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Master of Public Health Research Project

Has Richmond, Virginia become safer in the past five years (2002-2006)?

An analysis of ambulance data regarding penetrating trauma incidents.

By
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MPH Research Project: EPID 691

Virginia Commonwealth University/VCU Medical Center

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Dedication

I would like to dedicate this in loving memory of my Grandpa John McCabe and Grandpa Charlie Rogers who taught me that life and the important things in it are worth the struggles and that where there's a will there's a way.

Acknowledgements

I would like to thank my family, especially my parents and baby brother who have supported me through every step in my life.

I would also like to thank my advisor Dr. Vance, Dr. Turf and my preceptor Derek Andresen for all of their assistance with my research project.

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Abstract

Introduction: The World Health Assembly declared violence as a worldwide public health problem. Homicides have been identified as a leading cause of death in the United States across all age groups. The national homicide rate for 2004 and 2005 are 5.5 and 5.6 per 100,000 population, respectively. The reported rates for Virginia are 5.2 (2004) and 5.6 (2005) per 100,000 population, showing a 16.9% increase. Richmond has been ranked as high as the sixth most dangerous among similar cities in the United States. This study examines penetrating trauma injuries identified through 9-1-1 calls as an indicator of the incidence of homicide in Richmond, Virginia. The purpose of this study was to determine if Richmond has become a safer city, with respect to this type of injury over a five year period.

Objectives: (1) To determine if the incidence of penetrating trauma has changed significantly over the five year study period. (2) To examine possible trends in descriptive statistics of study variables. (3) To assess trends in the distribution of response location.

Methods: This is a retrospective study of data collected from 911 calls to Richmond Ambulance Authority in Richmond, Virginia, with a chief complaint of penetrating trauma during the years 2002-2006. Descriptive statistics were completed on all transported patients. Chi-square tests were used to determine trends. GIS was used to spatially examine the distribution of incident locations.

Results: There was no significant trend in the incidence by year. Annual distribution of shooting versus stabbings varied significantly over the study period with the proportions of gunshots decreasing while stabbings increased. There was no significant trend in age, gender, number of patients transported or transport protocol over the study period. Level of care varied significantly over the five year period with BLS decreasing while Basic ALS increased. 39% of neighborhoods had no known incidents, while 8% of neighborhoods accounted for 40% of known gunshot and stabbing incidents.

Discussion: These findings show that overall, with respect to known penetrating trauma incidents, Richmond has not become much safer over the five year period. A major limitation of this study is that most analyses were completed using only patients transported by the RAA. Future research should examine outcome data to determine if the change in type of penetrating trauma proportions resulted in greater survival rates.

Introduction

Annually, Morgan Quinto Press, a Kansas based research firm, ranks the cities of the United States according to characteristics they have determined as important qualification for a safe environment. Richmond, Virginia has been classified as one of the most dangerous cities with a population between 100,000 and 499,999 in the United States, ranking as high as number six out of 198 cities in the same population category and ninth overall in 369 cities in 2004¹⁴. Recently, police and city officials have made a concerted effort to change this status and in 2006 the city had dropped to number eight on the list. The rankings are based on homicide, rape, robbery, aggravated assault, burglary and arson. The rankings are computed by scoring the reported rates for each category against national average crime rates per 100,000 population. The score for each category is weighted equally and the total is used for ranking among the other cities or metropolitan areas¹⁴. Richmond Police Chief Rodney Monroe claims that the city has improved along all of these aspects excluding arson¹⁷.

The World Health Assembly declared violence as a worldwide public health problem¹¹. Violence can result in a variety of injuries or even death. Death as a result of a violent act is considered homicide. Homicides have been identified as a leading cause of death in the United States across all age groups⁶. Homicide has also been identified as a major cause of pediatric death⁹. The U.S. Department of Justice and the Federal Bureau of Investigation report national and state crime rates. The national homicide rate for 2004 and 2005 are 5.5 and 5.6 per 100,000 population, respectively. The reported rates for Virginia are 5.2

(2004) and 5.6 (2005) per 100,000 population, showing a 16.9% increase²⁰.

There are a wide range of causal factors leading to homicides and methods of completing the act itself. The most frequent homicides are caused by firearms, physical beatings and stabbings¹. The Bureau of Justice Statistics reports that in 2005, in violent crimes where a weapon was used 71% involved guns, 14% involved knives and 16% used other weapons⁴. Penetrating injury is defined as an injury incurred when an object penetrates into the body. While almost any sharp object can be used as the mechanism of penetrating injury, the most prevalent types are guns (shootings) and knives (stabbings)⁵.

Firearm death rates in the United States have been estimated at approximately 14.24/100,000 population. This estimate exceeds other high income countries (defined as gross national income per capita of \$10,726 or more) by 1.76 times¹¹. A study using mortality data from the National Center of Health Statistics showed an increase of 137% in firearm related deaths over a 32 year period (1962-93)⁷. Though there is generally a higher occurrence of stabbing incidents than shootings, victims of firearm incidents suffer three times the mortality rate of stabbing victims. Victims of gunshot incidents are more likely to die on scene rather than at a medical facility¹². Case studies of hospital records in Cordoba, Argentina show that as many as 93% of gunshot victims are male and that the average age is approximately 28 years old².

The incidence of stabbings has not changed in the same pattern as shootings. A six year study showed that there was no significant increase in the incidence of stabbings³. This study also showed that the majority of stabbing

victims were young males and were injured after 1800 hours on a Friday, Saturday or Sunday evening. An additional study found that the majority of victims were young men in urban areas with a median age of 32 years (range: 1-88 years)³. Researchers at the Glasgow Royal Infirmary Accident and Emergency Department have found that approximately 27% of stabbing victims are teenagers¹⁹.

Richmond Ambulance Authority (RAA) serves an area of approximately 62 square miles with a day-time population over 1,000,000 and a nighttime population of approximately 200,000 people. During the study period, 2002-2005, there were a total of n=3,234 penetrating trauma incidents reported. Researchers in this study used RAA data collected by emergency dispatchers and personnel responding to penetrating trauma incidents to assess trends in this type of injury. This study examines penetrating trauma injuries identified through 9-1-1 calls as an indicator of the incidence of homicide in Richmond, Virginia. The purpose of this study was to determine if Richmond has become a safer city, with respect to this type of injury over a five year period.

Methods

Study Design and Population:

This study is a retrospective study that compares characteristics of penetrating trauma in the city of Richmond, Virginia over a five year period. The data was separated into five discrete groups by year and characteristics were compared to determine if significant changes in penetrating trauma characteristics had occurred or if the risk remained constant throughout the five

year study period. Along with comparing overall characteristics, this study used GIS graphing to visually examine the trends in penetrating trauma location by organizing the city into neighborhoods.

Data Source

The RAA uses a dispatching system that collects information about each incident occurring in the response area. The system distinguishes the type of call and severity of the injury or illness and collects basic demographic and location characteristics. The data set analyzed includes all incidents that were classified as a “penetrating trauma” from January 2002 to December 2006. The data set also includes basic characteristics of calls where the victim was not transported to a medical facility, as long as the incident was reported to the agency. The majority of analysis was done on cases where one or more patients were transported.

The annual population statistics for Richmond City used in this study were obtained from The Weldon Cooper Center for Public Service at the University of Virginia²¹. Though these estimates are often different from census statistics, the same source was used for all five years so the estimates were considered acceptable.

Variables

Three groups of variables were included in this study: demographic variables, basic call characteristics and incident characteristics.

Demographic

Demographic variables included in this study were age and sex. These are the only variables that are collected by the system and are only collected on patients that are transported. Age was used as a continuous and categorical variable during analysis. Age was categorized into four groups: 0-19 years, 20-29 years, 30-39 year and 40 or older.

Basic Call Characteristics

Basic call characteristics collected were date of the incident and response location. The response location address was geo-coded into longitude and latitude for use in GIS.

Incident Characteristics

Incident characteristics included the type of penetrating trauma injury, level of care provided during transport, number of patients transported and the transport level. Only incidents classified as a penetrating trauma were analyzed. These were further classified into three specific types: gunshot, stabbing and unknown/other. There were two variables used to classify the incident in severity. The level of care provided during transport and transport level are based on the medical personnel's determination of the severity. Level of care was divided into five categories: death or no care given, advanced advanced life support (Advanced ALS), basic advanced life support (Basic ALS) and basic life support (BLS). Among those transported, the transport level was either emergency or non-emergency.

Data Analysis

Statistical data analysis was completed using SPSS Version 14.0. Descriptive statistics were calculated for all patients that were transported by RAA over the five year study period. These included frequencies for categorical variables and mean, range and standard error for the continuous variables. Chi-Square (categorical variables) and ANOVA (continuous variables) were used to test homogeneity in the descriptive characteristics over the study period. Chi-square for trend was calculated using Epi Info.

ArcGIS version 9.1 Graphing Software was used to examine the distribution of response location for gunshot or stabbing victims that were transported by RAA during the study period. Data were graphed by type of penetrating trauma and year of incident. Richmond Redevelopment Housing Authority (RRHA) family housing units were added to determine their relationship to the incident locations. The incidents were also spatially linked to the 148 neighborhoods recognized by the city.

Results

Descriptive Data

There was a total of 3,234 calls to RAA for penetrating traumas over the five year study period. The number of cases and the incidence for each year are provided in Table 1. There was a peak in 2004 where the highest incidence during the study period occurred (3.52/1000 population). There was no significant trend identified.

The proportion of 911 calls for penetrating trauma that resulted in transport varied significantly over the five years with no clear trend seen (Table 2). Data were missing from n=103 multiple unit incidents. Overall 46.4% of incidents resulted in transport. In 2004, the lowest proportion of patients were transported (41.8%).

The type of penetrating trauma was known for 2,394 incidents (missing data on 26%) (Table 3). For the entire study period there were 1720 (71.8%) shootings and 674 (28.2%) stabbings. The annual distribution of shooting versus stabbing changed significantly over the five year period ($\chi^2=29.2$, $df=4$, $p<0.001$), with the proportion of gunshots decreasing while stabbings increased. A significant chi-square for trend was seen. The rest of the results refer to transported patients only, a total of 1,452 cases.

The mean age for patients transported during the entire study period was 30.2 with a standard error of 0.3555. The median was 27.0 with ages ranging from 0 to 105 years old. The mean age per year ranged from 28.8 (2002) to 31.3 (2006). Year specific age summary data is provided in Table 4. An ANOVA test showed no significant difference between the mean age per year ($F=1.270$, $df=4$, $p\text{-value}=0.280$).

Age was categorized into four groups (0-19, 20-29, 30-39 and <40). The 20-29 year old group consistently accounted for the highest proportion of patients transported over the study period. Each of the other groups accounted for approximately 20% of transports each year, except during 2006 where persons over 40 represented almost 30% (Table 5).

Overall, the data showed that the patients transported were 81.7% male and 18.3% female. The proportion of males and females involved in penetrating trauma incidents varied slightly throughout the five year study period (Table 6). There was no significant trend seen over the study period.

The level of care provided during transport was classified into four categories. For the entire study period, the majority of cases were transported using basic ALS protocols such as starting an intravenous line (74.1%). The other types of priority were used dramatically less with advanced ALS being the second highest with only 13.1%. When categorized by year, the transport priority varied significantly throughout the five year study period, with a significantly decreasing trend in BLS care and increase in Basic ALS care (Table 7).

Transport protocol was 53.7% emergency status over the entire study period. Non-emergency was used as transport status for 46.3% of the penetrating trauma incidents. Table 8 shows the transport protocol by year. There was no significant difference in the groups per year ($\chi^2=6.253$, $df=8$, p -value=0.619)

The maximum number of patients transported was four and the mean transport number was 1.08 with a standard error of 0.008. The median number transported was one and there were 93 cases with two patients (6.0%) and less than 1% (13 cases) of transporting three or four patients. Summary data for number of patients transported is detailed in Table 9. An ANOVA test showed that there was not a significant difference between the transport number by year ($F=0.452$, $df=4$, p -value=0.771).

Neighborhood Analysis

There were 1014 cases during the study period where the type of penetrating trauma, either gunshot or stabbing, was known. The highest number of incidents was 260 (25.6%) and occurred in 2006, with the lowest number of incidents 181 (19.9%) in 2005 (Table 10).

The number of incidents in each neighborhood that had at least one incident during the five year period are reported in Table 11. There were 39 (26.3%) neighborhoods that did not have a known gunshot or stabbing incident over the 5 year period. There were 109 (73.6%) neighborhoods identified over the entire study period that had at least one event that met inclusion criteria. The distribution of incidents by neighborhood is seen in Table 12.

There were 14 neighborhoods identified as having eight or more incidents any year of the study. Six of these neighborhoods had more than eight or more incidents during more than one year. These neighborhoods were: Gilpin (5 years), Fulton (4 years), Jeff Davis (3 years), Fairmont (2 years), Mosby (2 years) and Whitcomb (2 years).

In Richmond there are 13 family housing communities located in 11 neighborhoods, as reported by the RHAA. Of these 11 neighborhoods, eight had eight or more incidents during one or more years of the study.

Discussion

These findings show that overall, with respect to known penetrating trauma incidents, Richmond has not become much safer over the five year period. The city's incidence did not change significantly over the study period

(Figure 1). There was also no significant trend in age, gender, number of patients transported or transport protocol.

The trends in type of penetrating trauma did vary significantly (Figure 2). The distribution of response location of shooting and stabbing incidents did not show a clear trend when mapped, and both types of penetrating trauma were spread throughout the same areas of the city. The proportions of shooting and stabbings did change, with shootings decreasing while stabbings increased.

The level of care provided during transport varied significantly during the study period (Figure 4). The increase in Basic ALS care and decrease in BLS care could be due to increased severity in penetrating trauma incidents. All RAA ambulance personnel are paramedics and trained with the ability to provide the same level of care to all patients transported. The level of care provided is determined by the paramedic and in direct response to the severity of the patient's injuries.

The neighborhood analysis showed that while the rates in Richmond did not significantly change, the distribution of response locations also remained consistent. Most neighborhoods that had the highest number of incidents, remained the highest throughout the study period. This shows that while Richmond has not become safer, there are areas of Richmond that continue to be safe while other account for a majority of the penetrating trauma incidents.

This study had several limitations. A major limitation of this study is that most analyses were completed using only patients transported by the RAA. This excludes patients that refuse transport along with patients that are transported to

a medical facility by other means. Individual data was also not available for incidents where more than one patient was transported. Another limitation is the lack of neighborhood population data. This would be useful in determining the incidence rates in the neighborhoods, which would result in a more accurate analysis of the distribution of events.

Future research should examine outcome data to determine if the change in type of penetrating trauma proportions resulted in greater survival rates. This could show that Richmond was safer with the respect to mortality, if stabbing incidents on average result in less severe injuries than gunshot incidents. Further studies should also use data sources that provide more information about incident and patient characteristics and include a more comprehensive study population (ex: hospital records).

References

1. Batten PJ, Hicks LJ and Penn DW. A 28-year (1963-90) study of homicide in Marion County, Oregon. *American Journal of Medicine and Pathology*. 1991; 12(3):227-34.
2. Biasutto SN, Moral AL and Bella JA. Firearm-related injuries: clinical considerations on 1326 cases. *International Surgery*. 2006; 91(1)39-43.
3. Bostrom L, Heinius G and Nilsson B. Trends in the incidence and severity of stab wounds in Sweden 1987-1994. *European Journal of Surgery*. 2000; 166(10):765-70.
4. Bureau of Justice Statistics. Crime Statistics. Available at: http://www.ojp.usdoj.gov/bjs/cvict_c.htm Accessed: March 20, 2007.
5. Dictionary.com. Penetrating Injury. Available at: <http://dictionary.reference.com/browse/penetrating%20injury>. Accessed: March 20, 2007.
6. Hammett M, et al. Homicide surveillance-United States, 1979-1988. *MMWR CDC Surveillance Summaries*. 1992; 41(3):1-33.
7. Ikeda RM, et al. Trends in fatal firearm-related injuries, United States, 1962-1993. *American Journal of Preventive Medicine*. 1997; 13(5):396-400.
8. Jason J, Flock M and Tyler CW. Epidemiologic characteristics of primary homicides in the United States. *American Journal of Epidemiology*. 1983; 117(4):419-28.
9. Jason J, Gilliland JC and Tyler CW. Homicide as a cause of pediatric mortality in the United States. *Pediatrics*. 1983; 72(2):191-7.
10. Kominato Y, et al. Homicide patterns in the Toyama Prefecture, Japan. *Medicine, Science, and the Law*. 1997; 37(4):316-20
11. Krug EG, Powell KE and Dahlberg LL. Firearm-related deaths in the United States and 35 other high- and upper-middle-income countries. *International Journal of Epidemiology*. 1998; 27(2):214-21.
12. Madiba TE, Thomson SR and Mdlalose N. Penetrating chest injuries in the firearm era. *Injury*. 2001; 32(1):13-6.
13. Minino AM, et al. Deaths: injuries, 2002. *National Vital Statistics Reports*. 2006; 54(10):1-124.
14. Morgan Quinto Press. Morgan Quinto Awards: 12th Annual America's Safest (and Most Dangerous) Cities. Available at: <http://www.morganquinto.com/cit06pop.htm>. Accessed: March 20, 2007.
15. Powell EC and Tanz RR. Child and adolescent injury and death from urban firearm assaults: association with age, race, and poverty. *Injury Prevention*. 1999; 5(1):41-7.
16. Reza A, Mercy JA and Krug E. Epidemiology of violent deaths in the world. *Injury Prevention*. 2001; 7(2):104-11.
17. Richmond Times-Dispatch. City ranks as safer in crime survey. Available at: http://www.timesdispatch.com/servlet/Satellite?pagename=RTD/MGArticle/RTD_BasicArticle&c=MGArticle&cid=1149191411014. Accessed: March 20, 2007.

18. Stebbings WS, et al. Stab injury-the experience of an East London Hospital 1978-1983. *Postgraduate Medical Journal*. 1987; 63(736):81-4.
19. Swann IJ, MacMillan R and Watson AA. A study of stab wounds. *Archives of Emergency Medicine*. 1985; 2(1):31-6.
20. U.S. Department of Justice, Federal Bureau of Investigation. Crime in the United States 2005. Available at:
http://www.fbi.gov/ucr/05cius/data/table_04.html Accessed: March 20, 2007.
21. Weldon Cooper Center for Public Service, University of Virginia. Population Estimates for Virginia Counties and Cities. Available at:
<http://www.coopercenter.org/demographics/POPULATION%20ESTIMATES/>
Accessed: March 20, 2007.

Table 1: Penetrating Trauma Calls Received and Incidence by Year.

Year	Incident Count	Population Estimate	Incidence (Per 1000)
2002	607	196380	3.09
2003	660	195200	3.38
2004	683	193915	3.52
2005	642	193777	3.31
2006	642	192032	3.34

*No significant difference between the groups (χ^2 for trend=1.139, p-value=0.286).

Table 2: Distribution of Transport Status by Year

Year	Transport	No Transport	Total
2002	278 (47.2)	311 (52.8)	589
2003	281 (44.1)	356 (55.9)	637
2004	277 (41.8)	385 (58.2)	662
2005	303 (48.9)	317 (51.1)	620
2006	313 (50.2)	310 (49.8)	623
Total	1452 (46.4)	1679 (53.6)	3131

*Significant difference between the groups ($\chi^2=12.236$, df=4, p=0.016).

**Data missing for n=103.

Table 3: Distribution of Type of Penetrating Trauma by Year.

Year	Gunshot	Stabbing	Total
2002	336 (77.6)	97 (22.4)	433
2003	382 (77.0)	114 (23.0)	496
2004	354 (72.1)	137 (27.9)	491
2005	289 (68.8)	131 (31.2)	420
2006	359 (64.8)	195 (35.2)	554
Total	1720 (71.8)	674 (28.2)	2394

*Significant difference between the groups (χ^2 for trend=28.2, p<0.001).

**Data missing for n=840.

Table 4: Summary Data of Age of Patients Transported by Year.

Year	Count	Mean	Median	Minimum	Maximum	Standard Error
2002	265	28.8	25	0	80	0.8
2003	256	30.1	27	5	91	0.8
2004	262	30.4	26	0	105	0.9
2005	294	30.2	28	0	67	0.7
2006	293	31.3	27	6	87	0.8
Total	1370	30.2	27	0	105	0.4

*No significant difference between the groups (ANOVA: F=1.270, df=4, p-value=0.280).

Table 5: Distribution of Age of Patients Transported by Year.

Year	0-19	20-29	30-39	≥40	Total
2002	56 (21.1)	109 (41.1)	51 (19.2)	49 (18.5)	265
2003	53 (20.7)	89 (34.8)	58 (22.7)	56 (21.9)	256
2004	54 (20.6)	99 (37.8)	50 (19.1)	59 (22.5)	262
2005	50 (17.0)	121 (41.2)	59 (20.1)	64 (21.8)	294
2006	64 (21.8)	96 (32.8)	50 (17.1)	83 (28.3)	293
Total	277 (20.2)	514 (37.5)	268 (19.6)	311 (22.7)	1370

*No significant difference between the groups ($\chi^2=14.907$, $df=12$, $p=0.247$).

Table 6: Distribution of Gender of Patients Transported by Year.

Year	Female	Male	Total
2002	53 (19.6)	218 (80.4)	271
2003	56 (21.9)	200 (78.1)	256
2004	40 (15.2)	223 (84.8)	263
2005	4 (15.9)	248 (84.1)	295
2006	57 (19.3)	238 (80.7)	295
Total	253 (18.3)	1127 (81.7)	1380

*No significant difference between the groups (χ^2 for trend=0.683, $p=0.409$).

**Data missing on n=103.

Table 7: Distribution of Level of Care Provided to Patients Transported by Year.

Year	Death	Advanced ALS	Basic ALS	BLS	Total
2002	10 (3.6)	33 (11.9)	193 (69.4)	42 (15.1)	278
2003	6 (2.1)	35 (12.5)	202 (71.9)	38 (13.5)	281
2004	6 (2.2)	46 (16.6)	210 (75.8)	15 (5.4)	277
2005	11 (3.6)	35 (11.6)	232 (76.6)	25 (8.3)	303
2006	3 (1.0)	41 (13.1)	239 (76.4)	30 (9.6)	313
Total	36 (2.5)	190 (13.1)	1076 (74.1)	150 (10.3)	1452

*Significant difference between the groups ($\chi^2=28.162$, $df=12$, $p=0.005$).

**Significant decreasing χ^2 for trend for BLS ($\chi^2=8.830$, $p<0.01$).

**Significant increasing χ^2 for trend for Basic ALS ($\chi^2=3.916$, $p<0.05$).

** Data missing on n=103.

Table 8: Distribution of EMT determined transport level by Year.

Year	Emergency	Non-Emergency	Total
2002	146 (52.5)	132 (47.5)	278
2003	147 (52.3)	134 (47.7)	281
2004	154 (55.6)	123 (44.4)	277
2005	177 (58.4)	126 (41.6)	303
2006	156 (49.8)	157 (50.2)	313
Total	780 (53.7)	672 (46.3)	1452

*Significant difference between the groups ($\chi^2=12.236$, $df=4$, $p=0.016$).

Table 9: Summary Data for Number of Patients Transported by Year.

Year	Count	Mean	Median	Minimum	Maximum	Standard Error
2002	278	1.1	1	1	3	0.0
2003	281	1.1	1	1	4	0.0
2004	277	1.1	1	1	4	0.0
2005	303	1.1	1	1	3	0.0
2006	313	1.1	1	1	2	0.0
Total	1452	1.1	1	1	4	0.0

*No significant difference between the groups (ANOVA: F=0.452, df=4, p-value=0.771).

Table 10: Number of Identified Gunshot or Stabbing Incidents Transported by Year.

Year	Incidents
2002	191 (18.8)
2003	200 (19.7)
2004	182 (17.9)
2005	181 (17.9)
2006	260 (25.6)
Total	1014

Table 11: Distribution of Incidents by Neighborhood, 2002-2006.

# Incidents/ Neighborhood	# Neighborhoods	Total Incidents
0	39 (26.3)	0
1 to 5	58 (39.2)	131 (12.9)
6 to 15	29 (19.6)	270 (26.6)
16 to 25	10 (6.8)	208 (20.5)
26 to 35	8 (5.4)	232 (22.9)
36 to 58	4 (2.7)	178 (17.6)
Total	148	1014

Figure 1: Incidence by Year

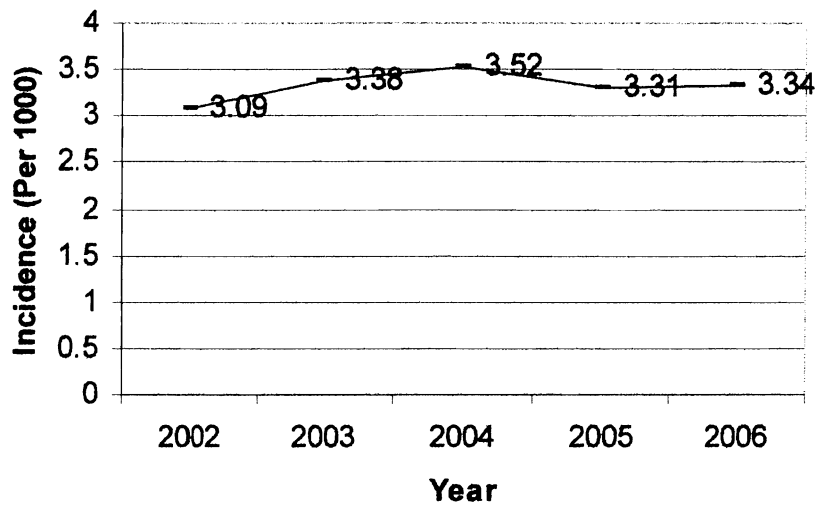


Figure 2: Distribution of Type of Penetrating Trauma by Year

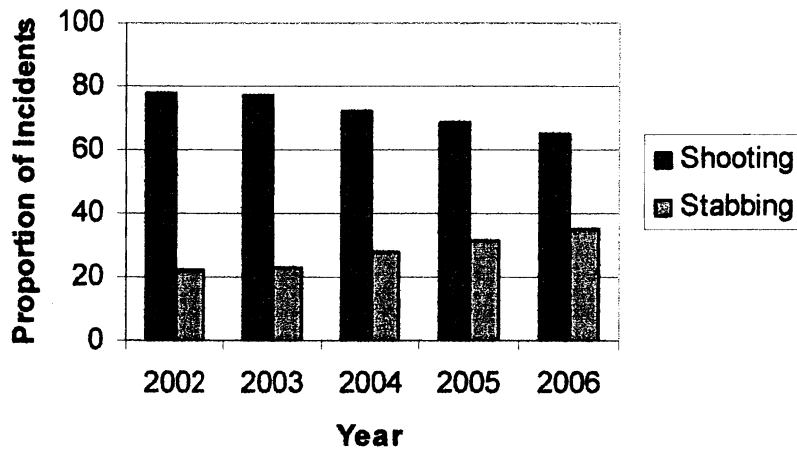


Figure 3: Distribution of Gender of Patients Transported by Year

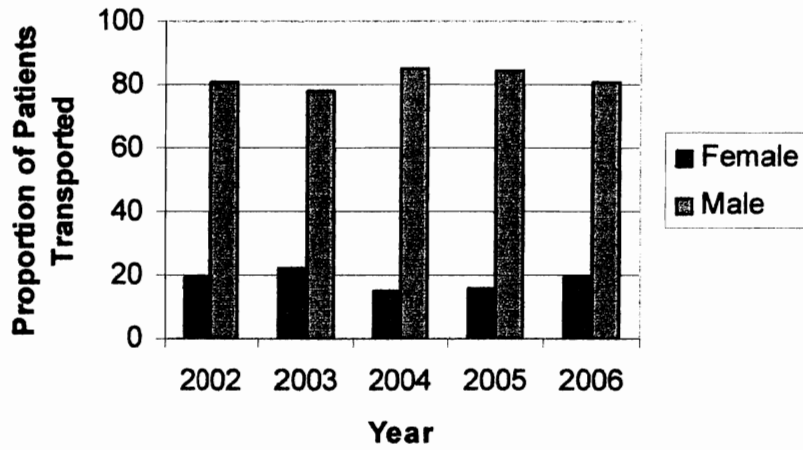
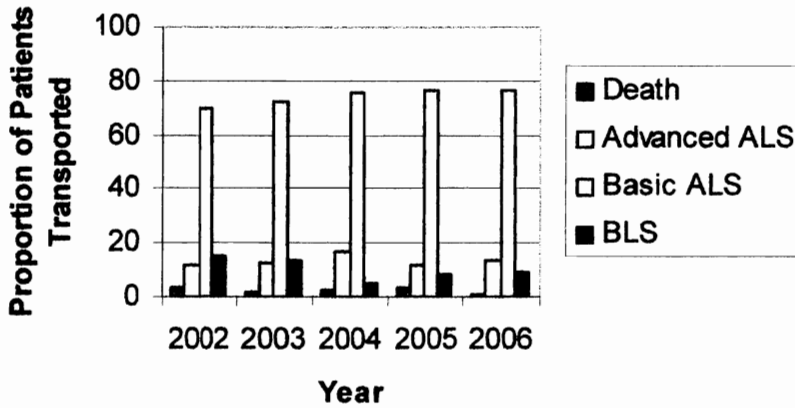


Figure 4: Distribution of Level of Care Provided to Patients Transported by Year



Appendix A: Distribution of Incidents Per Year by Neighborhood

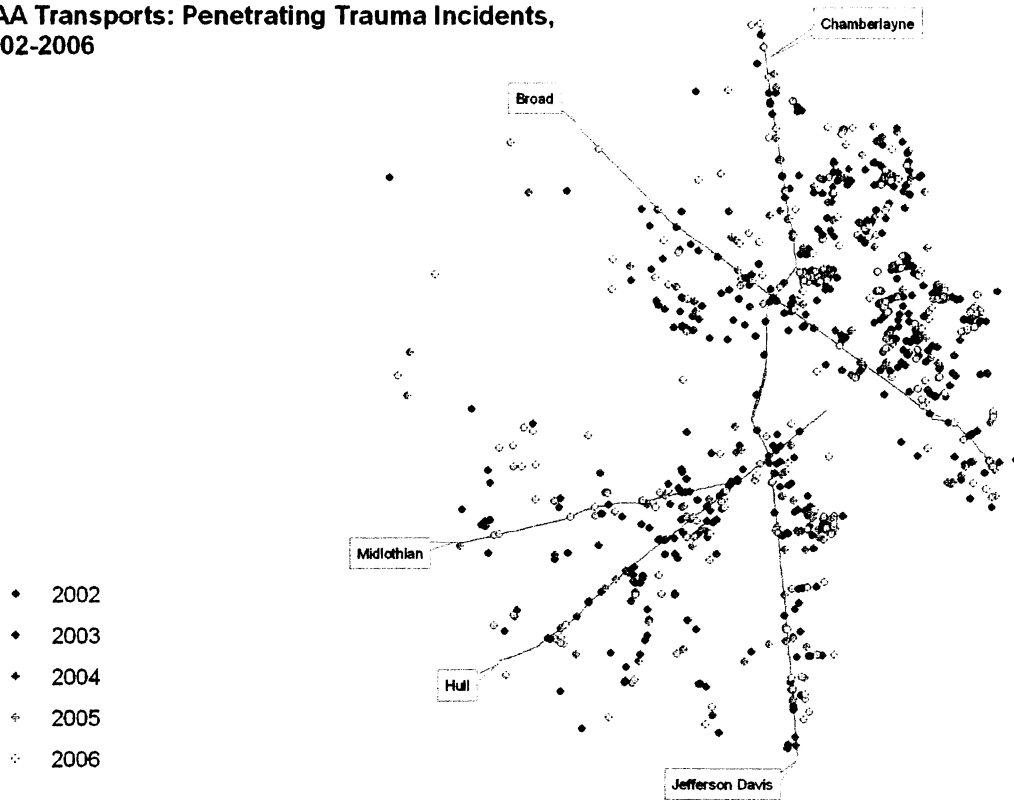
NEIGHBORHOOD	2002	2003	2004	2005	2006	TOTAL
GILPIN	16	12	8	13	9	58
FULTON	8	4	8	9	13	42
JEFF DAVIS	9	6	5	11	11	42
WHITCOMB	6	9	7	5	9	36
NORTH HIGHLAND PARK	4	6	7	9	7	33
MOSBY	7	3	10	3	8	31
NORTHERN BARTON HEIGHTS	5	5	6	5	9	30
BELLEMEADE	4	5	5	8	7	29
FAIRMOUNT	9	9	6	5	0	29
HIGHLAND PARK SOUTHERN TIP	5	7	3	4	8	27
SWANSBORO WEST	8	2	5	5	7	27
CHURCH HILL NORTH	3	5	5	6	7	26
GINTER PARK	7	3	2	6	7	25
THE FAN	3	8	3	5	6	25
CREIGHTON	4	5	3	4	8	24
HILLSIDE COURT	5	5	0	2	12	24
FAIRFIELD	5	4	5	5	3	22
BROAD ROCK	5	4	3	1	6	19
OAK GROVE	4	4	5	5	1	19
SWANSBORO	3	5	2	4	4	18
SOUTHWOOD	1	5	4	6	0	16
UNION HILL	2	3	1	5	5	16
BLACKWELL	2	5	3	3	2	15
MCGUIRE	1	2	5	3	3	14
MIDLOTHIAN	1	5	2	1	5	14
CHIMBORAZO	3	3	2	1	4	13
SHOCKOE BOTTOM	2	2	4	3	2	13
SOUTH GARDEN	0	3	5	2	3	13
CHAMBERLAYNE INDUSTRIAL CENTER	1	2	3	3	3	12
BROOKLAND PARK	2	1	3	1	3	10
HIGHLAND TERRACE	4	2	2	1	1	10
PETER PAUL	3	0	0	0	7	10
SOUTHERN BARTON HEIGHTS	2	2	1	2	3	10
HICKORY HILL	2	1	3	1	2	9
JACKSON WARD	0	0	4	2	3	9
JOHN MARSHALL	0	0	1	2	6	9
PINEY KNOLLS	2	2	2	1	2	9
RANDOLPH	1	4	3	1	0	9
CHURCH HILL	1	3	1	0	3	8
BELT CENTER	2	3	1	0	1	7
MCGUIRE MANOR	1	1	0	2	3	7
MONROE WARD	4	3	0	0	0	7
OAKWOOD CEMETERY	1	1	2	1	2	7
PROVIDENCE PARK	0	1	0	4	2	7
THE MUSEUM DISTRICT	2	2	1	1	1	7
BIOTECH AND MCV DISTRICT	1	3	1	1	0	6

BRITISH CAMP FARMS	0	1	2	1	2	6
CARVER	3	1	0	0	2	6
NORTHROP	0	0	1	2	3	6
VCU	3	1	1	0	1	6
WESTOVER	1	0	0	0	5	6
BYRD PARK	2	1	2	0	0	5
DAVEE GARDENS	0	0	2	0	3	5
OAKWOOD	2	1	2	0	0	5
REEDY CREEK	1	0	3	0	1	5
VIRGINIA UNION	1	1	0	2	1	5
CITY CENTER	0	2	2	0	0	4
EASTVIEW	1	0	1	0	2	4
GREEN PARK	0	1	1	1	1	4
HIOAKS	1	3	0	0	0	4
JAHNKE	0	1	1	0	2	4
MANCHESTER	0	0	2	0	2	4
WALMSLEY	1	0	1	0	2	4
WOODLAND HEIGHTS	1	1	0	1	1	4
BRAUERS	2	0	1	0	0	3
CARYTOWN	1	0	0	1	1	3
CEDARHURST	1	0	0	0	2	3
CULLENWOOD	0	1	0	2	0	3
DEERBOURNE	1	2	0	0	0	3
MAURY	0	2	0	0	1	3
NEWTOWNE WEST	0	0	0	2	1	3
THE DIAMOND	0	0	1	0	2	3
WINDSOR	2	0	0	1	0	3
CAPITOL DISTRICT	1	0	0	0	1	2
CHIPPENHAM FOREST	0	0	0	1	1	2
ELKHARDT	0	1	0	0	1	2
FOREST VIEW	0	0	1	0	1	2
MAGNOLIA INDUSTRIAL CENTER	0	0	1	1	0	2
OREGON HILL	1	1	0	0	0	2
POCOSHOCK	0	0	2	0	0	2
SHOCKOE SLIP	0	2	0	0	0	2
STONEWALL COURT	0	0	0	2	0	2
WOODHAVEN	0	1	1	0	0	2
WOODVILLE	1	0	0	1	0	2
ANACAROWS LANDING	0	1	0	0	0	1
BELLE AND MAYO ISLANDS	0	1	0	0	0	1
BELLEVUE	0	0	0	0	1	1
BROAD ROCK INDUSTRIAL PARK	1	0	0	0	0	1
BROOKBURY	0	1	0	0	0	1
BROOKHAVEN FARMS	0	0	0	0	1	1
CENTRAL OFFICE	0	0	0	0	1	1
COLONIAL PLACE	0	1	0	0	0	1
COTTRELL FARMS	0	0	0	0	1	1
EDGEWOOD	0	0	0	0	1	1

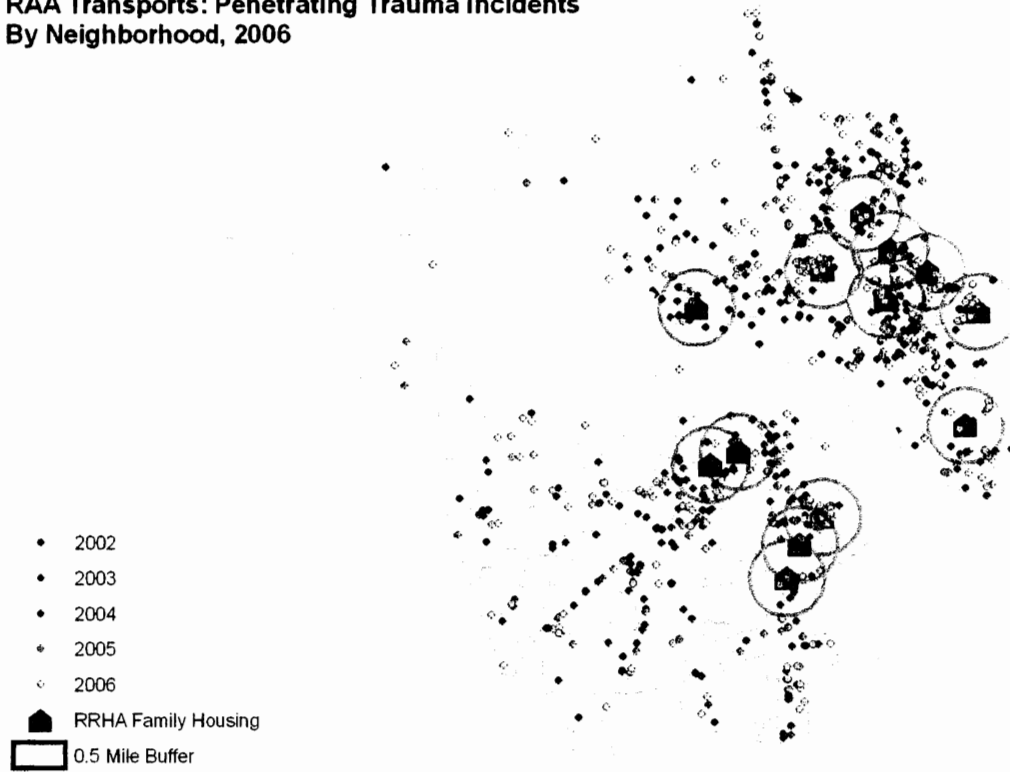
FOREST HILL PARK	0	1	0	0	0	1
GINTER PARK TERRACE	1	0	0	0	0	1
HOLLYWOOD CEMETERY	0	0	1	0	0	1
MAYMONT	0	0	0	0	1	1
OLD TOWN MANCHESTER	0	0	0	0	1	1
OXFORD	0	0	0	1	0	1
ROSEDALE	0	1	0	0	0	1
SAUER'S GARDENS	0	0	0	0	1	1
SCOTTS ADDITION	1	0	0	0	0	1
STADIUM	0	0	0	0	1	1
STRATFORD HILLS	0	0	0	0	1	1
UPPER SHOCKOE VALLEY	0	0	0	0	1	1
WESTHAMPTON	0	0	0	0	1	1
WESTLAKE HILLS	0	0	1	0	0	1
WORTHINGTON	0	0	0	0	1	1
TOTAL	191	200	182	181	260	1014

Appendix B: GIS Maps

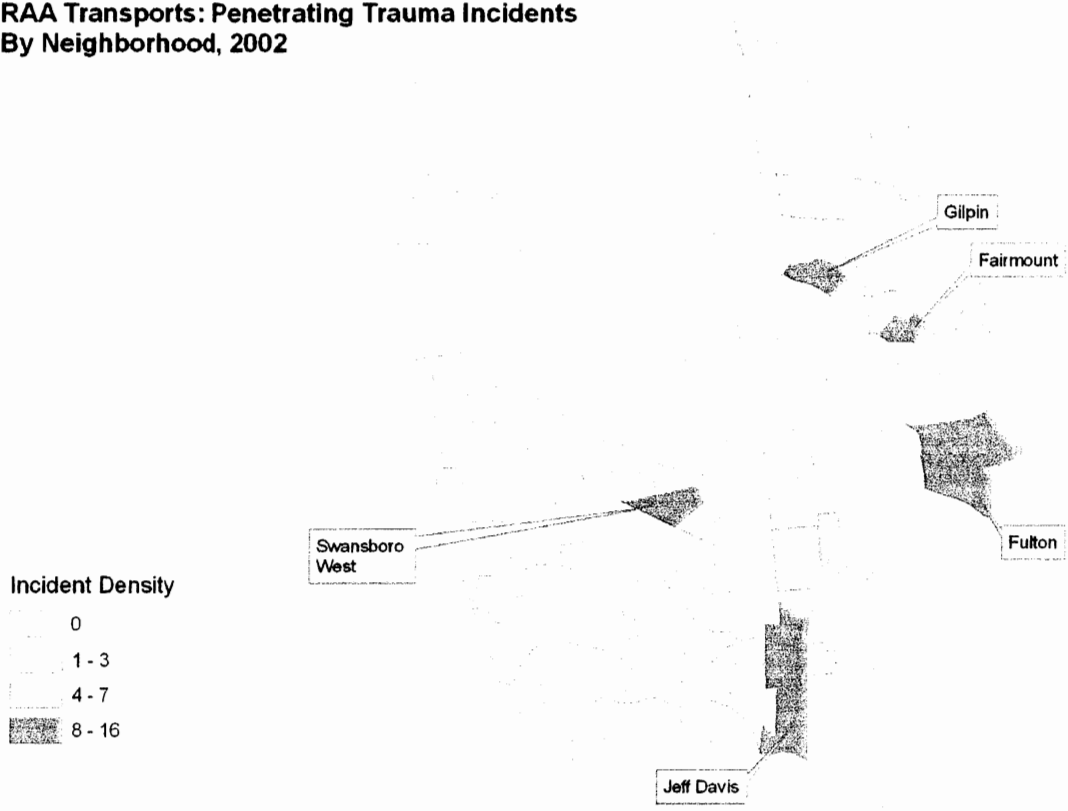
RAA Transports: Penetrating Trauma Incidents,
2002-2006



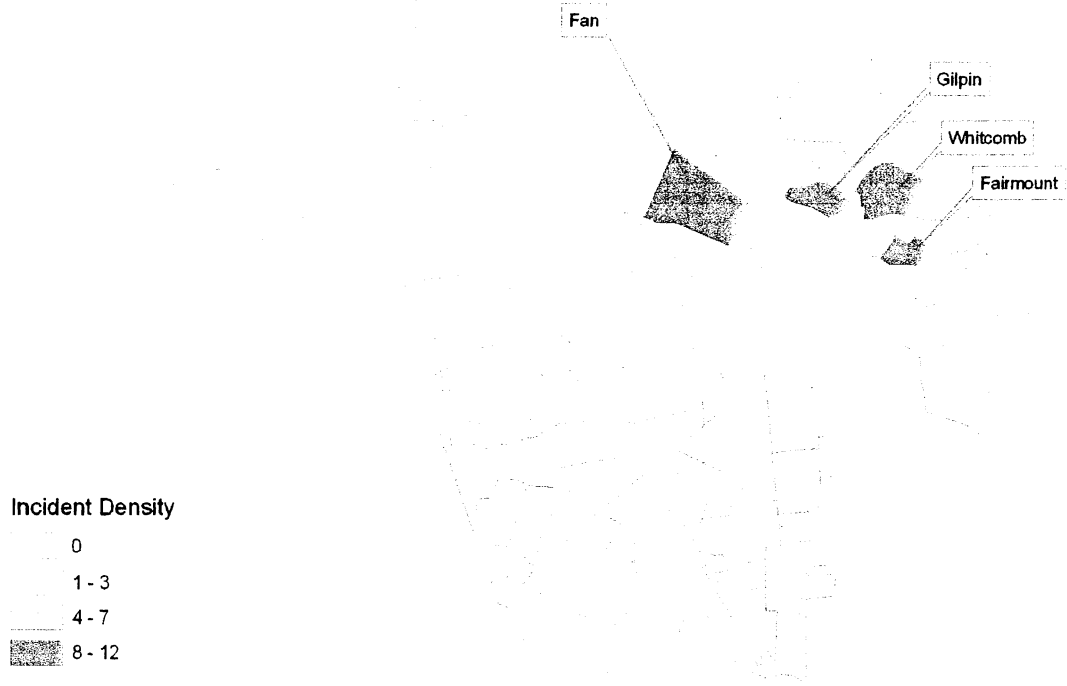
**RAA Transports: Penetrating Trauma Incidents
By Neighborhood, 2006**



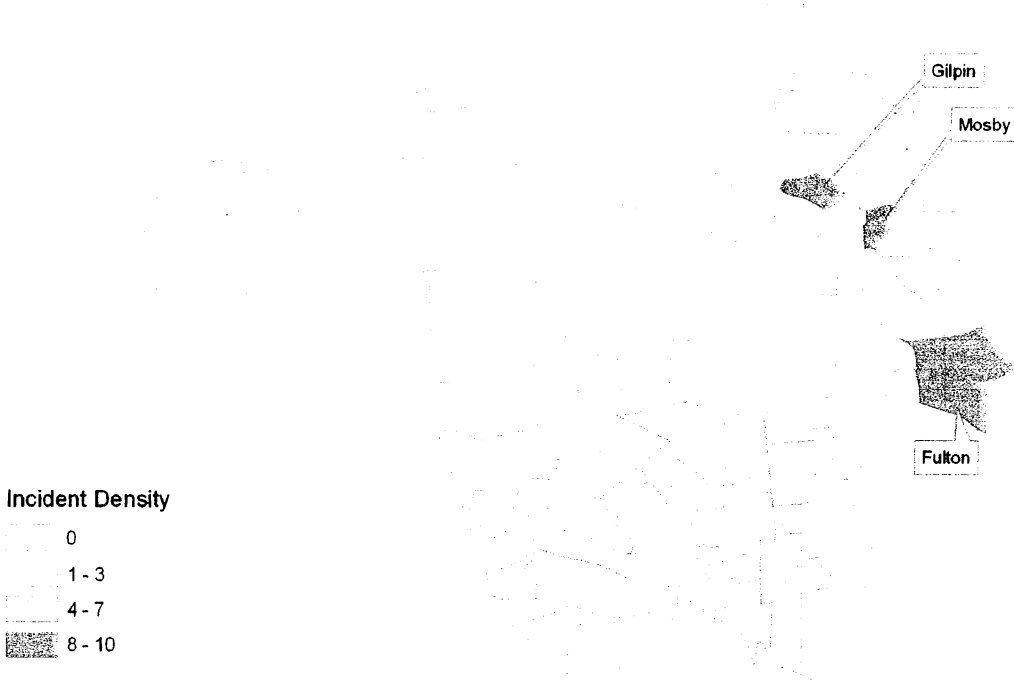
**RAA Transports: Penetrating Trauma Incidents
By Neighborhood, 2002**



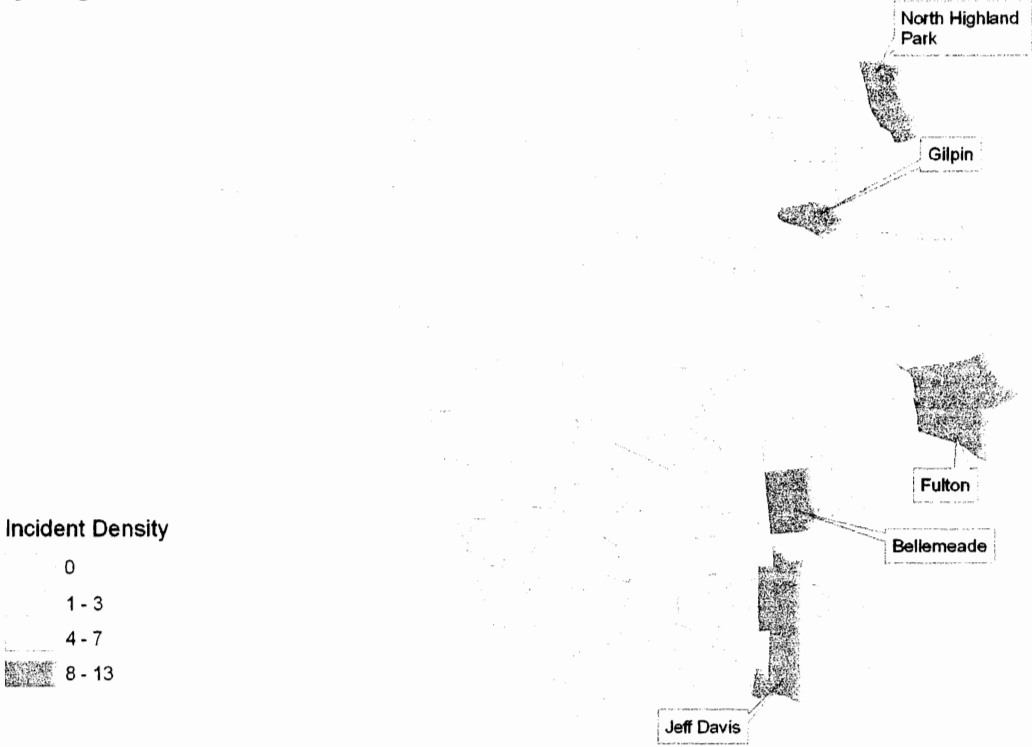
**RAA Transports: Penetrating Trauma Incidents
By Neighborhood, 2003**



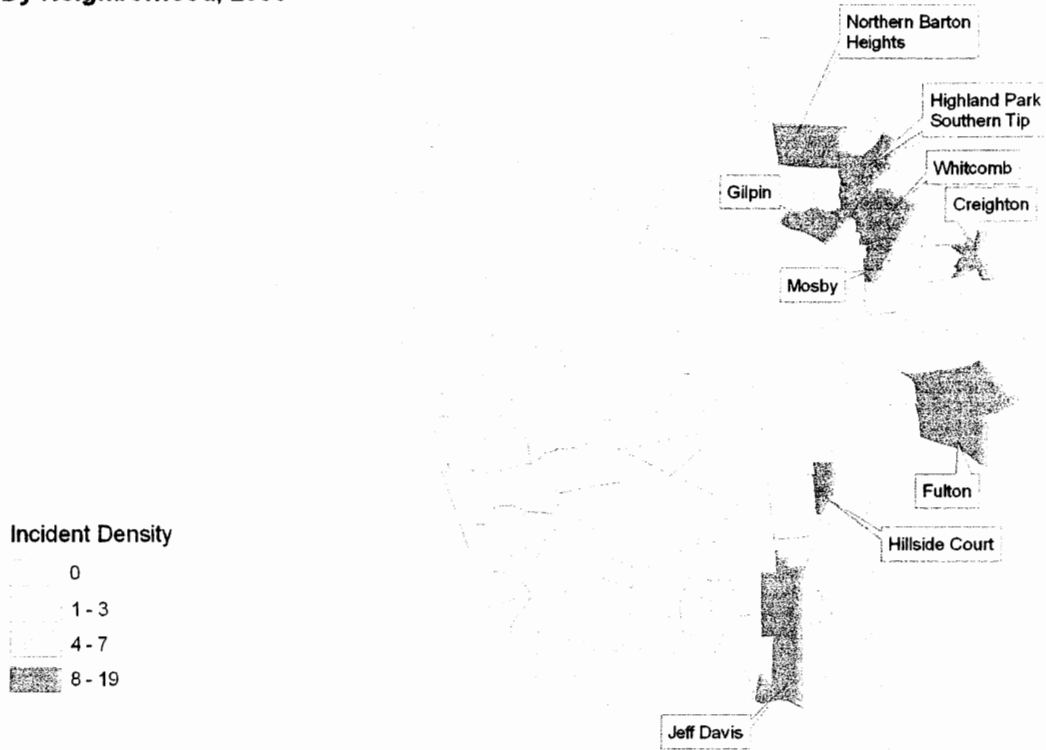
**RAA Transports: Penetrating Trauma Incidents
By Neighborhood, 2004**



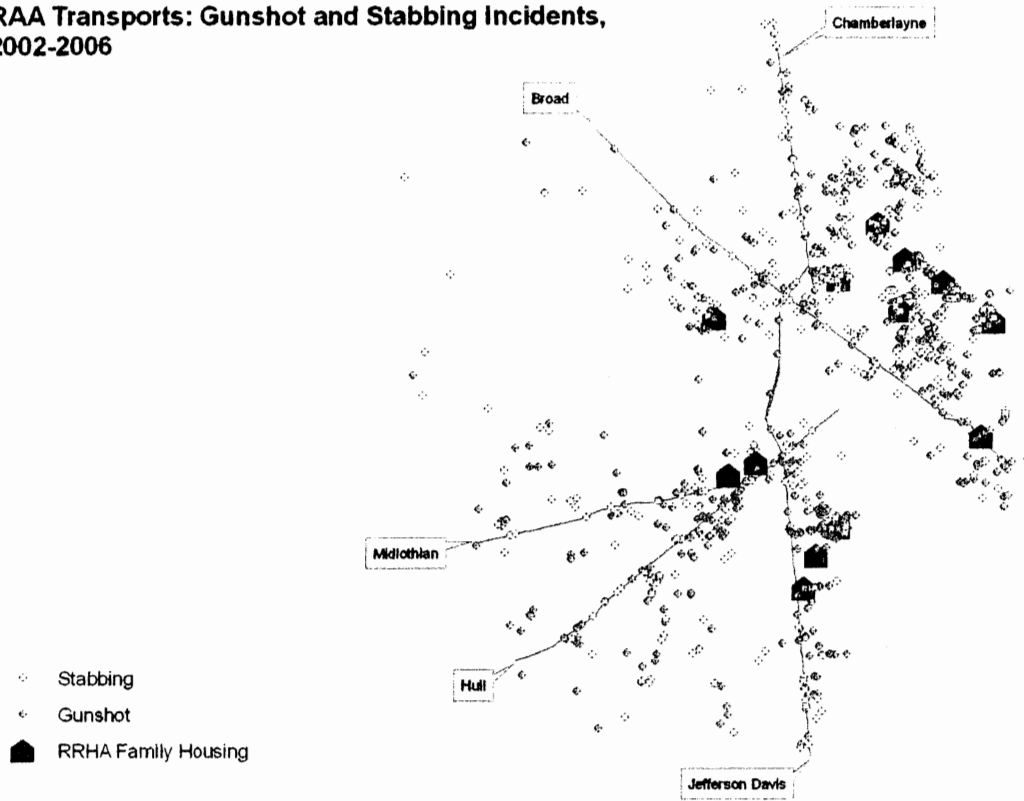
**RAA Transports: Penetrating Trauma Incidents
By Neighborhood, 2005**



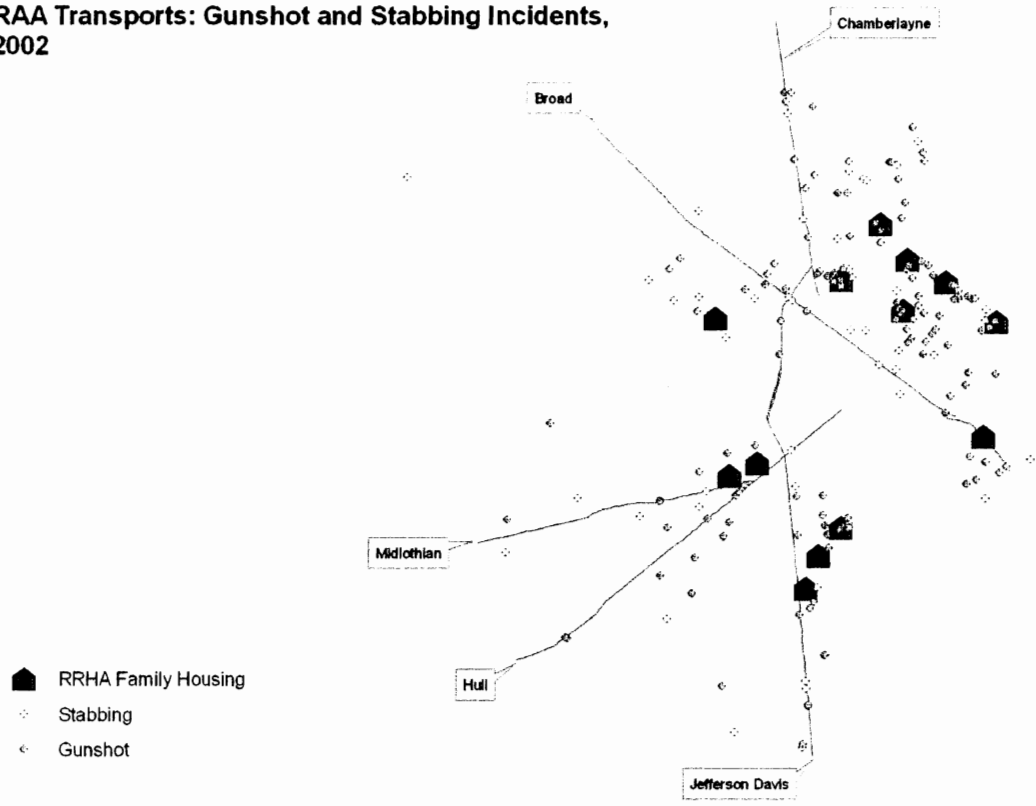
**RAA Transports: Penetrating Trauma Incidents
By Neighborhood, 2006**



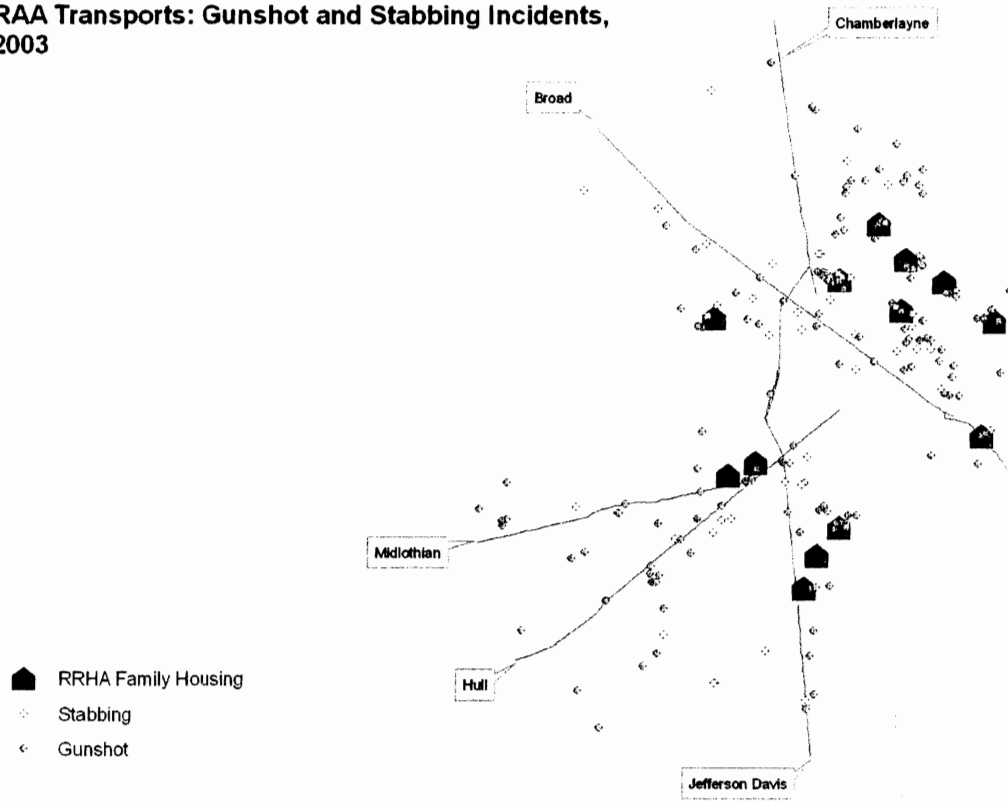
**RAA Transports: Gunshot and Stabbing Incidents,
2002-2006**



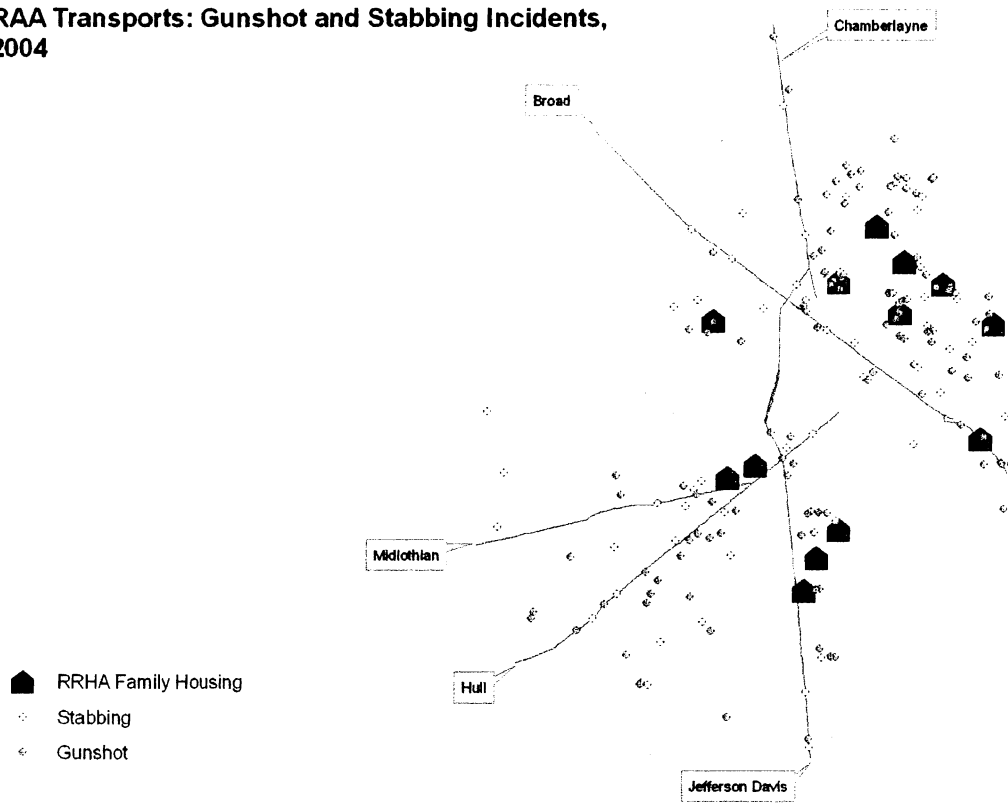
RAA Transports: Gunshot and Stabbing Incidents, 2002



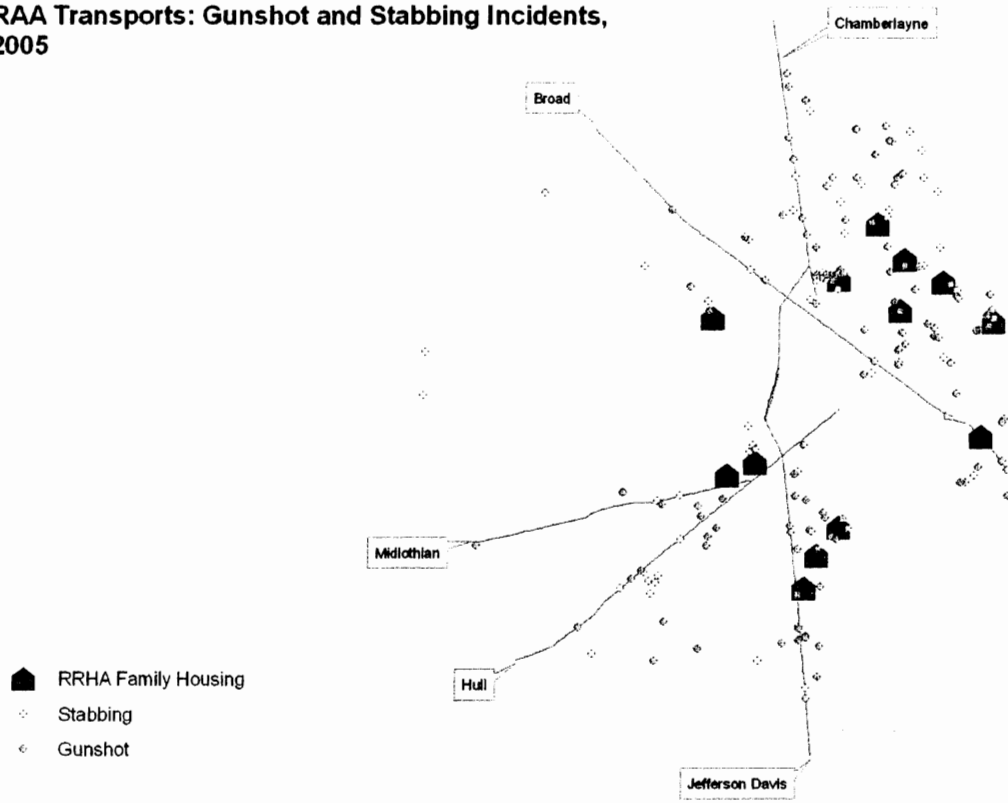
RAA Transports: Gunshot and Stabbing Incidents, 2003



RAA Transports: Gunshot and Stabbing Incidents, 2004



RAA Transports: Gunshot and Stabbing Incidents, 2005



**RAA Transports: Gunshot and Stabbing Incidents,
2006**

