School Location, Year Built and Youth Pedestrian Crashes:

Safety Around Schools in New Jersey

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Prepared for:
State of New Jersey Department of Transportation
Federal Highway Administration

Date:
January 2014

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NEW JERSEY Safe Routes to School
www.saferoutesnj.org

DEPARTMENT OF TRANSPORTATION THE STATE OF NEW JERSEY

U.S. Department of Transportation
Federal Highway Administration

Contents

Abstract

School siting is an important land use and planning issue for transportation professionals and agencies. Students' ability to walk and bike to and from school and parents' and students' perceptions of safety depends on where schools are located. Nationwide, large schools are being built at greater distances from neighborhoods. As a result, students walk and bicycle to and from school less frequently and parents, tax-payers, and schools bear additional costs because of the need to drive and bus students to and from school.

The research contained in this report evaluates the characteristics of K-8 students, the schools, and the areas surrounding schools based on the establishment year of each school to examine crash trends. Establishment year for 82% of public schools with at least 30 students in grades K-8 were obtained from the Office of School Facilities of the New Jersey Department of Education (NJDOE). The Plan4Safety database allowed for evaluation of youth pedestrian crashes (under 18 years of age) within half a mile of the school. Demographic data was gathered from the American Community Survey.

Fifteen schools with high numbers of youth pedestrian crashes within half a mile of the school were examined in more depth by using Bing aerial photos, NJDOT's Straight Line Diagrams, and Google Earth. Lastly, field visits were conducted at one case study location: Roosevelt Elementary in New Brunswick.

Based on our analyses, schools in New Jersey appear to have grown over time only in terms of the number of students but not in terms of parcel or class size. Additionally, of all the schools with establishment years, 67% are located on local roads, 21% are located on county roads, and 12% are

located on state roads. Among the schools established in the 1960s and 1970s, only 6-7% are located on state roads, whereas among the schools established in the 1980s and 1990s, 18-19% are located on state roads. However, only 12% of the schools established since 2000 are located on state roads.

Lastly, the analyses showed that the number of crash incidents is highest around schools established prior to 1910 and lowest for schools established in the 1960s. Crash incidents are more frequent around schools established after 1970, although they are less frequent than the schools established prior to 1940. The number of pedestrian crash incidents is much higher around schools in Abbott districts compared to other schools. Of the 60 schools with the highest number of crash incidents within a half-mile buffer, all but two are located in Abbott districts.

School siting practices should be examined to avoid dangerous infrastructure, with special attention paid to urban areas in order to encourage walking and bicycling to school.

Background

School siting practices may have consequences for transportation planning because of the relationship to land use. Students' ability to walk and bike to school in addition to parents' travel behavior depends on the location of schools. Where schools are located, known as school siting, impacts the mode of transportation that community members use to get to and from area schools. School siting practices can also impact roadway congestion, and traffic safety, as well as fuel consumption by the transportation sector. In a 2003 study, the Environmental Protection Agency (EPA) concluded that school siting practices are important not only for school children and staff, but for entire communities and society at large *(1)*.

Over the past 40 years, active travel, such as walking and bicycling, has been on the decline, especially for children. Only 12.9% of all US schoolchildren used active travel to school in 2001 compared to 40% in 1969 *(2)*. Active travel decline occurred even for those living close to school. In the 1960s, more than 85% of students living within a mile walked to school, while by the early 2000s fewer than half walked *(2)*. During this same time, driving to school increased from approximately 20% to 55% *(2)*. In a document titled *"Travel to School: The Distance Factor,"* The Federal Highway Administration (FHWA) attributes the decrease in walking and bicycling school trips to the increasing distance between schools and homes, often caused by school siting practices *(3)*. A report by the Government Accountability Office (GAO) recommends that the FHWA work with the Environmental Protection Agency (EPA) to address Safe Routes to School (SRTS) issues, including school siting.

As a result of the growing concerns about the evolving pattern of school siting, including active travel, traffic safety and fuel consumption, in October 2011 the EPA published its voluntary *School Siting Guidelines* pursuant to the Energy Independence and Security Act (EISA) of 2007 *(4)*. These guidelines focus on transportation for students and staff, efficient use of energy, and potential use of schools as emergency shelters. Simultaneously, the EPA has noted the nationwide trend toward bigger schools requiring larger sites. This upsizing in schools resulted in a nationwide decrease of elementary and secondary schools from 200,000 to 62,000 between 1940 and 1990, despite a 70 percent growth in population during this period. Although economic efficiency may be enhanced by having fewer schools with larger populations, there are adverse impacts of this trend. First, by increasing the distance between homes and schools, students are discouraged from walking and bicycling to schools. Several studies have found that distance to school is the single most important reason that parents drive children to school *(5)*. Second, several studies have shown that the practice of locating schools near major roadways adversely affects the health

of students because of air pollution from vehicle emissions. Third, the trend imposes additional travel costs on the government, school districts, and parents because of the increased need to bus and drive students to and from school. Lastly, and the focus of this study, research shows that because of the larger space requirement and need to attract more students many new schools are located on major roads, thereby exposing students to unsafe traffic conditions.

In order to determine the consequences of school siting of New Jersey public schools on crash data, the characteristics of the K-8 students, the schools, and the areas surrounding schools established in different time periods and their relationship to crash data were evaluated.

Literature Review

The location and size of schools are important factors for transportation planners because they affect the mode use patterns of school children and their parents, as well as the safety of children walking or bicycling to school. When schools are located far from homes, the propensity of children to walk or bicycle to school diminishes. School siting policies and practices that affect the size and location of schools can have serious environmental consequences due to the emission of greenhouse gases by school-related motorized travel, as well as health consequences due to high exposure to bus fumes and diminished physical activity by children *(6-7)*. Similarly, when schools are located on or near roads with high traffic volumes and speed, the safety of school children is compromised. Thus, excessive distance between homes and schools, as well as the location of schools in unsafe environments, can be a deterrent to the efforts to promote walking and bicycling among children.

Fortunately, school siting practices have come under immense scrutiny by government agencies in recent years. In a 2003 study, the EPA showed a grave concern about the consequences of changes in school characteristics over time *(1)*. According to the study, the number of schools nationwide has decreased 70% since World War II, whereas the average number of students per school has increased fivefold, from 127 to 653. In addition to emphasizing that the replacement of small neighborhood schools with fewer, larger schools discourages walking and bicycling among children, the study claims that due to an increasingly poorer walking environment around schools, many students who live within walking distance currently travel to school predominantly by school bus or household vehicle *(1)*.

School siting is very important to promote active travel as a large number of studies have found that distance between home and school decreases children's propensity to walk and bicycle to school *(7-12)*. In a review of studies from various countries, Stewart noted that 21 of 22 attempts by researchers showed evidence that the distance to school is a deterrent to walking and bicycling to school *(8)*. In three other studies using US National Household Travel Survey (NHTS) data, McDonald concluded *(7, 9, 10)* that distance to school decreases the propensity for active travel to school. In one of those studies *(10)*, she concluded that the increase in distance between home and school can potentially explain about half the decrease in walking and bicycling by school children between 1969 and 2001.

The literature shows that the increasing distance between homes and schools is primarily due to the replacement of small neighborhood schools by large regional schools that draw students from more distant locations. Small neighborhood schools are consistently being replaced despite having been shown to promote walking and bicycling, while maintaining better academic standards *(12)*. One study in Georgia found that small enrollment size was associated with more walking and bicycling to school by children *(13)*, however, the trend away from small neighborhood schools remains. Some authors have attributed this trend to suburbanization, a tendency to build new schools on undevel-

oped land, and minimum lot size requirements *(14)*, while others showed the economic efficiency larger schools can provide by placing multiple community amenities on one site *(15)*.

Studies have also shown that urban form and socioeconomic characteristics play a substantial role in determining children's transportation mode to school *(16-17)*. McMillan *(16)* found that physical characteristics of homes as well as street characteristics affect children's travel mode to school, whereas Kerr, et al., *(17)* found that children's travel to school in high-income and low-income areas is affected by the physical attributes of neighborhoods and streets. Although, as shown in Stewart *(8)*, a large number of variables, including distance to school, sidewalk quality, street connectivity, walkability, land use mix, and population density, have been found to have a significant effect on walking and bicycling by school children, in the realm of school siting practices, size of schools and distance to schools have attracted the most attention. In an attempt to address these issues, the EPA published its first School Siting Guidelines in 2011 *(4)*, which suggest, among other things, consideration of distance to school, size of schools, design of schools, cost of school transportation, availability of alternative transportation modes, and sidewalk connectivity when determining school location. Similar guidelines have been published by at least two states, Oregon and California, as well as a metropolitan planning organization, the Atlanta Regional Commission *(18-20)*. Although these recommendations may help some states and municipalities to consider more issues as they plan for school sitings in the future, many large schools throughout the country have already replaced small neighborhood schools, the impacts of which are still being examined.

Travel to and from School by New Jersey Children

New Jersey faces the same issues that arise nationally where the increasing distance between home and school and the location of schools in hazardous areas are the primary transportation-related concerns regarding school siting practices. Based on the analysis of 2009 National Household Travel Survey (NHTS) data, distance to school is a less serious concern in New Jersey compared to most other states, whereas safety of children walking or bicycling to school is a much greater concern.

According to the NHTS, 13% of the New Jersey children aged 5-15 walk to or from school, 45% travel by household vehicle, and 42% take a school bus. The proportion of walking trips and trips by household vehicles for New Jersey children is virtually identical to the national average despite the fact that New Jersey children, on average, live closer to school than children in most states. While 52% of school children nationwide live farther than two miles and 71% live farther than one mile from school, 45% of students in New Jersey live farther than two miles and 64% live farther than one mile. In many states, including West Virginia, Delaware, Kentucky, Louisiana, Mississippi, and Tennessee, more than 75% students live farther than two miles from school. Due to this proximity, New Jersey students also spend less time traveling to school compared to children in most other states.

The NHTS also shows that New Jersey parents are less concerned about distance to school than about children's safety. The proportion of parents who perceive distance to school as a serious concern is almost identical for New Jersey (40%) as the nation (41%). However, possibly due to the relatively urbanized nature of the state, traffic volume and speed are of much greater concern for New Jersey parents compared to parents nationwide. While 43% of parents nationwide perceive traffic volume on roads as a serious issue for their children's travel to school, 56% of the New Jersey parents are concerned about traffic volume. Similarly, 48% of New Jersey parents consider traffic speed on roads as a serious issue, whereas only 40% of parents nationally show that level of concern. These differences are significant at the 1% level on an independent-sample t-test. Although the state contains a few older cities with very high crime rates, most residents live in low-crime suburban areas and a significantly lower proportion of New Jersey parents perceive crime to be a serious issue (8%) compared to the nation as a whole (14%). Overall, the 2009 NHTS data show that parents in New Jersey are more concerned about traffic volume and speed than distance to school or crime. The greater parental concern about traffic volume and speed in

New Jersey could potentially explain why the proportion of children walking to school is not higher in the state than the national average, considering that students in New Jersey, on average, live closer to school.

New Jersey parents have a reason to be concerned about traffic safety when children walk to school. According to 2009 data from the National Highway Safety Administration (NHSTA), New Jersey ranks fifth among all states in terms of total number of pedestrian fatalities *(21)*. Perhaps more importantly, New Jersey is second only to Washington, DC in terms of pedestrian fatalities as a proportion of total traffic fatalities. Approximately 27% of traffic fatalities in the state are pedestrian fatalities.

However, pedestrian crashes in New Jersey are not uniformly distributed across the 21 counties. According to a 2011 report prepared by the Alan M. Voorhees Transportation Center of Rutgers University, where geocoded crash data were analyzed for the 2003-2010 period, far more crashes involving pedestrians occur in heavily urbanized counties such as Essex, Hudson, Bergen, Union, and Passaic than in predominantly suburban or rural counties *(22)*. When normalized by the population of each county, pedestrian crashes in the predominantly urban counties appear to be even more frequent than suburban or rural counties. Although schools may be located closer to homes in the urban counties than suburban counties, the greater frequency of pedestrian crashes in urban counties may discourage parents from supporting walking to and from school.

Methods

Data for this study came from multiple sources, described in detail below. According to a list acquired from the Office of School Facilities of the NJDOE, there are 2,445 public schools throughout the state, of which 1,903 include at least 30 students in the K-8 grades. Data from the NJDOE provided the establishment year for 878 of these schools (46%). Researchers at the Alan M. Voorhees Transportation Center obtained the establishment year of another 685 schools (36%) through the web pages of individual schools and through inquiries to school officials by email. For the remaining 350 schools (18%), the establishment year could not be obtained. However, an in-depth examination of the schools with and without establishment year revealed that the two groups of schools are almost identical in geographic diversity and mean number of students. For example, the county-wise distribution of the schools with establishment year is 98% similar to the distribution of all schools, whereas the mean number of K-8 students in the schools with establishment year is only 0.67% smaller than all schools (443 vs. 446 students). Thus, the schools with data on establishment year can be considered highly representative of all public schools with more than 30 K-8 students in the state. Table 1 shows the location of the 1,903 schools in the data set, distinguishing the schools with data on establishment year from those with missing data on establishment year.

Additional information on schools, including the number of students, racial and ethnic diversity of students, class size, and students' participation in the free-lunch program, was compiled from a publicly available NJDOE data source *(23)*. To examine the socioeconomic characteristics of the areas around schools established in different time periods, data from the 2006-2010 American Community Survey (ACS) were extracted at the census tract level and aggregated for one-mile buffers around the schools by using GIS. Location-specific geocoded data on pedestrian crashes for the period 2003-2010 were obtained from the Plan4Safety database maintained by the Center for Advanced Infrastructure and Transportation at Rutgers University *(24)*. Finally, data on lot size, or parcel size, of most schools were obtained from the New Jersey Geographic Information Network *(25)*. For schools missing information in this data source, parcel sizes were manually approximated by using GIS polygons.

Table 1: Distribution of K-8 Schools by County

Counties	Schools with K-8 Students		Schools with Establishment Year		Schools Established since 1980	
	Number of Schools	Percent of Schools	Number of Schools	Percent of Schools	Number of Schools	Percent of Schools
Atlantic	56	2.9%	33	2.1%	12	6.6%
Bergen	217	11.4%	186	12.0%	3	1.7%
Burlington	111	5.8%	83	5.3%	18	9.9%
Camden	128	6.7%	119	7.7%	16	8.8%
Cape May	25	1.3%	17	1.1%	2	1.1%
Cumberland	38	2.0%	27	1.7%	3	1.7%
Essex	177	9.3%	132	8.5%	5	2.8%
Gloucester	68	3.6%	52	3.3%	7	3.9%
Hudson	88	4.6%	62	4.0%	5	2.8%
Hunterdon	41	2.2%	35	2.3%	6	3.3%
Mercer	72	3.8%	58	3.7%	8	4.4%
Middlesex	146	7.7%	113	7.3%	12	6.6%
Monmouth	139	7.3%	129	8.3%	24	13.3%
Morris	122	6.4%	103	6.6%	5	2.8%
Ocean	85	4.5%	65	4.2%	18	9.9%
Passaic	111	5.8%	90	5.8%	7	3.9%
Salem	22	1.2%	19	1.2%	1	0.6%
Somerset	62	3.3%	49	3.2%	8	4.4%
Sussex	36	1.9%	31	2.0%	5	2.8%
Union	123	6.5%	115	7.4%	10	5.5%
Warren	36	1.9%	35	2.3%	6	3.3%
Total	**1903**	**100.0%**	**1553**	**100.0%**	**181**	**100.0%**

Data Analyses

This section reviews the year of establishment of schools with K-8 students, then reviews the geographic variation by county, then compares schools and students by establishment year. We examine the average parcel size and class size by year of establishment, and the overall number of students, in addition to the race/ethnicity of these students, and their free-lunch participation. We then provide a comparison of school surroundings such as population density, socioeconomic characteristics, housing characteristics, mode of transportation, road type, and pedestrian crash incidents by year of establishment. Discussion of the relationship of Abbott districts, pedestrian crash incidents, and the year of establishment also follows.

Establishment of Schools over the Decades

The distribution of the 1,553 schools by year of establishment is shown in Table 2. The table shows that during the 1950s and 1960s, schools experienced the most rapid growth and was when 44% of the existing schools were established. This was

also a period of massive road construction and rapid suburbanization. The only other period that experienced rapid growth in number of schools was during the 1920s, when almost 15% of the schools were established. Growth slowed during the 1930s and 1940s, presumably because of the Great Depression and World War II. Since 1970, fewer new schools have been established than in the prior decades, although the years since 2000 have experienced a modest increase in school establishment in K-8 schools in New Jersey.

Table 2: Year of Establishment of Schools with K-8 Students

Year of Establishment	Number of Schools	Percent of Schools
Before 1910	106	6.8%
1910 - 1919	110	7.1%
1920 - 1929	227	14.6%
1930 - 1939	108	7.0%
1940 - 1949	40	2.6%
1950 - 1959	415	26.7%
1960 - 1969	268	17.3%
1970 - 1979	98	6.3%
1980 - 1989	28	1.8%
1990 - 1999	64	4.1%
2000 or later	89	5.7%
Total	**1553**	**100.0%**

A map in Figure A2 in the Appendix shows the location of schools by period of establishment. One can see clustering of schools established prior to 1940 in the heavily urban areas of the northeastern part of the state (Hudson, Bergen, Essex, Passaic, and Union Counties), and the areas in and around the cities of Camden and Trenton. In contrast, many schools were established in relatively suburban counties such as Morris and Middlesex in the 1950s, 1960s, and 1970s. The newest schools are being built predominantly in the suburban counties, but many of them are located in urban areas within those counties.

Establishment Year of Schools by County

Table 3 shows the number and proportion of schools for counties by broad categories of establishment year: before 1940, between 1940 and 1979, and 1980 and later. More than two-thirds of the existing schools in Hudson and Essex Counties were established before 1940. Almost half of the schools in Union, Bergen and Passaic Counties were also established during this period. During the 1940-1979 period, a large number of schools were established in the suburban counties such as Morris and Middlesex, although the largest number of schools were established in Bergen County. Since 1980, more schools have been established in Monmouth, Ocean, Burlington, and Camden Counties, in the southern part of the state, than in other counties.

Comparison of Schools and Students by Establishment Year

As noted previously, an EPA report indicated that schools nationwide have become larger over time while the number of schools has decreased. To examine how school size has changed over time in New Jersey, the average parcel size and class size of schools established in different time periods were compared. Comparisons are also made regarding race/ethnicity of students as well as participation in the free-lunch program. The land parcel data for most schools were obtained from the New Jersey Geographic Information Network.[1] Since this data set does not include Middlesex and Essex counties, the parcel size of the schools in these two counties were manually approximated by using GIS polygons. The parcels include all areas, including school buildings, playgrounds, fields, parking lots, and unused areas. The information on class size was obtained from the New Jersey Department of Education web site.[2] The average class size for K-8 classes of each school was estimated by using detailed grade-specific data found on the web site.

1. Available at: https://njgin.state.nj.us/NJ_NJGINExplorer/IW.jsp?DLayer=Parcels%20by%20County/Muni. Accessed on July 11, 2012.

2. Available at http://education.state.nj.us/rc/rc11/database.htm. Accessed on July 17, 2012.

Table 3: Distribution of K-8 Schools by County

Counties	Before 1940		1940-1979		1980 or later	
	Number of Schools	Percent of Schools	Number of Schools	Percent of Schools	Number of Schools	Percent of Schools
Atlantic	6	18.2%	15	45.5%	12	36.4%
Bergen	89	47.8%	94	50.5%	3	1.6%
Burlington	19	22.9%	46	55.4%	18	21.7%
Camden	37	31.1%	66	55.5%	16	13.4%
Cape May	3	17.6%	12	70.6%	2	11.8%
Cumberland	5	18.5%	19	70.4%	3	11.1%
Essex	92	69.7%	35	26.5%	5	3.8%
Gloucester	16	30.8%	29	55.8%	7	13.5%
Hudson	48	77.4%	9	14.5%	5	8.1%
Hunterdon	13	37.1%	16	45.7%	6	17.1%
Mercer	19	32.8%	31	53.4%	8	13.8%
Middlesex	19	16.8%	82	72.6%	12	10.6%
Monmouth	29	22.5%	76	58.9%	24	18.6%
Morris	21	20.4%	77	74.8%	5	4.9%
Ocean	7	10.8%	40	61.5%	18	27.7%
Passaic	42	46.7%	41	45.6%	7	7.8%
Salem	3	15.8%	15	78.9%	1	5.3%
Somerset	7	14.3%	34	69.4%	8	16.3%
Sussex	6	19.4%	20	64.5%	5	16.1%
Union	57	49.6%	48	41.7%	10	8.7%
Warren	13	37.1%	16	45.7%	6	17.1%
Total	**551**	**35.5%**	**821**	**52.9%**	**181**	**11.7%**

The mean parcel size and class size for schools established in different time periods are shown in Table 4. The table demonstrates that variations in mean parcel size and class size between schools established in different time periods are small. No evidence was found that school parcel size is becoming larger over time. However, it should be noted that the standard deviations for each period are substantially larger than the means, indicating that parcel sizes vary significantly among schools established during the same period. The variations in mean class size are even smaller than the variations in parcel size. The small variation in class size is potentially due to regulations concerning maximum allowable class size.

Establishment Year and Number of Students

According to data from 2010-11, the average number of K-8 students for schools with an establishment year is 443. However, the number of students varies by school establishment year, with the newer schools having more students than older schools (see Figure 1). While the schools established before 1960 have close to 400 students, a larger number of students are enrolled in schools established since 1960. The schools established in the 1990s have the highest enrollment with an average of 584 students. Although schools established since 2000 have a slightly smaller number of students than the schools established in the 1990s, this may be because the newest schools have yet to reach

Table 4: Average Parcel Size and Class Size by Year of Establishment

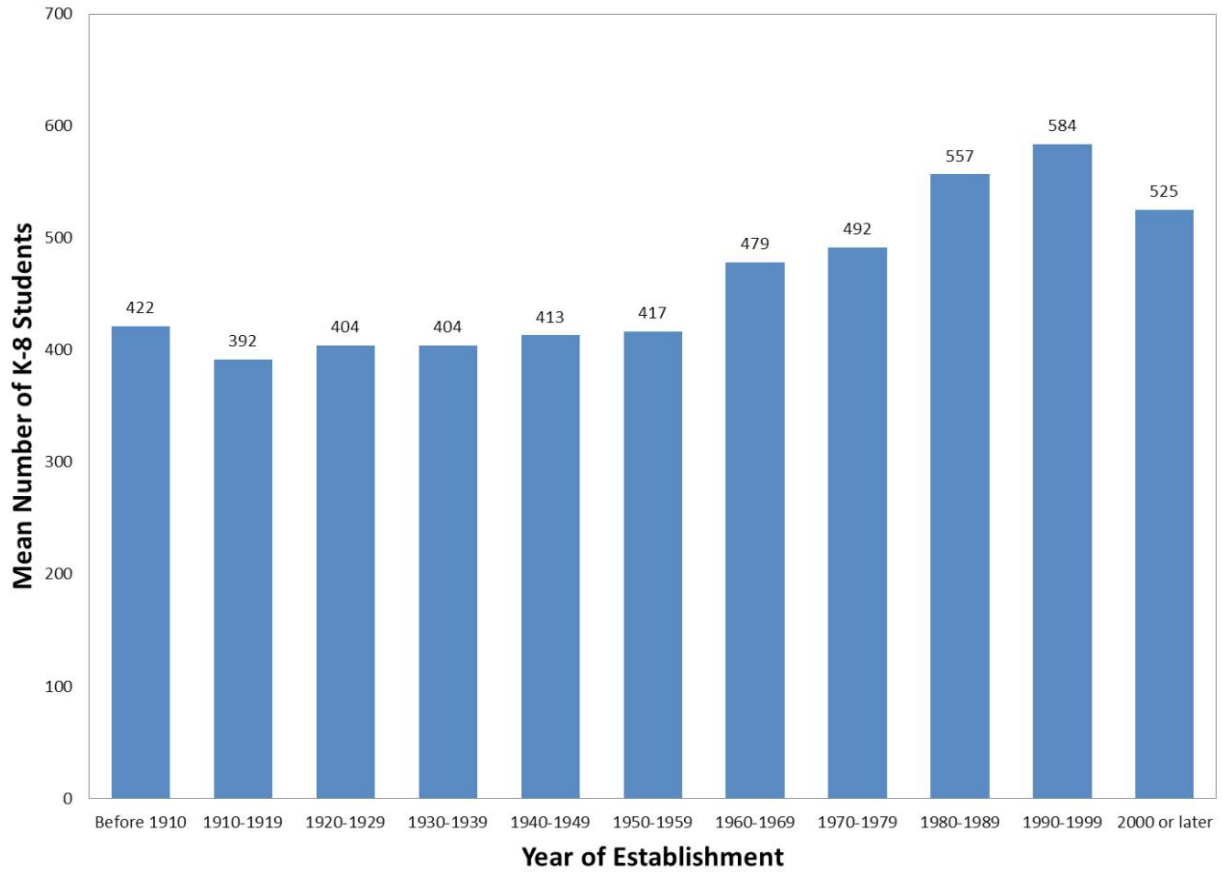
Year of Establishment	Mean Parcel Size (acres)	Mean Class Size of K-8 Grades
Before 1910	9.1	20.9
1910 - 1919	6.9	20.8
1920 - 1929	8.9	20.5
1930 - 1939	10.7	20.4
1940 - 1949	9.2	20.8
1950 - 1959	10.3	20.5
1960 - 1969	8.6	20.8
1970 - 1979	7.3	20.4
1980 - 1989	8.0	20.6
1990 - 1999	12.1	21.5
2000 or later	8.4	20.8
Total	**9.2**	**20.7**

their full potential in terms of enrollment. The finding that newer schools have a larger number of students than older schools is consistent with the 2003 EPA study on school siting *(1)*. Despite this finding, geographic distribution of schools by number of enrolled K-8 students varies across the state (see Figure A3). Mercer County has the highest proportion of schools with 800 or more K-8 students (32%), followed by Middlesex (25%) and Hudson (25%). The greater number of students in newer schools potentially indicates that they have larger building space (i.e., more class rooms and facilities) than older schools.

Year of Establishment and Race/ Ethnicity of Students

The racial and ethnic composition of student populations varies by establishment year of schools. Figures A4 and A5 show schools and the corre-

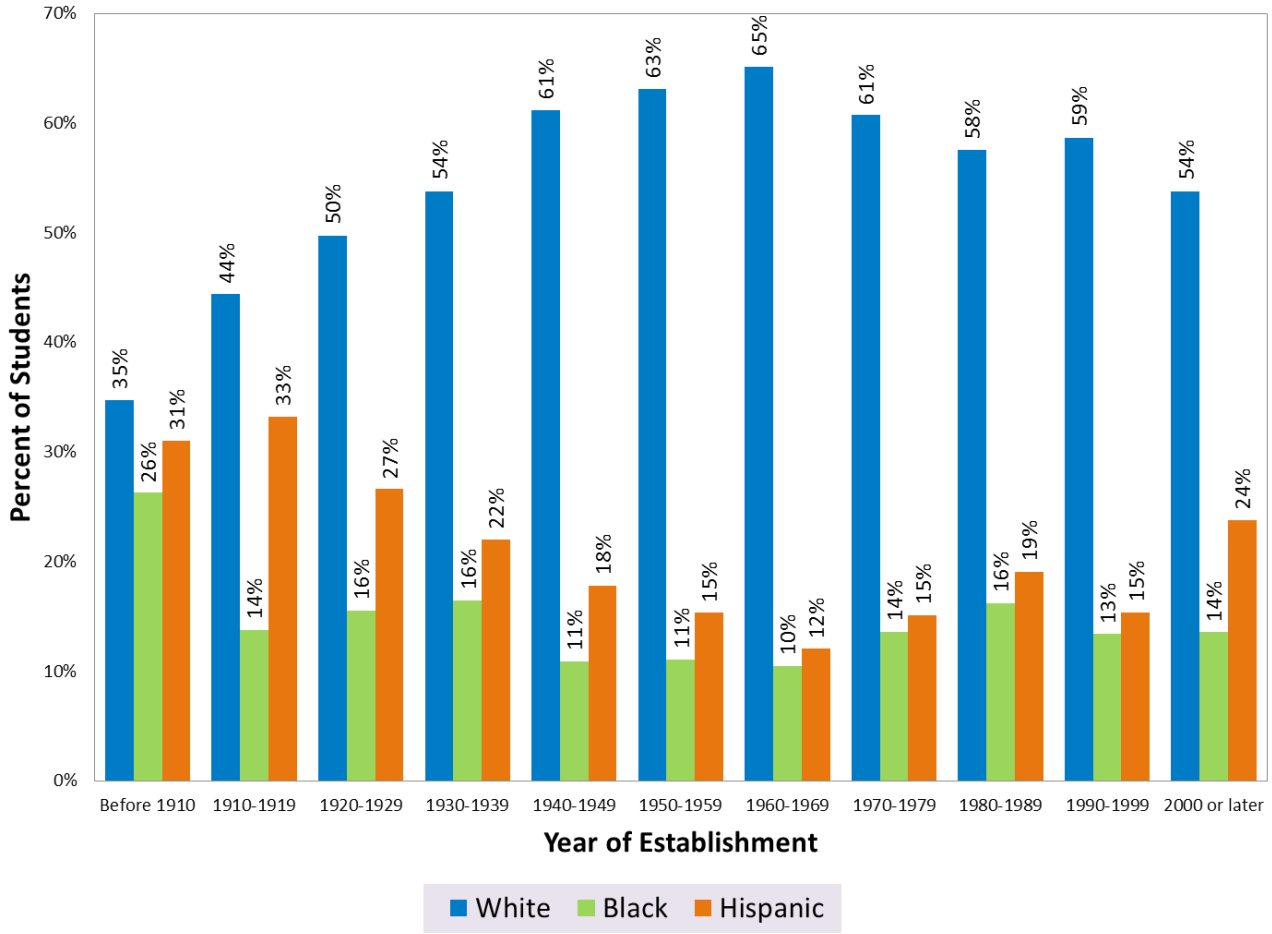
Figure 1: Number of enrolled K-8 Students by Year of Establishment of Schools



sponding proportion of African American and Hispanic students. Schools with a high proportion of African American students are concentrated in the Newark area of Essex County, Elizabeth in Union County, Jersey City in Hudson County, Camden City in Camden County, Trenton City in Mercer County and a few small pockets in Union, Monmouth, and Burlington Counties. The schools with a high proportion of Hispanic students are also highly concentrated in specific areas, although they appear to be more dispersed than the schools with a high proportion of African American students. In addition to the areas with schools that have a high concentration of African American students, the Paterson area of Passaic County, the Plainfield area of Union County, and the Vineland area of Cumberland County contain a number of schools with a high proportion of Hispanic students.

Figure 2 shows the proportion of white K-8 students is the highest in schools established in the 1950-1969 period, whereas African American and Hispanic students constitute a large proportion of students in older schools. A reason for this pattern is the concentration of African American and Hispanic populations in urban centers, where most of the older schools are located. However, the newest schools, those established since 1980, have a smaller proportion of white students and a larger proportion of Hispanic students. For example, in schools established since 2000, 54% of the students are white and 24% are Hispanic, whereas in schools established in the 1960s, 65% of the students are white and 12% are Hispanic.

Figure 2: Race and Ethnicity of K-8 Students by Year of Establishment of Schools



Year or Establishment and Free Lunch Program Participation

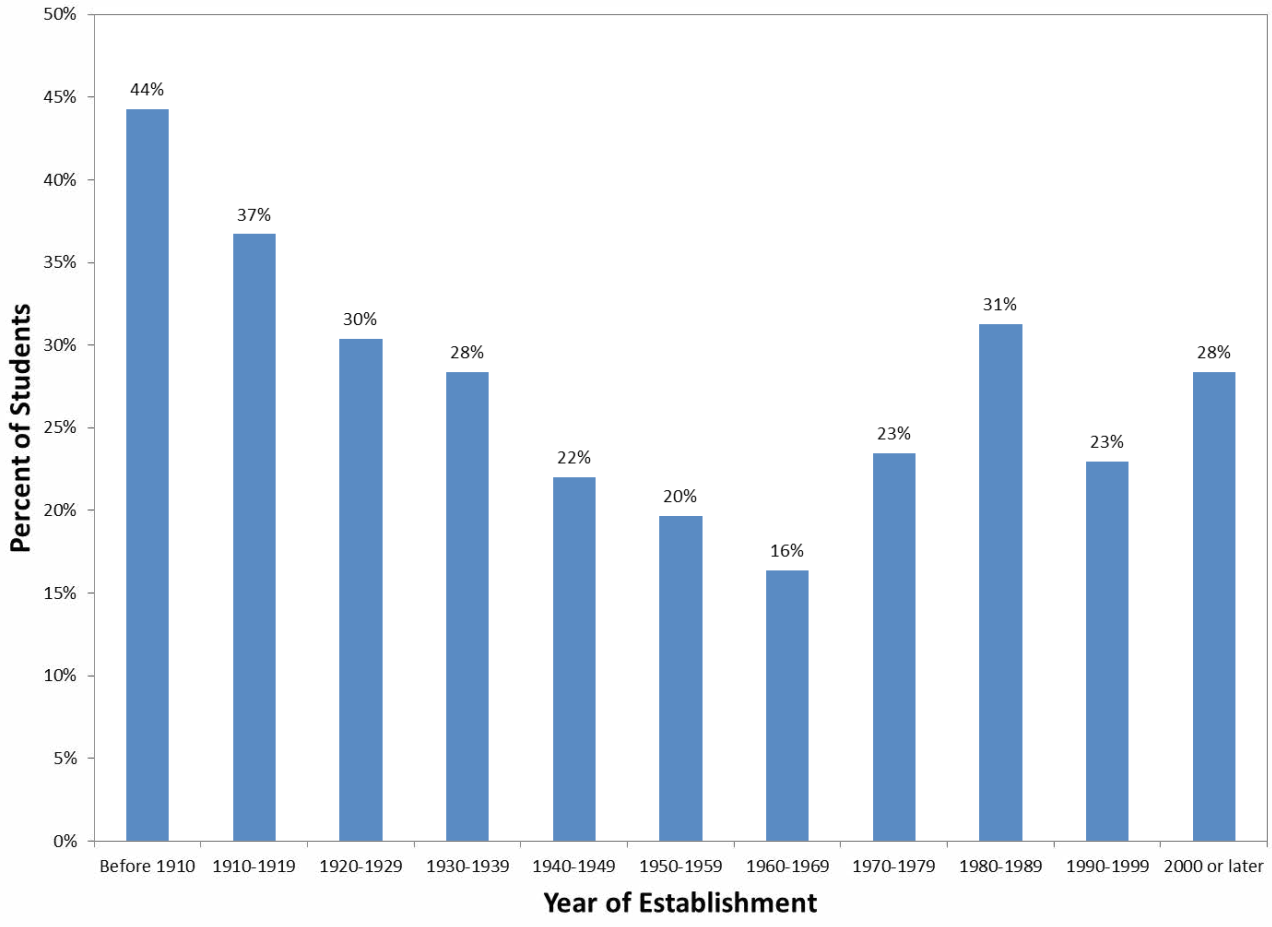
An indication of the economic status of students is their participation in the free lunch program in school. The free lunch program is a needs-based program that takes into account household income and size. Foster children from all families, as well as children from families that receive food stamps or benefits from the Temporary Assistance for Needy Families (TANF) program usually qualify for the free lunch program. The proportion of students participating in the school lunch program in New Jersey is shown in Figure A6 in the Appendix. Areas with a high participation in the free lunch program coincide with the areas with a high proportion of African American and Hispanic students, shown in Figures A4 and A5.

Figure 3 shows that the participation in the free lunch program is highest in the oldest schools, especially those established before 1920, and lowest in schools established in the 1950s and 1960s. These figures are consistent with the racial/ethnic distribution of students shown in Figure 2, which showed that the oldest schools have the highest proportion of minority students, whereas the schools established in the 1950s and 1960s have the highest proportion of white students. Consistent with a higher proportion of minority students, the schools established since 1980 show a higher participation in the free lunch program than the schools established in the 1950s and 1960s.

Comparison of School Surroundings by Establishment Year

Analyses were carried out to examine the spatial and socioeconomic characteristics of the areas where schools were established in different time periods. Using the 2006-2010 ACS data, analyses examined population and enrolled student density around

Figure 3: Proportion of Students Participating in Free Lunch Program by Year of Establishment of Schools



schools; dwelling type including size, tenure, and value; household income, poverty, education, race, and ethnicity; as well as mode used for commuting purposes. To define the areas around schools, one-mile buffers were first created around each school in the data set and census tracts within each buffer were identified using GIS. In the next step, ACS data at the census tract level were aggregated for each buffer to obtain the average of each characteristic. These averages were subsequently compared for schools established in different time periods.

In addition to socioeconomic, housing, and commuting characteristics, this section provides a comparison of road types, proximity to freeways and major roads, and pedestrian crash incidents around schools established in different time periods. Data from Plan4Safety was used for crash data analyses.

Population Density around Schools

Population density is often associated with transportation modes used. A number of studies have shown that people walk more in areas with high population density *(26)*. Average density of population in census tracts within one-mile buffers of schools established in different time periods is shown in Table 5. Since the focus of this study is on school-age children, the density of children aged 5-14 years and the density of children enrolled in grades K-8 who live within the buffers are also shown in the table.

Table 5 shows that there is a direct correlation between density of population and density of children. Density is substantially higher in areas surrounding schools established prior to 1940 compared to schools established after 1940. The density of population and children is the highest around schools established prior to 1910 and lowest around schools established in the 1960s. Density decreases from decade to decade between 1910 and 1970, but is slightly higher for schools established after 1970. Schools established since 2000 have a higher population density in the surrounding areas compared to schools established in any decade after the 1940, indicating that the newest schools are not being established in the lowest density areas. The average density of the population and children around the newest schools may be high because newer schools are being established in old urban centers at a faster rate than in the 1960s and 1970s.

Table 5: Mean Density of Population, Children in Age 5-14, and Children Enrolled in Grades K-8 within One-Mile Buffer of Schools Established in Different Time Periods

Categorical years	Population per acre	Number of children ages 5-14 years per acre	Number of children enrolled in grades K-8
Before 1910	18.29	2.35	2.11
1910-1919	16.86	2.10	1.89
1920-1929	12.81	1.65	1.49
1930-1939	11.72	1.54	1.38
1940-1949	6.91	0.97	0.89
1950-1959	6.06	0.79	0.70
1960-1969	4.44	0.60	0.54
1970-1979	6.70	0.83	0.75
1980-1989	6.40	0.88	0.80
1990-1999	5.11	0.71	0.64
2000 or later	8.62	1.18	1.07
Total	**8.94**	**1.16**	**1.04**

Socioeconomic Characteristics of Population around Schools

The analysis of students at the school level indicated that the proportion of low-income and minority students is the highest for the oldest schools and lowest for the schools established in the 1950s, 1960s, and 1970s. Additional analyses were undertaken to compare the socioeconomic characteristics of populations around schools established in different time periods. Table 6 shows the comparison of racial, ethnic, and linguistic characteristics of the areas within one-mile buffers around schools established in different time periods, whereas Table 7 shows selected economic characteristics of the areas.

Table 6 shows that the proportion of African Americans, Hispanics, and persons speaking a language other than English at home is the highest for the oldest schools and lowest for the schools established in the 1970s. However, the proportion of minority populations is higher around schools established since 1980 than the schools established in the three prior decades. These results are consistent with the racial and ethnic comparison of enrolled students, which also showed that the newest schools have a higher proportion of minority students than the schools established during the 1950s, 1960s, and 1970s.

The comparison of economic characteristics of the areas around schools established in different periods, presented in Table 7, shows that the schools established prior to 1920 are in the poorest areas, where per capita income is the lowest and the proportion of food stamp recipients and unemployed persons is the highest. The areas around those schools also have a lower proportion of college graduates compared to schools constructed in most other periods. In contrast, the areas around schools established between 1940 and 1970 appear to be the most affluent, where the level of education is also higher. The schools established in the 1980s appear to be in some of the poorest areas, where per capita income and the proportion of college graduates are even lower than for schools established prior to 1910. (Note that fewer schools were established in the 1980s than any other decade). However, the schools established since 1990 are in areas with moderate incomes, where the level of education also appears to be higher. The comparison of the information in Table 6 and Table 7 reveals that even though the newest schools are located in areas with a high proportion of minority populations, these areas do not necessarily have low economic conditions. The economic con-

Table 6: Racial, Ethnic, and Linguistic Characteristics of Population within One-Mile Buffer of Schools Established in Different Time Periods

Categorical years	Percent African American	Percent Hispanic	Percent Non-English Speaker
Before 1910	24%	22%	35%
1910-1919	14%	24%	37%
1920-1929	14%	19%	31%
1930-1939	16%	17%	28%
1940-1949	8%	12%	23%
1950-1959	9%	11%	23%
1960-1969	8%	9%	20%
1970-1979	10%	10%	20%
1980-1989	11%	14%	21%
1990-1999	11%	12%	22%
2000 or later	12%	17%	25%
Total	**12%**	**14%**	**26%**

Table 7: Economic Characteristics within One-Mile Buffer of Schools Established in Different Time Periods

Categorical years	Per capita income	Percent households receiving food stamps	Unemployment rate	Percent with bachelor's degree or higher
Before 1910	$30,824	9%	9%	30%
1910-1919	$32,398	6%	8%	31%
1920-1929	$34,689	6%	8%	34%
1930-1939	$35,120	6%	8%	35%
1940-1949	$38,526	3%	7%	38%
1950-1959	$38,331	3%	7%	38%
1960-1969	$40,580	3%	7%	40%
1970-1979	$36,156	4%	7%	34%
1980-1989	$30,227	5%	8%	26%
1990-1999	$37,076	5%	8%	36%
2000 or later	$35,000	5%	8%	33%
Total	**$36,510**	**5%**	**8%**	**36%**

dition of these areas is higher than the areas where the oldest schools are located, although they are poorer than the areas where schools were established between 1940 and 1970.

Housing Characteristics around Schools

Residential density may also influence the mode of transportation the residents use for utilitarian travel *(27)*. Table 8 shows the proportion of single-family homes, the average size of dwellings (median number of rooms), the proportion of rented homes, and the mean value of homes within one-mile buffers of schools established in different time periods. The areas around the oldest schools have a lower proportion of single-family detached homes, smaller dwellings, and a higher proportion of rented homes compared to schools established in the subsequent decades. Median home value around these schools is also lower than the schools established between 1920 and 1970, but comparable to the schools established in the most recent decades. In contrast, the areas around schools established between 1940 and 1970 have a very high proportion of single-family detached homes, larger dwellings, a smaller proportion of rented units, and a high home value. Overall, the data suggest that the schools established since 1980 are in areas where home values are lower, the proportion of single-family detached homes is lower and the proportion of rented dwellings is higher compared to the areas where schools were established in the 1960s and 1970s.

Mode Used for Commuting in Areas around Schools

The American Community Survey provides data on the transportation mode used for commuting, but does not provide similar information on trips made for other purposes. However, the data on commuting provide a broad understanding about the mode use patterns in different areas.

The mode use pattern of commuters living in one-mile buffers around schools established in different time periods is shown in Table 9. The proportion of households having no vehicles in the household is also shown in the table since vehicle ownership is usually associated with greater usage of vehicles and lower usage of public transportation and non-motorized modes *(28)*. The data show that the oldest schools are located in areas where automobile usage for commuting is lower, whereas the proportion of public transit and walk/bike trips is higher compared to the schools established in subsequent decades. The proportion of households without vehicles is also substantially higher around the oldest schools compared to schools established in later decades. Compared

Table 8: Housing Characteristics within One-Mile Buffer of Schools Established in Different Time Periods

Categorical years	Percent single family homes	Median number of rooms	Percent rented homes	Median home value
Before 1910	40%	5.3	47%	$368,118
1910-1919	45%	5.4	42%	$373,428
1920-1929	55%	5.8	36%	$388,483
1930-1939	58%	6.0	34%	$403,460
1940-1949	67%	6.1	26%	$418,373
1950-1959	69%	6.3	24%	$406,501
1960-1969	71%	6.6	21%	$418,473
1970-1979	67%	6.3	24%	$356,288
1980-1989	66%	6.0	25%	$300,792
1990-1999	64%	6.3	24%	$367,099
2000 or later	62%	6.2	29%	$371,573
Total	**62%**	**6.1**	**29%**	**$392,365**

Table 9: Mode Use Pattern for Commuting and the Proportion of Carless households within One-Mile Buffer of Schools Established in Different Time Periods

Categorical years	Percent trips by automobile	Percent trips by public transit	Percent trips by walk or bike	Percent households without vehicles
Before 1910	73%	16%	5%	19%
1910-1919	76%	14%	5%	15%
1920-1929	79%	12%	4%	12%
1930-1939	80%	11%	4%	12%
1940-1949	83%	8%	3%	8%
1950-1959	85%	7%	3%	7%
1960-1969	86%	7%	3%	6%
1970-1979	85%	7%	2%	8%
1980-1989	86%	6%	3%	9%
1990-1999	85%	6%	3%	8%
2000 or later	84%	8%	3%	10%
Total	**82%**	**9%**	**3%**	**10%**

to the schools established prior to 1920, schools established in all subsequent decades, including the past three decades, are located in areas where personal vehicles are used more often and use of public transportation and non-motorized modes is used less often. In areas surrounding the schools established since 2000, commuters use public transportation slightly more than the areas around the schools established between 1940 and 1999, but walking and bicycling appear to be less common even among the newest schools compared to the oldest schools. This trend may influence how students get to and from school.

Establishment Year and Road Type

Local roads are generally safer than higher-level roads for pedestrians because of the lower speed of vehicles. Thus, a school that is located on a local road can be expected to be safer for students walking or bicycling to school compared to schools that are located on a county road or a state road. The

Table 10: Year of Establishment and Type of Road where School is Located

Establishment Year	State Road		County Road		Local Road	
	Count	Percent	Count	Percent	Count	Percent
Before 1910	9	8%	20	19%	77	73%
1910-1919	13	12%	23	21%	74	67%
1920-1929	25	11%	46	20%	156	69%
1930-1939	18	17%	23	21%	67	62%
1940-1949	6	15%	7	18%	27	67%
1950-1959	55	13%	102	25%	258	62%
1960-1969	18	7%	50	19%	200	74%
1970-1979	6	6%	21	21%	71	73%
1980-1989	5	18%	6	21%	17	61%
1990-1999	12	19%	9	14%	43	67%
2000 or later	11	12%	23	26%	55	62%
Total	**178**	**12%**	**330**	**21%**	**1045**	**67%**

map in Figure A9 shows the location of schools by type of road on which they are situated. Urban areas appear to have a higher proportion of schools on local roads than suburban areas.

To examine if a variation between schools established in different time periods and the type of road where they are located exists, an analysis was undertaken with geocoded addresses of the schools. The results are presented in Table 10. Close to two-thirds of the schools established in all time periods are located on local roads. It appears that a slightly higher proportion of the schools established in the pre-1910 period as well as schools established during the 1960s and 1970s are located on local roads compared to schools established in other time periods. A smaller proportion of schools established since 1980 are on local roads compared to schools established in the 1960s and 1970s, whereas a greater proportion of the schools are located on state roads.

Distance to Freeways, Major Roads, and Freeway Ramps

Since proximity to major highways, freeways, and freeway ramps often raises pedestrian safety concerns, an analysis was performed to examine if there were significant variations in proximity to the facilities between schools established in different time periods. For this analysis, the distance between each school and the closest facility was first estimated using GIS. Subsequently, mean distances to the facilities were estimated for schools established in different time periods. The results are shown in Table 11. Freeways and freeway ramps, on average, are closer to the schools established prior to 1930 compared to schools established since 1930. However, no particular pattern was found between proximity to major highways and establishment year of schools.

Year of Establishment and Pedestrian Crashes in Surrounding Area

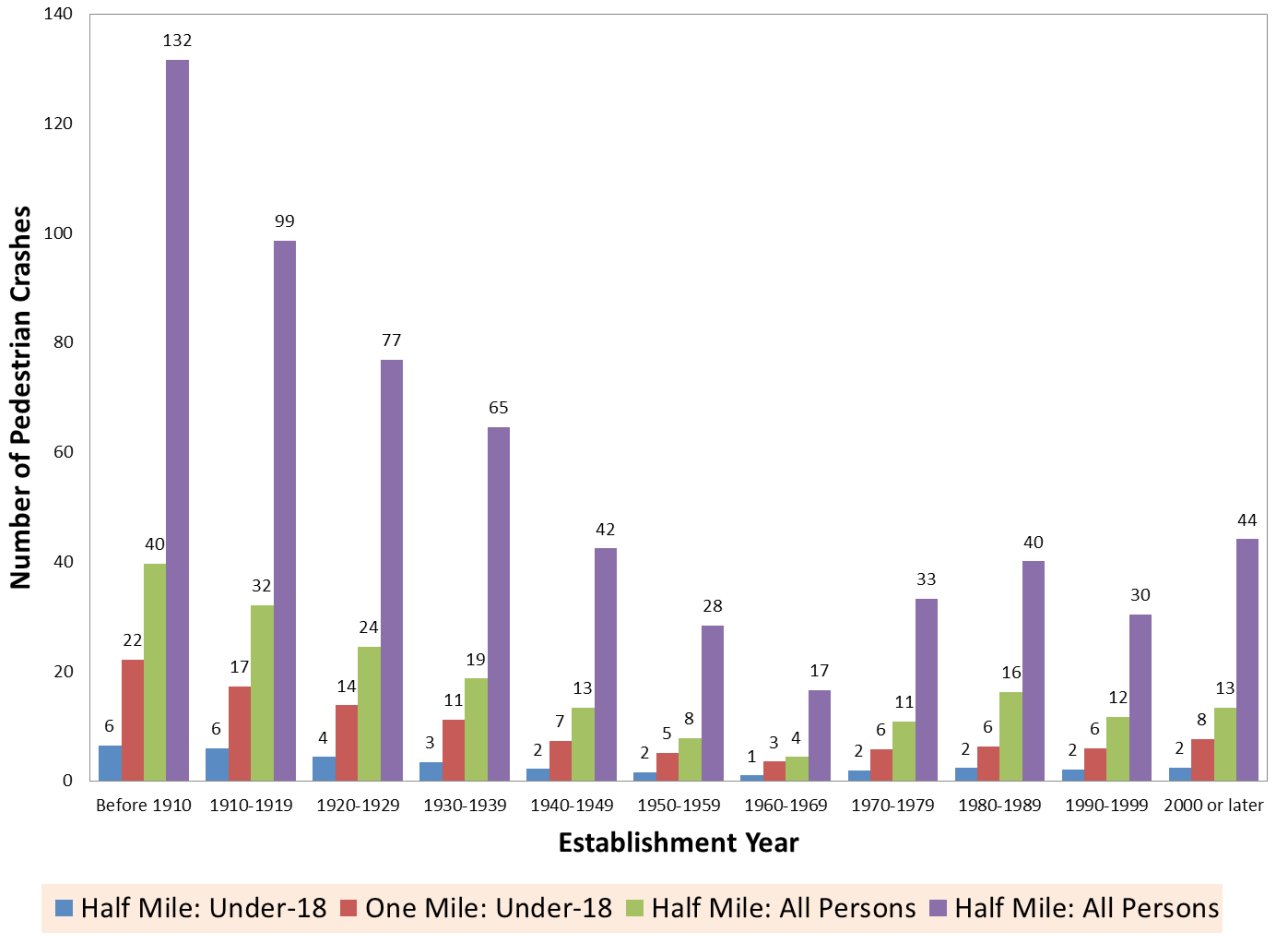
To examine how pedestrian crash incidents vary between schools established in different time periods, half-mile and one-mile buffers were created around all schools by using GIS. Subsequently pedestrian crashes occurring during the 2003-2010 period within the buffers were aggregated for victims of all ages and victims below 18 years of age. The crashes involving pedestrians of all ages and under 18 years in one-mile and half-mile buffers are shown for schools established in different time periods in Figure 4. Crashes are the highest around schools established prior to 1910. The number of crashes is lower for schools established in the sub-

Table 11: Mean Distance to Facilities by Year of Establishment of Schools

Establishment Year	No. of Schools	Mean Distance to Freeway (miles)[a]	Mean Distance to Freeway Ramp (miles)[b]	Mean Distance to Major Highway (miles)[c]
Before 1910	106	3.8	4.9	1.1
1910-1919	110	3.8	4.9	1.1
1920-1929	227	3.6	4.6	1.1
1930-1939	108	4.0	5.7	1.4
1940-1949	40	4.1	5.3	1.1
1950-1959	415	4.3	5.7	1.2
1960-1969	268	4.0	5.4	1.4
1970-1979	98	4.0	5.5	1.0
1980-1989	28	4.4	6.1	1.1
1990-1999	64	4.0	5.3	0.9
2000 or later	89	4.6	6.1	1.1
Total	**1553**	**4.0**	**5.4**	**1.2**

a Example: Interstate 80
b Example: Interstate 80 ramp
c Example: US-1

Figure 4: Number of Pedestrian Crashes in School Surroundings by Year of Establishment of Schools



sequent decades and lowest for the schools established in the 1960s. However, the number of crashes around schools is higher for schools established in more recent years.

The map in Figure A7 shows the location of schools along with the frequency of crashes involving pedestrians under age 18 within one mile of the schools. Pedestrian crashes occur more frequently in the heavily urban areas of Hudson, Essex, Passaic, Union, and Bergen Counties in the northeast as well as in Camden, Trenton and Atlantic City areas compared to other locations. The areas with the highest number of crashes are also where the proportion of low-income and minority students is high.

A list of 60 schools with the highest pedestrian crash incidents involving persons below age 18 within a half-mile during the 2003-2010 period is presented in Table A1. Jersey City contains the most schools (14), followed by Paterson (13), Camden (9), East Orange (7) and Newark (5). The other schools in the list are located in Atlantic City (1), Bayonne (1), Irvington (3), New Brunswick (1), Passaic (4), Perth Amboy (1), and West New York (1). These are all urban communities and some of the oldest in the state. Also note that all but two of the 60 schools in the list are located in Abbott districts, which are districts that are provided with state remedies due to their poorer and generally urban status *(29)*.

The New Schools with High Pedestrian Crash Incidents in Vicinity

Table A2 in the Appendix shows the 40 schools established since 1980 with the highest pedestrian crashes involving persons under age 18 within a half-mile. Thirty-one of these 40 schools (77.5%) are located in Abbott districts, (which are all of the Abbott districts in the state,) indicating that even among the new schools with the greatest pedestrian safety concerns, most are located in poor urban districts. Many of the new schools with a high number of pedestrian crash incidents in the vicinity outside Abbott districts are located in old communities such as Bayonne, Union, Clifton, and Ewing. Thus, even among new schools, pedestrian safety is a primary concern for schools located in an urban setting.

Abbott Districts and School Establishment Year

Most data analyzed in this report indicate that the schools established prior to 1910 and the schools established in the 1960s and 1970s are the most distinct from each other. For example, the schools established prior to 1910 contain a large proportion of minority students, and they are surrounded by areas where the proportion of single-family homes is low, the proportion of transit trips and non-motorized trips is high, and pedestrian crash incidents are frequent. In contrast, the schools established in the 1960s and 1970s contain the least minority students, are located in low-density areas where automobile ownership and use are high and pedestrian crash incidents are few. Various analyses pertaining to students and surrounding areas revealed that, compared to the schools established in the 1960s and 1970s, the schools established after 1980 are more similar to the oldest schools. In these schools, the share of minority and free lunch students is higher than in the schools established in the 1960s and 1970s, and they are located in areas where population density is higher than the schools established in the 1960 and 1970s. Pedestrian crashes are also more common in their vicinity than in the vicinity of the schools established in the 1960s and 1970s. This difference in the characteristics of schools established since 1980 may be due to changes in the school funding formula under the Abbott rulings, whereby in 1985, the New Jersey Supreme Court ruled in a decision known as Abbott I that the state must ensure that urban students could compete with their suburban peers.

The distribution of schools by Abbott District designation and year of establishment is shown in Table 12. As expected, the oldest schools, those established before 1910, are the most likely to be in an Abbott district, whereas the schools established during the 1940-1970 period are the least likely to be in an Abbott district. Interestingly, schools established since the year 2000 are more likely to be in an Abbott district compared to schools established in any period since 1910. A reason for the increase in schools in Abbott districts in recent years

may be the additional funding received by schools in Abbott districts in the form of state aid. The larger proportion of minority and free-lunch students in the newest schools, as shown in Figure 2 and Figure 3 respectively, may be the result of an increase in the number of schools in Abbott districts in recent years. The Abbott districts are shown in Figure A8.

Table 12: Year of Establishment of Abbott and Non-Abbott Schools

	Before 1940		1940-1979	
Establishment Year	Number of Schools	Percent of Schools	Number of Schools	Percent of Schools
Before 1910	65	61%	41	39%
1910-1919	83	75%	27	25%
1920-1929	183	81%	44	19%
1930-1939	84	78%	24	22%
1940-1949	36	90%	4	10%
1950-1959	378	91%	37	9%
1960-1969	247	92%	21	8%
1970-1979	80	82%	18	18%
1980-1989	23	82%	5	18%
1990-1999	57	89%	7	11%
2000 or later	63	71%	26	29%
Total	**1299**	**84%**	**254**	**16%**

Conclusions

This research shows that the oldest schools and the schools established in the 1950s, 1960s, and 1970s are the most distinct from each other. In addition, the mean number of students is substantially higher in schools established in the post-World War II period compared to the oldest schools, although no discernible differences were found in terms of class size or parcel size of schools. Potentially due to the Abbott designation of a number of school districts in poorer cities, which allows for additional state aid to the districts, the newest schools are being established at a higher rate in disadvantaged communities than in other areas. For example, among the schools established since 2000, 29% are in Abbott districts, whereas only 8-9% of the schools established in the 1950s and 1960s are in these districts. However, pedestrian crashes are far more frequent in the Abbott districts than elsewhere. In addition, a larger number of pedestrian crashes occur around the newest schools compared to schools established in the 1950s, 1960s, and 1970s. These newest schools are also more likely to be located on state roads compared to schools established in the 1960s and 1970s.

This research shows that the transportation issues facing schools established in different periods are dissimilar. For example, the oldest schools are predominantly located in Abbott districts, where population density is high and people walk more frequently, but those areas also experience frequent pedestrian crashes. The same is true for many of the newest schools because they are being established in Abbott districts at a higher rate than other areas. Thus, pedestrian safety ought to be a major concern for these schools. In contrast, the schools

established during the 1950s, 1960s, and 1970s are predominantly located in lower density areas, where people drive more but pedestrian crashes are far less frequent than in the Abbott districts. For schools in lower density areas, automobile use for school trips appears to be an important issue. Further analysis is needed to compare transportation mode-specific school trips by children attending schools in these areas compared to urban areas.

Highlights

The analysis revealed a number of important findings, listed below.

1. The oldest schools, especially those established prior to 1920, have a high proportion of minority and low-income students (as reflected by participation in the free lunch program) and they are located in areas with a high concentration of minorities. In contrast, the schools established between 1940 and 1970 are located in areas with smaller proportions of low-income and minority populations. The schools established after 1980 also contain a high proportion of minority students and students participating in the free lunch program, although the proportions are lower than in the oldest schools.
2. In terms of parcel size of schools, no evidence was found that the newer schools are larger than the older schools. However, the data show that the total number of K-8 students is significantly larger for schools established in the post-1960 period compared to schools established prior to 1960. Thus, schools in New Jersey appear to have grown over time only in terms of the number of students but not in terms of parcel or class size.
3. Mean distance to freeways and freeway ramps is slightly shorter for the schools established prior to 1930 compared to newer schools. Older schools are located in urban centers, which are served by freeways, thus these schools are located close to freeway and freeway ramps.
4. Of all the schools with establishment years, 67% are located on local roads, 21% are located on county roads, and 12% are located on state roads. However, among the schools established in the 1960s and 1970s, only 6-7% are located on state roads, whereas among the schools established in the 1980s and 1990s, 18-19% are located on state roads. However, only 12% of the schools established since 2000 are located on state roads.
5. To comprehend the characteristics of the areas surrounding schools established in different periods, recent American Community Survey data were analyzed at the census tract level by creating a one-mile radius around each school. The analysis showed that the oldest schools are located in areas with a high proportion of low-income and minority populations, whereas the schools established in the 1960s and 1970s are located in relatively affluent areas. The schools established since 1980 are located in areas with a higher proportion of minority populations compared to schools established in the 1960s and 1970s, potentially indicating that the new schools are disproportionately being established in older communities.
6. Population density is the highest around schools established prior to 1910 and continues to be high for schools established until 1940. Population density is slightly higher for schools established since 2000 compared to the schools established between 1940 and 2000.
7. Since transportation mode is associated with type of housing, analysis was undertaken to comprehend types of housing around schools established in different time periods. Schools established prior to 1940 are located in areas where the proportion of single-family homes is significantly lower and the share of multi-family homes is higher compared to the schools established between 1940 and 1980. The schools established since 1980 have a lower proportion of single-family homes in their surrounding compared to the schools established during the period 1940-1980, although the proportion is significantly higher than the schools established prior to 1940.
8. The automobile is the most common mode for commuting in areas surrounding schools established in all periods. However, the proportion of trips by automobile is noticeably lower and the proportion of trips by non-motorized modes is higher for schools established prior to 1920. The proportion of house-

holds without vehicles is also the highest in the areas surrounding the schools established prior to 1920.

9. Pedestrian crash data from Plan4Safety were analyzed in one-mile and half-mile buffers around schools established in different time periods. For this analysis, pedestrian crashes involving persons of all ages and persons below age 18 were aggregated for the period 2003-2010. The analysis showed that the number of crash incidents is highest around schools established prior to 1910 and lowest for schools established in the 1960s. Crash incidents are more frequent around schools established after 1970, although they are less frequent than the schools established prior to 1940. The number of pedestrian crash incidents is much higher around schools in Abbott districts compared to other schools. Of the 60 schools with the highest number of crash incidents within a half-mile buffer, all but two are located in Abbott districts.
10. The characteristics of students and school surroundings suggest that the establishment of new schools in New Jersey has been influenced by the Abbott decisions beginning in the 1980s. The data suggests that schools established since 1980 are predominantly in Abbott districts, where more financial support was allocated due to changes in the school funding formula.

Further Study and Evaluation of Schools

As a result of the data analysis on the establishment years of schools throughout New Jersey, newer schools built beginning in the 1980s have predominantly been constructed in Abbott districts where more financial aid was distributed, which are mostly located in low income, urban areas. The newest schools are being established predominantly in the suburban counties, but most of them are located in urban areas within those counties. This analysis suggests new schools are predominantly being built in urban areas in New Jersey, contrary to the nationwide trend of school construction on larger sites in suburban areas where distances between homes and school are great. The task of developing a school siting handbook for the State of New Jersey may be a lower priority since schools are being built mainly in urban neighborhoods. However, many of the urban schools are located in city centers which are served by freeways. These schools are located close to freeways and freeway ramps that create safety issues for students walking and bicycling to school. Therefore, an analysis of pedestrian crash data for persons under 18 years surrounding schools in New Jersey indicated that the top schools with the highest number of pedestrian crashes were in need of further study and evaluation. This analysis follows.

Identifying Schools of Interest

In an effort to identify land use patterns and characteristics associated with schools that have a high number of crashes, the top 20 schools with the highest number of crashes involving pedestrians age 18 and under within a half mile radius were identified from 2003-2010. Several interesting associations were noted. From the list of the top 20 schools with the highest number of pedestrian crashes, all but one were Abbott schools. The only non-Abbott school was the Philip G. Vroom School in Bayonne. Establishment year was another noteworthy factor as the majority of the schools in the top 20 crash list were built in 1979 or earlier, with only three schools built later than 1979. Two of these schools are located in Camden and one is located in Passaic.

The 20 schools with the highest number of crashes are located in only six New Jersey municipalities. These are Camden, Jersey City, Paterson, East Orange, Passaic and Bayonne. The Henry L. Bonsall Family School in Camden is the top crash school with 36 youth pedestrian crashes within a half-mile radius. In general, three common characteristics were noticeable in this list:

1) They are located primarily in Abbott districts, which are correlated with lower-income areas,
2) They tend to be older schools, and
3) They are primarily located in urban areas.

Because of the low number of non-Abbott schools and schools built in 1979 and later, the top five non-Abbott schools and schools built on or after 1980 with the highest youth pedestrian crashes within a half mile radius were identified for possible further study. Finally, the high number of schools in urban areas led researchers to identify the top five crash schools in suburban areas. Further examination of these schools was intended to help understand the land use patterns and characteristics that could lead to high numbers of crashes around suburban schools.

In total, a list of 35 schools with high youth pedestrian crash rates was generated consisting of the top 20 crash schools, top five non-Abbott schools, top five new schools, and top five suburban schools. From this list, 16 schools were chosen as candidates for further examination and creation of a school profile. First, the school with the highest number of crashes was selected from each of the six municipalities that are home to all 20 of the state's highest crash schools. The second highest crash school was also selected from Camden because of its high crash status. This process generated seven schools to examine more closely. From the list of five non-Abbott schools, Nicholas Oresko in Bayonne and Burnet Middle School in Union were chosen because their locations offered geographic diversity for further study. From the list of five new schools, Public School #3 in West New York was chosen for further examination along with Lord Stirling Elementary School in New Brunswick. Public School #3, with 19 crashes was the highest crash school from the new school list and Lord Stirling Elementary with 15 crashes is a local school in New Brunswick near VTC's offices and has been the site of past school research.

All top five suburban schools were chosen as candidates for further study primarily because schools in suburban locations were completely absent from the previous selection and characteristics of suburban schools were of particular interest to this research. The other schools of interest are largely located in urban, northern New Jersey cities with relatively high population density. New Jersey schools located in suburban areas have unique siting and safety circumstances. Furthermore, low population density in suburban locations may lead to fewer crashes, but the number of crashes per capita in these areas can still be high. While higher numbers of crashes can be expected in larger population density areas, the research team was interested in examining land use and pedestrian conditions around suburban schools with a high number of crashes as well. Through the process described, a total of 16 schools in 13 municipalities were identified for further examination.

School Profiles

The School Characteristic Profile tool was used to identify preliminary data on key features of identified schools. These features were gathered from online sources including Bing aerial photos, NJDOT's Straight Line Diagrams, and Google Earth. Further study of identified schools may prompt researchers to make field visits, however, the profile tool provides substantial initial information.

The tool is focused on a few areas. First, an aerial photograph and general land use information, including primary land use, street connectivity, and block size, are captured. Next, elements of the pedestrian realm such as sidewalks, marked crosswalks, and pedestrian signals are considered and quantified where possible. The remaining fields in this tool capture the vehicular use of the area including the speed limit outside of school hours, roadway ownership, and on- and off-street parking information.

The resulting summary of important information may be relevant to future crash analyses around high crash schools. The distilled information may allow researchers to identify land use patterns in the immediate vicinity of local schools that contribute to higher numbers of crashes.

Field Visits

Conducting extensive fieldwork was beyond the scope of this research. However, schools were identified as targets for potential future fieldwork, and

one case study was completed as an example (see below). To further examine relationships between the built environment, land use, pedestrian conditions and youth pedestrian crashes, six schools in three municipalities were identified for possible further analysis through field visits and pedestrian safety assessments. Pairs of schools in high-interest municipalities were identified. These municipalities were Bayonne, New Brunswick, and Glassboro. In addition to two schools in each of these three municipalities, Henry L. Bonsall School in Camden was identified. With 36 crashes, Bonsall School has the highest number of youth pedestrian crashes in New Jersey within a half-mile radius of the school.

In Bayonne, Philip G. Vroom School was identified for further fieldwork. Bayonne is a non-Abbott school district with a high number of crashes, making it a site of interest. Nicholas Oresko School, the next highest crash school in Bayonne was also identified as a site for more fieldwork.

Lord Stirling Elementary School in New Brunswick was determined to be a school of interest because it is a new school (built in 2002) with a high number of youth pedestrian crashes (15 crashes). New Brunswick is located in central New Jersey and is an Abbott district. Public School Number Three in West New York is a new school with the highest number of crashes on the list, but because of the township's proximity to Bayonne, New Brunswick would offer more diverse conditions for fieldwork. Looking back to the overall list of crashes, Roosevelt Elementary School was the highest crash school in New Brunswick with 17 crashes. Lord Stirling and Roosevelt Elementary Schools are approximately seven blocks apart and many of the crashes in the area are within a half-mile radius of both schools.

The top crash schools in suburban communities were both in Glassboro. These were Thomas E. Bowe School with 11 crashes and Glassboro Intermediate School with 9 crashes. Because high crash schools in suburban areas offer an interesting counterpoint to the mostly urban schools identified earlier in the project, the two Glassboro schools were selected as potential additional sites for further fieldwork. These schools are also close in proximity and share several of the same crashes.

Researchers at VTC undertook a detailed study of Roosevelt Elementary School in New Brunswick as a model for possible future fieldwork to be completed either by VTC or by local communities seeking to understand land use characteristics around their local schools that may contribute to pedestrian crashes. The following section outlines the process and findings for the fieldwork completed at Roosevelt Elementary School in New Brunswick, New Jersey located in Middlesex County.

Case Study of Roosevelt Elementary School in New Brunswick

Roosevelt Elementary School

Roosevelt Elementary School was constructed in 1913, and is within an Abbott school district. Roosevelt Elementary is the largest elementary school in New Brunswick, instructing 820 students in grades pre-K through 5th and employing 81 teachers, paraprofessionals, administrators, and staff. Families of Roosevelt are low income with many living at or below the poverty threshold, as indicated by New Brunswick's District Factor Group (DFG) "A" designation as well as the school's presence on the Schools Development Authority (SDA) list *(30-31)*. Student body composition is predominantly of Hispanic origin, and 98% of Roosevelt Elementary students are eligible to receive free or reduced lunches.

The school property occupies one city block bounded by Livingston Avenue (State Highway 26), Redmond Avenue, Drift Street, and Welton Street. The area around New Brunswick's Roosevelt Elementary School is densely built with a mix of commercial, civic, and residential properties along Livingston Avenue and predominantly residential

properties along the side streets. The research team at VTC looked at the incidence of youth pedestrian crashes within a half-mile radius of the school. Lord Stirling Elementary School is a newer school, bounded by George Street, Commercial Avenue, Redmond Avenue, and Throop Avenue, and shares most of the half-mile radius with Roosevelt School. Lord Sterling and Roosevelt are approximately half mile from each other using the street network. As a result, an examination of youth pedestrian crashes shows that many overlap between the two schools. Future research may include a more detailed examination of conditions around Lord Stirling School.

Youth Pedestrian Crashes near Roosevelt Elementary

Between 2003 and 2010, the crashes involving pedestrians aged 18 years and younger, within a half-mile radius of Roosevelt Elementary School and Lord Stirling Elementary School totaled 19. Fourteen of these crashes were within a half-mile radius of both schools. Roosevelt had an additional three youth pedestrian crashes within a half-mile radius and Lord Stirling had two additional crashes within a half-mile radius. Roosevelt School had a total of 17 crashes while Lord Sterling had a total of 16. With a majority of the overlapping crashes between the two schools occurred in the more dense residential area immediately surrounding Roosevelt Elementary. Since the school is situated centrally in this high crash zone, Roosevelt Elementary is a pertinent choice for analysis.

In addition to the cluster of youth pedestrian crashes in the residential area around Roosevelt Elementary, a survey of the crashes reveal a band of crashes on Livingston Avenue to the south of the study area. Four crashes occurred on Livingston Avenue within a half-mile radius of Roosevelt Elementary. However, within 10 blocks south of the study area there are six more youth pedestrian crashes on the Avenue. Livingston Avenue is a potentially significant area of further study because of the large number of youth pedestrian crashes.

The 17 crashes around Roosevelt Elementary resulted in injuries to the pedestrians, but no fatalities. Three of these crashes occurred during daylight hours in the summer months, two during the weekend and one on a weekday. Five occurred after 8:00pm when streetlights had been turned on, including one incident which was on a weekend. Three crashes occurred during the daylight on a weekend. The remaining six crashes occurred during daylight hours on weekdays between September and June. All victims were residents of New Brunswick. There is, however, no certainty that the victims of these six crashes were Roosevelt Elementary students walking to or from school, nor is there certainty that the evening crash victims were Roosevelt Elementary students leaving from after school activities.

- An eight-year-old male was struck at 3:30pm on a Monday in October.
- A nine-year-old male was struck on a Thursday afternoon at 4:27pm in September.
- A 10-year-old male was struck on a Wednesday afternoon in September at 2:00pm.
- A 14-year-old female was struck on a Monday in April at 8:30am.
- A 17-year-old female was struck 5:48pm on a Tuesday in September.
- An 18-year-old female was struck at 7:22am on a Thursday in March.

One fatal injury occurred just outside the half-mile radius of Roosevelt Elementary and within the half-mile radius of Lord Stirling Elementary School. This crash took place in October 2009 on Route 18 when a 15-year-old boy crossed the highway.

Assessment Results of Roosevelt Elementary School

Dismissal time at Roosevelt Elementary for a regular school day is 3:15pm. The after school program serves approximately 250 students who are dismissed between 5:30-5:45pm. According to school administrators, 25 children walk home alone at 5:45pm. While observing dismissal, the research team saw only two regular sized school buses and one smaller school bus indicating that few students traveled to and from school by school bus. Even if all three buses were filled to capacity, approximately 15% of the students at Roosevelt are bused with the remaining 85% of the students either walking or being driven to and from school. There were no

students bicycling after school the afternoon of the observation.

The research team at VTC conducted a walking assessment of the area around Roosevelt Elementary School. VTC observed the surrounding area to inventory elements of the neighborhood, such as sidewalk conditions, crosswalks, crossing guards, traffic signals, pedestrian signals, signage, and driveways. This assessment was conducted directly after 3:15pm dismissal in order to also observe the behavior of students, parents, teachers, and school staff. The purpose of this area assessment and observation was to identify basic pedestrian conditions around the school and identify any potential coincidences at intersections with high crashes.

Prior to dismissal, walking parents gathered around one of three doors used to release students from school. Many parents with younger children first retrieved their children from a daycare facility across Welton Street. During dismissal, students exited the building from two doors on the Welton Street side of the building and from the front door on Livingston Avenue. School bus drop off and pick up is also in front of the school on Livingston Avenue, with one small bus parked for student pick up on Redmond Avenue. Car drop off and pick up of students was observed on Welton Street with some parents double parking their cars. Though bus and car pick up were observed, most students left in groups or with their parents on foot. The intersections at the front of the school on Livingston Avenue were more heavily used by students leaving the school than the intersections at the back of the school on Drift Street. In general, pedestrians walked away from the school south on Livingston Avenue and east on Welton Street and Redmond Avenue.

Parking for teachers and staff is very limited at the school. A staff member informed researchers that school staff must find street parking if they drive to work. A few staff members with high seniority and positions that require them to leave and return to school during the school day, such as truant officers, were an exception and have access to limited staff parking. The limited staff parking is located on the Welton Street side of the school between the school building and the sidewalk. Although staff must drive across the sidewalk to access these parking spaces, researchers did not observe any conflicts between the drivers and pedestrians during dismissal time since staff did not leave at the same time as students.

Livingston Avenue has two lanes of traffic moving in both directions and parking lanes on both sides of the street. One crossing guard is stationed at the corner of Livingston and Welton, and another crossing guard is one block away at the corner of Livingston and Redmond. These two intersections were of particular interest as they have the highest concentration of student and parent pedestrians before and after school. Crossing guards assisted children and parents crossing the street at these intersections using marked crosswalks.

Two freestanding "State Law - Stop for Pedestrians" bollard signs are positioned on the center line of Livingston Avenue in the block between Redmond Avenue and Welton Street. Both marked intersections are equipped with curb cuts and tactile pads on all four corners. The marked crosswalks on Livingston are ladder striped, while the marked crosswalks at Welton and Redmond on Livingston are simple with no striping. North of the school on Livingston, vehicle drivers are alerted to the presence of children with a Slow School Zone traffic sign. There are no traffic lights at the intersection of Welton and Livingston, however, there is a traffic light at Redmond and Livingston with a pedestrian activated crossing signal (ped head).

The intersection of Suydam Street and Livingston Avenue, two blocks south of the school, was also of interest as it is the site of two youth pedestrian crashes, both of which occurred during school hours. The intersection and surrounding built environment are busy for pedestrian and vehicular traffic. A large residential apartment building is located on the northwest corner of the intersection, and a church is situated on the southeast corner. A bus stop for those traveling southbound is located north of Suydam Street on the west side of Livingston Avenue, and a bus stop for those going northbound is located south of Suydam on the east side of Livingston. Pedestrian infrastructure at this intersection includes striped crosswalks on each of

the four crossings, pedestrian activated ped heads, and curb cuts with tactile pads.

Pedestrian Counts

Pedestrian counts were conducted at two main intersections on Livingston Avenue. These were Redmond and Livingston and Welton and Livingston. Counts were conducted in the morning from 7am to 10am and in the evening from 3pm to 6pm. All pedestrians using the crosswalk were counted. Pedestrians were counted every time they entered a crosswalk, meaning pedestrians may have been counted twice if they used two crosswalks in the same intersection. Each of the intersections' four crosswalks were counted separately, but for the purposes of this study, we discuss the pedestrian use of the whole intersection and total the pedestrian tallies from each crosswalk.

Roosevelt School serves breakfast from 8am to 8:30am. Class begins at 8:45 and school is dismissed at 3:15pm. On Redmond and Livingston on the morning of December 14, 2012, 136 pedestrians were observed using the crosswalks between 7am and 7:59am. The number spiked to 692 between 8am and 8:59am, and dropped to 117 between 9am and 9:59am. The count was highest for the 15-minute interval just before school starts—between 8:30am and 8:45am. In the evening on December 6, 2012, 803 pedestrians were observed between 3pm and 3:59pm. 292 were observed between 4pm and 4:59pm and 374 were observed between 5pm and 5:59pm. The high number of pedestrians between 3 and 3:59 is undoubtedly due to school being let out at 3:15pm. The uptick in pedestrians between 5pm and 5:59pm may be due to after school activities ending and children going home. In the morning and the evening, the crosswalk on the east side of the intersection crossing Livingston, which has a crossing guard posted, was more commonly used than the other crosswalks. In the three hour AM period, the non-crossing guard crosswalk across Livingston only saw 32 pedestrians in the entire three-hour period. Three hundred fifty-seven pedestrians were observed in the crossing guard crosswalk in the same three-hour period. A similar occurrence was observed in the evening between the two crosswalks.

At Livingston and Welton in the morning on December 14, 2012 and in the evening on November 29, 2012 the following was observed. Between 7am and 7:59am 82 pedestrians were observed. Between 8am and 8:59am 304 pedestrians were observed. Between 9am and 9:59am 114 pedestrians were observed. In the evening, 401 pedestrians were observed between 3pm and 3:59, 197 pedestrians were observed between 4pm and 4:59pm, and 258 pedestrians were observed between 5pm and 5:59pm. Overall, this intersection is used less by students, but the same usage patterns apply. Use is highest in the hour school is dismissed. At this intersection also, the intersection staffed by a crossing guard was observed to be much more commonly used by pedestrians.

Traffic Counts

Traffic counts were conducted at three intersections near Roosevelt Elementary. These were at (1) Welton Street and Livingston Avenue, (2) Redmond Avenue and Livingston Avenue and (3) Redmond Avenue and Drift Street. Counts were taken for a half-hour period from 3pm to 3:30pm, which is 15 minutes before and after school dismissal time of 3:15pm. Counts were conducted on a normal school day on Thursday November 29, 2012. For the purpose of traffic counts, traffic traveling northwest along Welton Street and Redmond Avenue was considered to be traveling north. All motorized vehicles were counted and the direction from which they entered the intersection was recorded.

At the intersections of (1) Welton Street and Livingston Avenue and (2) Redmond Avenue and Livingston Avenue, traffic counts were taken using a traffic counter application using an itouch and ipad. Traffic counts at (3) Redmond Avenue and Drift Street were taken manually.

At the corner of (1) Welton Street and Livingston Avenue, 51 vehicles entered the intersection from the south on Welton Street and 63 vehicles entered from the north. Vehicles traveling on Livingston Avenue and entering the intersection from the west totaled 208, and vehicles entering the intersection from the east totaled 188.

At the intersection (2) at Redmond and Livingston vehicle traffic entering the intersection from the south on Redmond totaled 30 vehicles and traffic traveling from the north also totaled 30 vehicles. Vehicles approaching the intersection from the west on Livingston totaled 206, and vehicles traveling on Livingston from the east totaled 208.

At (3) Redmond Avenue and Drift Street between 3pm-3:15pm, nine vehicles headed north on Redmond, 11 vehicles headed south on Redmond, and 19 vehicles headed east on Drift, a one-way street. From 3:15pm-3:30pm, 17 vehicles headed north on Redmond, eight vehicles drove south on Redmond, and 20 vehicles drove east on Drift.

Conclusions

Overall, Roosevelt School has taken several excellent measures toward protecting students and providing safe walking locations. Based on observation and pedestrian counts, the crossing guards stationed at Welton and Redmond in front of the school were used by many pedestrians and are helpful to pedestrians navigating the intersections in the front of the school. Students are dismissed from the front of the school on Livingston as well as through doors on Redmond and Welton. This reduces the mass of students using sidewalks and crossing streets simultaneously. School buses use Livingston to pick up children, minimizing driving on smaller roads behind the school where visibility may be compromised. In addition to these measures, observed pedestrian infrastructure was adequate. Crosswalks were well marked and stoplights were equipped with ped heads.

Additional traffic calming may be appropriate for Livingston Avenue. A speed sentry sign notifying drivers of their speed could be a helpful addition. Many road diets and traffic calming engineering measures have been proposed for Livingston Avenue, and these measures would be welcome due to the high number of pedestrian users. This could include reducing lanes of travel to one in each direction, adding bicycle lanes in both directions, and putting in a turn lane in the center of the road.

Recommendations

Through a review of the literature, primary New Jersey school siting data, fieldwork, and data analysis, several preliminary recommendations for school siting in New Jersey emerged. The location and size of schools affect the transportation patterns of students, which in turn have implications for student safety and health and traffic circulation. These recommendations should be taken into consideration by the New Jersey Schools Development Authority in the construction of new schools.

» **Consider crash data.** The Plan4Safety data platform administered by Rutgers University's Center for Advanced Infrastructure and Technology gives school siting professionals access to pertinent data on local crashes. Consideration of youth pedestrian crash vulnerability can guide planning professionals in siting and building the infrastructure for new schools and can avoid or mitigate dangerous built environments or conditions.

» **Know the built environment.** While distance to school is one of the factors that most commonly influences students' mode of travel to school, in New Jersey other factors such as street connectivity, land use mix, population density, and sidewalk quality may be more significant factors affecting children's ability to walk or ride a bicycle to school. Understanding the land use patterns of the area around potential school sites can have a positive impact on children's active travel to school and overall safety.

» **Road characteristics make parents cautious.** New Jersey parents are more concerned about the safety of their children who walk and bike to school when it comes to traffic volumes and speeds than parents in other parts of the country. Ultimately parents decide whether their children are allowed to walk and bike to school. By

directly confronting these fears and striving to site schools in areas with lower traffic volumes along roads with lower speeds, parents may be influenced to allow their children to walk and bike to school.

» **Pay special attention to urban areas.** Students in urban areas have a high potential to use active travel to get to and from school. These students live closer to their schools than students in rural or suburban areas. Unfortunately pedestrian crashes are more frequent in urban areas than suburban areas, which could discourage parents from allowing their children to walk and bike. Safer pedestrian and bicycle infrastructure around schools in urban areas could ameliorate these fears and reduce the number of pedestrian crashes.

» **Less is more.** The parcel size of New Jersey schools has not grown substantially since the beginning of the 20th century. These smaller-scale schools, many tucked into residential and mixed-use environments, could account for New Jersey students living a shorter than average distance from their schools. Constructing schools on smaller parcels will increase the likelihood that students can walk and bike to their schools.

» **Avoid dangerous infrastructure.** Newer schools, largely located in urban areas, are often located near freeways and freeway onramps. It can be difficult to avoid building on unappealing parcels in largely built-out urban areas, but limiting school construction near dangerous infrastructure such as freeways can make walking and biking more appealing activities, thereby increasing student physical activity and safety.

Next Steps

Based on research undertaken during this project, some steps for implementing lessons learned through this research are as follows.

1) Examine land use around the highest crash schools in New Jersey. The list of the top 20 highest crash schools would be a fruitful beginning point. Possible additional analyses are outlined in the School Profiles section of this report. Additional schools were chosen to represent a broad range of land uses and types in New Jersey. Further examination of these schools' traits may yield more concrete and geographically important recommendations.
2) Fieldwork in identified schools would lead to a more nuanced understanding of school siting concerns. Further fieldwork would enhance our understanding of the relationship between school siting, the built environment, student safety, and children's ability to walk and bicycle to school.
3) In future school siting projects, we recommend municipalities, school boards, and the development authority consider lessons learned through this research.

Appendices

Figure A1: Location of Schools Indicating Whether School Establishment Year is Available

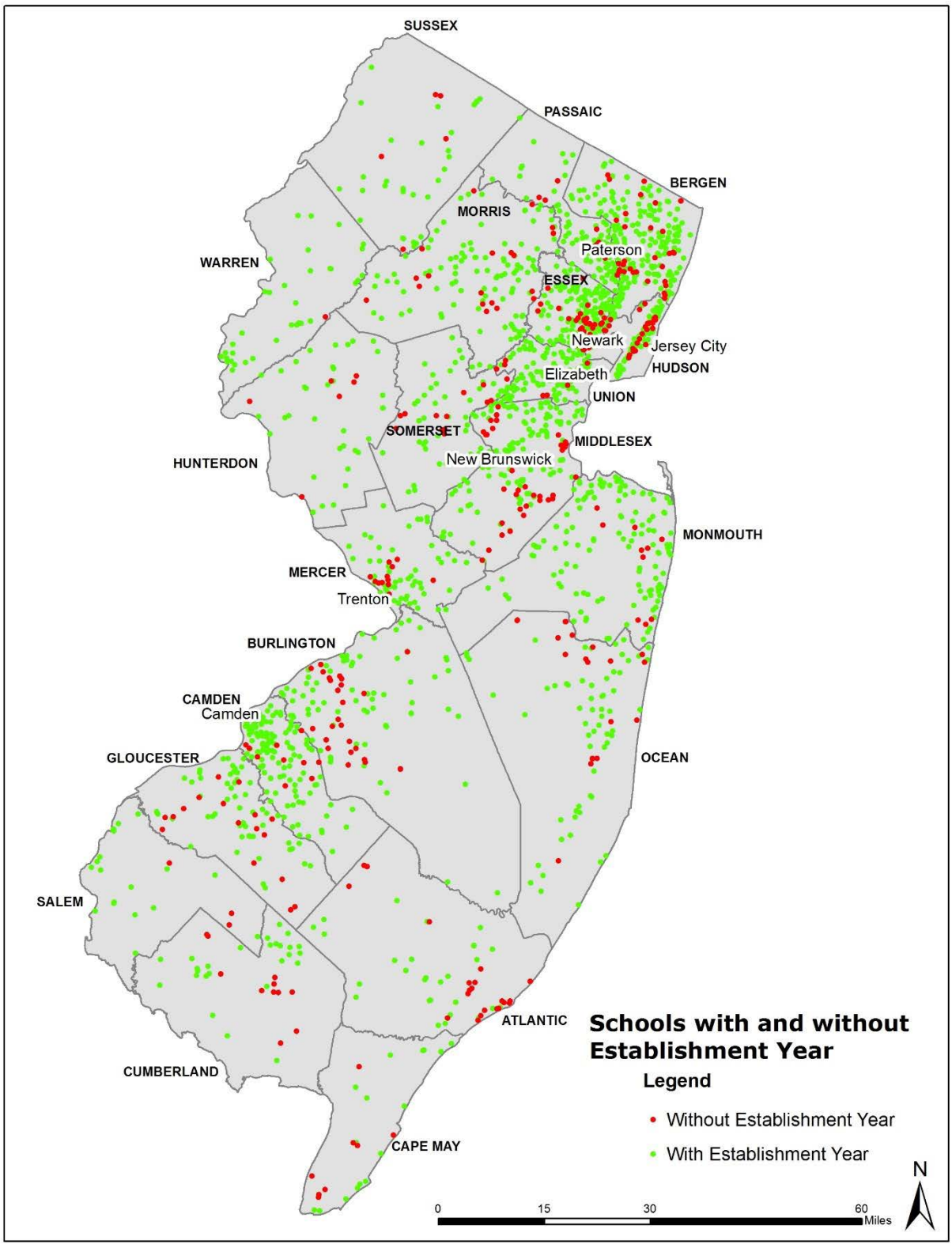


Figure A2: Schools by Period of Establishment

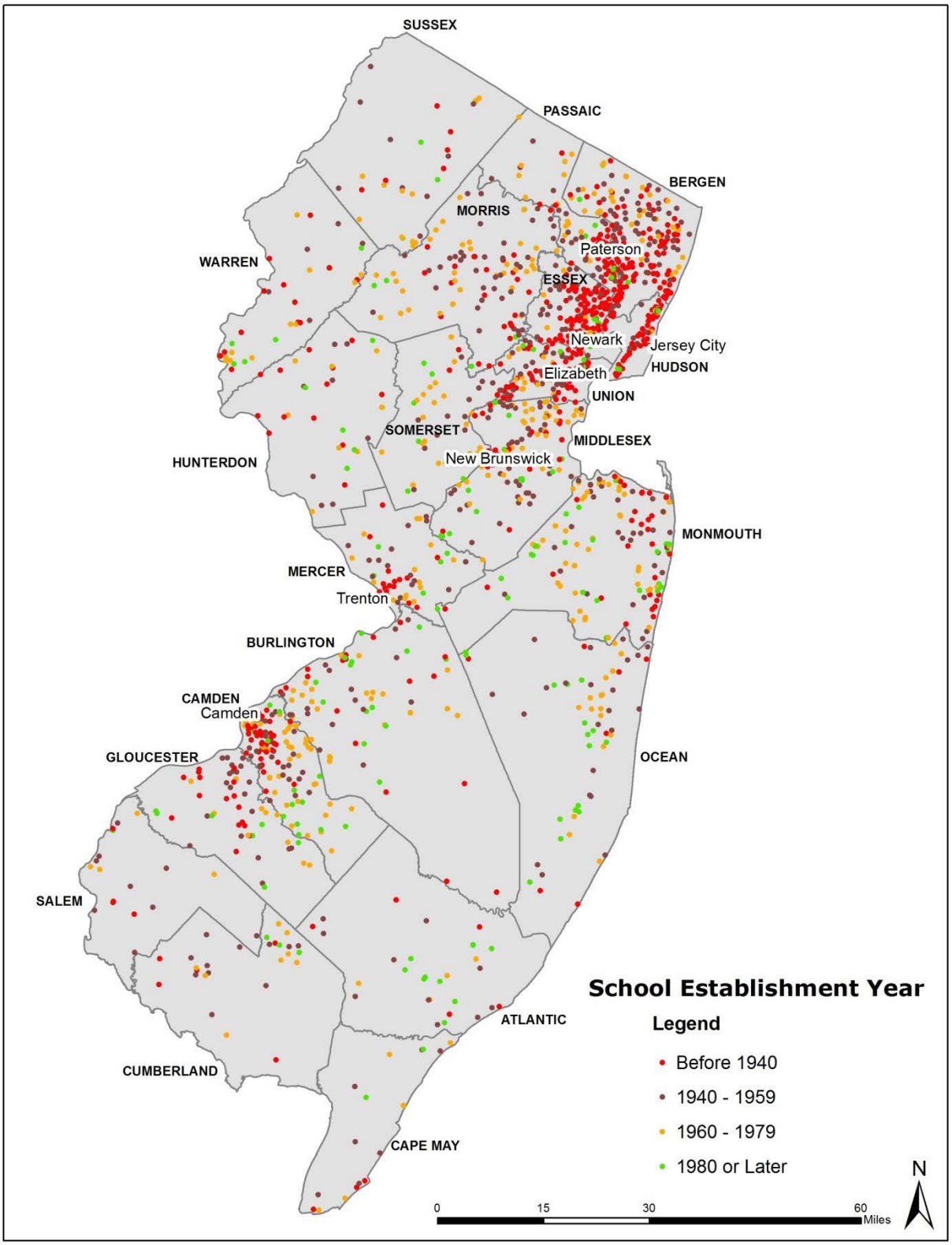


Figure A3: Number of Enrolled K-8 Students in School

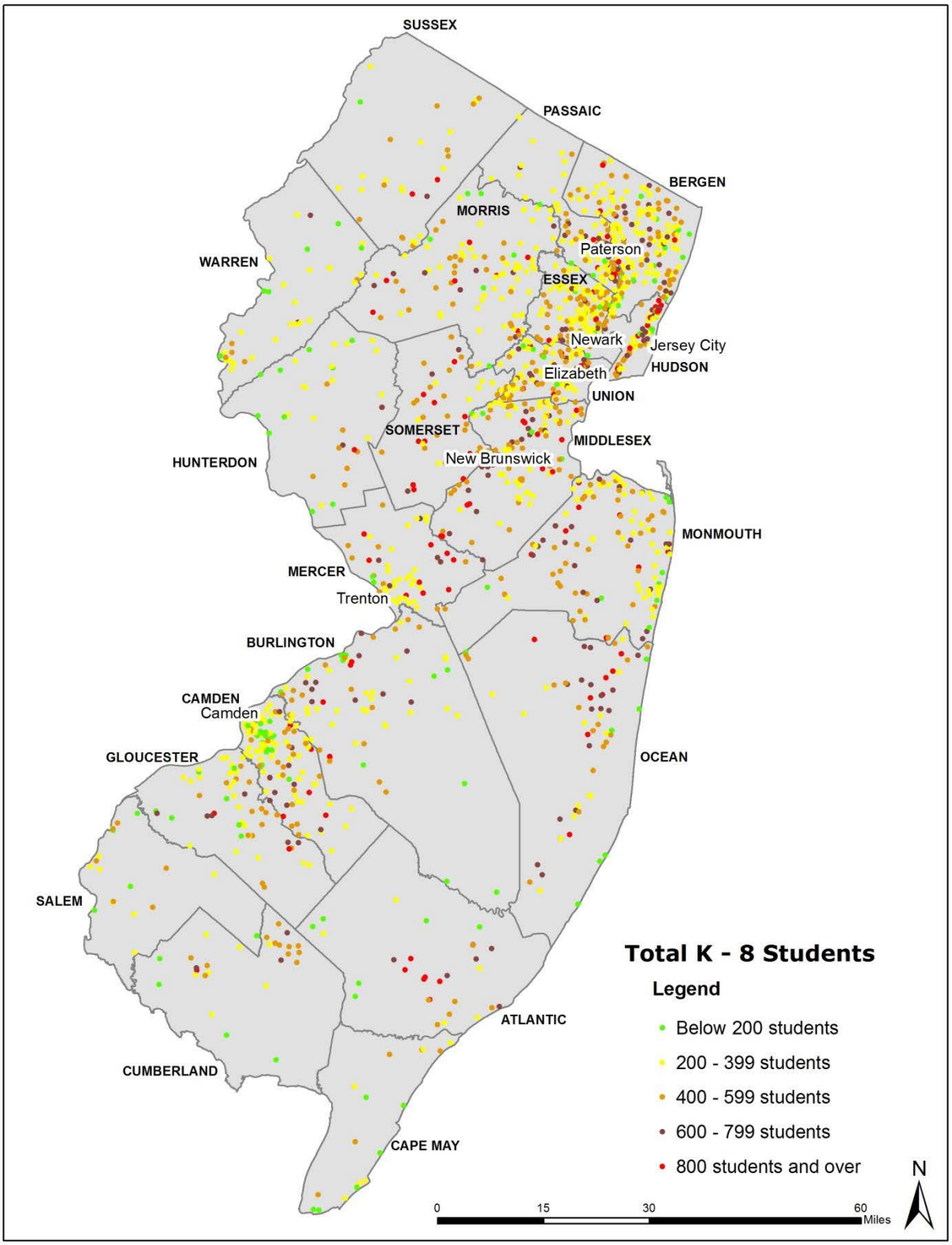


Figure A4: Proportion of African American Students in School

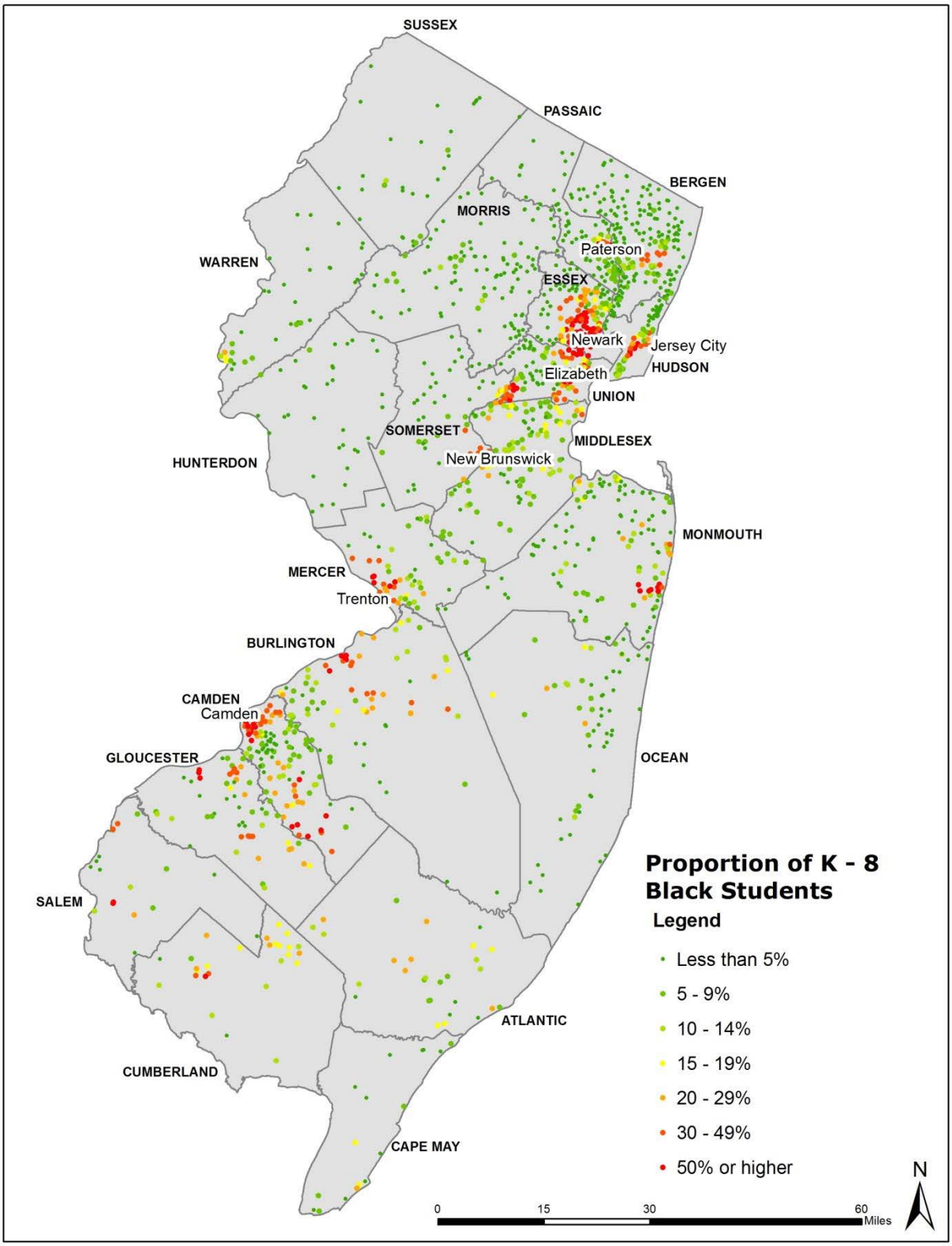


Figure A5: Proportion of Hispanic Students in School

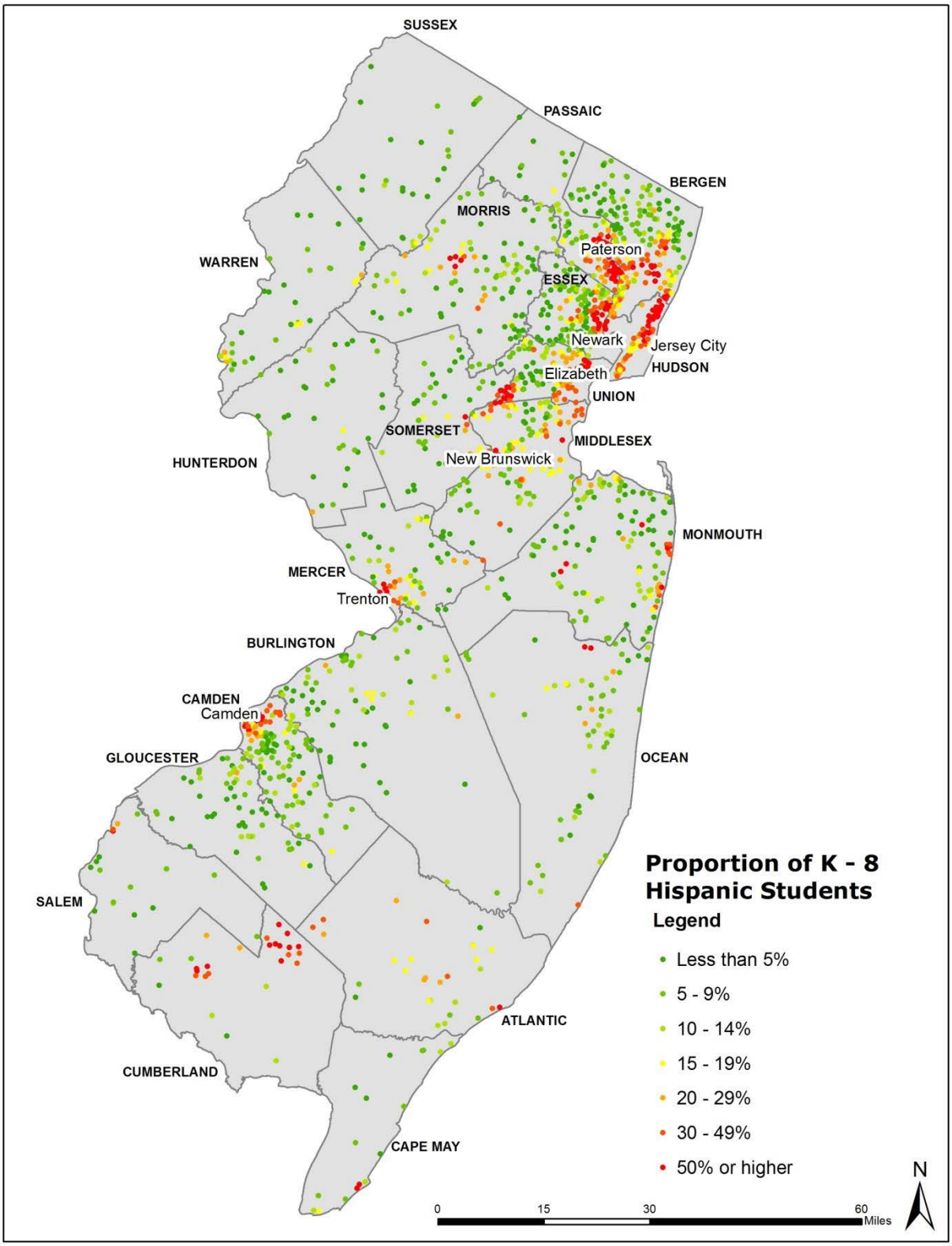


Figure A6: Proportion of Free Lunch Students in School

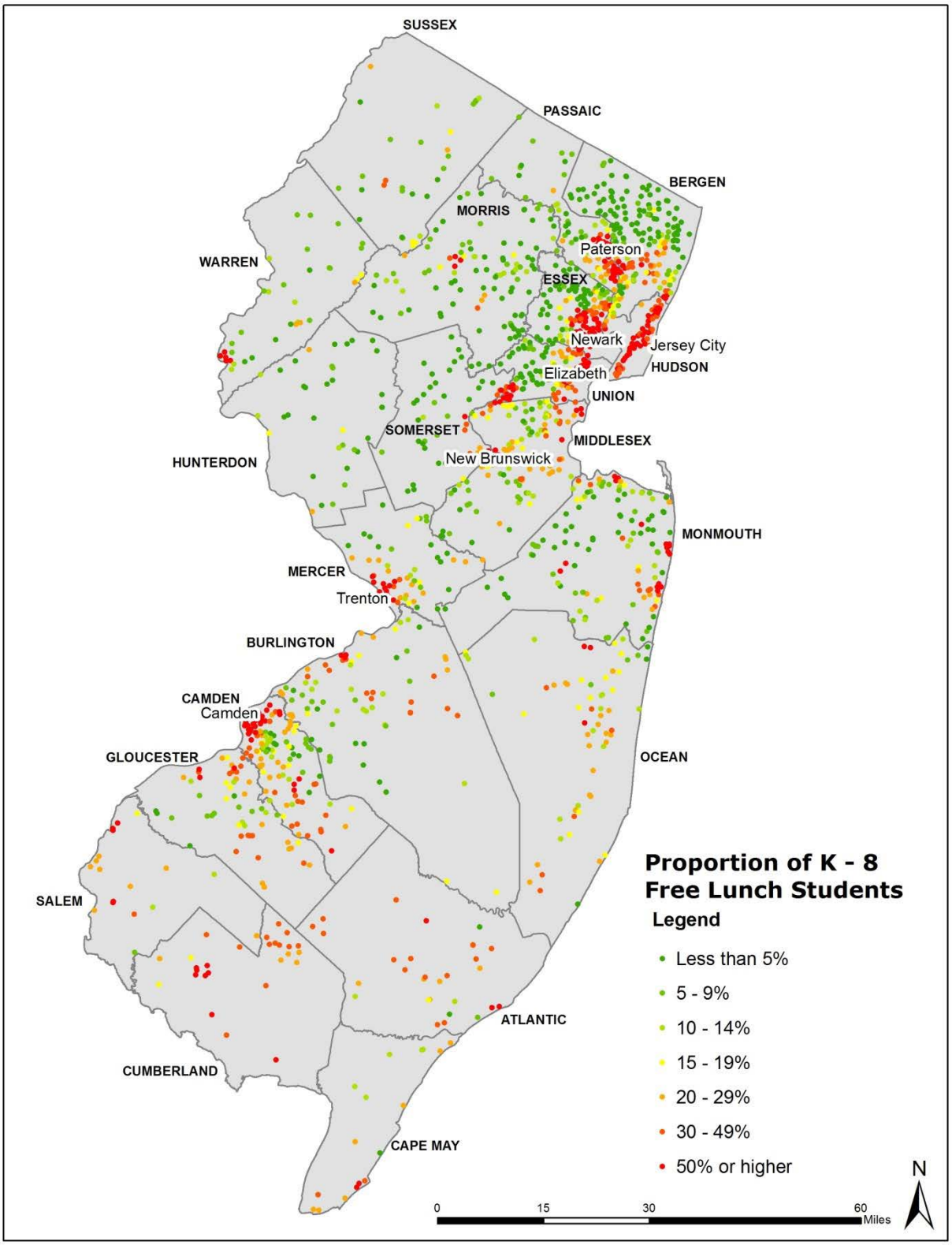


Figure A7: Frequency of Pedestrian Crashes involving Persons under Age 18 within One Mile of Schools

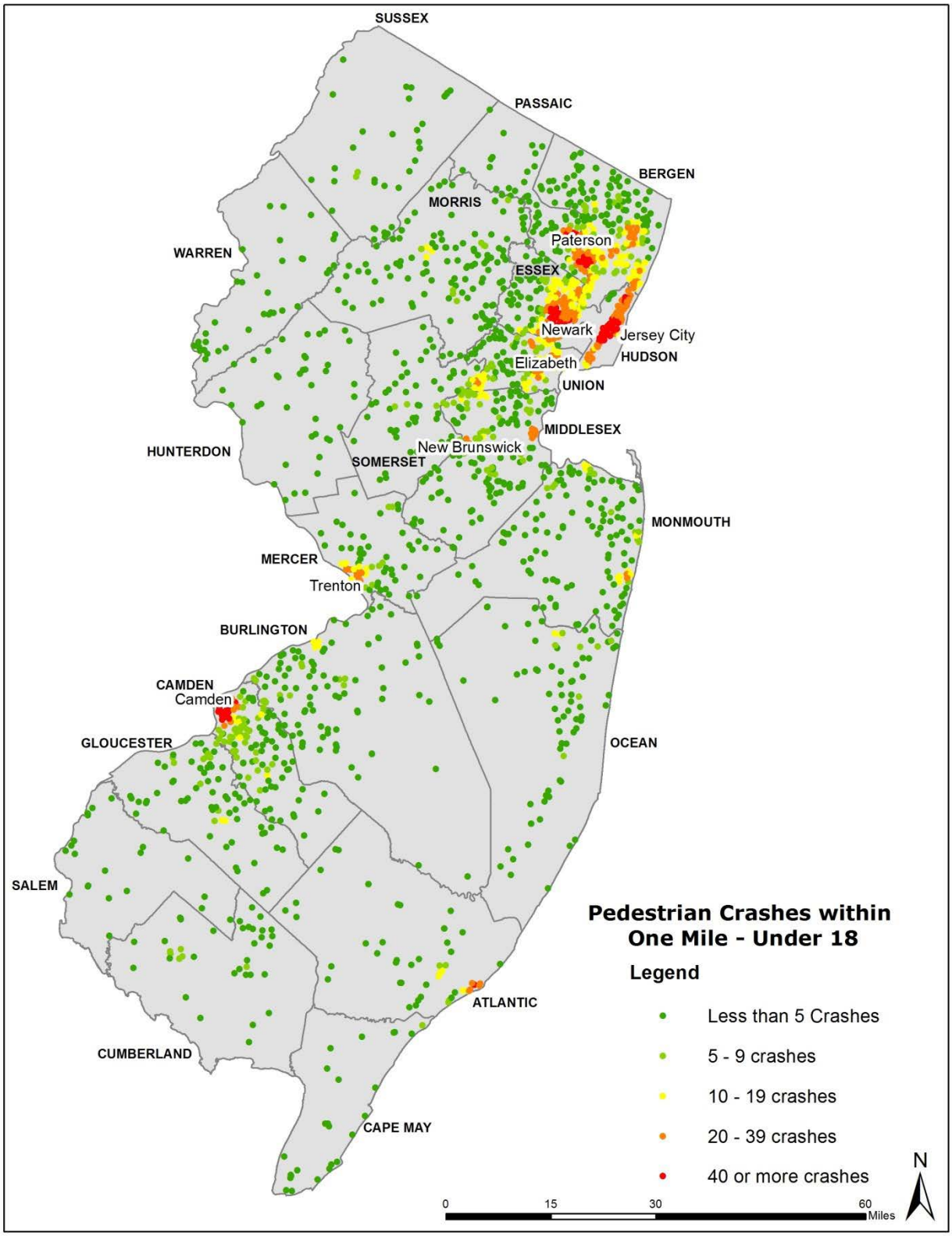


Figure A8: Abbott School Districts and Year of School Establishment

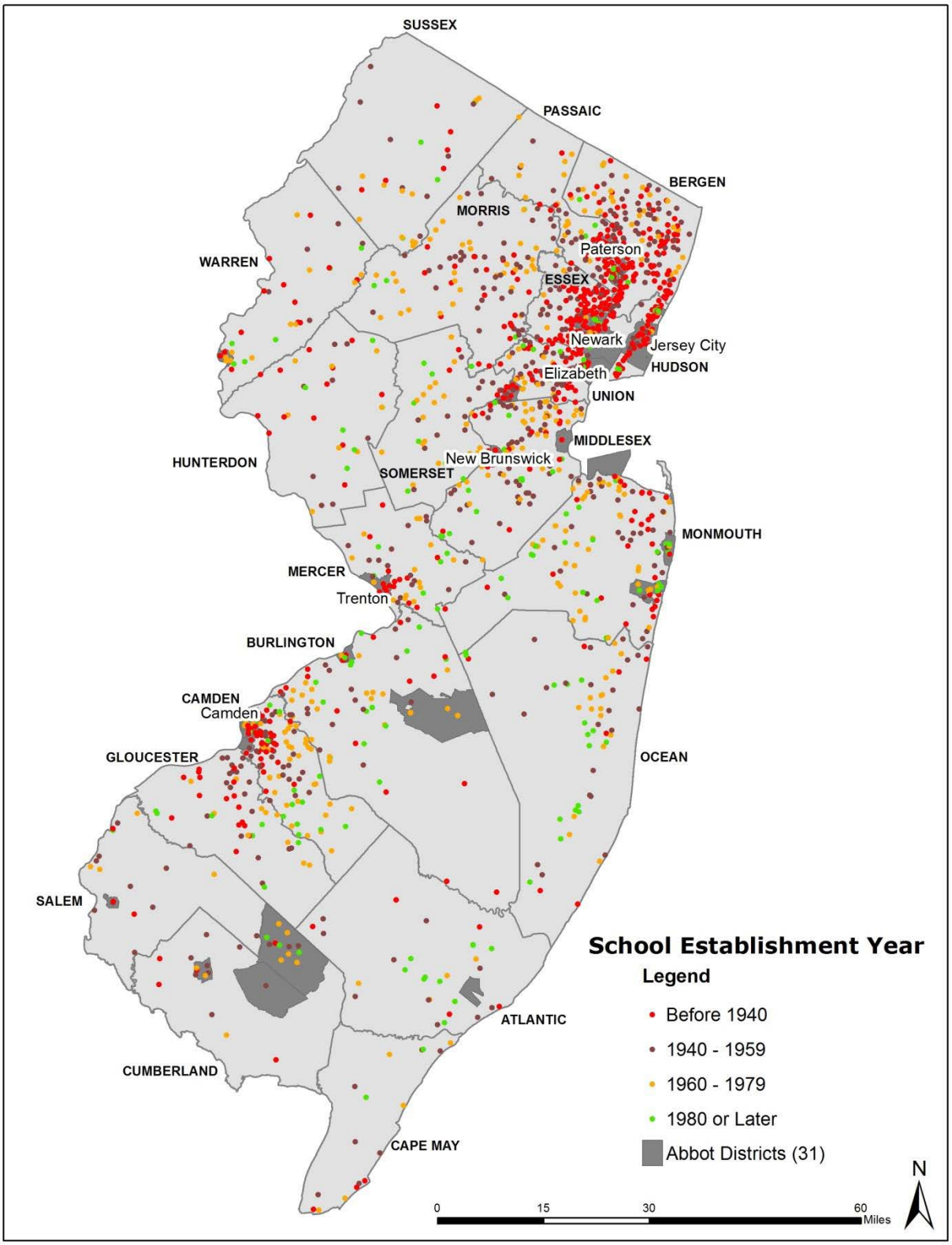


Figure A9: School Locations and Adjacent Road Types

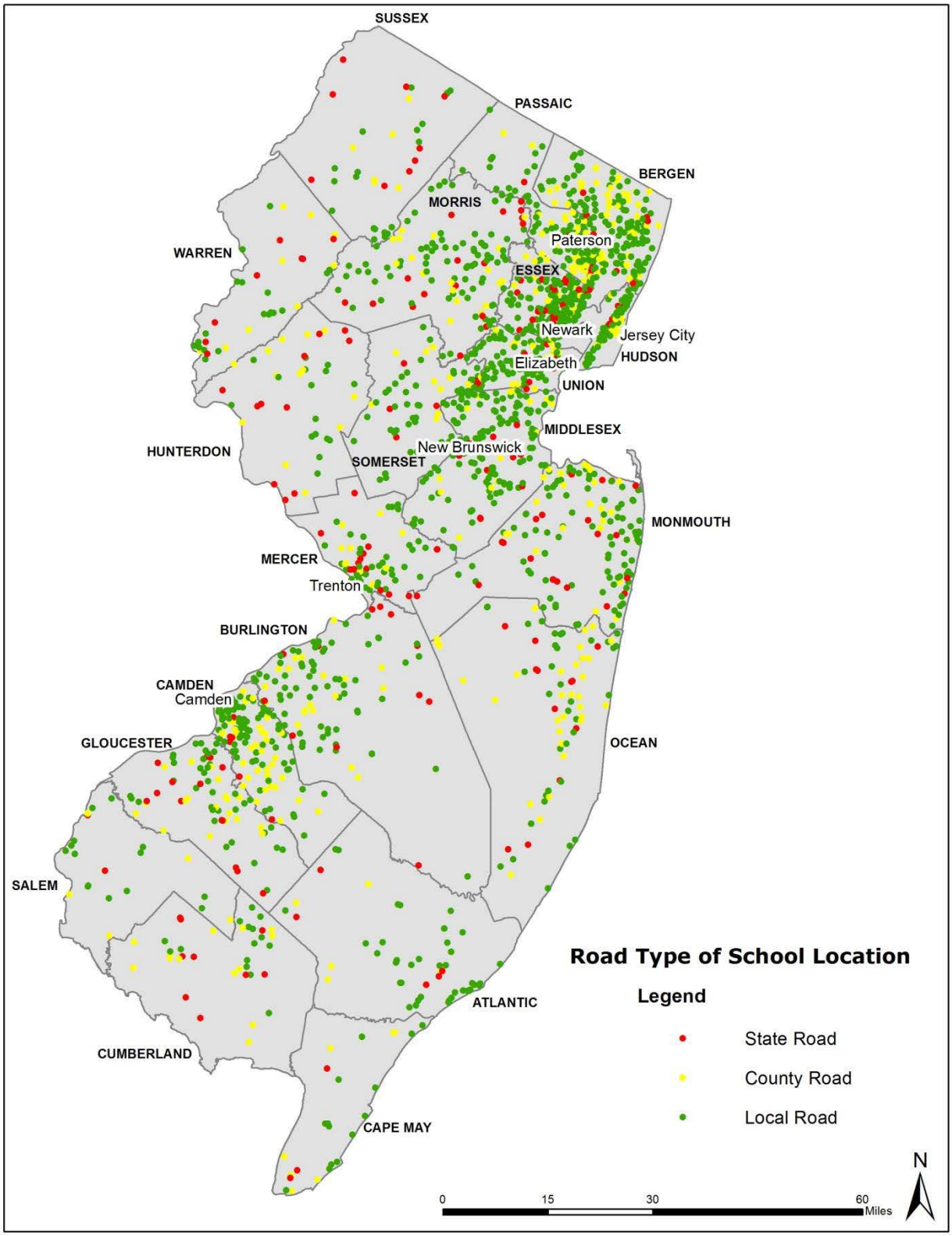


Table A1: Top 60 Schools with the Highest Pedestrian Crashes within Half Mile in the 2003-2010 Period

School	City	Board	Pedestrian Crashes	Abbott
Henry L. Bonsall Family School	Camden	Camden City Public Schools	36	Yes
Ollie Culbreth, Jr. School	Jersey City	Jersey City Public Schools	34	Yes
The Academy I	Jersey City	Jersey City Public Schools	31	Yes
Gladys Nunery School	Jersey City	Jersey City Public Schools	30	Yes
SCHOOL 6/ACADEMY OF PERFORMING ARTS	Paterson	Paterson Public Schools	30	Yes
Martin Luther King, Jr. School	Jersey City	Jersey City Public Schools	28	Yes
Alfred Cramer College Preparatory Lab	Camden	Camden City Public Schools	27	Yes
Whitney M. Young, Jr. School	Jersey City	Jersey City Public Schools	27	Yes
Chaplain Charles Watters School	Jersey City	Jersey City Public Schools	26	Yes
James F. Murray School	Jersey City	Jersey City Public Schools	26	Yes
Jotham W. Wakeman School	Jersey City	Jersey City Public Schools	26	Yes
Charles Sumner Elementary School	Camden	Camden City Public Schools	25	Yes
SCHOOL 13	Paterson	Paterson Public Schools	25	Yes
Riletta Twyne Cream Family School	Camden	Camden City Public Schools	24	Yes
Langston Hughes Elementary School	East Orange	East Orange School District	24	Yes
Ecole Toussaint Louverture	East Orange	East Orange School District	24	Yes
Cicely L. Tyson Community Middle/High School	East Orange	East Orange School District	24	Yes
J. Garfield Jackson Sr. Academy	East Orange	East Orange School District	24	Yes
THURGOOD MARSHALL SCHOOL	Irvington	Irvington Board Of Education	24	Yes
Martin Luther King, Jr. School # 6	Passaic	Passaic City Public Schools	24	Yes
School # 16	Passaic	Passaic City Public Schools	24	Yes
Cicely L. Tyson Community Elementary School	East Orange	East Orange School District	23	Yes
HARRIET TUBMAN ELEMENTARY SCHOOL	Newark	The Newark Public Schools	23	Yes
Philip G. Vroom #2	Bayonne	Bayonne Board Of Education	22	No
Octavio V. Catto Family School	Camden	Camden City Public Schools	22	Yes
Althea Gibson Academy	East Orange	East Orange School District	22	Yes
Joseph H. Brensinger School	Jersey City	Jersey City Public Schools	22	Yes
SCHOOL 11	Paterson	Paterson Public Schools	22	Yes
ROBERTO CLEMENTE	Paterson	Paterson Public Schools	22	Yes
NEW ROBERTO CLEMENTE	Paterson	Paterson Public Schools	22	Yes
NORMAN S WEIR	Paterson	Paterson Public Schools	22	Yes
East Camden Middle School	Camden	Camden City Public Schools	21	Yes
Julia A. Barnes School	Jersey City	Jersey City Public Schools	21	Yes
Mahatma K. Gandhi School	Jersey City	Jersey City Public Schools	21	Yes
Anthony J. Infante School	Jersey City	Jersey City Public Schools	21	Yes
School # 5	Passaic	Passaic City Public Schools	21	Yes
Alexander Hamilton Academy	Paterson	Paterson Public Schools	21	Yes
EDWARD W KILPATRICK	Paterson	Paterson Public Schools	21	Yes

School	City	Board	Pedestrian Crashes	Abbott
SCHOOL 2	Paterson	Paterson Public Schools	21	Yes
SCHOOL 28	Paterson	Paterson Public Schools	21	Yes
New York Avenue School	Atlantic City	Atlantic City Public Schools	20	No
John Greenleaf Whittier Elementary School	Camden	Camden City Public Schools	20	Yes
Edward T. Bowser, Sr. School of Excellence	East Orange	East Orange School District	20	Yes
BERKELEY TERRACE	Irvington	Irvington Board Of Education	20	Yes
Christa McAuliffe School	Jersey City	Jersey City Public Schools	20	Yes
AVON AVENUE SCHOOL	Newark	The Newark Public Schools	20	Yes
EIGHTEENTH AVENUE ELEMENTARY SCHOOL	Newark	The Newark Public Schools	20	Yes
William B. Cruise Memorial School # 11	Passaic	Passaic City Public Schools	20	Yes
Forest Hill School	Camden	Camden City Public Schools	19	Yes
Francis X. McGraw Elementary School	Camden	Camden City Public Schools	19	Yes
UNIVERSIY MIDDLE SCHOOL	Irvington	Irvington Board Of Education	19	Yes
Center for the Arts	Jersey City	Jersey City Public Schools	19	Yes
CLEVELAND	Newark	The Newark Public Schools	19	Yes
Public School Number Three	West New York	West New York Board of Education	19	Yes
Livingston Elementary School	New Brunswick	New Brunswick Board of Education	18	Yes
FOURTEENTH AVENUE SCHOOL	Newark	The Newark Public Schools	18	Yes
REV DR FRANK NAPIER, JR SCHOOL	Paterson	Paterson Public Schools	18	Yes
SCHOOL 5	Paterson	Paterson Public Schools	18	Yes
SCHOOL 21	Paterson	Paterson Public Schools	18	Yes
William C. McGinnis Middle School	Perth Amboy	Perth Amboy Public Schools	18	Yes

Table A2: Top 40 Schools Established Since 1980 with the Highest Pedestrian Crashes within Half Mile in the 2003-2010 Period

School	City	Board	Pedestrian Crashes	Abbott
Riletta Twyne Cream Family School	Camden	Camden City Public Schools	24	Yes
Martin Luther King, Jr. School # 6	Passaic	Passaic City Public Schools	24	Yes
Octavio V. Catto Family School	Camden	Camden City Public Schools	22	Yes
Public School Number Three	West New York	West New York Board of Education	19	Yes
Midtown Community School #8	Bayonne	Bayonne Board of Education	17	No
Daniel F. Ryan Elementary School # 19	Passaic	Passaic City Public Schools	16	Yes
Nicholas Oresko #14	Bayonne	Bayonne Board of Education	16	No
School #17	Clifton	Clifton Public Schools	15	No
Lord Stlrling Elementary School	New Brunswick	New Brunswick Board of Education	15	Yes
Hannah Caldwell Elementary	Union	Twp Of Union Board of Education	15	No
Thomas H. Dudley Family School	Camden	Camden City Public Schools	14	Yes
Public School Number Four	West New York	West New York Board of Education	13	Yes
West New York Middle School	West New York	West New York Board of Education	13	Yes
Wilbur Watts Intermediate School	Burlington	Burlington City Public Schools	11	Yes
Nicholas S. Lacorte-Peterstown School No. 3	Elizabeth	Elizabeth Public Schools	10	Yes
Dr. Orlando Edreira Academy School No. 26	Elizabeth	Elizabeth Public Schools	10	Yes
Paul Robeson Community School	New Brunswick	New Brunswick Board of Education	10	Yes
Vincent Capuana School # 15	Passaic	Passaic City Public Schools	8	Yes
Dr. E. ALMA FLAGG SCHOOL	Newark	The Newark Public Schools	8	Yes
Ivy Hill Elementary School	Newark	The Newark Public Schools	7	Yes
Rafael Cordero Molina Elementary School	Camden	Camden City Public Schools	7	Yes
School 1	Paterson	Paterson Public Schools	6	Yes
William F. Halloran School No.22	Elizabeth	Elizabeth Public Schools	6	Yes
Midtown Community Elementary School	Neptune	Neptune Township School District	6	Yes
First Avenue School	Newark	The Newark Public Schools	5	Yes
Parkway Elementary School	Ewing	Ewing Township Public Schools	5	No
A A Anastasia Elementary School	Long Branch	Long Branch Public Schools	5	Yes
Long Branch Middle School	Long Branch	Long Branch Public Schools	5	Yes
Belmont Runyon Elementary School	Newark	The Newark Public Schools	4	Yes
Bradley Elementary School	Asbury Park	Asbury Park School District	4	Yes
Clementon Elementary School	Clementon	Clementon Elementary School	4	No
Juan Pablo Duarte - Jose Julian Marti #28	Elizabeth	Elizabeth Public Schools	4	Yes
Gregory Elementary School	Long Branch	Long Branch Public Schools	4	Yes
Elliott Street Elementary School	Newark	The Newark Public Schools	3	Yes
Dorthy L. Bullock School	Glassboro	Glassboro Public Schools	3	No
Thurgood Marshall Elementary School	Asbury Park	Asbury Park School District	3	Yes
Joseph R. Bolger Middle School	Keansburg	Keansburg School District	3	Yes
A Chester Redshaw School	New Brunswick	New Brunswick Board Education	3	Yes
Ann A. Mullen Middle School	Sicklerville	Gloucester Township Public Schools	3	No
Riverside Elementary School	Riverside	Riverside Township	3	No

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