significant positive spatial autocorrelation of suspension incidents ($p<0.01$), thus disproving the null hypotheses. Table 13 details those distance bands where Moran's Global I peaked.

Table 13: Distance bands with most significant clustering of suspension incidents by subgroup

Study Group	Distance Band (Feet)	Moran's Global I Z-score
All Students	6,500	8.44
African American	7,000	8.46
Hispanic	6,500	7.90
White	5,000	6.33
Low Socioeconomic	5,000	8.12
Defiance Suspensions	6,500	8.68
Violence Suspensions	7,500	7.32
Drugs/Alcohol Suspensions	6,000	5.63

4.2.2 Hot Spot Analysis of Suspensions – Detailed Example and Summary

Having determined that suspension clustering within the district does exist, those census block groups where suspension incident clustering was most pronounced were identified using Hot Spot Analysis. The Getis-Ord Gi*(d) statistic was calculated for all students and significant subgroups using the distance bands indicated in Table 13. As described in

Section 3.5.2, incident clustering Z-scores were determined for each census block group. A Z-score greater than 2.58 indicates significant incident clustering ($p<0.01$) and was identified as a suspension hotspot.

In Figure 14 below, a portion of the analysis of those suspension incidents identified as Acts of Violence has been visualized. As defined in Section 3.1, census block groups within an elementary school's boundaries are defined to be an elementary school neighborhood. All census block groups within the Anton Elementary School neighborhood are shown as red hotspots, having Z-scores greater than 2.58; less than 20 percent of the census block groups within the boundaries of Monterey Elementary School neighborhood are identified as hotspots.

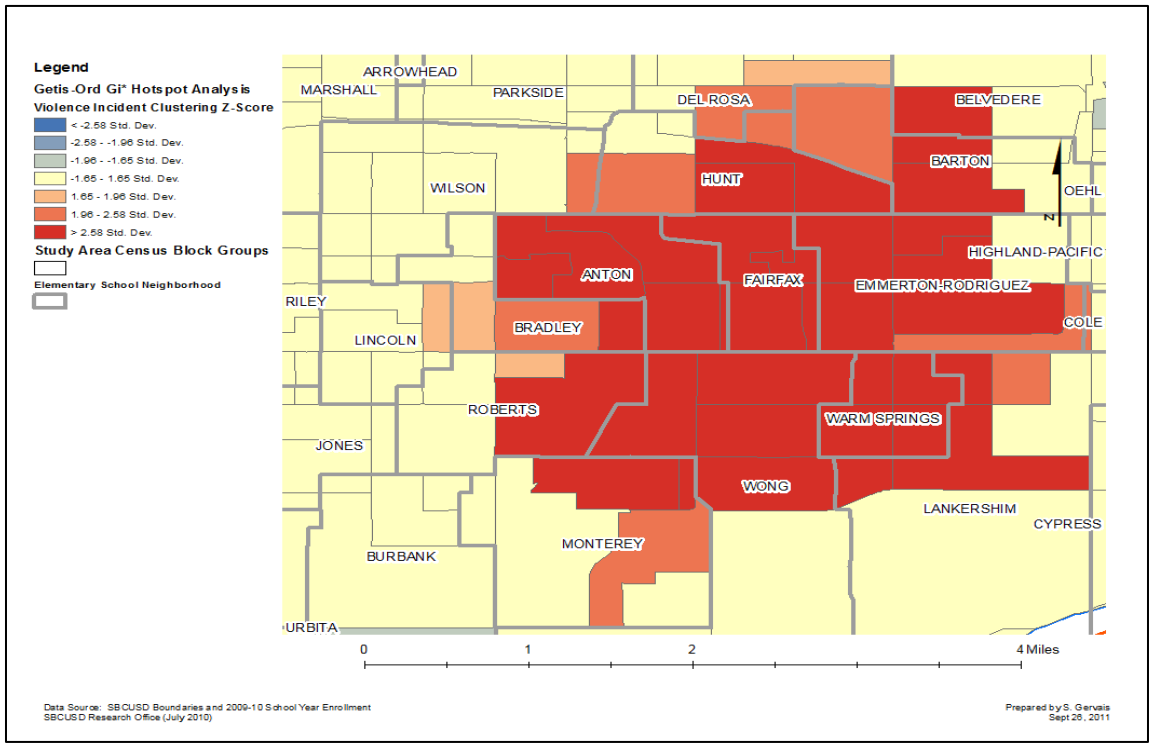


Figure 14: Hotspot analysis by census block groups using Getis-Ord Gi* statistic (reported as violence incident clustering z-scores)

The visualization of the Lincoln Elementary School neighborhood, having some census block groups with a positive Z-score less than 2.58, indicates that while some clustering of violent incidents can be identified, it has no census block groups that are considered to indicate a hotspot for violent suspension incidents.

Table 14 below summarizes this hotspot analysis and indicates the percent of those neighborhoods by each suspension incident type studied that are considered to be hotspots. The table is ordered by hotspot rates for all students and helps to highlight the differences between neighborhoods. For example, the Warm Springs neighborhood is considered to be a 100 percent hotspot for all groups analyzed except those focusing on Whites and Drug/Alcohol suspension incidents. The Emmerton-Rodriguez and Bradley neighborhoods have high hotspot rates for suspensions involving African Americans students and much lower rates for suspensions involving Hispanics. Conversely, the Lincoln neighborhood has a high hotspot rate for suspensions involving Hispanics and much lower rates for African Americans. The Hillside neighborhood has a high hotspot rate only for suspensions incidents involving White students.

Table 14: Percent of neighborhood hotspot incident clustering by elementary school neighborhood and suspension incident category

		Suspension Incident Category							
Elementary School Neighborhood	Area (sqMiles)	All Students	African American	Hispanic	White	Low SES	Defiance	Violence	Drugs Alcohol
WARM SPRINGS	0.44	100.0%	100.0%	100.0%	0.0%	100.0%	100.0%	100.0%	0.0%
EMMERTON-RODRIGUEZ	1.34	100.0%	100.0%	14.2%	0.0%	77.2%	100.0%	64.7%	23.9%
LINCOLN	0.53	99.9%	0.0%	100.0%	0.0%	100.0%	100.0%	0.0%	74.8%
BRADLEY	0.57	87.1%	15.8%	100.0%	0.0%	99.7%	100.0%	15.9%	19.6%
ANTON	0.82	72.9%	53.2%	70.1%	0.0%	15.9%	72.9%	100.0%	13.0%
ROBERTS	0.89	71.3%	0.0%	99.9%	0.0%	51.4%	99.9%	48.5%	1.8%
FAIRFAX	0.51	57.7%	100.0%	7.8%	0.0%	57.7%	57.7%	100.0%	0.0%
RILEY	0.64	56.3%	0.0%	96.3%	0.0%	46.4%	62.3%	0.0%	56.2%
COLE	0.44	55.1%	55.1%	0.0%	0.0%	55.1%	55.1%	0.0%	0.0%
LANKERSHIM	2.53	38.2%	38.2%	24.0%	0.0%	34.4%	38.2%	24.0%	0.0%
WONG	3.53	30.9%	22.9%	30.9%	0.0%	22.9%	30.9%	30.9%	0.0%
CYPRESS	1.79	22.6%	8.6%	0.0%	0.0%	0.0%	22.6%	0.0%	0.0%
HIGHLAND-PACIFIC	0.68	12.5%	12.6%	0.0%	0.0%	4.1%	12.5%	0.0%	0.0%
JONES	0.65	9.7%	0.0%	89.9%	0.0%	12.9%	42.5%	0.0%	11.3%
MONTEREY	1.42	2.4%	2.4%	2.4%	0.0%	2.4%	2.4%	20.2%	0.0%
WILSON	1.19	2.3%	0.0%	23.1%	0.0%	16.4%	16.4%	6.0%	0.0%
BARTON	0.85	0.1%	99.8%	0.0%	0.0%	0.1%	0.1%	25.8%	0.0%
HUNT	0.85	0.0%	51.2%	0.0%	0.0%	29.1%	0.0%	76.6%	0.0%
ARROWHEAD	0.49	0.0%	0.0%	0.0%	10.3%	0.0%	0.0%	0.0%	0.0%
BELVEDERE	3.00	0.0%	12.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
BURBANK	2.29	0.0%	0.0%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%
DAVIDSON	1.44	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
DEL ROSA	2.99	0.0%	4.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
HILLSIDE	0.70	0.0%	0.0%	0.0%	98.2%	0.0%	0.0%	0.0%	0.0%
INGHRAM	0.98	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	38.6%
KENDALL	1.32	0.0%	0.0%	0.0%	39.7%	0.0%	0.0%	0.0%	0.0%
KIMBARK	15.48	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
LYTLE CREEK	1.54	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
MARSHALL	1.11	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
MT VERNON	0.75	0.0%	0.0%	23.9%	0.0%	0.0%	0.0%	0.0%	42.7%
MUSCOY	2.05	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	57.6%
NEWMARK	1.67	0.0%	0.0%	0.0%	3.9%	0.0%	0.0%	0.0%	0.0%
NORTH PARK	6.05	0.0%	0.0%	0.0%	3.3%	0.0%	0.0%	0.0%	0.0%
NORTH VERDEMONT	4.44	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%
OEHL	2.65	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PALM	2.96	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PARKSIDE	2.94	0.0%	0.0%	0.0%	4.5%	0.0%	0.0%	0.0%	0.0%
RAMONA-ALESSANDRO	0.93	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
RIO VISTA	1.37	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	16.9%
ROOSEVELT	0.49	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
SALINAS	0.71	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
THOMPSON	1.45	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
URBITA	1.21	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
VERMONT	3.55	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.6%

4.2.3 Neighborhood Hot Spot Grouping Patterns

Several classes of incident clustering patterns within neighborhoods were identified in the table of ordered suspension incident clusters prepared in Section 3.5.4. They include neighborhoods where: (1) incident clustering is significant for all students and balanced between African American and Hispanic subgroups; (2) incident clustering is significant for all students and one ethnic/racial subgroup; (3) incident clustering is not significant for all students but was significant for one ethnic/racial subgroup; (4) incident clustering is significant only for drug/alcohol incidents; and (5) incident clustering is not significant.

Elementary school neighborhoods in group 1 (Table 15) generally have the greatest percent of suspension incident clustering among all neighborhoods and have a near equal balance of suspension incident clustering between the African American and Hispanic subgroups. These neighborhoods are also characterized by higher rates of clustering for the LowSES, violence, and defiance subgroups. The choropleth map in Figure 15 shows this group in red, extending as a single continuous field across the south-eastern portion of the study area.

Table 15: Elementary school neighborhoods – group pattern 1

	Percent of Neighborhood Hotspot Incident Clustering		Suspension Incident Category							
Grouping Pattern	Elementary School Neighborhood	Area (sqMiles)	All Students	African American	Hispanic	White	Low SES	Defiance	Violence	Drugs Alcohol
Group 1	Balanced - Similar Clustering for All Students, African American and Hispanic Subgroups									
	WARM SPRINGS	0.44	100.0%	100.0%	100.0%	0.0%	100.0%	100.0%	100.0%	0.0%
	ANTON	0.82	72.9%	53.2%	70.1%	0.0%	15.9%	72.9%	100.0%	13.0%
	LANKERSHIM	2.53	38.2%	38.2%	24.0%	0.0%	34.4%	38.2%	24.0%	0.0%
	WONG	3.53	30.9%	22.9%	30.9%	0.0%	22.9%	30.9%	30.9%	0.0%
	MONTEREY	1.42	2.4%	2.4%	2.4%	0.0%	2.4%	2.4%	20.2%	0.0%

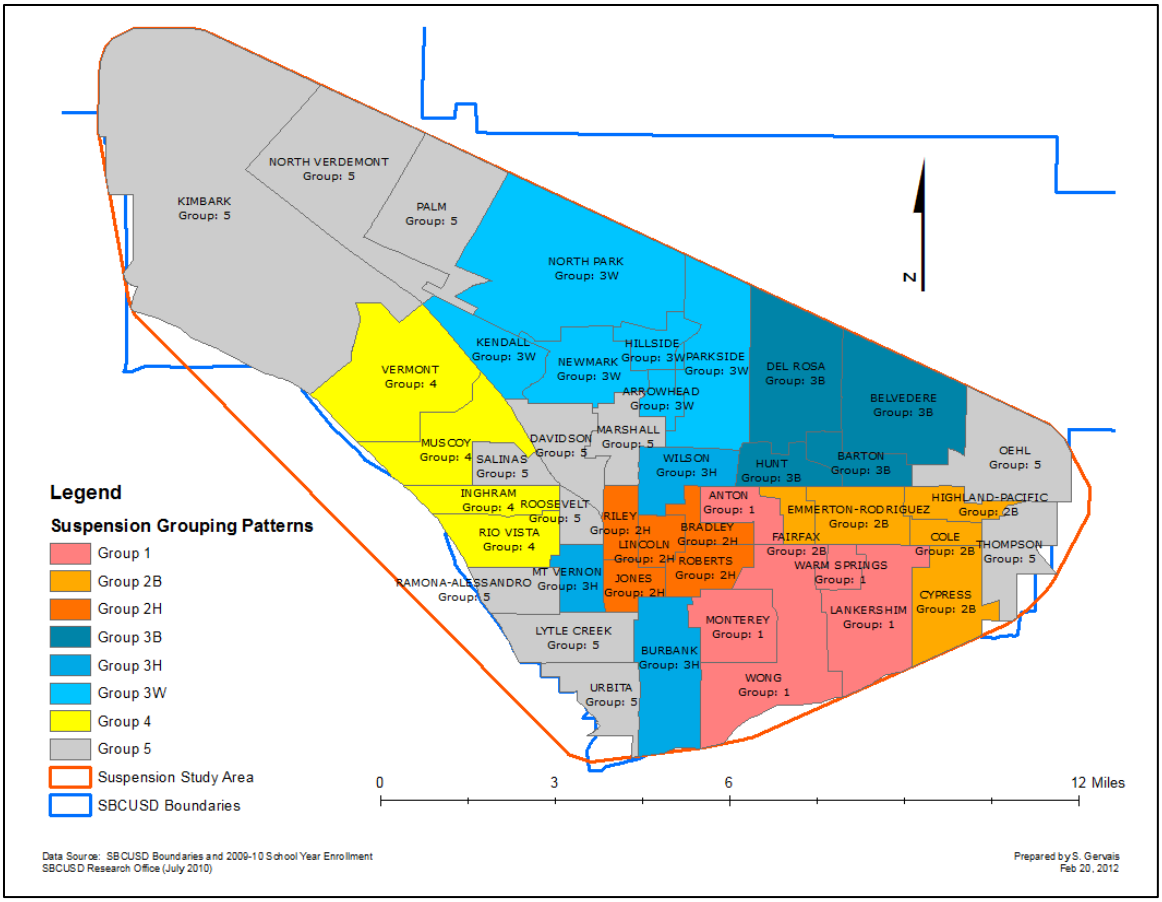


Figure 15: 2009-10 School Year suspension grouping patterns

Elementary school neighborhoods in group 2 (Table 16) have significant suspension incident clustering for all students and one ethnic/racial subgroup and are visualized in orange hues in Figure 15: 2009-10 School Year suspension grouping patterns. Group 2 neighborhoods with significant clustering for African Americans students (Group 2B) all lie along the eastern boundaries of the group 1 neighborhoods. These neighborhoods generally have a higher percentage of incident clustering in the LowSES and defiance subgroups and limited incident clusters in the violence subgroup. Group 2 neighborhoods with significant clustering for Hispanic students (Group 2H) all

lie along the northwestern boundaries of the group 1 neighborhoods. These neighborhoods also have higher percentages of incident clustering in the LowSES and defiance subgroups. Different from the African American neighborhoods in group 2, the Hispanic neighborhoods also have higher rates of incident clustering that involve drugs and alcohol.

Table 16: Elementary school neighborhoods – group pattern 2

Grouping Pattern	Elementary School Neighborhood	Area (sqMiles)	Percent of Neighborhood Hotspot Incident Clustering: All Students	African American	Hispanic	White	Low SES	Defiance	Violence	Drugs Alcohol
			Suspension Incident Category							
Group 2	Clustering High for All Students and Primarily Within One Race/Ethicity Subgroup									
African Am	EMMERTON-RODRIGUEZ	1.34	100.0%	100.0%	14.2%	0.0%	77.2%	100.0%	64.7%	23.9%
	FAIRFAX	0.51	57.7%	100.0%	7.8%	0.0%	57.7%	57.7%	100.0%	0.0%
	COLE	0.44	55.1%	55.1%	0.0%	0.0%	55.1%	55.1%	0.0%	0.0%
	HIGHLAND-PACIFIC	0.68	12.5%	12.6%	0.0%	0.0%	4.1%	12.5%	0.0%	0.0%
	CYPRESS	1.79	22.6%	8.6%	0.0%	0.0%	0.0%	22.6%	0.0%	0.0%
Hispanic	LINCOLN	0.53	99.9%	0.0%	100.0%	0.0%	100.0%	100.0%	0.0%	74.8%
	BRADLEY	0.57	87.1%	15.8%	100.0%	0.0%	99.7%	100.0%	15.9%	19.6%
	ROBERTS	0.89	71.3%	0.0%	99.9%	0.0%	51.4%	99.9%	48.5%	1.8%
	RILEY	0.64	56.3%	0.0%	96.3%	0.0%	46.4%	62.3%	0.0%	56.2%
	JONES	0.65	9.7%	0.0%	89.9%	0.0%	12.9%	42.5%	0.0%	11.3%

In group 3 (Table 17), clustering in elementary school neighborhoods is significant for only one racial/ethnic group. These neighborhoods generally do not have significant suspension incident clusters in any other subgroup. Group 3 neighborhoods that have significant suspension incident clustering for African Americans (Group 3B) lie to the north along the mountains above the group 2 neighborhoods that have significant incident clustering for African American students. Group 3 neighborhoods that have significant incident clustering for Hispanics (Group 3H) are located west of group 1 and north and south of the group 2 neighborhoods significant for Hispanic incident clustering. Group 3

neighborhoods that are significant for incident clustering among Whites (Group 3W) lie near the mountains in the central portion of the city. Neighborhoods in group 3 are colored in blue hues in Figure 15.

Table 17: Elementary school neighborhoods – group pattern 3

	Percent of Neighborhood Hotspot Incident Clustering		Suspension Incident Category							
Grouping Pattern	Elementary School Neighborhood	Area (sqMiles)	All Students	African American	Hispanic	White	Low SES	Defiance	Violence	Drugs Alcohol
Group 3	Clustering Low for All Students and High Within One Race/Ethicity Subgroup									
African Am	HUNT	0.85	0.0%	51.2%	0.0%	0.0%	29.1%	0.0%	76.6%	0.0%
	BARTON	0.85	0.1%	99.8%	0.0%	0.0%	0.1%	0.1%	25.8%	0.0%
	BELVEDERE	3.00	0.0%	12.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	DEL ROSA	2.99	0.0%	4.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Hispanic	MT VERNON	0.75	0.0%	0.0%	23.9%	0.0%	0.0%	0.0%	0.0%	42.7%
	WILSON	1.19	2.3%	0.0%	23.1%	0.0%	16.4%	16.4%	6.0%	0.0%
	BURBANK	2.29	0.0%	0.0%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%
White	HILLSIDE	0.70	0.0%	0.0%	0.0%	98.2%	0.0%	0.0%	0.0%	0.0%
	KENDALL	1.32	0.0%	0.0%	0.0%	39.7%	0.0%	0.0%	0.0%	0.0%
	ARROWHEAD	0.49	0.0%	0.0%	0.0%	10.3%	0.0%	0.0%	0.0%	0.0%
	PARKSIDE	2.94	0.0%	0.0%	0.0%	4.5%	0.0%	0.0%	0.0%	0.0%
	NEWMARK	1.67	0.0%	0.0%	0.0%	3.9%	0.0%	0.0%	0.0%	0.0%
	NORTH PARK	6.05	0.0%	0.0%	0.0%	3.3%	0.0%	0.0%	0.0%	0.0%

In group 4 (Table 18), clustering for elementary school neighborhoods is significant for only drug and alcohol suspension incidents. These neighborhoods are all located along the western edge of the study area and are visualized in Figure 15 using yellow hues.

Table 18: Elementary school neighborhoods – group pattern 4

	Percent of Neighborhood Hotspot Incident Clustering		Suspension Incident Category							
Grouping Pattern	Elementary School Neighborhood	Area (sqMiles)	All Students	African American	Hispanic	White	Low SES	Defiance	Violence	Drugs Alcohol
Group 4	Clustering High Only For Drug/Alcohol Incidents									
	MUSCOY	2.05	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	57.6%
	INGHRAM	0.98	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	38.6%
	RIO VISTA	1.37	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	16.9%
	VERMONT	3.55	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.6%

Elementary school neighborhoods in group 5 (Table 19) were not identified as having any significant suspension incident clustering. In Figure 15, they are visualized in gray and are not located in any specific region of the study area. Neighborhoods in group 5 can be observed near the urban center of the study area and along the less densely populated edges of the city in the north, south and east.

Table 19: Elementary school neighborhoods – group pattern 5

	Percent of Neighborhood Hotspot Incident Clustering		Suspension Incident Category							
Grouping Pattern	Elementary School Neighborhood	Area (sqMiles)	All Students	African American	Hispanic	White	Low SES	Defiance	Violence	Drugs Alcohol
Group 5	No Significant Clustering									
	KIMBARK	15.48	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%
	NORTH VERDEMONT	4.44	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
	PALM	2.96	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
	OEHL	2.65	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
	LYTLE CREEK	1.54	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	THOMPSON	1.45	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	DAVIDSON	1.44	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	URBITA	1.21	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	MARSHALL	1.11	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	RAMONA-ALESSANDRO	0.93	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	SALINAS	0.71	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	ROOSEVELT	0.49	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

4.3 Modeling Suspension Incident Rates Using Regression Analysis

Having identified the location for neighborhood suspensions hotspots, a model was developed using student data gathered during the 2009 October CBEDS data collection to predict cumulative end-of-school-year suspension incidents by census block group. The final model was developed in stages using exploratory regression analysis to identify likely explanatory factors and candidate models, ordinary least-squares regression (OLS) to refine and validate the candidate model, and geographic weighted regression (GWR) to account for non-stationary variance in the OLS model.

4.3.1 Exploratory Regression Analysis

Exploratory regression analysis identified several possible attributes that could be used in the candidate suspension model. Table 20 details the summary report of independent variable significance toward predicting the total number of suspension incidents.

Table 20: Exploratory regression summary of variable significance

CBEDS Enrollment 2009-10 Variable	% Significant
N Days Students Suspended 2008-09	100.0%
N Students CBEDS GPA < 2.0	89.7%
N Suspension Incidents 2008-09	81.0%
N LowSES Students	63.1%
N Student Mobile 2008-09	61.0%
Total Days Students Absent At CBEDS	54.1%
N White Students	45.2%
N Male Students	40.4%
N Students CBEDS Absence > 4	39.2%
N Students Suspended 2008-09	30.9%
N Hispanic Students	27.4%
N Students Attending HS	25.5%
N African American Students	19.7%
N Students Attending ELM	18.2%
N Students Attending MS	12.1%

Previous suspensions history from the 2008-09 school year was determined to be 100 percent significant when considered as the total number of days suspended and 81 percent significant when considered as the total number of suspension incidents. The number of students at-risk of dropping out with a CBEDS reported GPA below 2.0 was nearly 90 percent significant. Also found significant was the number of students who

were in the low socioeconomic (LowSES) subgroup (63%), the number of students who were mobile (61%), and the number of days of absence logged by CBEDS day during the 2009-10 school year (54%).

4.3.2 Ordinary Least-Square (OLS) Regression

While several combinations of these variables were found to produce suspension models with good fit, the final analysis indicated that the simplest model with best fit and least redundancy included only two of the candidate variables: the total number of days suspended in 2008-09 and the number of students in the LowSES subgroup. The final OLS model, predicting the number of suspension incidents by census block group, is given by the equation below:

$$S(d_i, l_i) = 1.372534 * (d_i) + 0.054569 * (l_i) + 0.631966 \qquad (3)$$

where for each census block group, i, d_i = the sum of the number of days suspended in 2008-09 for students living in the i^{th} census block group; l_i = the number of identified LowSES students in the i^{th} census block group; and $S(d_i,l_i)$ = the estimate of the number of suspension incidents within the ith census block group. Complete output from the OLS model is reported in Appendix 3.

Overall, the model would appear to be a good predictor of the number of suspension incidents. The adjusted R^2 value for the model was 0.88, indicating that the model accounts for 88 percent of the variance in the data being modeled. The Wald statistic indicated that the variables in the model were jointly significant ($p < 0.01$).

Visualizing the standardized residuals of the OLS regression model (Figure 16), however, indicated that the number of suspension incidents were underestimated on the west side of the study area and overestimated on the east side of the study area. The Jarque-Bera statistic was significant ($p<0.01$), confirming that the residuals deviated from a normal distribution. The Koenker (BP) statistic was also significant ($p < 0.01$) and confirmed that the model has significant non-stationary variance. Using the model's residuals to calculate Moran's I, a Z-score of 7.67 indicated the presence of statistically significant clustering ($p < 0.01$) in the residuals and it was determined that a geographically weighted regression (GWR) model should be considered.

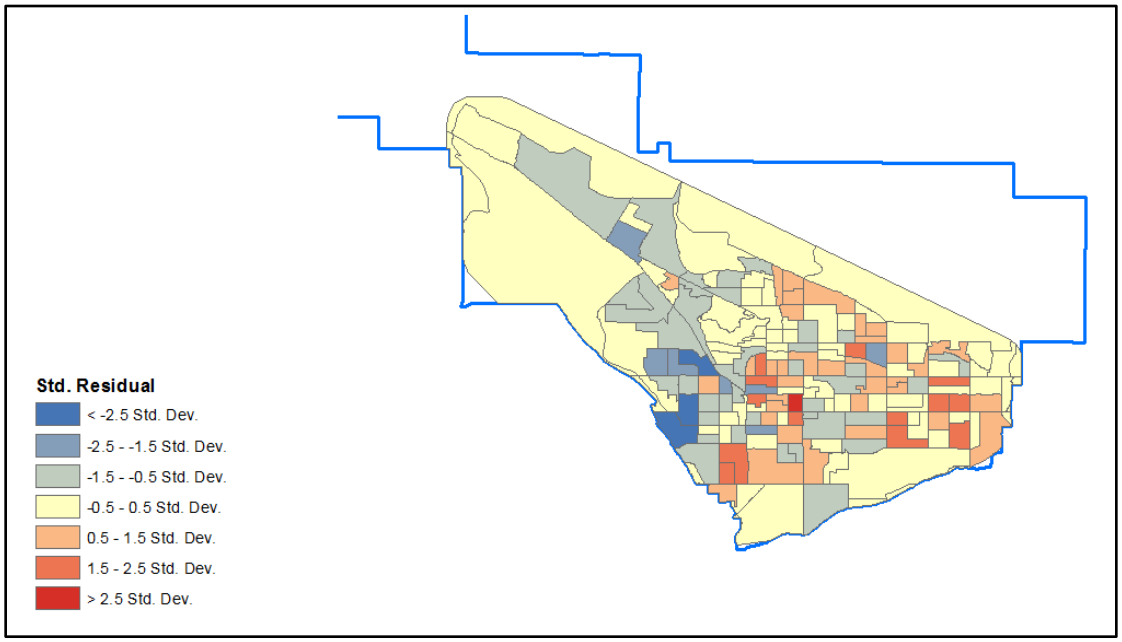


Figure 16: OLS regression model standardized residuals

4.3.3 Geographically Weighted Regression

The geographically weighted regression (GWR) model developed in Section 3.6.3 allows the regression coefficients to vary smoothly across the study area. Review of the GWR model output raster layers indicates an improved fit over the OLS model developed in Section 3.6.2 with residuals more randomly distributed across the study area (see Figure 17).

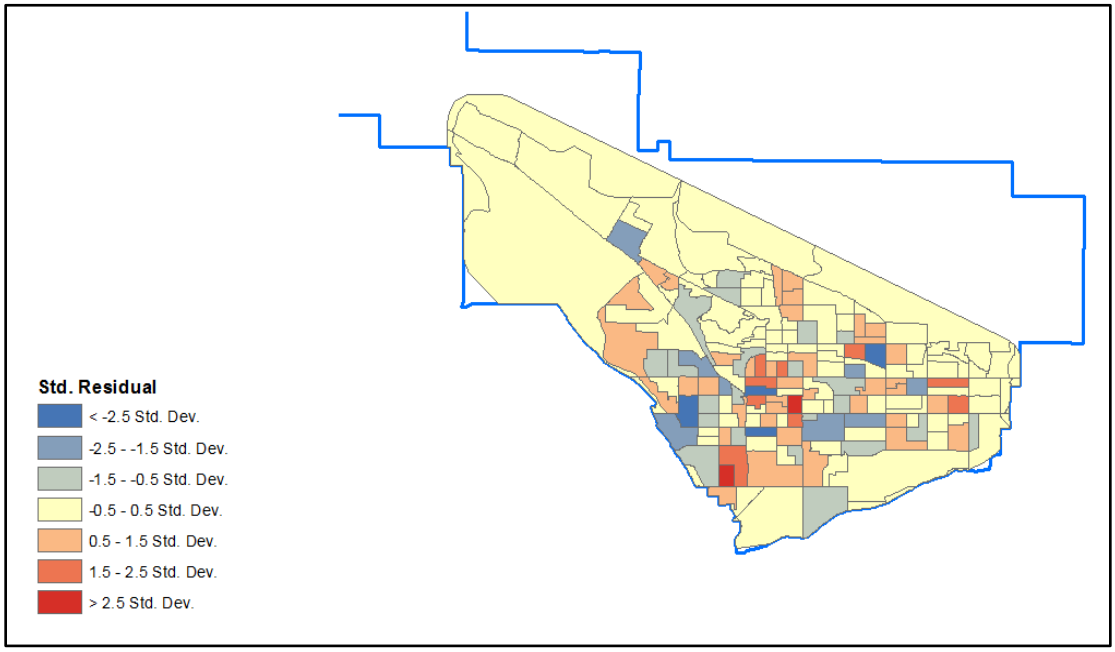


Figure 17: GWR model standardized residuals

The overall, adjusted R^2 for the GWR model increased to 0.90 with local R^2 values varying from a low of 0.57 to a high of 0.999. The GWR model accounts for the most variance in the eastern and more densely populated central portion of the study area. In the western and less densely populated Muscoy region of SBCUSD, the GWR model accounts for far less of the model variance (Figure 18).

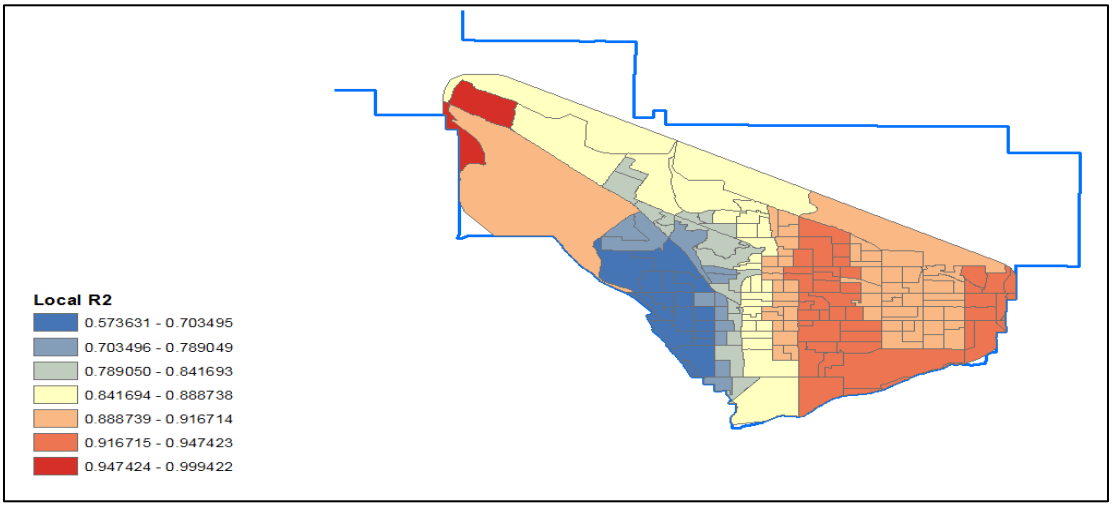


Figure 18: GWR model adjusted local R^2

In the GWR model, similar to the OLS model, coefficient #1 is the multiplier of the total number of days suspended in the 2008-09 school year of those students enrolled on CBEDS day in each census block group. It varies across the study area and ranges from 0.67 to 1.83, with the greatest weighting in more populous, central portion of SBCUSD (Figure 19).

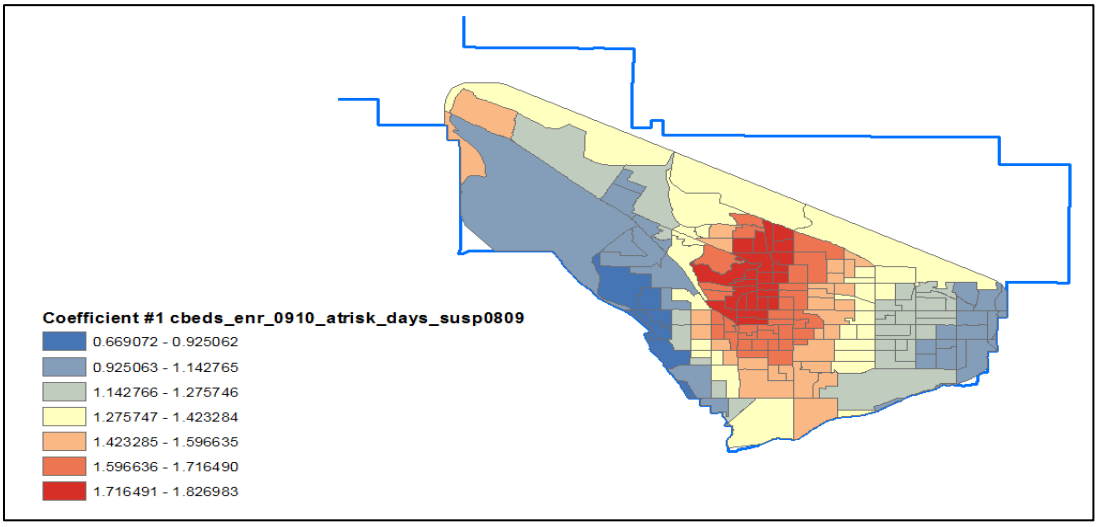


Figure 19: GWR Coefficient #1 - CBEDS enrollment total days suspended 2008-09

Coefficient #2 is the multiplier of the total number of students enrolled on CBEDS day in each census block group who were identified as LowSES. It also varies across study area and ranges from -0.14 to 0.22, with the greatest weighting in the less affluent southern portion of SBCUSD along the Santa Ana River. The northern and more affluent portions of the study area have the least weighting (Figure 20).

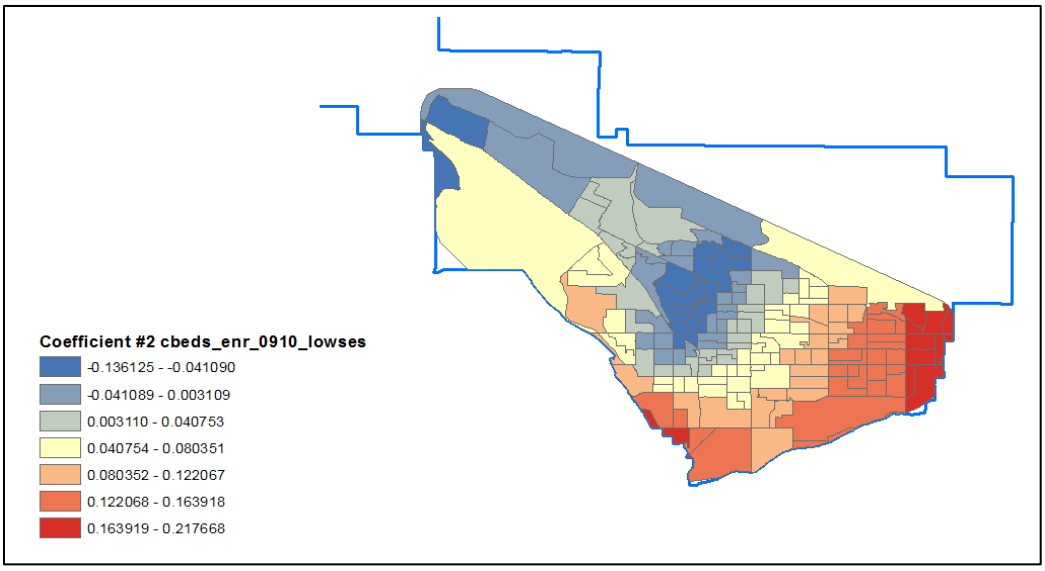


Figure 20: GWR Coefficient #2 - CBEDS enrollment identified as LowSES

As a final check of the GWR model, a comparison of the observed (Figure 21) and predicted (Figure 22) suspension incidents for the 2009-10 school year was made using maps with the same classification groupings. Consistent with the model fit indicators, the predicted model mapping closely resembles the mapping of observed suspension incidents for 2009-10. The complete GWR model coefficients and residuals are available for review in Appendix 4.

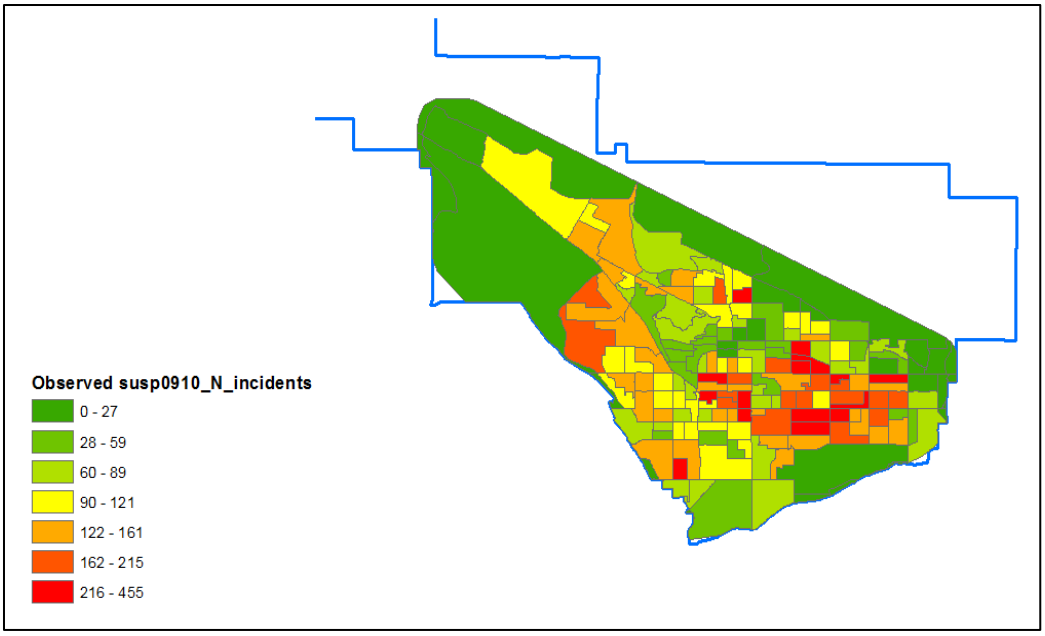


Figure 21: 2009-10 observed suspension incidents

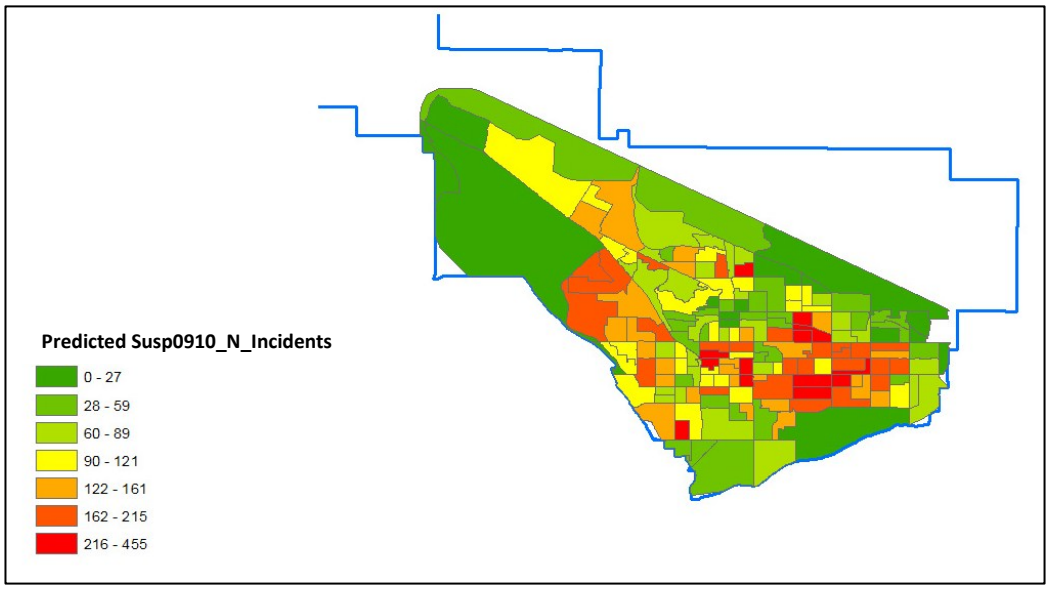


Figure 22: 2009-10 predicted suspension incidents, GWR Model

Chapter 5

Discussion and Conclusions

The objectives of this thesis research were to (1) determine if student suspension incidents were clustered within SBCUSD; if so, then (2) determine where incident clustering is most intense by elementary school neighborhood; and (3) develop a regression model, based on well-defined local factors, in order to predict overall neighborhood incident numbers. Student datasets were processed to define a suitable study area. Multiple maps were prepared to visualize enrollment and suspension incident patterns for all students and significant student subgroups. Various spatial analyses were conducted and the results were summarized in several tables. A regression model predicting overall suspension incident numbers by census block group was prepared. Results were presented in three sections and this same sequence is used below to discuss the wider significance of this work.

5.1 Patterns in Student Enrollment

Investigation into patterns in student enrollment by residence within the study area confirmed the reported high poverty rate that exists throughout SBCUSD. Only four of the 44 elementary school neighborhoods defined in this study had less than sixty percent of students identified as having low socioeconomic (LowSES) status. The overall district average showed that more than 80 percent of students included in the study were identified as LowSES. This is a significant factor that sets SBCUSD apart from many other school districts in California and likely asserts considerable influence upon the

environment that leads to out-of-school student suspensions. It would be interesting to compare the results of a similarly focused suspension study from a school district with a low poverty rate.

In addition to poverty, enrollment patterns reported in the study area were primarily defined in terms of race and ethnicity. Geographic distribution of enrollment by residence among African American students (17 percent of the overall student population) and Hispanic students (nearly 70 percent of the overall student population) in SBCUSD covered similar areas. No elementary school neighborhood had an African American student population of more than 30 percent, while several neighborhoods had Hispanic student populations of nearly 90 percent of the total enrollment. White students (10 percent of the overall student population) within the district have a geographic distribution with a center that lies more northward and runs along the foothills of the city. Many elementary school neighborhoods along the foothills have White student populations that are more than 20 percent of the enrollment total. In order to better understand the distribution of ethnicities in the district and possibly help interpret the suspension grouping patterns observed in Section 4.2.3, additional work should be done to quantify clustering of significant subgroups at a local level.

Finally, many but not all of the neighborhoods with high enrollment densities were also identified as neighborhoods having higher than average rates of suspension incidents clustering. Understanding how elementary school neighborhoods like Emmerton-Rodriguez and Mt. Vernon with similar student enrollment densities (approximately 2,000

students per square mile) might differ in ways that influence the numbers of students suspended would be an important for follow-up. Having constructed the study area using the 2010 Census Block Groups, it should be possible to compare and contrast these neighborhoods using the published US Census Bureau 5-year American Community Survey results (US Census Bureau 2011a).

5.2 Analysis of Student Suspensions

Strong evidence exists indicating that suspension incident clustering does occur within the elementary school neighborhoods of SBCUSD. As measured by Moran's Global I, distance bands of suspension incidents for all students had Z-scores greater than 2.58 indicating significant positive spatial autocorrelation of suspension incidents ($p<0.01$), thus disproving the null hypotheses of this thesis that suspension incidents for all students are evenly distributed geographically over neighborhoods throughout the entire school district. Significant results were also observed for the study's subgroups by race and ethnicity, low socioeconomic status, and suspension incident type. It would be interesting to compare suspensions within SBCUSD to a school district with a more equal heterogeneous race and ethnic mixture of students.

At the local level, analysis of suspension incidents for all students and subgroups within the study area showed hotspot patterns within the district by census block group and elementary school neighborhoods. A suspension incident clustering profile was developed and, using a choropleth map, suspension incident hot-spot patterns were visualized across the district by elementary school neighborhood. In particular, those

neighborhoods identified as group 1 in the southeast portion of SBCUSD showed the greatest percent of suspension incident clustering for all students among all elementary school neighborhoods, a near equal balance of suspension incident clustering between the African American and Hispanic subgroups, and have higher levels of incident clustering for the Low SES, Defiance and Violence subgroups. Additional studies need to be conducted to see if these trends in suspension incident patterns hold true over multiple years within the district. If so, understanding how these elementary school neighborhoods differ from the others in the study is, again, an important issue for follow-up.

5.3 Modeling Suspension Incident Rates Using Regression Analysis

Regression models were developed that demonstrate, in the case of SBCUSD, that the strongest predictor of the total number of year-end (June) suspension incidents within a census block group is the number of days previously suspended by students residing in the census block group during the October enrollment census with adjustment for the number of students living in poverty. The final GWR model developed had an overall adjusted R^2 value greater than 0.90 indicating that it accounted for over 90 percent of the variance in the model. Additional studies need to be performed to determine if this model is accurate over multiple years. If so, it could be possible to measure the effects of a suspension intervention program on the reduction in the number of suspension incidents by using a counter factual analysis. In such an analysis, after accounting for all other explanatory factors, the differences between the predicted model and actual suspension incident numbers could be attributed to the effects of the intervention program.

5.4 Final Comments

Additional research needs to be conducted to verify that the patterns noted within this thesis hold steady before any recommendation can be made to act upon the results. If such patterns are found to hold steady between years, discipline issues within SBCUSD may in part be influenced by local neighborhood factors. This becomes an opportunity for the school district to act at a local level and identify strategies to reduce suspensions and improve student outcomes.

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Appendix 1

SBCUSD Notice of Suspension

School: _____ School Number _____ Student ID Number: _____ Grade: _____

Student: _____ Parent/Guardian: _____ Birth Date: ____/____/_____

Address: _____ Home Phone: _____

Incident Date: _____/_____/_____ Time of Incident: _____ Suspension Date: _____/_____/_____

THIS NOTIFICATION IS TO INFORM THE GUARDIAN, THE ABOVE-NAMED STUDENT HAS BEEN SUSPENDED FROM SCHOOL. WHILE ON SUSPENSION, THE STUDENT IS PROHIBITTED FROM BEING ON OR NEAR ANY CAMPUS WITHIN THE SAN BERNARDINO CITY UNIFIED SCHOOL DISTRICT (EC 48900) (PENAL CODE 626.2). IF THE STUDENT IS FOUND IN VIOLATION OF THE PENAL CODE, THE STUDENT MAY BE SUBJECT TO ARREST AND/OR EXPULSION.

THE LENGTH OF THIS SUSPENSION SHALL BE: See below.

Students shall be allowed to complete all assignments and tests missed during the suspension period

- ❑ Balance of the day only
- ❑ _____days (not to exceed five consecutive school days)
- ❑ Pending recommendation for expulsion
- ❑ Extension of Suspension Requested

According *to California Law* [EC 48911(F)], the guardian MUST respond without delay, to the school site's request to attend a conference with school officials regarding the student's behavior.

Student may return to school on: ____/___/_____.

Reason for Suspension (Ed Code 48900)

_____ a(1) Caused, attempted to cause, or threatened to cause physical injury to another person
_____ a(2) Willfully used force or violence upon the person of another, except in self-defense
_____ b Possessed, sold, or otherwise furnished any firearm, knife, explosive, or other dangerous object
_____ c Possessed, used, sold, or otherwise furnished, or been under the influence of any controlled substance, alcohol or intoxicant
_____ d Offered, arranged, or negotiated to sell any controlled substance, alcohol, intoxicant or representation of items thereof
_____ e Committed or attempted robbery or extortion
_____ f Caused or attempted to cause damage to school or private property
_____ g Stole or attempted to steal school or private property
_____ h Possessed or used tobacco or tobacco products
_____ i Committed an obscene act or engaged in profanity or vulgarity
_____ j Possessed, offered, arranged or negotiated to sell any drug paraphernalia
_____ k Disrupted school activities or willfully defied valid authority
_____ l Knowingly received stolen school property or private property
_____ m Possessed an imitation firearm
_____ n Committed or attempted to commit a sexual assault
_____ o Harassed, threatened, or intimidated a witness
_____ p Sexual Harassment (EC 48900.2)
_____ q Hate violence (48900.3)
_____ r Intentionally engaged harassment, threats, or intimidation against a pupil, groups of pupils, or staff (EC § 48900.4)
_____ s Pupil has made terroristic threats against school officials or school property, or both (EC § 48900.7)
_____ t Unlawfully arranged to sell drug Soma
_____ u Aided or abetted the infliction or attempted infliction of physical injury
_____ v Engaged in or attempted to engage in hazing
_____ w 48915 (c) Mandatory Expulsion
_____ x Engaged in an act of bullying, electronic bullying as defined by EC 32261 (defined by Penal Code 240, 242)
_____ x1 Engaged in bullying based on sexual orientation
_____ x2 Engaged in bullying based on ethnicity or race
_____ x3 Engaged in bullying based on physical and/or mental disability

***Education Code Section 48915 (ABRIDGED):**

_____ (a)(1) Causing serious physical injury to another person, except in self-defense
_____ (a)(2) Possession of any knife, explosive, or other dangerous object of no reasonable use to the pupil
_____ (a)(3) Unlawful possession of any controlled substance, (except for the first offense of not more than one ounce of marijuana)
_____ (a)(4) Robbery or extortion
_____ (a)(5) Assault or battery upon any school employee
_____ (c)(1) Possessing, selling, or otherwise furnishing a firearm
_____ (c)(2) Brandishing a knife at another person
_____ (c)(3) Unlawfully selling a controlled substance
_____ (c)(4) Committing or attempting to commit a sexual assault
_____ (c)(5) Possession of an explosive

Attach Suspension Justification Due Process form to this document.

1. Is this student **Special Education?** Yes ( ) No ( ) **OR** Does this student have a **504?** Yes ( ) No ( ).
If the answer was yes to either of the above, has the site scheduled a pre-expulsion meeting? Pre-expulsion meeting Date: _____ Time: _____

2. Was an informal conference held prior to the suspension with the student by Principal/Designee? Yes ( ) No ( )

3. Has a Due Process pre-expulsion meeting been held? Yes ( ) No ( ) NA ( )

4. Was reason for this suspension explained to the student? Yes ( ) No ( )

5. Was the student cited? Yes ( ) No ( ) If yes, by whom: _____ Penal Code Violation: _____

6. A conference with the guardian has been scheduled: Date _____ Time _____ Place _____

7. Counting this suspension, the above named student has _____ day(s) suspension - include current school year only.

8. Has a suspension re-entry meeting been scheduled? Meeting Date: _____ Time: _____

9. Was student informed of school rules? Yes ( ) No ( ) If yes, what date: _____

I, the above named student, have read and understand this Notice of Suspension. Student Signature: _____

By signing this notice of suspension, the administration certifies a thorough investigation has been conducted.

Signature of Administrator issuing this suspension & Title: _____ Print Name: _____

The guardian may appeal this suspension by contacting the site principal or the superintendent's designee: Phone 880-6812.

School MUST contact victims of violent crimes to offer transfer option under NCLB

Appendix 2

SBCUSD Suspension Incident Rank Reporting Plan

Instructions

Suspensions and expulsions - Assemble, for each school with a separate CDS code in the LEA, statistics about all suspensions and expulsions for the current fiscal year, including the summer session.

1. The annual number of suspension and expulsion actions is needed separately for each section of the *EC.* For each suspension or expulsion, report ***only one*** code section describing the most severe offense. If a Section 48915 offense is one of the code sections cited, the Section 48915 offense ***must*** be reported. When a student is expelled, also report the suspension that preceded the expulsion. *(SBCUSD severity order listed below)*

2. All expulsions must be reported, including those that are suspended, modified, or stipulated. "In-school" suspensions and suspensions from only one class are not reportable. Suspensions or expulsions from summer school programs will be reported for the site at which the summer school program was held. *(Expulsion action type marked A – E are included)*

3. A suspension or expulsion will be reported as occurring in the current fiscal year when the disciplinary action was taken in the current fiscal year. The fiscal year in which the actionable incident occurred is not relevant. For expulsions the date of the school board action is the relevant date. *(Reporting year period per Youth Services runs from May 15 to May 14 of the following year.)*

UMIRS Suspension Code Order of Severity
Determined by SBCUSD Youth Services

Ed Code 48915	Ed Code 48900	
1. 48915_c1	11. 48900_b	24. 48900_i
2. 48915_c2	12. 48900_n	25. 48900_r
3. 48915_a1	13. 48900_d	26. 48900_p
4. 48915_a5	14. 48900_e	27. 48900_o
5. 48915_c4	15. 48900_c	28. 48900_k
6. 48915_c3	16. 48900_a2	29. 48900_v
7. 48915_c5	17. 48900_a	30. 48900_j
8. 48915_a2	18. 48900_s	31. 48900_m
9. 48915_a4	19. 48900_t	32. 48900_u
10. 48915_a3	20. 48900_q	33. 48900_l
	21. 48900_f	34. 48900_x
	22. 48900_g	35. 48900_x1
	23. 48900_h	36. 48900_x2
		37. 48900_x3

Prepared by Research Revised 6/7/2011

Appendix 3

OLS Summary of Results

Summary of OLS Results

Variable	Coefficient	StdError	t-Statistic	Probability	Robust_SE	Robust_t	Robust_Pr	VIF [1]
Intercept	0.631966	3.508828	0.180107	0.857274	2.940627	0.214909	0.830090	--------
CBEDS_ENR_0910_LOWSES	0.054569	0.022388	2.437439	0.015788*	0.025990	2.099637	0.037195*	4.092129
CBEDS_ENR_0910_ATRISK_DAYS_SUSP0809	1.372535	0.085949	15.969102	0.000000*	0.110633	12.406249	0.000000*	4.092129

OLS Diagnostics

Input Features:	BG_Join_CBEDS_OLS	Dependent Variable:	SUSP0910_N_INCIDENTS
Number of Observations:	177	Akaike's Information Criterion (AICc) [2]:	1656.109296
Multiple R-Squared [2]:	0.885434	Adjusted R-Squared [2]:	0.884117
Joint F-Statistic [3]:	672.385257	Prob(>F), (2,174) degrees of freedom:	0.000000*
Joint Wald Statistic [4]:	727.079961	Prob(>chi-squared), (2) degrees of freedom:	0.000000*
Koenker (BP) Statistic [5]:	42.456021	Prob(>chi-squared), (2) degrees of freedom:	0.000000*
Jarque-Bera Statistic [6]:	15.723807	Prob(>chi-squared), (2) degrees of freedom:	0.000385*

Notes on Interpretation

* Statistically significant at the 0.05 level.
[1] Large VIF (> 7.5, for example) indicates explanatory variable redundancy.
[2] Measure of model fit/performance.
[3] Significant p-value indicates overall model significance.
[4] Significant p-value indicates robust overall model significance.
[5] Significant p-value indicates biased standard errors; use robust estimates.
[6] Significant p-value indicates residuals deviate from a normal distribution.

Appendix 4

GWR Model by Census Block Group

	Observed			GWR Model					
Object ID	2009-10 Suspension Incidents	2009-10 CBEDS Enr N Days Susp 2008-09	2009-10 CBEDS Enr N Low SES	LocalR2	Predicted	Intercept	Coefficient #1	Coefficient #2	Residual
1	330	192	713	0.920764	329.644201	-16.248372	1.364848	0.117589	0.355798
2	37	34	62	0.915196	51.566939	2.234735	1.17202	0.152959	-14.566939
3	85	62	179	0.92675	91.388068	-18.507404	1.561508	0.073083	-6.388068
4	177	113	651	0.927351	205.732257	-21.675898	1.567811	0.077181	-28.732257
5	178	92	451	0.920374	161.776293	-13.6301	1.418986	0.099466	16.223706
6	1	0	5	0.918514	-10.987524	-11.747625	1.201812	0.15202	11.987524
7	50	25	182	0.925798	34.300365	-16.425329	1.606513	0.058037	15.699634
8	241	163	544	0.919477	272.164063	-9.109539	1.458001	0.080182	-31.164063
9	123	90	233	0.923575	139.972093	-13.334111	1.502888	0.077451	-16.972093
10	64	46	343	0.925057	76.103711	-19.369022	1.616076	0.061612	-12.103711
11	105	57	263	0.919716	95.703191	-3.12962	1.557467	0.03824	9.296808
12	131	69	221	0.912129	112.51768	-1.805542	1.419416	0.074133	18.482319
13	237	165	522	0.919374	270.924723	-14.219998	1.373106	0.112226	-33.924723
14	37	18	120	0.868805	22.448611	-3.657733	1.826983	-0.056494	14.551388
15	83	41	207	0.789048	58.053285	-22.335332	1.03417	0.183515	24.946714
16	46	30	85	0.923114	45.849428	-5.192742	1.659569	0.014765	0.150571
17	44	40	174	0.764678	61.174129	9.238996	1.311954	-0.00312	-17.174129
18	161	118	333	0.814723	163.342451	8.376217	1.3045	0.003108	-2.342451
19	123	109	420	0.814609	146.985029	16.712029	1.067818	0.033049	-23.985029
20	132	86	275	0.829114	118.682501	14.326584	1.11584	0.030522	13.317498
21	170	103	257	0.925232	164.343154	-12.32285	1.569908	0.058231	5.656845
22	14	10	54	0.90545	21.801383	8.449151	1.035274	0.055545	-7.801383
23	104	72	197	0.824248	99.791731	14.247418	1.132553	0.020307	4.208268
24	86	55	159	0.909712	88.315545	-6.011269	1.775071	-0.020767	-2.315545
25	89	71	226	0.920523	115.013265	-5.342255	1.534241	0.05055	-26.013265
26	18	9	47	0.911752	16.715309	1.024138	1.47164	0.052051	1.28469
27	105	41	249	0.909826	75.893474	0.293865	1.413508	0.070866	29.106525
28	119	60	182	0.915167	97.520569	-1.545334	1.487026	0.054089	21.47943
29	127	75	300	0.910948	120.486509	-16.99814	1.679451	0.038419	6.51349
30	38	42	141	0.904295	52.837543	-24.914511	1.58149	0.08035	-14.837543
31	107	79	336	0.91585	127.168471	-24.641639	1.596634	0.076416	-20.168471
32	115	62	295	0.91063	97.053654	-23.366038	1.62247	0.067208	17.946345
33	51	32	137	0.867249	37.294658	-22.76526	1.569105	0.071887	13.705341
34	245	140	407	0.911744	232.820772	-2.773452	1.805112	-0.042067	12.179227
35	99	46	169	0.910932	73.253736	-1.327522	1.818182	-0.05358	25.746263
36	62	45	174	0.800611	68.967549	13.067427	1.142765	0.025722	-6.967549
37	100	75	193	0.871811	100.023438	9.460461	1.226979	-0.007567	-0.023438
38	66	43	286	0.692045	65.763047	-4.865518	1.299524	0.05157	0.236952
39	119	112	350	0.867157	179.025468	-21.060289	1.607254	0.057352	-60.025468
40	146	78	208	0.88249	118.339578	-20.13802	1.648307	0.047642	27.660421
41	280	153	548	0.858281	252.334604	-14.115355	1.70334	0.010654	27.665395
42	184	98	329	0.897013	159.130395	-17.44179	1.688005	0.033883	24.869604
43	184	93	409	0.894797	153.427152	-18.860683	1.673333	0.040752	30.572847
44	455	250	715	0.915721	430.930887	-19.207584	1.656896	0.050229	24.069112
45	64	29	129	0.84961	40.510948	-6.257892	1.795498	-0.041089	23.489051
46	158	134	325	0.866512	219.575963	-12.91402	1.729269	0.002362	-61.575963
47	236	121	335	0.871154	198.17854	-11.551002	1.749837	-0.005972	37.821459
48	136	62	251	0.903208	97.601438	-12.451315	1.727272	0.0118	38.398561
49	160	65	248	0.870579	101.263546	-8.344093	1.787921	-0.026642	58.736453
50	131	105	428	0.694494	152.538366	-1.467381	1.380559	0.021137	-21.538366
51	103	87	323	0.701329	125.984974	2.375895	1.470372	-0.013353	-22.984974
52	151	101	463	0.641087	137.346526	12.10589	1.246596	-0.001437	13.653473
53	104	93	363	0.643524	125.484372	14.827356	1.128171	0.015804	-21.484372
54	147	106	319	0.850974	143.267407	12.222473	1.180318	0.018593	3.732592
55	56	43	240	0.691344	63.75412	-7.68695	1.225039	0.078184	-7.75412
56	111	53	137	0.888737	81.470657	-11.002696	1.756654	-0.004593	29.529342
57	93	76	322	0.915444	123.954859	-13.361927	1.690968	0.027338	-30.954859
58	18	15	100	0.896915	16.702555	-8.269753	1.777516	-0.016904	1.297444
59	24	19	110	0.89663	22.918965	-9.65673	1.763591	-0.008477	1.081034

Appendix 4 (Cont'd.)

	Observed			GWR Model					
Object ID	2009-10 Suspension Incidents	2009-10 CBEDS Enr N Days Susp 2008-09	2009-10 CBEDS Enr N Low SES	LocalR2	Predicted	Intercept	Coefficient #1	Coefficient #2	Residual
60	42	37	124	0.919542	54.923592	-10.008217	1.692575	0.0186	-12.923592
61	108	56	220	0.911324	89.063118	-4.455379	1.787582	-0.029936	18.936881
62	81	39	233	0.921523	60.216112	-12.459139	1.66524	0.033179	20.783887
63	104	63	189	0.884757	101.271805	-3.308038	1.821304	-0.053769	2.728194
64	47	26	117	0.893358	36.78806	-6.334282	1.801357	-0.031734	10.211939
65	19	18	106	0.910438	22.928229	-7.784417	1.753838	-0.008079	-3.928229
66	70	32	274	0.838558	57.551185	-23.809387	1.235672	0.152624	12.448814
67	68	37	356	0.772433	54.399663	-9.849764	1.547269	0.019664	13.600336
68	61	57	256	0.806664	84.142907	-7.160632	1.699205	-0.021684	-23.142907
69	43	38	219	0.794156	52.650257	-1.578573	1.738183	-0.053982	-9.650257
70	46	21	153	0.783438	28.436787	2.711915	1.698951	-0.065052	17.563212
71	59	30	231	0.782117	38.359659	2.016717	1.71649	-0.065592	20.64034
72	27	33	97	0.92083	49.556212	-7.428251	1.700471	0.008957	-22.556212
73	0	0	0	0.841692	-21.91135	-21.91135	1.010619	0.198305	21.91135
74	0	0	0	0.726038	-19.239688	-19.239688	0.796357	0.213501	19.239688
75	0	0	0	0.735877	-19.819198	-19.819198	0.858597	0.203859	19.819198
76	15	16	53	0.866644	27.907383	7.660412	1.312247	-0.014131	-12.907383
77	0	0	0	0.999299	6.736258	6.736258	1.596282	-0.136125	-6.736258
78	14	6	14	0.903434	14.78961	5.552325	1.371456	0.072039	-0.78961
79	64	50	157	0.879969	77.029712	-0.565428	1.667192	-0.036716	-13.029712
80	23	16	70	0.999422	22.937635	6.884021	1.586501	-0.133291	0.062364
81	180	105	767	0.699951	164.610957	26.4505	0.669072	0.088536	15.389042
82	206	119	370	0.908186	193.090818	-1.662829	1.25705	0.122066	12.909181
83	135	98	383	0.923192	161.442625	-18.950161	1.37106	0.120179	-26.442625
84	167	112	400	0.925015	185.234929	-16.744472	1.504554	0.083673	-18.234929
85	0	0	0	0.917754	-6.876316	-6.876316	1.131622	0.16308	6.876316
86	106	60	300	0.576549	89.175453	20.360963	0.828941	0.063593	16.824546
87	120	67	218	0.823364	95.568532	12.11046	1.171336	0.022837	24.431467
88	0	0	0	0.947422	-5.278829	-5.278829	1.090597	0.217668	5.278829
89	0	0	1	0.94201	-3.895823	-4.107998	1.088279	0.212174	3.895823
90	99	55	328	0.914522	101.840294	-8.799112	1.328493	0.114549	-2.840294
91	29	22	98	0.924794	29.407589	-10.308972	1.586645	0.049085	-0.407589
92	124	97	269	0.924066	153.342305	-20.873244	1.619463	0.063671	-29.342305
93	53	36	106	0.923945	53.180283	-8.617291	1.577614	0.047202	-0.180283
94	258	131	659	0.774822	228.548369	-21.118081	1.181592	0.143972	29.45163
95	19	17	38	0.929537	25.243873	-0.989613	1.137841	0.18132	-6.243873
96	65	35	210	0.906627	68.463337	-0.057959	1.275745	0.113667	-3.463337
97	75	31	155	0.906117	60.310174	2.720102	1.223259	0.126896	14.689825
98	0	0	0	0.932314	-1.173436	-1.173436	1.084607	0.199287	1.173436
99	51	33	174	0.920219	69.326406	2.959312	1.101377	0.172538	-18.326406
100	151	95	312	0.913726	158.036057	2.787508	1.123693	0.155441	-7.036057
101	157	111	732	0.774513	162.813016	18.376785	0.970732	0.050116	-5.813016
102	178	121	586	0.788701	166.194719	18.821469	0.971081	0.050976	11.80528
103	160	140	598	0.692771	189.78403	9.499575	1.397621	-0.025723	-29.78403
104	141	83	325	0.910095	143.743136	-0.429995	1.18571	0.140797	-2.743136
105	168	91	430	0.912339	172.126444	3.015792	1.139252	0.152182	-4.126444
106	292	187	523	0.908875	295.659295	0.035908	1.198919	0.136568	-3.659295
107	4	1	12	0.940449	-0.029612	-3.583946	1.106897	0.203953	4.029612
108	97	48	162	0.905833	80.260263	1.008224	1.303733	0.102918	16.739736
109	76	36	200	0.925135	48.036127	-24.970372	1.56644	0.083073	27.963872
110	105	53	217	0.712559	78.065807	5.045516	1.534492	-0.038284	26.934192
111	74	80	286	0.769618	120.560211	-0.976019	1.676072	-0.043879	-46.560211
112	81	93	332	0.584527	120.978958	8.820912	0.885561	0.089761	-39.978958
113	8	2	18	0.936931	3.145942	-2.699236	1.095178	0.203045	4.854057
114	86	29	194	0.923067	69.031561	2.339229	1.086146	0.181412	16.968438
115	243	111	721	0.911395	228.381856	-4.709305	1.234725	0.133199	14.618143
116	165	110	284	0.90857	170.709159	-1.202236	1.226519	0.130261	-5.709159
117	206	98	449	0.911207	183.153654	3.074574	1.155089	0.148953	22.846345
118	18	16	80	0.928296	32.221296	-0.419824	1.119638	0.184086	-14.221296

Appendix 4 (Cont'd.)

	Observed			GWR Model					
Object ID	2009-10 Suspension Incidents	2009-10 CBEDS Enr N Days Susp 2008-09	2009-10 CBEDS Enr N Low SES	LocalR2	Predicted	Intercept	Coefficient #1	Coefficient #2	Residual
119	118	70	243	0.85679	106.929028	-15.868828	1.675368	0.022724	11.070971
120	181	119	514	0.888111	183.518359	-1.965652	1.798162	-0.055442	-2.518359
121	86	56	204	0.863811	85.699235	-0.839563	1.745245	-0.054877	0.300764
122	68	52	159	0.867346	76.228945	5.823309	1.338198	0.005152	-8.228945
123	91	47	181	0.899345	73.233445	-1.658002	1.804799	-0.054884	17.766554
124	84	61	191	0.81286	94.350309	1.362073	1.728417	-0.065158	-10.350309
125	0	0	0	0.837506	-22.081452	-22.081452	1.01307	0.197389	22.081452
126	18	16	48	0.925981	26.618169	-0.050564	1.135133	0.17722	-8.618169
127	73	31	209	0.925997	73.07479	0.551124	1.110648	0.182265	-0.07479
128	35	13	103	0.903958	30.703557	3.620336	1.302618	0.098535	4.296442
129	0	0	0	0.686483	-15.401789	-15.401789	0.695833	0.21711	15.401789
130	0	0	3	0.9115	3.32837	2.892035	1.180595	0.145445	-3.32837
131	237	122	422	0.913387	208.757118	2.775869	1.162022	0.152167	28.242881
132	249	136	406	0.918202	222.364417	-5.994755	1.473933	0.068729	26.635582
133	75	41	171	0.923738	58.616134	-17.50507	1.632514	0.053731	16.383865
134	124	94	268	0.595859	118.492884	18.890967	0.925061	0.047186	5.507115
135	123	90	532	0.703495	127.524636	15.251156	1.079206	0.028467	-4.524636
136	151	161	603	0.622022	213.423807	9.320987	1.171533	0.025681	-62.423807
137	46	31	139	0.859139	44.856441	-3.809538	1.824825	-0.05686	1.143558
138	59	56	268	0.840046	82.496583	-3.862758	1.807658	-0.055483	-23.496583
139	99	49	218	0.886005	69.889586	-25.348719	1.510996	0.097245	29.110413
140	52	30	156	0.888188	37.981945	-23.5153	1.330118	0.138421	14.018054
141	46	21	134	0.905027	45.025585	3.034158	1.250168	0.117446	0.974414
142	62	18	108	0.913958	39.702195	2.434625	1.188202	0.147036	22.297804
143	132	78	231	0.913466	128.420366	2.927932	1.154329	0.153483	3.579633
144	124	44	265	0.916713	95.892359	3.741471	1.107107	0.163917	28.10764
145	35	23	97	0.916459	44.839245	3.256878	1.122309	0.162569	-9.839245
146	215	101	402	0.916655	182.383158	2.79569	1.133054	0.162062	32.616841
147	58	32	144	0.836439	49.019303	5.22223	1.407965	-0.008734	8.980696
148	79	61	155	0.831378	88.266354	8.148599	1.299904	0.005313	-9.266354
149	0	0	0	0.684979	-14.943197	-14.943197	0.754353	0.203467	14.943197
150	0	0	0	0.57363	23.753636	23.753636	0.69294	0.083433	-23.753636
151	96	70	394	0.764867	102.191479	-4.571703	1.611491	-0.015333	-6.191479
152	93	49	239	0.815031	70.908492	-12.160829	1.641753	0.010976	22.091507
153	195	110	369	0.911141	182.216429	-15.446636	1.689427	0.032048	12.78357
154	85	63	312	0.849074	96.798496	-17.4875	1.634108	0.036337	-11.798496
155	253	131	481	0.915648	221.914873	-21.499994	1.640834	0.059179	31.085126
156	144	88	375	0.902675	144.325551	-21.20556	1.64881	0.054495	-0.325551
157	132	85	357	0.929354	137.471002	-24.789805	1.497583	0.097944	-5.471002
158	130	79	433	0.911187	155.456453	0.288308	1.163743	0.146033	-25.456453
159	107	98	471	0.631146	132.098949	21.661666	0.8203	0.063795	-25.098949
160	147	109	448	0.686508	160.862704	-12.838362	0.983776	0.148369	-13.862704
161	21	4	37	0.922219	4.958438	-1.573382	1.696481	-0.006867	16.041561
162	121	79	328	0.87441	119.215441	-0.729843	1.709653	-0.046089	1.784558
163	145	108	370	0.848398	159.314766	2.03653	1.544723	-0.025815	-14.314766
164	124	93	277	0.83169	139.309693	2.295204	1.579796	-0.035764	-15.309693
165	117	83	441	0.803871	133.560512	-17.006495	1.510899	0.057057	-16.560512
166	152	64	443	0.798958	113.372668	-21.211474	1.351241	0.108588	38.627331
167	103	56	366	0.755993	87.772889	-12.646747	1.423283	0.0566	15.22711
168	69	58	268	0.928399	87.547069	-25.748607	1.481398	0.102143	-18.547069
169	245	148	513	0.914631	246.981897	-5.97673	1.396932	0.090083	-1.981897
170	86	86	342	0.910916	146.055831	-2.523592	1.376445	0.088318	-60.055831
171	190	104	382	0.913878	173.570054	-7.183994	1.353598	0.104659	16.429945
172	230	144	259	0.907988	212.228971	-1.61535	1.275431	0.116533	17.771028
173	198	85	536	0.913026	173.675951	-4.920708	1.198979	0.143066	24.324048
174	137	79	482	0.928072	139.606955	-23.555515	1.54713	0.084935	-2.606955
175	0	0	1	0.932747	-26.588505	-26.731982	1.318292	0.143477	26.588505
176	132	100	325	0.907066	165.60365	1.849279	1.208427	0.132035	-33.60365
177	63	47	156	0.811197	71.532861	2.548283	1.630931	-0.049161	-8.532861