

NASSAU HEALTH REPORT

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Pedestrian Injuries and Fatalities in Nassau County

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NASSAU HEALTH

Abstract

In an effort to identify and describe factors that contribute to the occurrence and severity of pedestrian injuries in Nassau County, the department of health analyzed data on pedestrian injury incidence, hospitalization and fatality.

There were 9,284 pedestrian injuries and 299 pedestrian deaths in Nassau County Between 1991 and 2000, for an average of 928 injuries and 30 deaths per year. Annual injury and fatality rates were constant over the 10 year period. Pedestrian incidents accounted for only 2% of all traffic-related injuries, but were responsible for 27% of all traffic-related deaths.

Overall there was an increase in pedestrian injuries over the winter months, but children were more likely to be injured in late spring and summer. The average age of an injured pedestrian was 37, but the greatest numbers of injured pedestrians were aged 16. Most injuries occurred during daylight hours, but there was some evidence of an increased risk of fatality at night. 26% of pedestrians injured at intersections were crossing with the signal. There was an association between racial, ethnic and economic variables and the risk of hospitalization for pedestrian injury in a community.

A geographic information system was created to identify the sites of multiple pedestrian injuries and fatalities on county roads and to help inform engineering, educational and enforcement efforts.

Introduction

Recent press reports have highlighted the issue of pedestrian injuries on Long Island.¹ In a study excluding New York City, Nassau County had the highest rate of pedestrian injury hospitalizations in New York State.² There were 348 pedestrian-injury related hospitalizations in Nassau County in 1992, for a rate of 27 hospitalizations per 100,000 population. The next highest rate was for Schenectady with a rate of 21 hospitalizations per 100,000. Nearby Suffolk County had a rate of 20 hospitalizations per 100,000. There was no information for other years, nor were there population-based injury incidence rates or data on fatalities.

Pedestrian injury deaths have decreased 51% in the United States since 1975; they have declined 80% for pedestrians under the age of 9.³ New York City has witnessed significant declines in pediatric pedestrian injury rates over the last decade.⁴ No comparable studies have been conducted in Nassau County. The Nassau County Department of Health, in collaboration with the Nassau County Traffic Safety Board and the New York Coalition for Transportation Safety, conducted this analysis of pedestrian injuries and fatalities in Nassau County.

The study aims to: (1) describe pedestrian injury occurrence, fatality and hospitalization rates over the past decade, (2) compare the experience in Nassau County with the nation, the state and

surrounding areas, (3) map pedestrian injury hospitalization rates by community, and (4) develop a geographic information system to locate the sites of pedestrian injury and fatality occurrence. The goal is to decrease the incidence and severity of pedestrian injuries in Nassau County by identifying factors that contribute to pedestrian/motor vehicle crashes.

Methods and Sources

Data on fatalities were obtained from the National Highway Traffic and Safety Administration, which maintains a data base of all traffic-related fatalities in the United States as part of their Fatality Analysis Reporting System.⁵ Information on pedestrian injury-related hospitalizations was obtained from the New York State Department of Health which reports counts of hospital admissions based on etiologies such as pedestrian injuries as part of the Statewide Planning and Research Cooperative System (SPARCS).⁶ New York City pedestrian injury data was based on published reports⁴ and on analyses conducted by the author. A New York State Department of Motor Vehicles data base of all motor vehicle crashes involving pedestrians, based on police investigation form MV-104AN, contained information for Nassau County for the years 1998 and 1999 and was utilized for age-specific descriptive analyses of injured pedestrians. Pedestrian injury and fatality counts and map files for Nassau County for 1991 to 2000 were obtained from the New York State Department of

Transportation, Safety Program Management Bureau. 78% (7,259/9,248) of the injuries that occurred in Nassau County between 1991 and 2000 had complete geographic location information and were mapped using the New York State Department of Transportation "link and node" system.

Pedestrian fatality frequencies and rates were calculated for Nassau County, New York City, New York State and the United States. Descriptive data are presented on injured pedestrians including age and gender, date of occurrence and weather conditions. Bicyclists were not included in the analysis.

Pedestrian injury hospitalization rates were calculated by zip code of pedestrian residence. Pearson's correlation coefficients were used to measure the association between hospitalization rates and demographic characteristics of zip code tabulation areas.

A geographic information system to locate the occurrence of pedestrian fatalities was created using ArcView GIS 3.2.

Statistical analyses were conducted with Microsoft Excel XP, SPSS version 11.0 and SAS version 8e.

Results

I. Injury, Fatality and Case-Fatality

Between 1991 and 2000 pedestrian injuries accounted for 2% (9,248/461,955) of all motor vehicle crashes in Nassau County, but were responsible for 27% (299/1,105) of all traffic-related fatalities. The yearly number and rate of pedestrian injuries and fatalities in Nassau County have remained constant over the last 10 years. (Table 1) There were an average of 30 fatalities per year and an average of 2.3 pedestrian deaths per 100,000 population per year.

Over the last decade, pedestrian injury incidence rates in Nassau County remained steady at approximately 71 injuries per 100,000 population per year. New York City, pedestrian injury rates per 100,000 population declined 20% over the last 10 years. (Figure 1)

Nationally, there was a 13% decline in the pedestrian fatality rate since 1994 and a similar 17% decline in New York State over the same time. Nassau County rates were more variable. (Figure 2)

Case fatality rates in Nassau County declined 17% over the past decade, from 33.4 fatalities per 1000 injuries in 1991 to 27.9 in 2000. During a similar time period case-fatality rates in New York City were consistently lower and declined 30%, from 18.3 fatalities per 1000 injuries in 1992 to 12.8 in 2001. (Figure 3).

A majority (61%) of the 9284 pedestrian injuries between 1991 and 2000 occurred during daylight hours. While there was some evidence of an increased risk of fatality at night, it was not statistically significant (Odds Ratio = 2.0 95% CI 0.6, 6.4)

II. Descriptive Epidemiology

In 1998 and 1999 there were 1999 pedestrian injuries and 79 fatalities in Nassau County. These data formed the basis for age-related analyses.

The average age of an injured pedestrian was 37; the most common age (mode) was 16. Fifteen to 19 year olds had the highest rate of injuries, but pedestrians older than 55 had the highest fatality rate. (Table 2) For all ages, injuries declined over the summer months then increased during the fall and early winter. (Figure 4) Children, though, were more likely to be injured in the spring and early summer. (Figure 5) Overall, the largest proportion (18%) of injuries occurred on Fridays, the smallest (8%) occurred on Sundays.

Thirty six percent of all pedestrian injuries occurred where there was no signal or marked crosswalk; a significant minority (14%) were crossing with a signal. (Table 3) When restricted to the 57% (2,371/5,168) injuries coded as occurring at intersections, 623 (26%) were crossing with a signal, 478 (20%) were crossing against a signal and 616 (26%) occurred at intersections where there was no signal or crosswalk.

III. Injury Hospitalizations and Correlates

There were 3,111 pedestrian-injury hospitalizations for Nassau County residents between 1992 and 2002. Average yearly pedestrian hospitalization rates were calculated (Table 4) and mapped to zip codes (Figure 6). Hempstead, Uniondale and Roosevelt had the highest rates of hospitalization with 5 to 6 hospitalizations per 10,000 population per year. Rockville Centre, Freeport, Bellemore, Mineola, Westbury, Glen Cove, Lawrence, Long Beach and parts of Great Neck had the next highest rates at 3 to 4 hospitalizations per 10,000 population per year.

Minority group and socio-economic status of a community were associated with hospitalization rates. Zip-code specific pedestrian injury hospitalization rates were strongly and positively correlated to the proportion of residents self-identified as Black ($r = 0.685$, $p < 0.0001$) or Hispanic ($r = 0.578$, $p < 0.0001$). Rates were negatively but less strongly correlated to median household income ($r = -0.287$, $p = 0.018$) and per capita income ($r = -0.291$, $p = 0.017$). There was some association between the proportion of residents using public transportation and injury rates ($r = 0.301$, $p = 0.013$).

V. Mapping System Demonstration

Of the 9,284 pedestrian injuries occurring in Nassau County between 1991 and 2000, 7,259 (78%) had geographic

“Link and Node” coordinate information that allowed mapping. Figure 7 demonstrates the overall geographic distribution of pedestrian injuries and fatalities in Nassau County between 1991 and 2000. Figure 8 presents similar information for fatal injuries. The capability of the system to display more detailed information in areas of apparent clustering is demonstrated in figure 9.

Discussion

As is the case in many urban and suburban communities, pedestrian injuries account for a disproportionate number of traffic-related fatalities in Nassau County and are a public health and safety issue. With this effort, we begin to describe who is being injured and where the injuries are occurring in time and space. By looking at injuries as well as fatalities we can get a fuller and clearer picture of the problem on a community-wide level. This data can guide prevention and mitigation efforts. The conclusions can be broadly grouped under the headings of person, place and time.

Nassau County has a relatively high proportion of elderly residents. Senior citizens may have perceptual difficulties that contribute to the risk of pedestrian injuries. The elderly, though, are not over-represented among those injured in pedestrian injuries in Nassau County. Although the elderly are at greater risk

of fatality when they are injured, the greatest numbers of injuries occur among the pediatric age group.

Areas of the county with lower median household incomes and higher proportions of minority residents are impacted most severely by pedestrian injuries. A number of studies have demonstrated that being a member of a minority or non-white group clearly increases the risk of pedestrian injury.^{7 8 9 10} Studies have pointed primarily to race¹¹ or to economics¹² or to some as yet undefined factor that puts people at risk of more proximal risk factors.¹³ Some of the risk likely lies in higher levels of pedestrian traffic and population density. This study serves as a point of departure for a more detailed analysis of these areas. Geographic information systems can help guide that analysis.

The correlations we described, while strong and statistically significant, looked at related, collinear variables. Per capita income and median household income are strongly associated with each other. The use of public transportation is likely measuring a similar socio-economic factor. The correlation between proportion of non-white residents and injury hospitalization was double that of income, but economics and minority status are still closely related. It is difficult to tease out the strength of the factors involved based on these simple correlations. Future studies should include statistical methods such as factor analysis and regression modeling.

The higher case-fatality rates in Nassau County compared to New York City may be due to higher vehicle speeds. New York City has a higher traffic and population density than Nassau County. These variables are associated with more injury occurrence but less severe injuries due to lower speeds.¹⁴

That rates of pedestrian injury and death have been declining elsewhere but not in Nassau should be interpreted cautiously. Comparisons between Nassau and the rest of New York State and the nation are based solely on fatality statistics. Nassau's 30 yearly fatalities in a population of 1.3 million are already low and are less statistically stable than the statewide and national numbers. It may be more difficult to demonstrate a decline. New York City injury rates, while declining, are consistently higher than those in Nassau. There may be some element of regression to the mean at play.

The reasons behind pedestrian injury decline are complex and involve declining rates of pedestrian exposure.¹⁵ Pediatric pedestrians have experienced the greatest decline, but children are less likely to walk to school or play in the street than they were just 10 years ago. This may result in a decreased injury risk through decreased exposure.

Injury numbers, such as those upon which comparisons to New York City are based, may be more informative, but are more difficult to come by. It may be that given its population density, injury rates in Nassau County are as low as can reasonably be expected and that the appropriate comparison is to other

mature suburban communities such as Westchester or Suffolk counties. Unfortunately, those numbers are not available. Still, as noted in the introduction, hospitalization rates, which are available, indicate that Nassau County experiences more pedestrian injuries than areas like Westchester and Suffolk.

The crash location information contained in the geographic program developed as part of this effort is a potentially useful tool. It appears there are areas in Nassau County where pedestrians are at increased risk of injury or fatality. Formal temporal and spatial cluster analyses should be conducted to identify them. Site visits can be planned based on these desktop analyses, and possible engineering and law enforcement interventions instituted.

Future pedestrian injury control efforts in Nassau County should include an interdisciplinary team of traffic engineers, law enforcement officials and health professionals. Current law enforcement and educational efforts can be enhanced by the results of surveillance and study. These efforts should be informed by including the participation of neighborhood and community groups. Such research and advocacy can be supported by applications for federal and state funding.

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Tables and Figures

Table 1: Total (All-Age) Pedestrian Injury Frequency, Injury Rate per 100,000 Population, Fatality Frequency, Fatality Rate per 100,000 Population and Case-Fatality Rate per 1000 Injuries, Nassau County, NY, 1991-2000.

Year	Number Injured	Injury Rate	Number Killed	Fatality Rate	CFR
1991	899	69.8	30	2.3	33.4
1992	909	70.4	41	3.2	45.1
1993	923	71.2	24	1.9	26.0
1994	952	73.2	29	2.2	30.5
1995	930	71.2	24	1.8	25.8
1996	893	68.1	16	1.2	17.9
1997	936	71.1	30	2.3	32.1
1998	934	70.7	34	2.6	36.4
1999	975	73.6	45	3.4	46.2
2000	933	70.2	26	2.0	27.9
Total	9284		299		

Figure 1: Pedestrian Injury Rates per 100,000 population, 1991-2000, Nassau County and New York City.

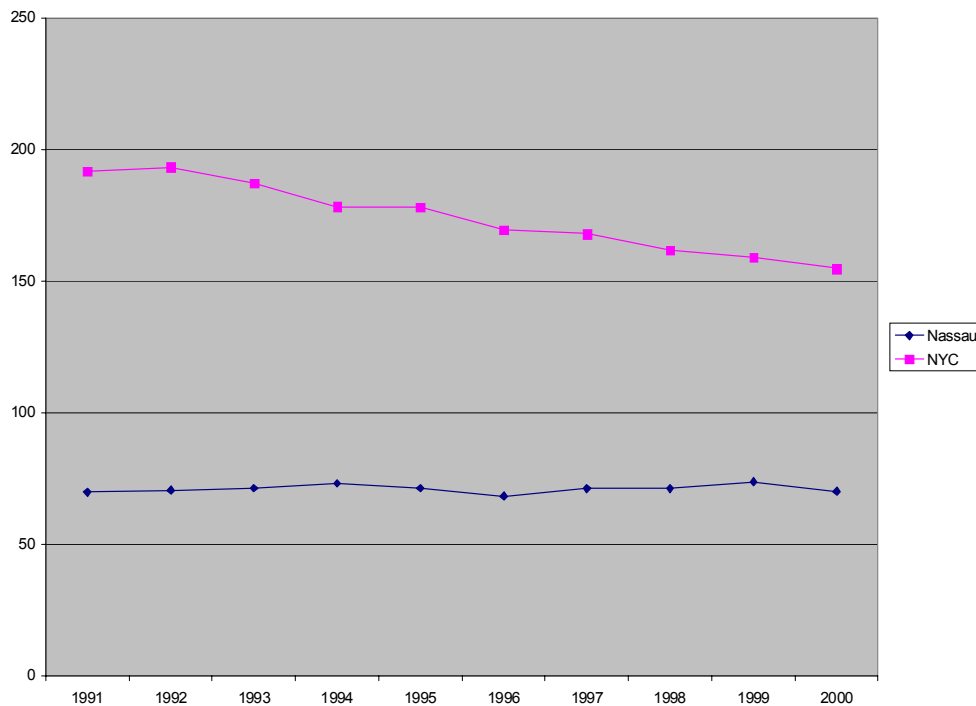


Figure 2: Pedestrian Fatality Rates per 100,000 Population, Nassau County, NY, New York State and U.S., 1994-2000.

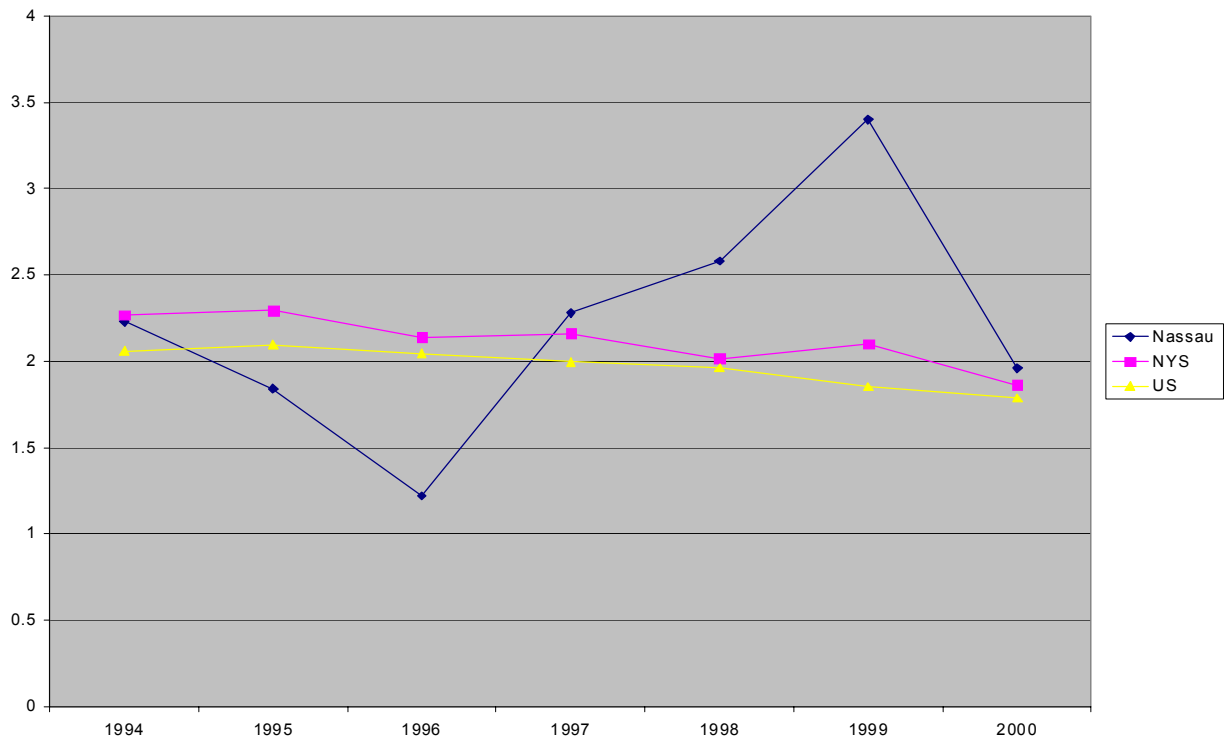


Figure 3 : Comparison Case-Fatality Rates per 1000 Injuries, Nassau County vs. New York City, 1992 – 2000.

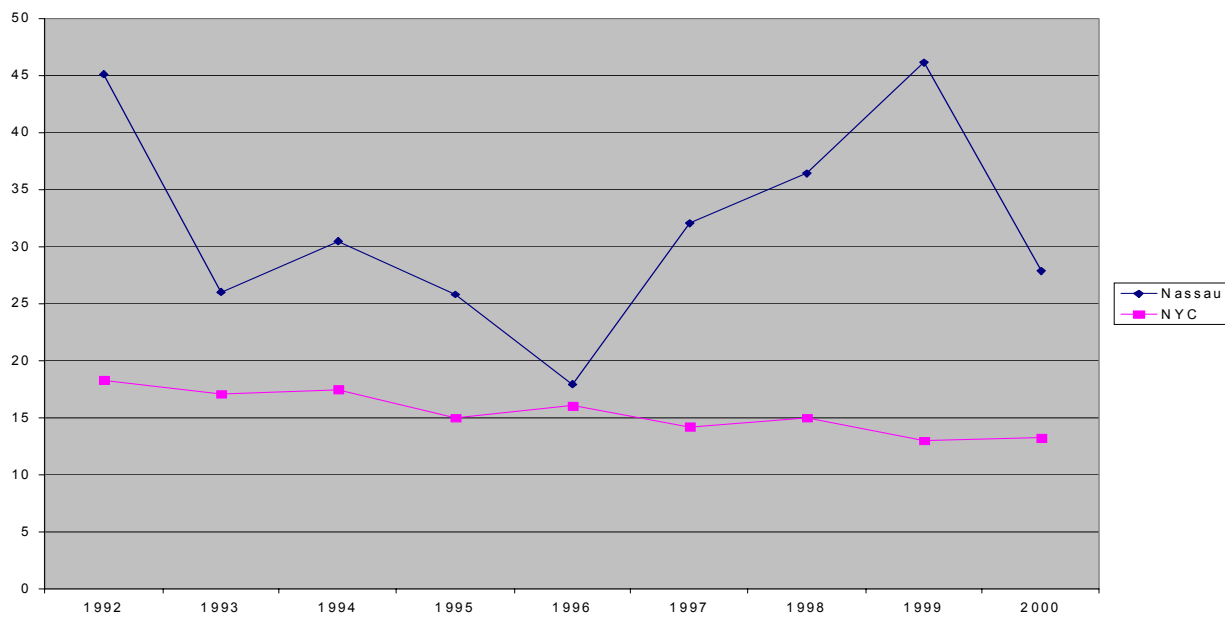


Table 2: Age-Specific Pedestrian Injuries, Fatalities and Rates per 100,000 Population, Nassau County, NY 1998-1999.

Age Category	Number Injured	Yearly Injury Rate	Number Killed	Yearly Fatality Rate
0-4	45	26.0	0	0.00
5-9	132	68.6	1	0.5
10-14	183	97.9	2	1.1
15-19	203	122.8	2	1.2
20-55	938	72.3	33	2.5
>55	442	67.6	40	6.1
TOTAL	1943	72.8	78	2.9

Figure 4: Frequency (Number) of Pedestrian Injuries by Month, All Ages, Nassau County, 1998-1999.

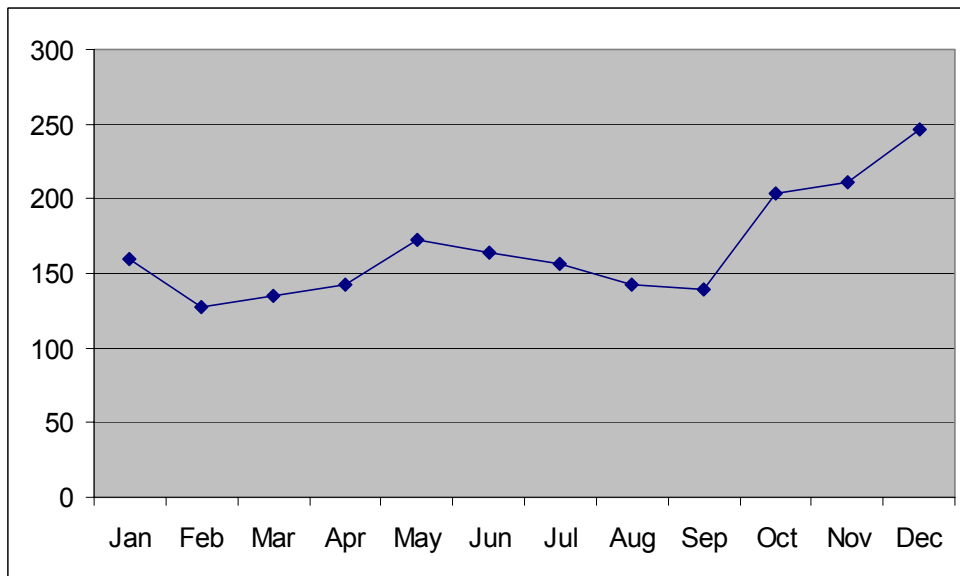


Figure 5: Frequency of Child (Ages 1-14) Pedestrian Injuries by Month, Nassau County, 1998-1999.

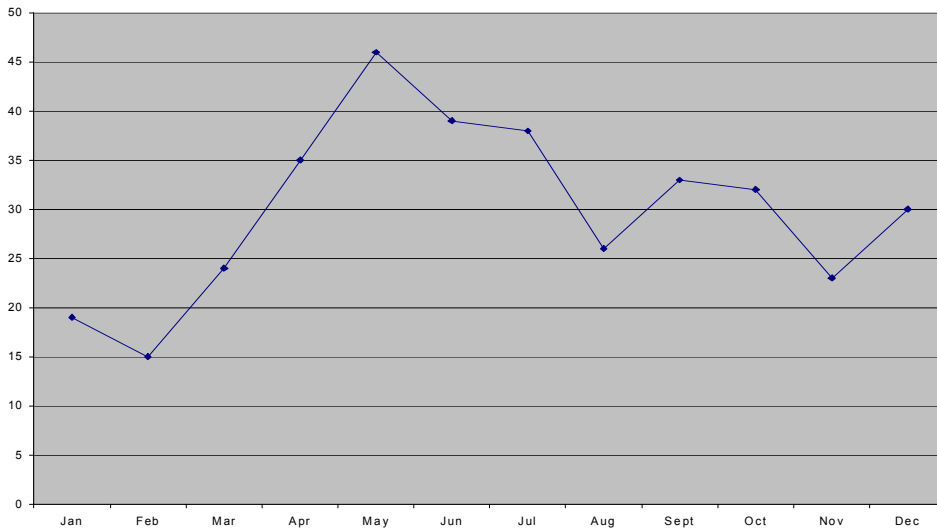


Table 3: Pedestrian Action and Location Prior to Injury, Nassau County, NY 1998-1999.

	Frequency	Percent
Crossing With Signal	1309	14.1
Crossing Against Signal	969	10.4
Crossing on Marked Crosswalk	418	4.5
Crossing No Signal or Crosswalk	3359	36.2
Along Highway	235	2.5
Highway	362	4.1
Child Getting on or off School Bus	36	0.4
Playing in Roadway	118	1.3
Getting on or off Vehicle	129	1.4
Pushing / Working on Car	38	0.4
Working in Roadway	151	1.6
Other	1009	10.9
Not on Road	346	3.7
Total	8900	

Table 4: Average Yearly Pedestrian Injury Hospitalization Rates per 10,000 Population, Nassau County 1992-2002.

Zip Code	Rate	Zip Code	Rate	Zip Code	Rate	Zip Code	Rate	Zip Code	Rate
11001	2.25	11514	1.57	11559	2.80	11581	1.22	11783	1.31
11003	2.56	11516	1.54	11560	0.93	11590	3.55	11791	1.08
11010	2.16	11518	1.70	11561	2.41	11596	1.81	11793	1.03
11020	3.60	11520	2.97	11563	2.03	11598	1.79	11797	0.71
11021	3.01	11530	1.72	11565	0.60	11709	0.38	11801	1.94
11023	2.57	11542	2.40	11566	1.17	11710	1.71	11803	1.31
11024	1.80	11545	1.20	11568	1.36	11714	1.82	11804	0.91
11030	1.86	11547	2.73	11569	0.58	11732	1.43		
11040	1.76	11548	1.08	11570	2.61	11735	1.61		
11050	1.97	11550	5.48	11572	1.92	11753	0.86		
11096	0.91	11552	2.11	11575	5.01	11756	1.63		
11501	3.09	11553	4.15	11576	1.77	11758	1.09		
11507	1.76	11554	1.36	11577	1.49	11762	1.23		
11509	1.59	11557	1.94	11579	1.59	11765	1.24		
11510	1.74	11558	1.70	11580	2.09	11771	1.24		

Figure 6: Geographic Representation Average Yearly Pedestrian Injury Hospitalization Rates per 10,000, Nassau County 1992-2002.

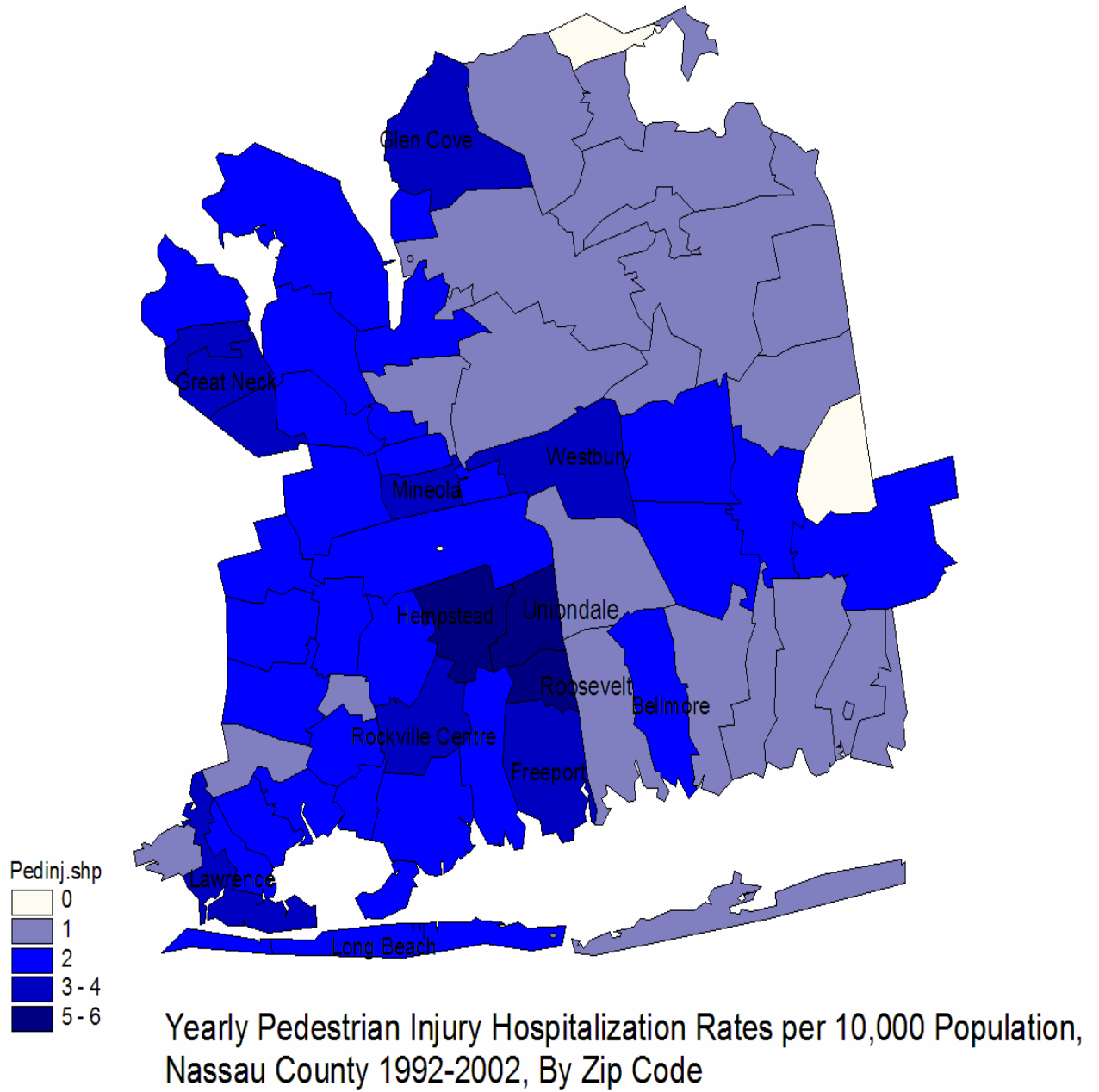


Figure 7: Demonstration of Pedestrian Injury Geographic Information System. Overview Pedestrian Injury and Fatality Sites, Nassau County, NY 1991-2000.

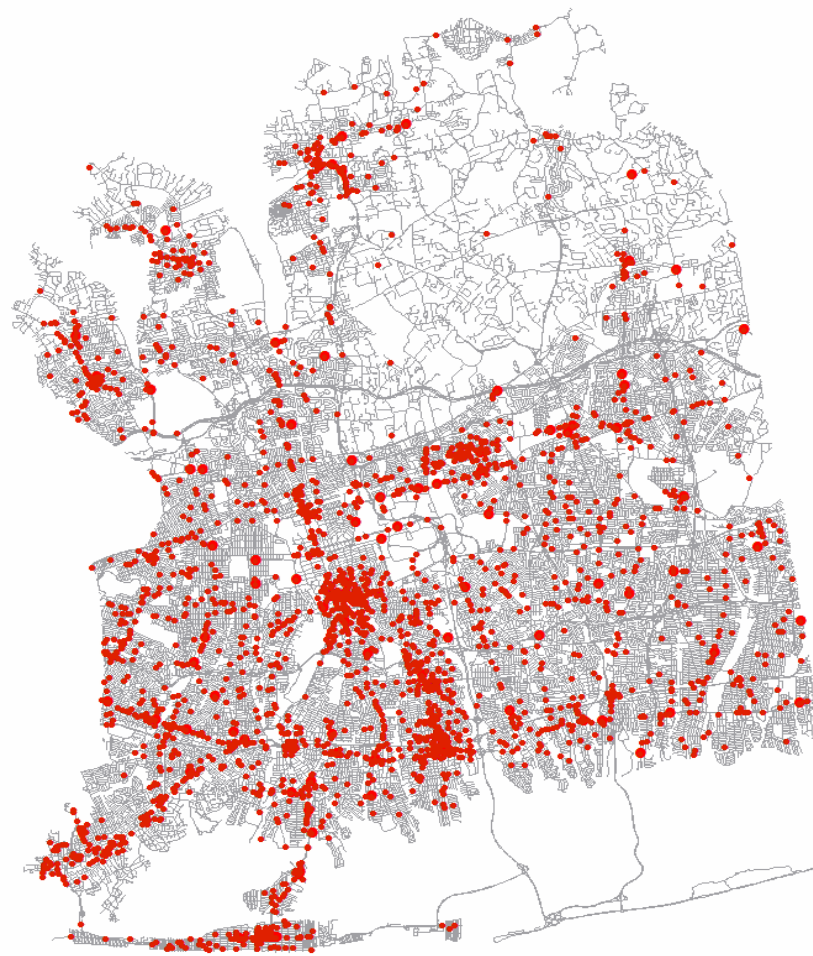


Figure 8: Demonstration of Pedestrian Injury Geographic Information System. Overview Pedestrian Fatality Sites, Nassau County, NY 1991-2000.

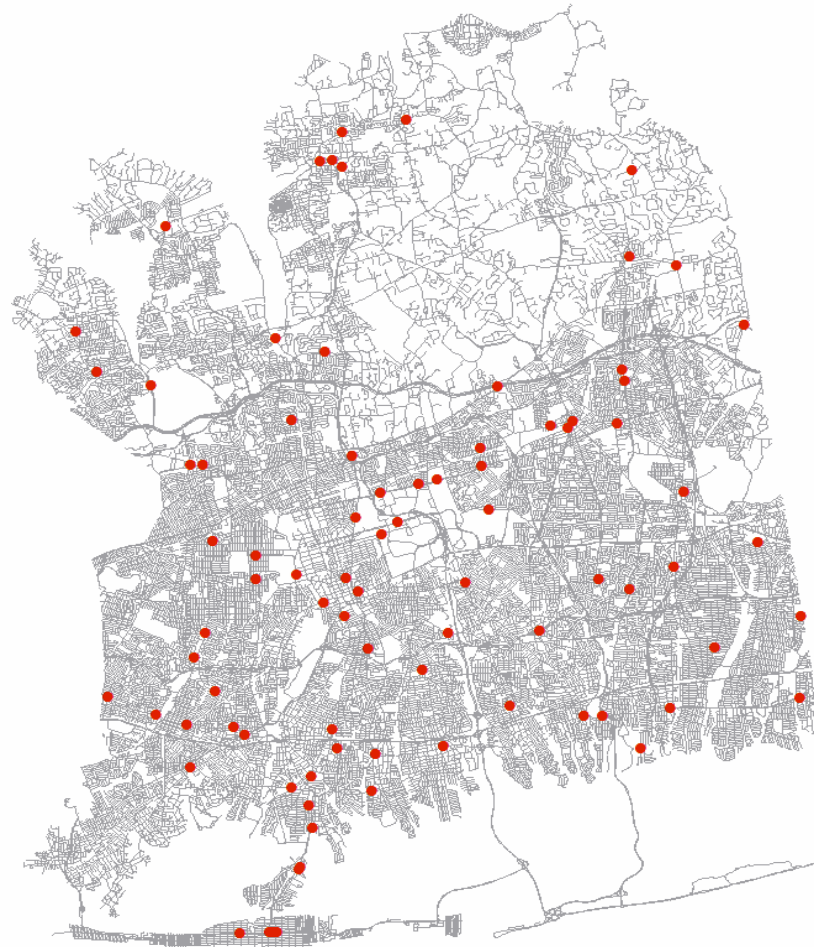


Figure 9: Demonstration of Pedestrian Injury Geographic Information System. Pedestrian Injury and Fatality Sites, Hempstead and Uniondale Areas. Nassau County, NY 1991-2000.

