

**The New York State
Trauma System**

2003 – 2006

New York State Department of Health

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Comments regarding the format or content of this report are welcome.



STATE OF NEW YORK DEPARTMENT OF HEALTH

Corning Tower The Governor Nelson A. Rockefeller Empire State Plaza Albany, New York 12237

Richard F. Daines, M.D.
Commissioner

James W. Clyne, Jr.
Executive Deputy Commissioner

April 12, 2010

Dear Colleague:

I am pleased to introduce the New York State Trauma System: 2003-2006 report, which provides important information about New York State hospital patients who have experienced severe traumatic injury. These patients were treated in our designated trauma hospitals and/or within one of our eight trauma regions.

This report was prepared for the New York State Department of Health (Department) by the School of Public Health with the assistance of the State Trauma Advisory Committee and Department staff. In addition to discussing trauma patient types, the report contains specific information about the performance of our trauma systems and trauma hospitals.

I am also pleased to report that an evaluation of the New York State Trauma System contained in this report, indicates our overall state trauma system performs very well, as compared to other states. This is a credit to our dedicated trauma surgeons and nurses, Emergency Medical Services (EMS) system and others who support the care of our patients.

Sincerely,

Richard F. Daines, M.D.
Commissioner of Health

**The New York State
Trauma System
2003 – 2006**

New York State Department of Health

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EXECUTIVE SUMMARY

This report describes and assesses the quality of the New York State trauma system in the years 2003-2006. It is intended for use by trauma clinicians and administrators to identify areas and issues for additional study to enhance systems development and clinical quality improvement. This report can also be used by the public to learn more about the trauma system in New York.

Data used in the report include data from

- (1) The New York State Trauma Registry (NYSTR) on trauma inpatients who are identified by the Statewide Trauma Advisory Committee (STAC) to be at significant risk of dying in the hospital subsequent to their injuries (see Appendix 1 for the set of ICD-9-CM diagnosis codes that define these patients) and who are treated in New York State trauma centers.
- (2) New York State's Statewide Planning and Research Cooperative System (SPARCS) on patients admitted to all hospitals in New York, not just trauma centers.
- (3) The Centers for Disease Control and Prevention (CDC), National Center for Injury Prevention and Control, Web-Based Injury Statistics Query and Reporting System (WISQARS), www.cdc.gov/ncipc/wisqars that enables the user to compare mortality from trauma in New York with the entire United States for selected trauma categories.

Demographics and Other Descriptive Statistics

Established in 1993, the New York State Trauma Registry (NYSTR) was designed to include data on trauma inpatients identified by the State Trauma Advisory Committee (STAC) to be at significant risk of dying in the hospital subsequent to their injuries (see Appendix 1 for the ICD-9-CM diagnosis codes that define these patients). These data were collected from all hospitals in New York State including regional trauma centers¹, area trauma centers², and community hospitals. However, since 1999, the NYSTR contains complete data for trauma centers only. This is the reason the current report combines NYSTR and SPARCS data.

The following descriptive statistics present information (1) on all trauma patients with serious enough injuries to qualify for the Registry, even those in non-centers, that are derived from SPARCS, and (2) on patients treated in trauma centers, based on data from the NYSTR.

Descriptive Statistics for All Seriously Injured Trauma Inpatients (from SPARCS)

According to SPARCS, the number of trauma patients admitted to New York State hospitals declined between the years 1990 and 1999, increased between 1999 and 2004 and has remained fairly level between 2004 and 2007. A total of 147,944 trauma patients were admitted to New York State hospitals in 2007, a decrease of 4.1 percent from the 154,054 trauma inpatients admitted in 1990. The number of patients qualifying for inclusion in the 2007 NYSTR was 26,815; an increase of 9.2 percent over the 1990 NYSTR of 24,564 patients. Thus, although the total number of trauma inpatients has decreased slightly in the last 20 years, the number of trauma patients with high-risk injuries has risen by almost 10 percent.

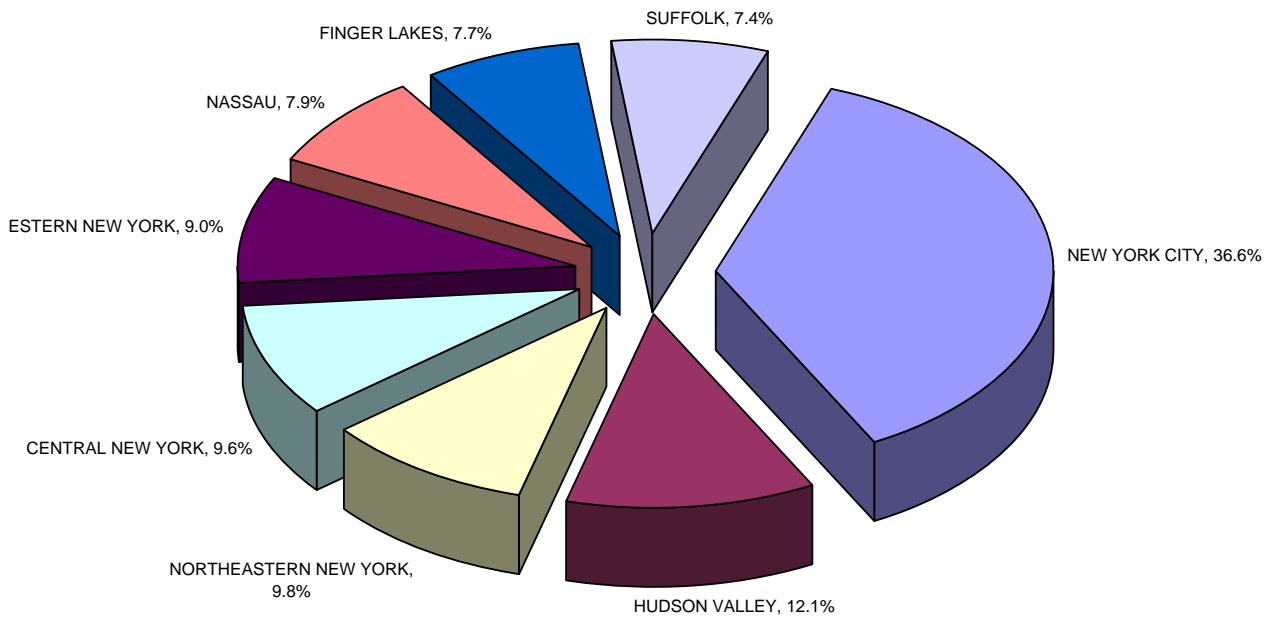
¹ "A regional trauma center is a facility with the ability to provide definitive treatment to the full-range of trauma patients including a commitment to trauma research and education. Such a facility has 24-hour availability of specialists in varied surgical and non-surgical fields." [10 NYCRR 708.2(b)(9)(ii)]

² "An area trauma center is a facility capable of providing definitive treatment to most trauma patients. Such a facility has emergency medicine specialists and general surgeons available 24-hours a day; other medical specialists are available on an "on-call basis." [10 NYCRR 708.2(b)(9)(iii)]

The following data apply to all patients with high-risk injuries that qualify for the NYSTR from 2003 through 2006, including patients from non-centers who are not contained in the Registry.

Approximately 37 percent of the patients were in New York City. No other region had more than 13 percent of the total.

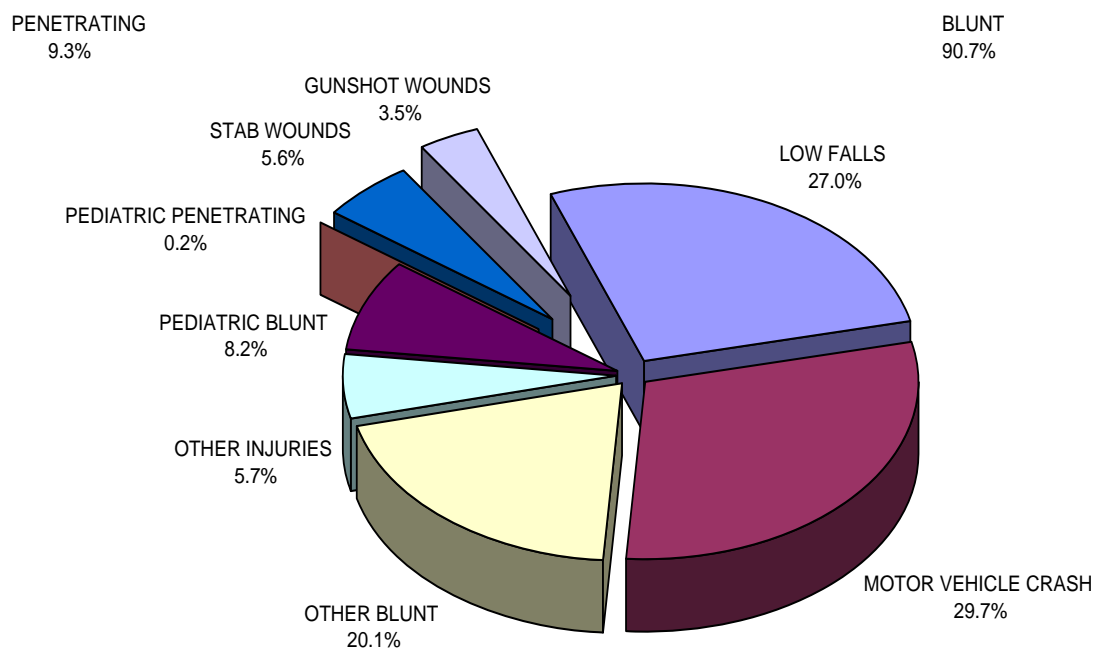
Regional Distribution of Severe Trauma Inpatients: 2003-2006



SOURCE: 2003-2006 SPARCS FILES

Blunt trauma occurred 90.7 percent of the time while the remaining 9.3 percent were classified as penetrating trauma. The most common type of blunt trauma was motor vehicle crashes (29.7 percent of all trauma patients), followed by low falls (27.0 percent of all trauma patients). A total of 8.2 percent of the patients were pediatric patients (age less than 13 years) experiencing blunt injuries. A total of 5.6 percent of all inpatients were adults who suffered stab wounds; 3.5 percent were treated for gunshot wounds. Only 0.2 percent of all inpatients were adults who suffered stab wounds; 3.5 percent were treated for gunshot wounds. Only 0.2 percent of all 2003-2006 patients were pediatric patients with penetrating injuries (stab or gunshot wounds).

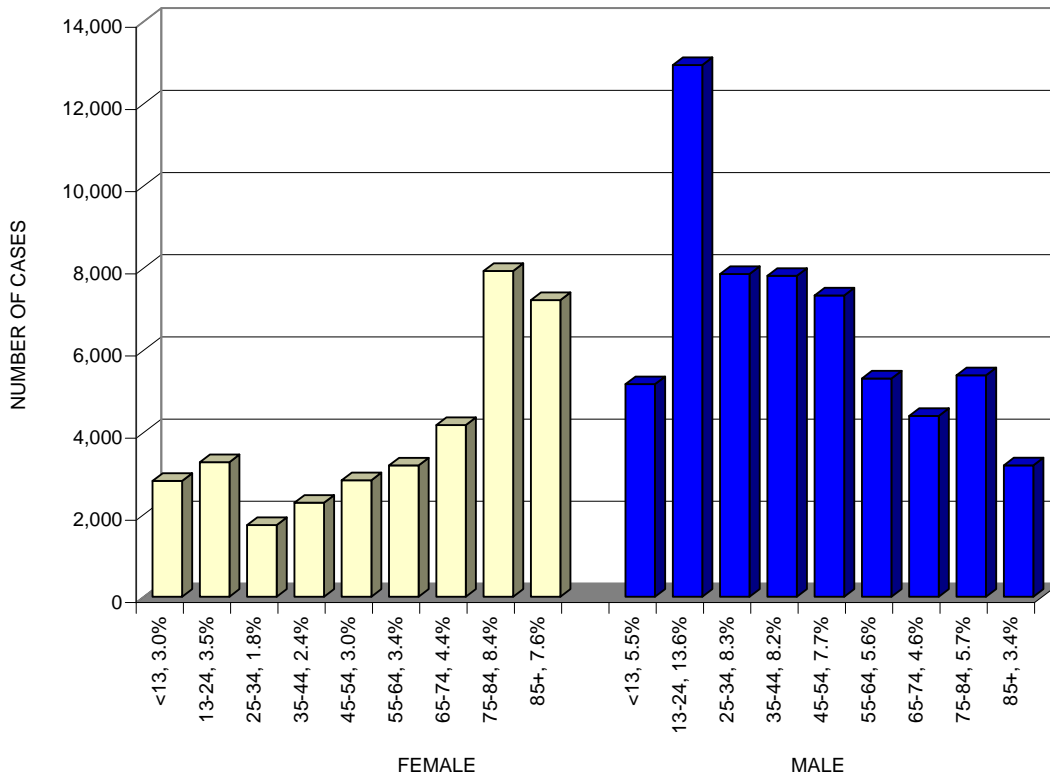
Mechanism of Injury of Severe Trauma Inpatients: 2003-2006



SOURCE: 2003-2006 SPARCS FILES

Males were the largest gender group (62.6 percent), with young men aged 13-24 making up the highest percentage of trauma inpatients (13.6 percent), followed by males 25-34 (8.3 percent), and males 35-44 (8.2 percent). In contrast, the most populous groups among females were elderly, with ages 75-84 comprising 8.4 percent of all patients, and ages 85 and higher comprising 7.6 percent of all patients. Generally, men were less likely to be in the Registry with increasing age, whereas women older than age 65 were more likely.

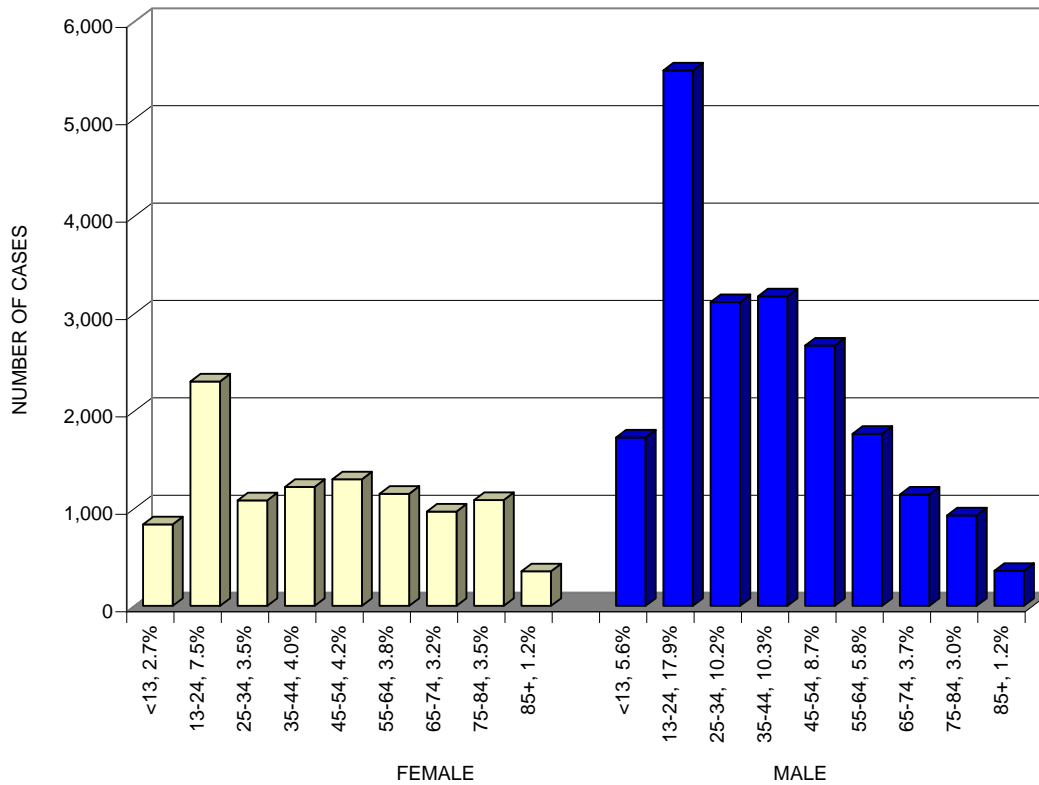
Age and Gender of Severe Trauma Inpatients: 2003-2006



SOURCE: 2003-20026 SPARCS FILES

Of the 30,719 inpatients qualifying for the 2003-2006 Registry who were victims of motor vehicle crashes, 66.4 percent were males. Females and males 65 and older were hospitalized victims of motor vehicle crashes at the same rates; however for nearly every age group below 65, more men than women were hospitalized subsequent to motor vehicle crashes.

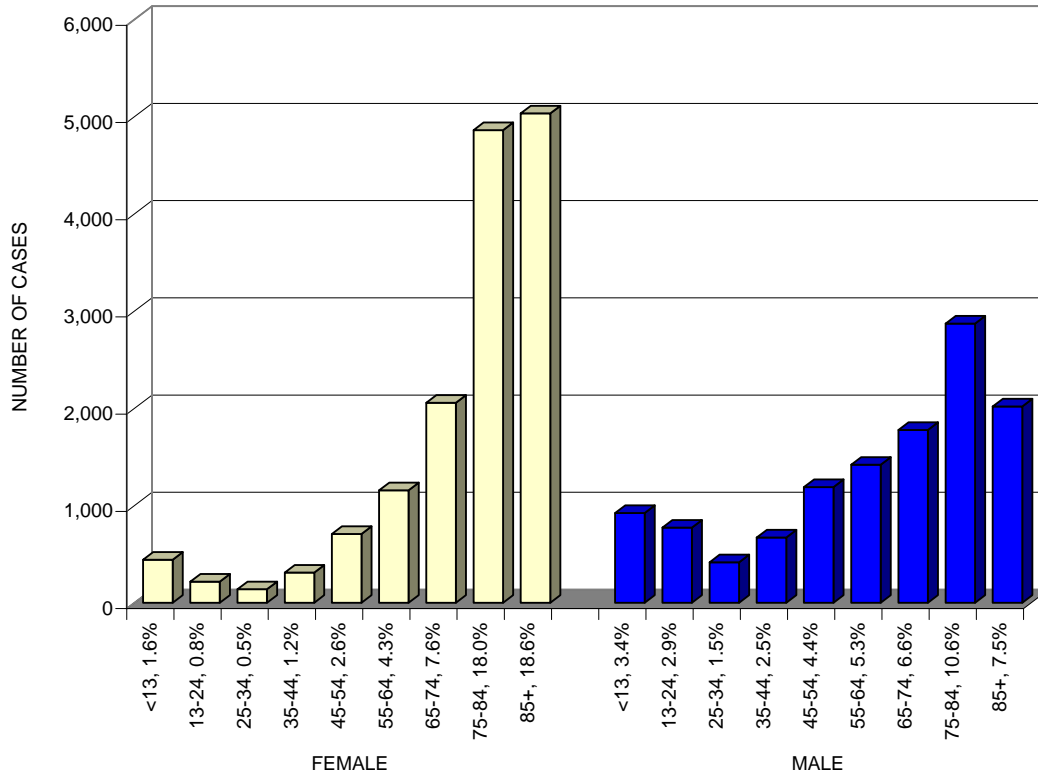
Age and Gender Motor Vehicle Crash Severe Trauma Inpatients: 1999-2002



SOURCE: 1999-2002 SPARCS FILES

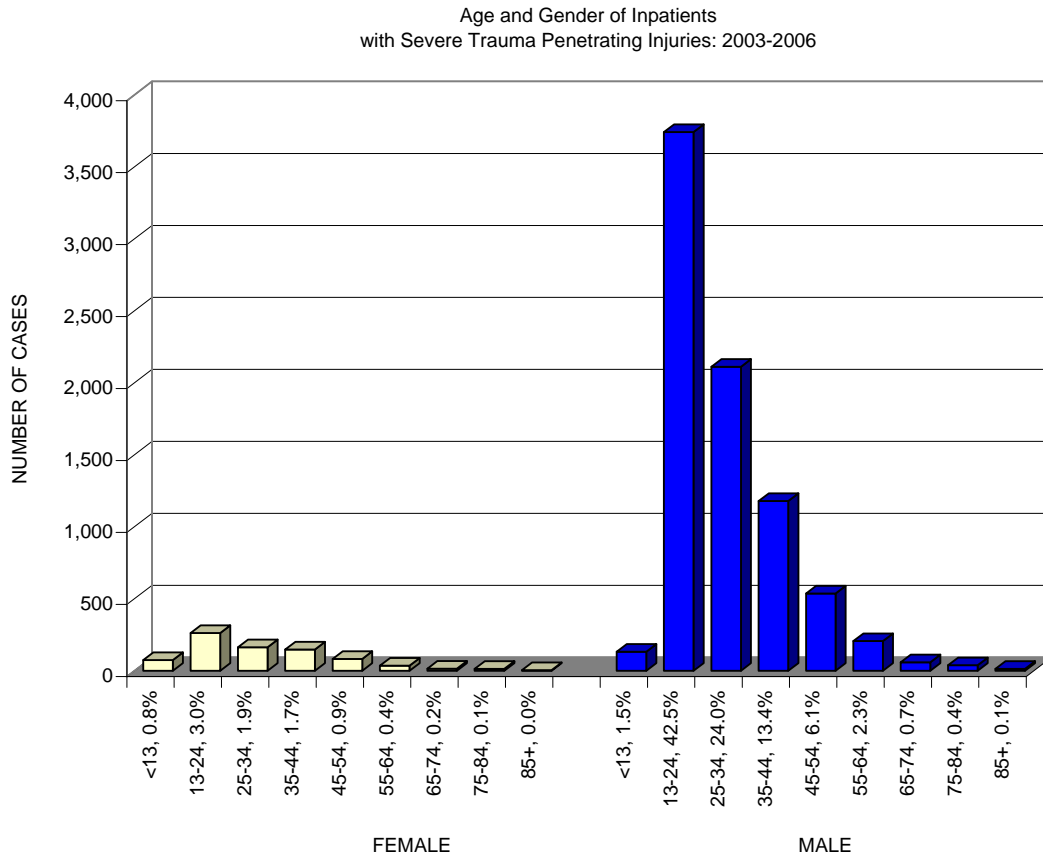
For the 27,006 inpatients who were victims of low falls, 55.2 percent were women. By far the most populous age/gender groups hospitalized with low falls were women age 75-84 and 85 and above, who comprised 18.0 percent and 18.6 percent of all low falls patients, respectively. These groups were followed by males age 75-84 (10.6 percent of all patients) and females age 65-74 (7.6 percent of all patients). The number of females hospitalized with low falls rose with age, with the largest increases occurring at 65-75 years old. The relationship to age was not as accentuated among men, with men of lower ages hospitalized more often with low falls than women of the same age, and not nearly as many elderly men hospitalized with low falls. This phenomenon is likely a result of greater longevity among women.

Age and Gender of Low Falls Severe Trauma Inpatients: 2003-2006



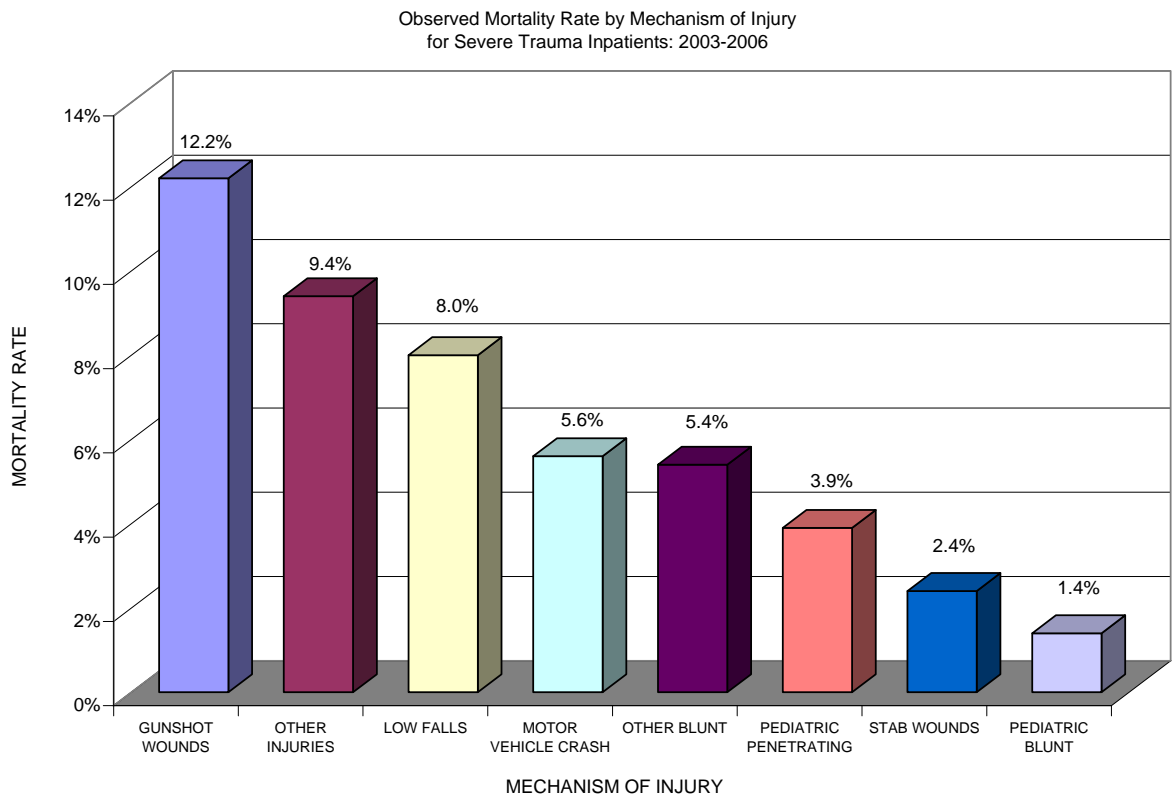
SOURCE: 2003-2006 SPARCS FILES

Of the 8,810 inpatients qualifying who were victims of penetrating injuries, 91.0 percent were males. The vast majority of these males were aged 13-24 (42.5 percent of all patients), 25-34 (24.0 percent of all patients), and 35-44 (13.4 percent of all patients). The most common age group among women who were hospitalized victims of penetrating injuries was 13-24 (3.0 percent of all patients).



SOURCE: 2003-2006 SPARCS FILES

The overall statewide mortality rate for trauma inpatients was 6.12 percent (5,814 deaths among 94,926 patients). Gunshot wounds created the highest inpatient mortality rate at 12.2 percent. The mechanisms of injury with the next highest mortality rates were “other injuries” (9.4 percent), low falls (8.0 percent), motor vehicle crashes (5.6 percent), and other blunt injuries (5.4 percent). The injury with the lowest mortality rate among adult trauma inpatients was stab wounds (2.4 percent). The mortality rates for pediatric patients were 3.9 percent for penetrating injuries and 1.4 percent for blunt injuries.



SOURCE: 2003-2006 SPARCS FILES

Descriptive Statistics for All Trauma Inpatients (Patients Treated in Trauma Centers)

The following two tables present the distribution of patients in the NYSTR by region according to level of trauma center designation (regional trauma center, area trauma center) and mechanism of injury (motor vehicle crash, low fall, other blunt injury, gunshot wound, stab wound). Among the inpatients in the models used to assess hospital performance, 79.8 percent were treated at regional centers and 20.2 percent were treated at area trauma centers. In New York City, all the patients were treated at regional centers because there are no area centers there. After New York City, the region with the next largest percentage of patients treated at regional centers was Western New York with 94.6 percent. The region with the smallest percentage of patients treated at regional centers was Suffolk with 43.6 percent.

Distribution of New York State Inpatients by Region and Level
Five Adult Mechanisms of Injury: 2003 - 2006

Region	Regional Trauma Centers n (%)	Area Trauma Centers n (%)	Total
Western	3,753 (94.6%)	214 (5.4%)	3,967 (7.5%)
Finger Lakes	3,176 (71.5%)	1,267 (28.5%)	4,443 (8.4%)
Central	2,844 (62.1%)	1,738 (37.9%)	4,582 (8.6%)
Northeastern	3,523 (84.0%)	673 (16.0%)	4,196 (7.9%)
Hudson Valley	2,769 (51.3%)	2,634 (48.8%)	5,403 (10.2%)
Nassau	5,042 (82.9%)	1,041 (17.1%)	6,803 (11.4%)
Suffolk	2,477 (43.6%)	3,207 (56.4%)	5,684 (10.7%)
New York City	18,864 (100.0%)	0 (0.0%)	18,864 (35.5%)
Total	42,448 (79.8%)	10,774 (20.2%)	53,222 (100.0%)

Among the inpatients in the models used to assess hospital performance, 44.6 percent were victims of motor vehicle crashes. For all regions, motor vehicle crashes created the largest percentage of severe trauma victims; however, this percentage ranged from a low of 32.7 percent in New York City to a high of 57.4 percent in Central New York. For most regions of the state, penetrating injuries (stab wounds and gunshot wounds) represent from 1.8 percent to 8.2 percent of the total patients. In New York City, these two mechanisms of injury represent 9.2 percent and 10.3 percent of patients.

Distribution of New York State Inpatients
by Region and Five Adult Mechanisms of Injury: 2003 – 2006

Region	Motor Vehicle Crash n (%)	Other Blunt n (%)	Low Falls n (%)	Stab Wounds n (%)	Gunshot Wounds n (%)	Total
Western	1,891 (47.7%)	955 (24.1%)	547 (13.8%)	249 (6.3%)	325 (8.2%)	3,967 (7.5%)
Finger Lakes	2,325 (52.3%)	1,006 (22.6%)	669 (15.1%)	113 (2.5%)	330 (7.4%)	4,443 (8.4%)
Central	2,630 (57.4%)	993 (21.7%)	697 (15.2%)	120 (2.6%)	142 (3.1%)	4,582 (8.6%)
Northeastern	2,271 (54.1%)	934 (22.3%)	719 (17.1%)	186 (4.4%)	86 (2.1%)	4,196 (7.9%)
Hudson Valley	3,036 (56.2%)	1,183 (21.9%)	950 (17.6%)	132 (2.4%)	102 (1.9%)	5,403 (10.2%)
Nassau	2,553 (42.0%)	1,440 (23.7%)	1,761 (29.0%)	200 (3.3%)	129 (2.1%)	6,083 (11.4%)
Suffolk	2,873 (50.6%)	1,191 (21.0%)	1,309 (23.0%)	207 (3.6%)	104 (1.8%)	5,684 (10.7%)
New York City	6,167 (32.7%)	5,091 (27.0%)	3,920 (20.8%)	1,735 (9.2%)	1,951 (10.3%)	18,864 (35.44%)
Total	23,746 (44.6%)	12,793 (24.0%)	10,572 (19.9%)	2,942 (5.5%)	3,169 (6.0%)	53,222 (100.0%)

Significant Mortality Results by Region and Level of Trauma Center Designation

Mortality rates for trauma patients were evaluated and compared according to region of the state and according to level of trauma center designation. Two types of mortality were examined: inpatient mortality (just those patients who died after being admitted to the hospital) and in-hospital mortality (both those patients who died after being admitted, plus any patients who died in while still in the emergency department). Mortality data were risk-adjusted to account for differences in patient injury severity before comparing performance across regions and levels of care. Risk factors used in the risk-adjustment process included age, gender, systolic blood pressure, two components of the Glasgow Coma Scale (eye opening and motor score), a measure of anatomic injury severity, transfer after admission to a referring hospital and transfer after an emergency department visit at a referring hospital. For motor vehicle crash patients, pedestrian status was used as a risk factor as was “fall from a height” for other blunt patients. Anatomic injury severity measures were not used in adjusting for in-hospital mortality because anatomic data were missing for patients who died in an emergency department.

Levels of Trauma Center Designation

There were no significant differences in mortality among levels of trauma center designation for any mechanism of injury or for all mechanisms combined, for either inpatient mortality or in-hospital mortality.

Regional Differences: Inpatient Mortality

Among motor vehicle crash inpatients, the overall inpatient mortality rate was 6.34 percent. Trauma inpatients in New York City had a risk-adjusted rate of 7.88 percent, which was significantly higher than the statewide rate.

Among inpatients treated for other blunt injuries, the overall inpatient mortality rate was 6.22 percent. Inpatients treated in Northeastern New York had a significantly lower risk-adjusted mortality rate (4.53 percent).

For all inpatients combined, the inpatient mortality rate was 6.98 percent. Western New York inpatients (6.00 percent) and Northeastern New York inpatients (6.12 percent) had risk-adjusted rates that were significantly lower, and New York City inpatients had a risk-adjusted rate (7.76 percent) that was significantly higher.

Regional Differences: In-Hospital (Inpatient or Emergency Department) Mortality

Among motor vehicle crash patients, the overall in-hospital mortality rate was 8.16 percent. Trauma patients who were admitted to the hospital or who died in the emergency department in Hudson Valley had a risk-adjusted mortality rate (7.21 percent) that was significantly lower than the statewide rate.

For all patients combined, the overall in-hospital mortality rate was 8.26 percent. Northeastern New York patients had a risk-adjusted rate (7.29 percent) that was significantly lower than this; Nassau (9.08 percent) had a risk-adjusted rate that was significantly higher than the statewide rate.

Individual Hospital Outcomes

The overall mortality rate for the 53,222 adult inpatients treated at all 46 trauma centers in the data used to assess performance for inpatients only was 6.98 percent. Observed mortality rates ranged from 0.00 percent to 9.45 percent. The risk-adjusted mortality rates used to measure performance for all hospitals ranged from 0.00 percent to 13.23 percent.

The overall mortality rate for the 53,970 adults treated at all 46 trauma centers in the data used to assess performance for deaths in the emergency department and inpatients was 8.26 percent. Observed mortality rates ranged from 0.00 percent to 11.70 percent. The risk-adjusted mortality rate used to measure performance for all hospitals ranged from 0.00 percent to 11.19 percent.

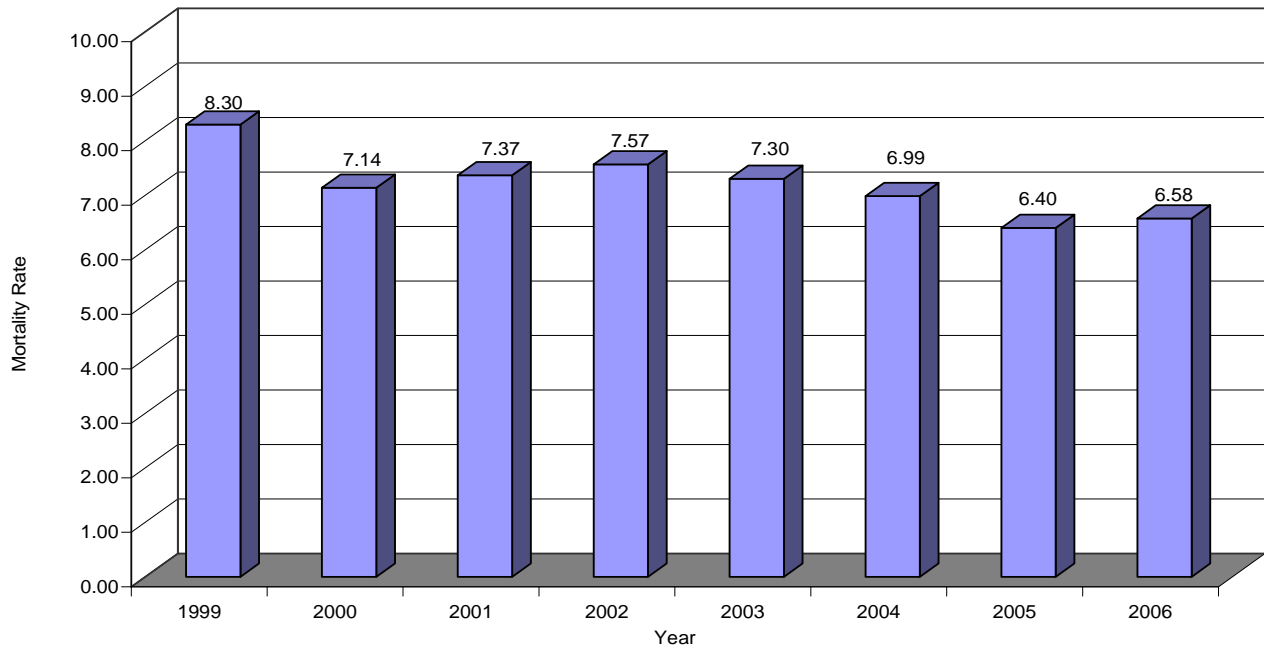
Three hospitals (Erie County Medical Center, Albany Medical Center, and University Hospital Stony Brook) had inpatient mortality rates that were significantly lower than the statewide mean. Five hospitals (Good Samaritan Hospital Medical Center, St. Barnabas, City Hospital Center at Elmhurst, Jamaica Hospital Medical Center and SVCMC-Mary Immaculate) had inpatient mortality rates that were significantly higher than the statewide rate.

Three hospitals (Mary Imogene Bassett Hospital, Westchester Medical Center, and Long Island Jewish Medical Center [pediatric patients only]) had in-hospital mortality rates that were significantly lower than the statewide rate, and two hospitals (Nassau University Medical Center and Brookdale Hospital Medical Center) had rates that were significantly higher than the statewide rate.

Recent Changes in Trauma Mortality in New York

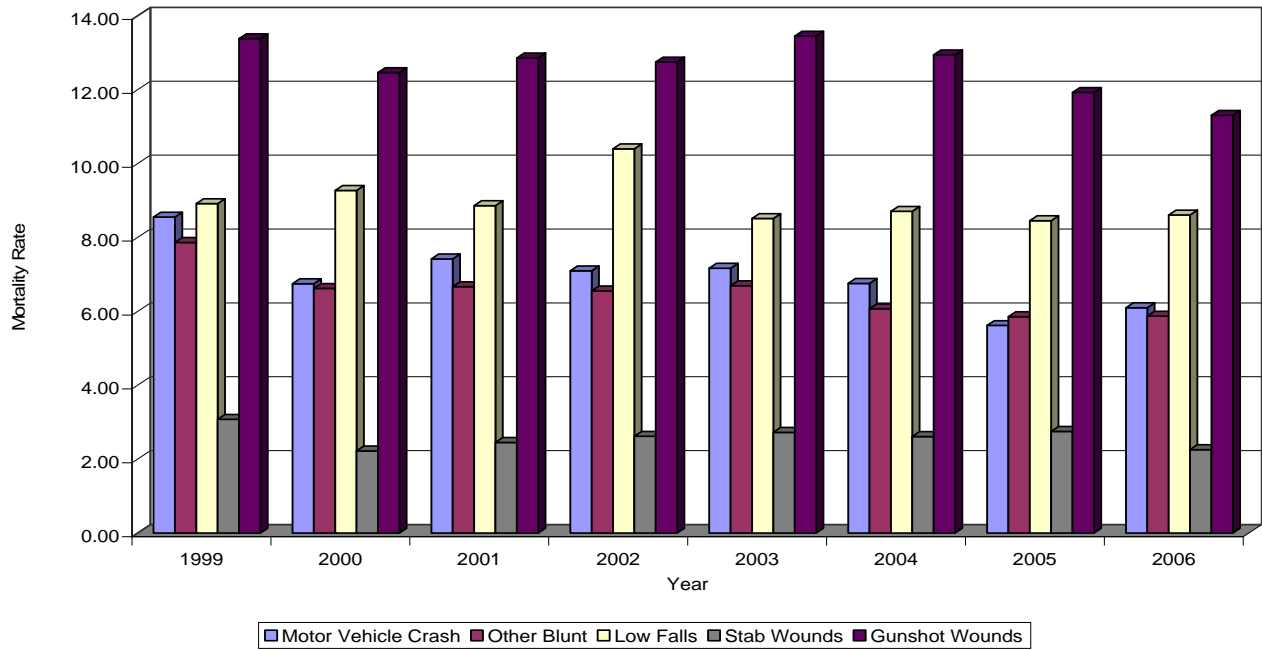
For the five adult mechanisms of injury combined (motor vehicle crashes, low falls, other blunt injuries, stab wounds, gunshot wounds), the inpatient mortality rate decreased from 8.3 percent in 1999 to 6.6 percent in 2006.

Mortality Rate in Trauma Centers
Five Adult Mechanisms of Injury (combined)
Severe Injuries
1999-2006 SPARCS



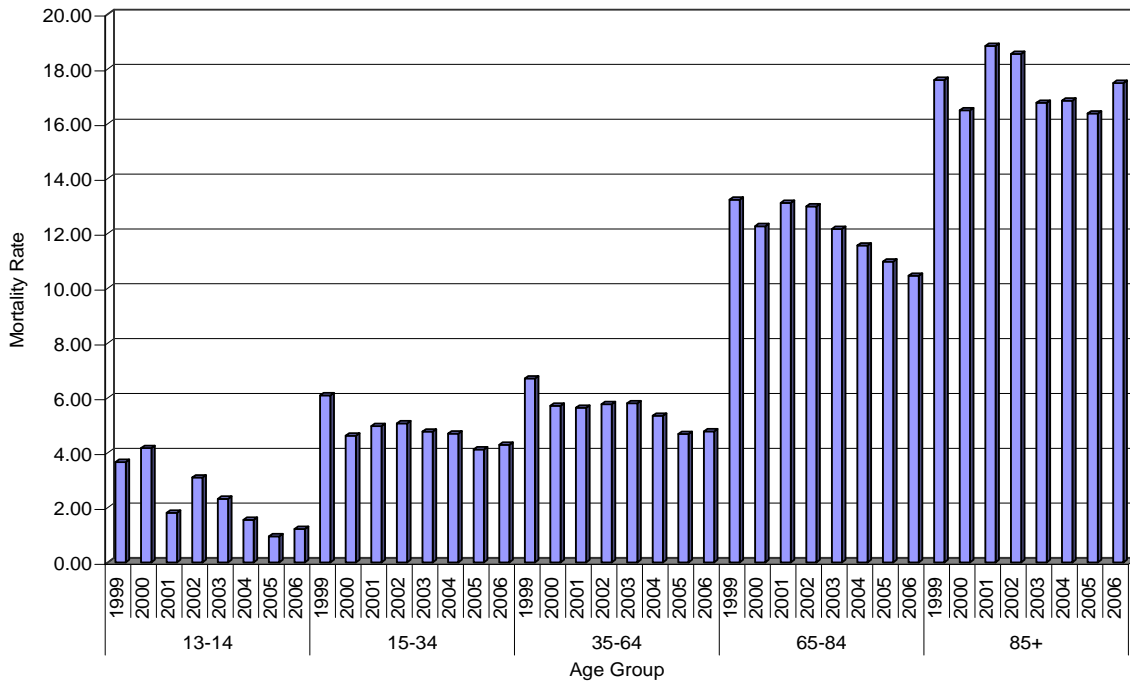
There were substantial decreases in mortality between 1999 and 2006 for patients with gunshot wounds (from 13.38 percent to 11.31 percent), stab wounds (from 3.08 percent to 2.26 percent), motor vehicle crashes (from 8.55 percent to 6.10 percent), and other blunt injuries (from 7.87 percent to 5.87 percent).

Mortality Rate in Trauma Centers
 Motor Vehicle Crash, Other Blunt, Low Falls, Stab Wounds, Gunshot Wounds
 1999-2006 SPARCS



As is clear in the following chart, this reduction in crude mortality³ has occurred for most age groups other than those patients age 85 and older over this time period.

Mortality Rate by Age Group in Centers
 Five Adult Mechanisms of Injury
 Severe Injuries
 1999-2006 SPARCS



Trends in Risk-Adjusted Mortality Rates for Mechanisms of Injury

³ Crude mortality is the total number of deaths divided by the total number of patients.

There was a significant 10 percent decrease by year in risk-adjusted inpatient mortality for both motor vehicle crash and for other blunt inpatients. There was a significant 6 percent decrease in risk-adjusted inpatient/deaths in the emergency department (DIE) mortality for motor vehicle crash patients. There were no significant changes in the risk-adjusted mortality in either direction for the other mechanisms of injury (MOI) in the inpatient or in the DIE/inpatient groups.

Comparison of Recent Trauma Mortality Rates in New York and the United States

Probably the best gauge of the performance of New York's trauma system in the past several years is a comparison with national trauma outcomes data from the CDC.⁴ The following is a comparison of outcomes in New York and the United States of three groups of trauma patients (motor vehicle crash, falls, and firearms⁵) that comprise approximately three-quarters of all traumatic injuries contained in New York's Registry.

Motor Vehicle Crashes

The rate of motor vehicle crash (MVC) deaths per 100,000 population in the United States in 2006 was considerably higher than the counterpart rate in New York State, as was the age-adjusted rate per 100,000 population. For example, the age-adjusted mortality rate per 100,000 population for MVCs in the United States was 14.97 percent, compared to 8.05 percent in New York State. The difference between these two rates was statistically significant ($p < 0.0001$).

Previous studies in other states have demonstrated that the mortality rate per capita for MVCs in a region is inversely related to the population density of the region. This may, in part, explain why New York's mortality rate per 100,000 population is so much lower than that of the United States.

The mortality rate in the United States changed from 15.30 per 100,000 in 2003 to 14.97 per 100,000 in 2006, a decrease of 2.2 percent. During the same time period in New York, the mortality rate per 100,000 changed from 8.03 to 8.05, a slight increase of 0.3 percent. The change in mortality rate per 100,000 in New York was found to be significantly different from the change in the United States ($p < 0.0001$).

Falls

The mortality rate for falls per 100,000 population in the United States in 2006 was higher than the rate in New York (6.59 vs. 4.97, respectively). This difference was statistically significant ($p < 0.0001$).

The mortality rate per 100,000 population in the United States rose from 5.82 in 2003 to 6.59 in 2006, an increase of 13.2 percent. During the same time period, the rate in New York fell slightly from 4.99 to 4.97, a decrease of 0.3 percent. New York's rate decreased while the rate in the United States increased, and the difference was statistically significant ($p < 0.0001$).

Firearms

The age-adjusted mortality rate of firearms per 100,000 population in the United States in 2006 was 10.20, significantly higher than the comparable rate in New York (5.20), ($p < 0.0001$).

The mortality rate for firearms per 100,000 population in the United States decreased slightly from 10.27 in 2003 to 10.20 in 2006, a decrease of 0.6 percent. During the same time period, the rate

⁴ Centers for Disease Control and Prevention (CDC), National Center for Injury Prevention and Control (NCIPC), Web-Based Injury Statistics Query and Reporting System (WISQARS), www.cdc.gov/ncipc/wisqars

⁵ New York State analyzes a group of injuries labeled "gunshot wounds" that is comparable to the CDC's grouping of firearms."

decreased in New York from 5.31 to 5.10, a decrease of 4.1 percent. The decrease in New York was found to be statistically significantly larger than the decrease in the United States ($p < 0.0001$). It appears that the quality assurance and improvement efforts associated with New York's trauma system and Registry may have resulted in a substantially higher decrease in population mortality than was experienced nationwide.

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THE NEW YORK STATE

TRAUMA SYSTEM

2003 – 2006

INTRODUCTION

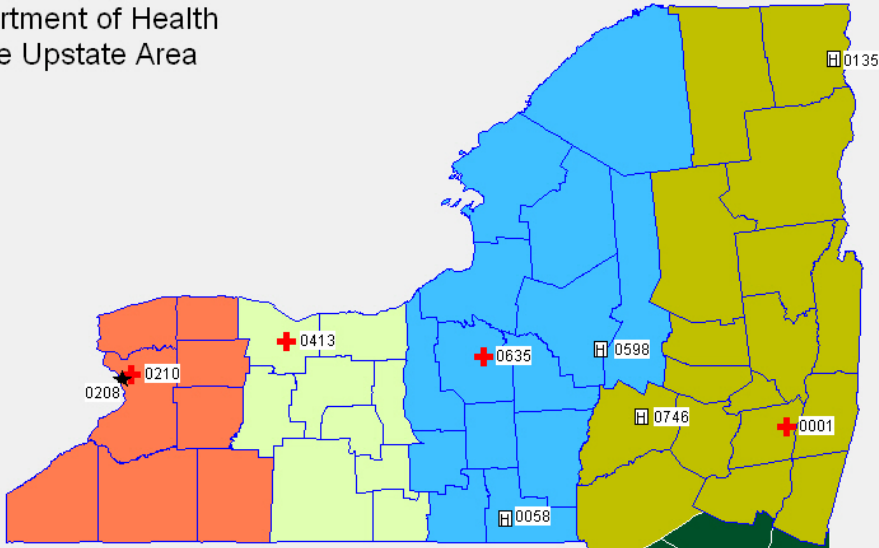
In the past two decades, New York has worked to improve trauma care in the state. In 1990, the State established minimum standards for trauma centers, and 36 hospitals were subsequently designated as centers. As of 2006, 44 trauma centers existed in New York State. Twenty-five of these centers are outside New York City. At the time of publication of this report, there are 41 trauma centers in the state, with 23 outside of New York City. In 1991, a group of trauma care specialists, primarily from New York State, was chosen to serve on a new State Trauma Advisory Committee (STAC).

In 1993, New York State created a statewide Trauma Registry. Although this Registry once included almost all hospitals in the state, it now includes only trauma centers. Data in the Registry include trauma-related deaths in the emergency department (DIEs) and trauma inpatient admissions with diagnoses identified by the STAC as having sufficiently high injury severity to be worthy of study. Sufficiently high injury severity is defined by the ICD-9-CM codes in Appendix 1. The trauma centers in New York from 2003-2006 are listed by region and level (regional trauma center, area trauma center) in Appendix 2.

The Registry uses a data entry package (*Trauma One* or *National Trauma Registry American College of Surgeons* [NTRACS]) to standardize the information obtained from each participating hospital and to facilitate analysis. Each regional and area trauma center has access to a software package and enters its own data in the system. Some area centers forward their data to regional centers that, in turn, forward the entire region's data to the evaluator at the School of Public Health at the University at Albany, State University of New York (SUNY). Other area centers submit their data directly to the School of Public Health. There are eight regional trauma programs in the state (Central New York, Finger Lakes, Hudson Valley, Nassau, New York City, Northeastern New York, Suffolk, and Western New York); each has at least one regional trauma center; New York City has 19 regional trauma centers. The following two maps show the boundaries of the eight regional systems and the locations of the currently designated trauma centers in New York City and elsewhere in New York State.

Figure 1 – Trauma Center Location Maps

New York State Department of Health
 Trauma Centers in the Upstate Area
 As of October 2009

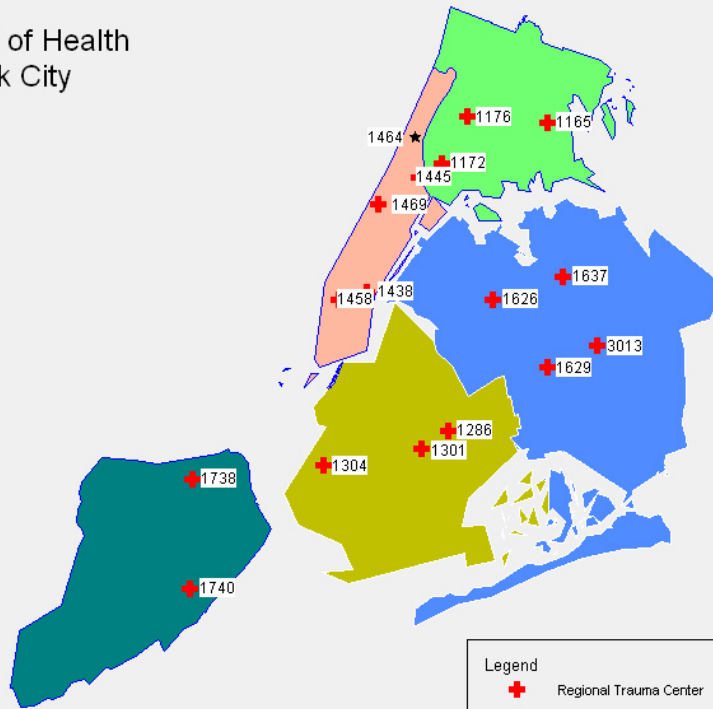


PFI_No	Trauma_Center_Name	Level
0001	Albany Medical Center	Regional
0058	United Health Services Hospital - Wilson Hospital Divi	Area
0135	Champlain Valley Physicians Hospital Medical Center	Area
0180	St. Francis Hospital	Area
0208	Women and Children's Hospital of Buffalo	Pediatric
0210	Erie County Medical Center	Regional
0413	Strong Memorial Hospital	Regional
0598	St. Elizabeth's Medical Center	Area
0635	University Hospital SUNY Health Science Center	Regional
0746	Mary Imogene Bassett Hospital	Area
0776	Nyack Hospital	Area
0779	Good Samaritan Hospital of Suffern	Area
1072	Sound Shore Medical Center of Westchester	Area
1139	Westchester Medical Center	Regional

Legend

- + Regional Trauma Center
- H Area Trauma Center
- ★ Pediatric Trauma Center
- Western New York Region
- Finger Lakes Region
- Central New York Region
- Northeastern New York Region
- Hudson Valley Region

New York State Department of Health
 Trauma Centers in New York City
 As of October 2009

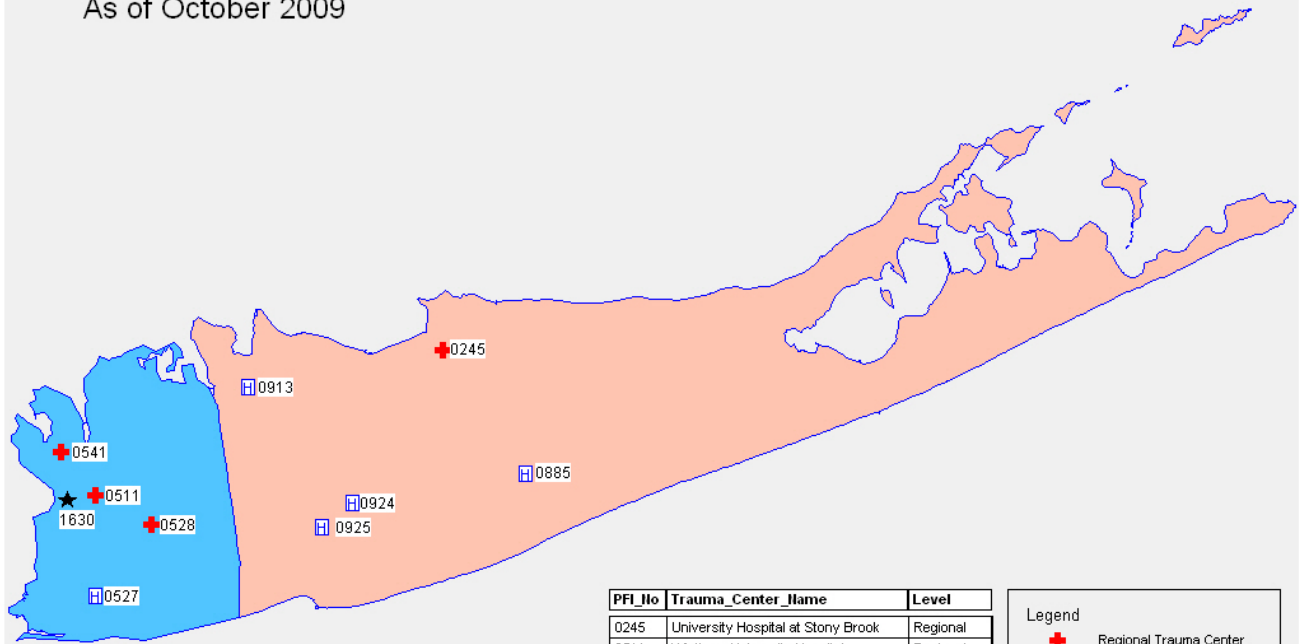


PFI_No	Trauma_Center_Name	Level
1165	Jacobi Medical Center	Regional
1172	Lincoln Medical and Mental Health Center	Regional
1176	St. Barnabas Hospital	Regional
1286	Brookdale University Hospital Med Ctr	Regional
1301	Kings County Hospital Center	Regional
1304	Lutheran Medical Center	Regional
1438	Bellevue Hospital Center	Regional
1445	Harlem Hospital Center	Regional
1458	NY Presbyterian Hospital - Cornell Campus	Regional
1464	Children's Hospital Of NY	Pediatric
1469	St. Luke's and Roosevelt Hospital Center	Regional
1471	St. Vincent's CMC Hospital - Manhattan	Regional
1626	Elmhurst Hospital Center	Regional
1629	Jamaica Hospital Medical Center	Regional
1637	NY Hospital Medical Center of Queens	Regional
1738	Richmond University Medical Center	Regional
1740	Staten Island University Hospital North	Regional
3013	Caritas - Mary Immaculate Hospital	Regional

Legend

- + Regional Trauma Center
- ★ Pediatric Trauma Center
- New York County (Manhattan)
- Bronx County (Bronx)
- Queens County (Queens)
- Kings County (Brooklyn)
- Richmond County (Staten Island)

New York State Department of Health
 Trauma Centers on Long Island
 As of October 2009



PFI_No	Trauma_Center_Name	Level
0245	University Hospital at Stony Brook	Regional
0511	Winthrop University Hospital	Regional
0527	South Nassau Communities Hospital	Area
0528	Nassau University Medical Center	Regional
0541	North Shore University Hospital	Regional
0885	Brookhaven Memorial Hospital	Area
0913	Huntington Hospital	Area
0924	Southside Hospital	Area
0925	Good Samaritan Hospital	Area
1630	LJMSchneider's Children's Hospital	Pediatric

Legend

- + Regional Trauma Center
- H Area Trauma Center
- ★ Pediatric Trauma Center
- Suffolk County
- Nassau County

Data in the system are derived from three sources: the Prehospital Care Report (PCR), the Emergency Department (ED) record, and information from the referring hospital and final hospital inpatient admissions.

The PCR information about the ambulance trip includes the time of the call, the time the ambulance arrived at the scene of the injury, the time spent by the Emergency Medical Service (EMS) team at the scene, travel time to the hospital, and information about the physiological state of the patient during the course of the ambulance trip.

The ED record includes information about the times the patient entered the ED and was admitted to the hospital, the treatment the patient received in the ED, and the physiological state of the patient at various times in the ED.

The inpatient data include patient demographics, diagnoses, procedures performed and their dates, the admission and discharge dates from the hospital, and the discharge status.

Registry data were first reported and analyzed in 1993. Data from trauma inpatients in 1993 were subdivided into different mechanisms of injury (motor vehicle crashes, low falls, etc.). Then, inpatient mortality rates were examined by hospital, region and level (regional center, area center and non-center) after adjusting the rates to account for differences in patient risk using known risk factors such as age, gender, injury severity, respiratory rate, systolic blood pressure and Glasgow Coma Scale.

In addition to looking at differences across all patients with a given mechanism of injury, risk-adjusted mortality was also calculated for subgroups of patients (e.g., head-injured patients, older patients, patients with injuries to the front of neck and thorax) to determine whether any regions had especially high or low outcome rates for each subgroup. This information was then communicated to the regional centers so that regions with high or low risk-adjusted mortality for subgroups of patients could explore the processes of care for these patients in relation to the processes in place in other regions of the state.

The second report, based on 1994-1995 data, profiled trauma patients in the state with respect to the mechanisms of injury they sustained and the relationship between demographics (age and gender) and the mechanisms of injury. It also examined the location of trauma patients and trauma patient deaths, both by region and by care location (on arrival to hospital, in hospital emergency department or as an inpatient). The tendency of trauma patients to be admitted to trauma centers vs. non-centers by region was also reported. In addition, changes in the volume and mortality rates of trauma patients over previous years were reported on both a statewide and regional basis.

To the best of our knowledge, this was the first state-issued report on trauma care that evaluated relative outcomes among regions of the state and among different levels of inpatient care (regional trauma centers, area trauma centers and non-centers). This was done by developing a statistical model for each mechanism of injury that was then used to calculate risk-adjusted mortality rates for regions of the state and for levels of care. The report included comparisons of these risk-adjusted rates by region and level.

The third report, covering 1996-1998, was similar to the 1994-1995 report and updated the information presented in the 1994-1995 report.

The fourth report, covering 1999-2002, is similar to the second and third reports, except it is limited primarily to information on trauma centers because the Registry no longer contains information from non-centers. The 1999-2002 report includes the state's first comparisons of risk-adjusted mortality rates for individual hospitals.

This report covers the years 2003-2006 and is based on the analysis of trauma center data from all trauma centers in New York State. As in the 1999-2002 report, regional, level and individual hospital outliers are presented. As in the earlier report, comparisons to United States data for three types of injuries (motor vehicle crashes, low falls, and firearms injuries) are presented. A new section of this 2003-2006 report shows trends in numbers of cases and mortality rates during the six years of 1999-2006.

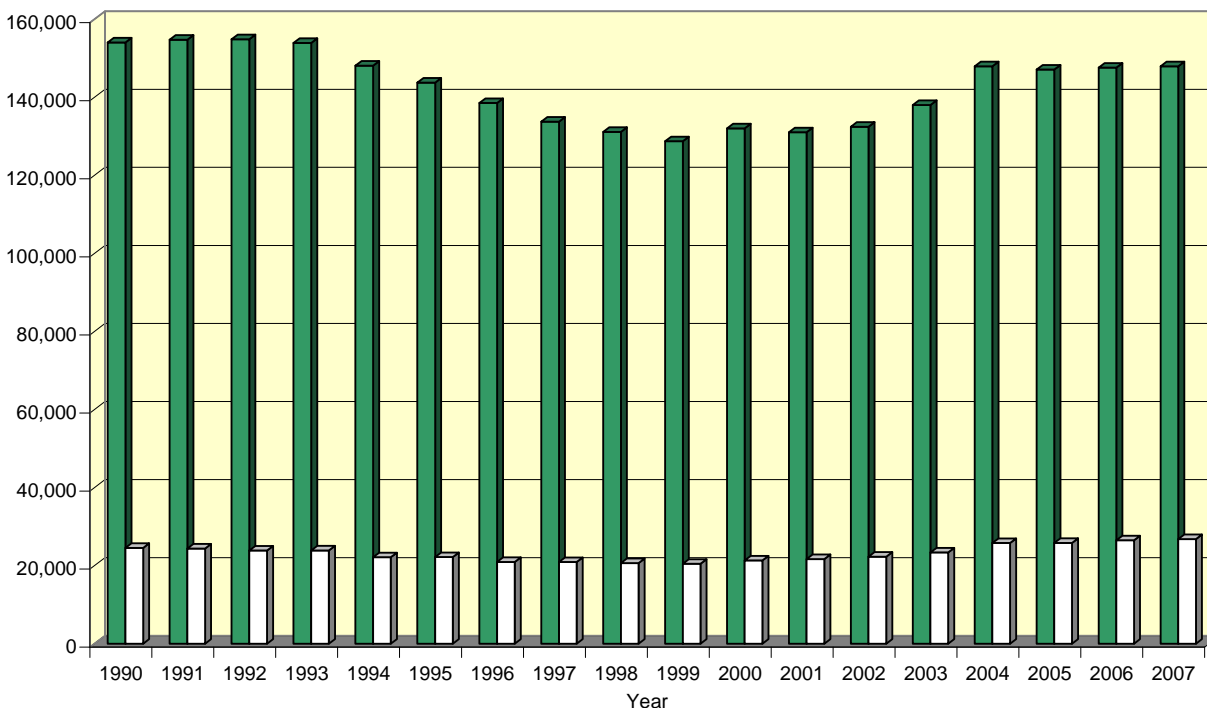
The New York State Department of Health and the STAC hope that these analyses and reports serve hospitals and EMS agencies throughout the state in their efforts to improve the care of injured patients. The statewide Registry and the risk-adjusted statistical methods that have been developed under the auspices of the Bureau of EMS provide a tool for monitoring these efforts and documenting improvements in outcome.

NEW YORK STATE TRAUMA SYSTEM POPULATION PROFILE

As shown in Chart 1, according to New York's Statewide Planning and Resource Cooperative System (SPARCS), the total number of trauma patients admitted to New York State hospitals declined between 1990 and 1999 and then increased between 1999 and 2007. A total of 147,944 trauma patients were admitted to New York State hospitals in 2007, a decrease of 4.0 percent from the 154,054 trauma inpatients admitted in 1990. Also shown in Chart 1 is that the number of severe trauma admissions increased from 24,564 to 26,815 between 1990 and 2007.

Chart 1

1990-2007 Statewide
Number of Trauma Inpatients and Number of Severe Trauma Inpatients



Source: 1990-2007 SPARCS

Number of All Trauma Inpatients
 Number of Severe Trauma Inpatients

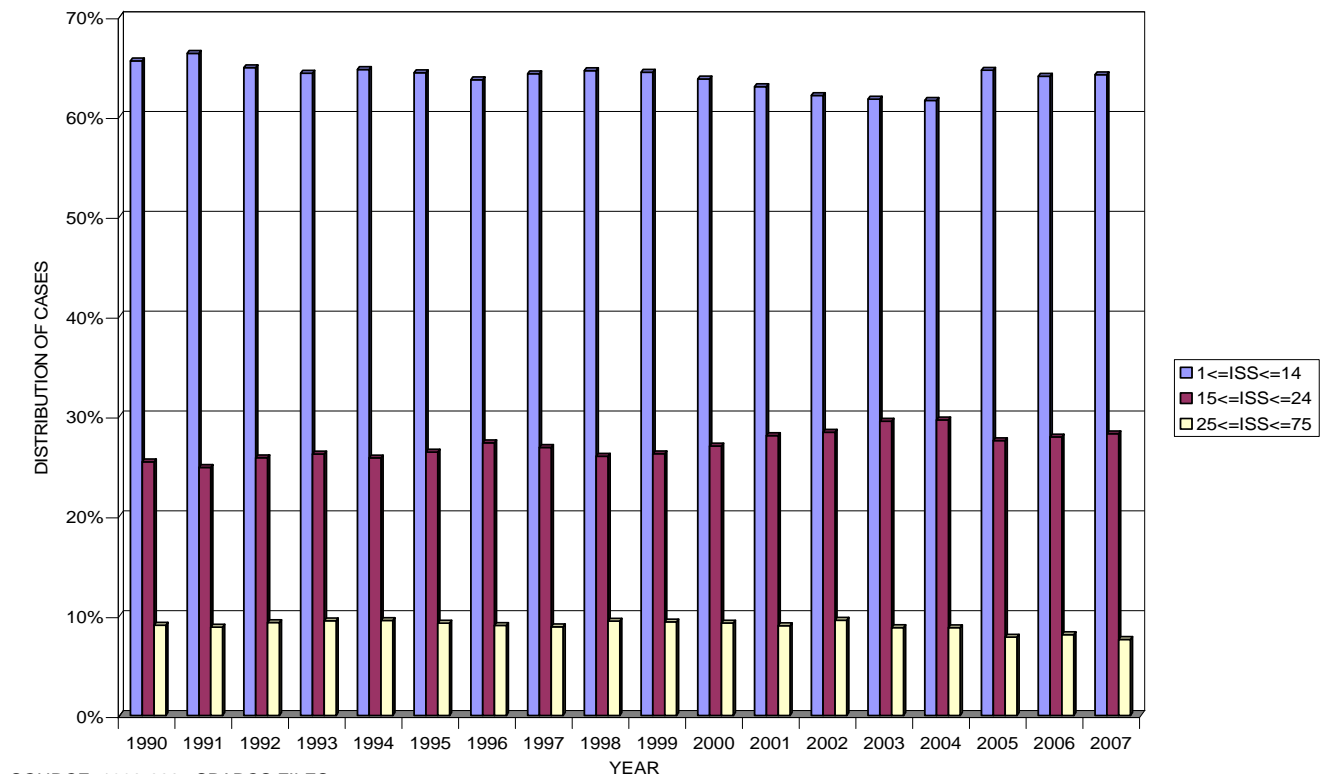
Established in 1993, the New York State Trauma Registry (NYSTR) was designed to include data on trauma patients that are identified by the Statewide Trauma Advisory Committee (STAC) to be at significant risk of dying subsequent to their injuries. These data were collected from all hospitals in New York State – regional and area trauma centers as well as from community hospitals.

As noted, a list of ICD-9-CM diagnostic codes that identify severe trauma patients is presented in Appendix 1. The number of patients qualifying for inclusion in the NYSTR in 2007 was 26,815, approximately 2,250 more patients than in 1990 (24,564 patients - see Chart 1). It should be noted that since the Registry’s inception in 1993, the trauma coordinators, after thorough review of the medical record, have been able to exclude records from the Registry that had qualified for inclusion based on ICD-9-CM codes. Since no 1990-1992 records were reviewed for exclusion, the 1993-2007 exclusions have been disregarded in Chart 1 to best capture trends in trauma patient admissions. The numbers show a slight downward trend from 1990 through 1999 and a slight upward trend since 1999. Since the Registry was not instituted until 1993, the patient volumes in the years prior to 1993 represent those patients who would have qualified for the Registry. Per year, approximately 119,000 SPARCS patients with a trauma diagnosis do not qualify for the Registry. The average mortality rate for these patients between 1990 and 2007 is approximately 2.08 percent.

Chart 2 presents the number of severe trauma admissions grouped by Injury Severity Score (ISS). Records with an ISS of 99 are excluded from this chart. The severity of each trauma injury is graded from one to six, with six being the most severe. Each region of the body is assigned a score equal to the highest score in that region. The scores for the three highest regions are then squared and summed. For example, if the three regions with the highest scores have scores of 3, 4 and 4, then the ISS is $3^2+4^2+4^2=41$. A score of six in any region generates the maximum ISS score of 75.

Chart 2

Distribution of Hospital Admissions for Severe Trauma by Injury Severity Score: 1990-2007



SOURCE: 1990-2007 SPARCS FILES

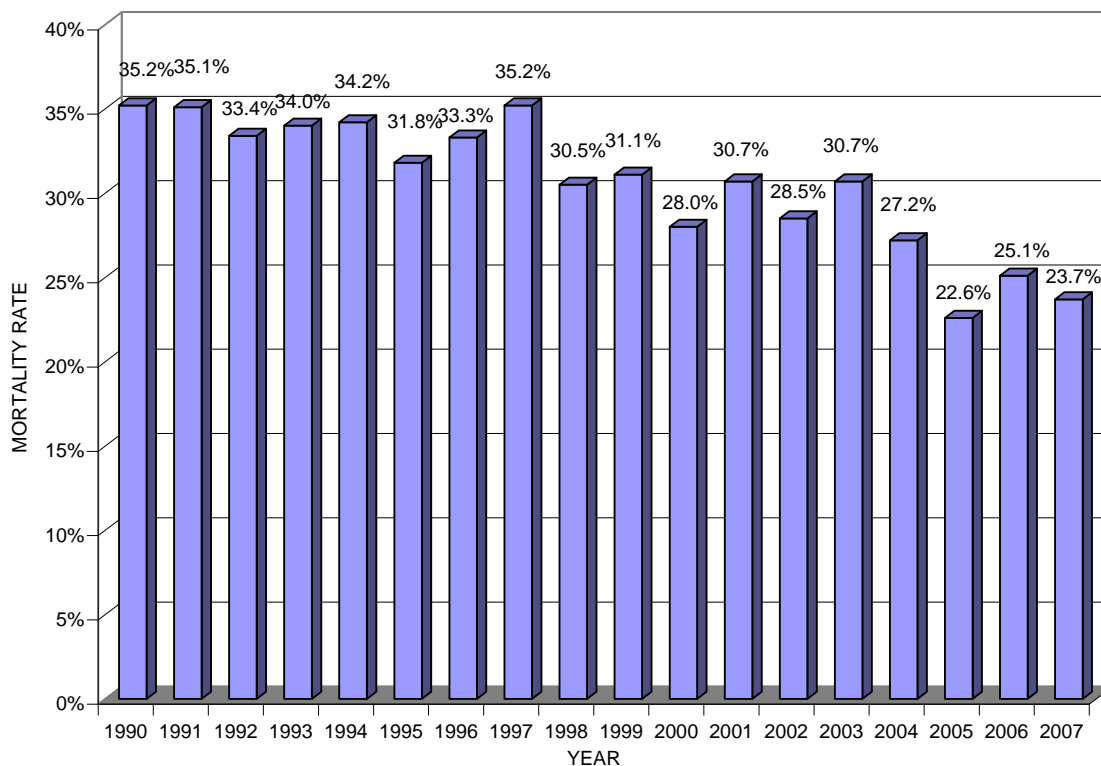
Changes in Mortality Rates by ISS Group for Severe Trauma Admissions: 1990-2007

The data in Charts 3 and 4 demonstrate the changes in in-hospital mortality rates between 1990 and 2007 for the three ISS groups. Two charts are presented because, if these mortality rates were presented on one chart, the most seriously injured group would mask the decline in mortality in the other groups. Records with an ISS of 99 are excluded.

Chart 3 shows that the very high mortality associated with patients with an ISS between 25 and 75 decreased noticeably from 1990-2007. Decreases in inpatient mortality are also evident for the other two ranges of ISS. Since 1990, when most trauma centers were designated, the inpatient mortality rate for patients with an ISS between 15 and 24 decreased from 7.2 percent to 5.8 percent, a reduction of 19.4 percent. For patients with an ISS between 1 and 14, the inpatient mortality rate increased slightly from 2.9 percent to 3.1 percent. The chi-square test for trend shows there was a very highly statistically significant decrease ($p < 0.0001$) in mortality rate for the time period of 1990-2007 for ISS groups 15-24 and 25-75.

Chart 3

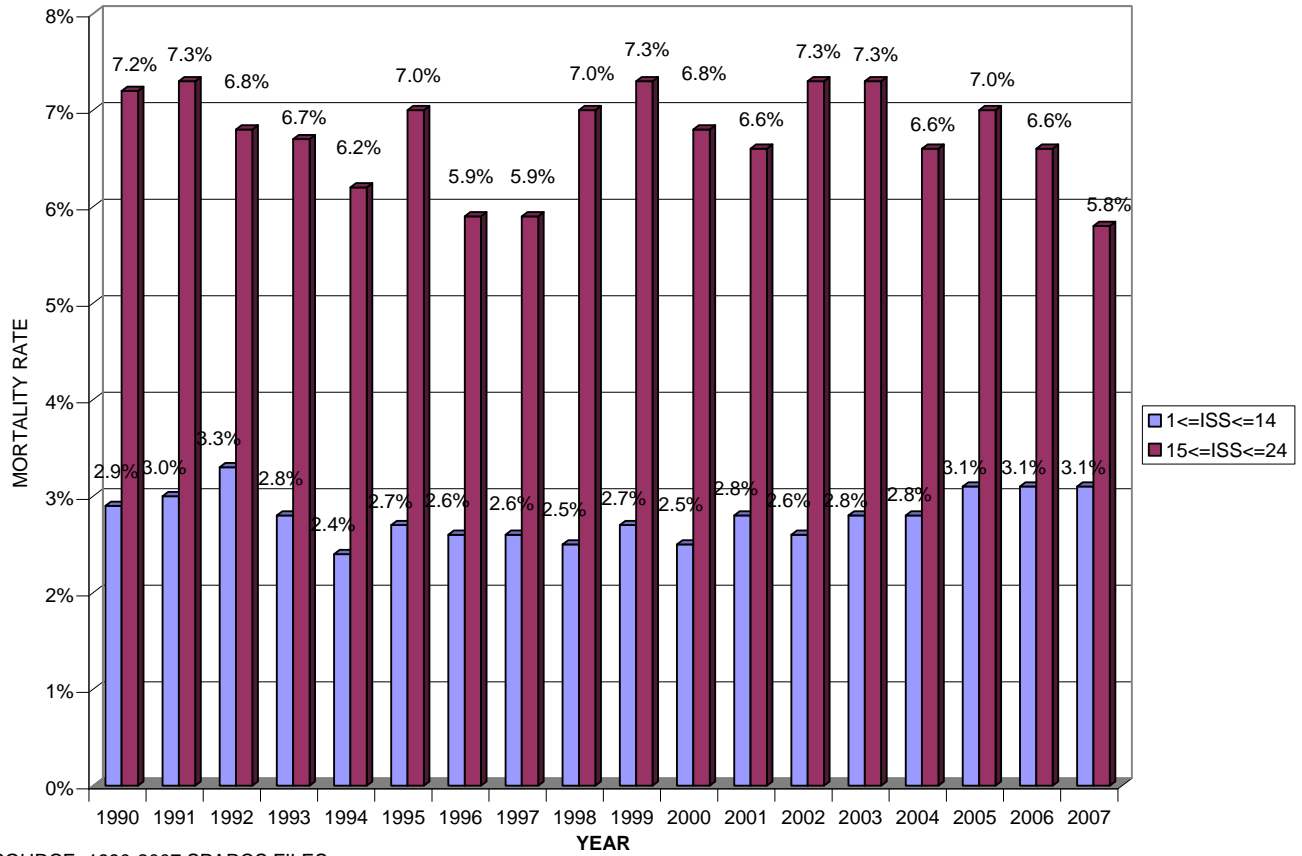
Changes in Mortality Rates for ISS 25-75
Severe Trauma Admissions: 1990-2007



SOURCE: 1990-2007 SPARCS FILES

Chart 4

Changes in Mortality Rates by ISS Groups 1-14 and 15-24
Severe Trauma Admissions: 1990-2007

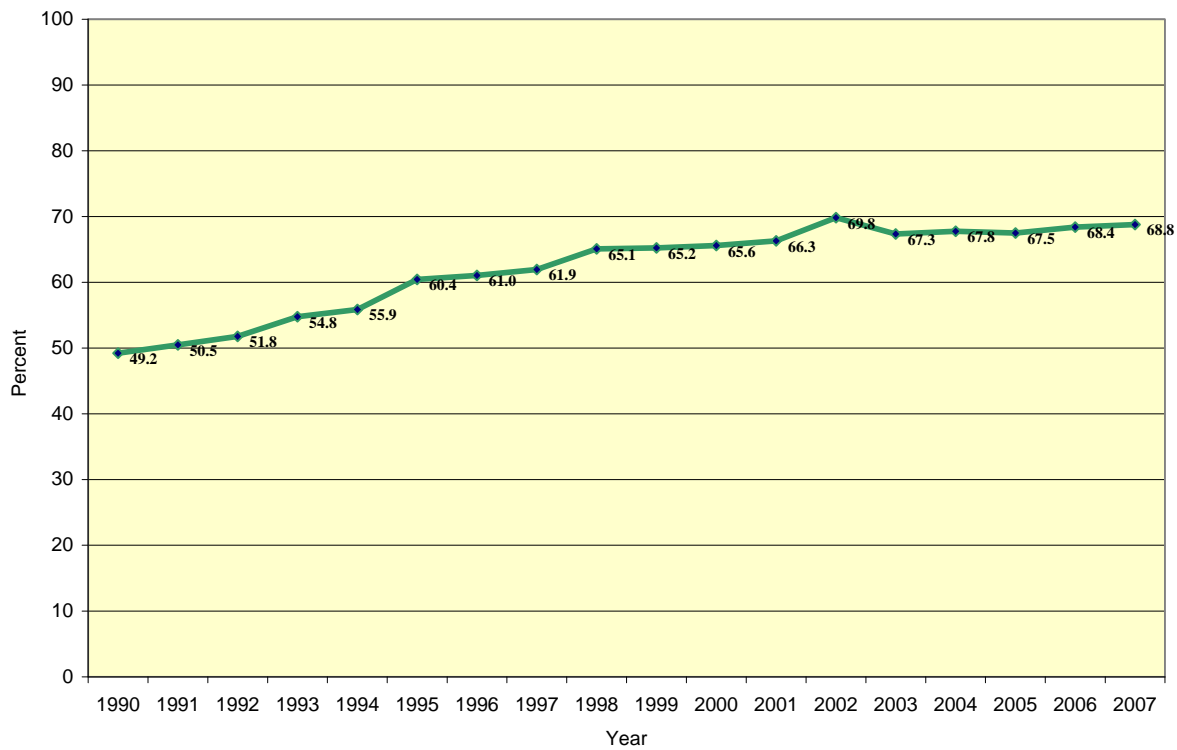


SOURCE: 1990-2007 SPARCS FILES

The data in Chart 5 present the percentage of New York State trauma patients admitted to trauma centers between 1990 and 2007. For the years 1990-1992, this chart defines a hospital as a trauma center as it was designated in 1993. The percentage of patients triaged to trauma centers has risen from 49.2 percent in 1990 to 68.8 percent in 2007, an increase of 39.8 percent. The trend identified in the chart is consistent with the policy of transporting the more seriously injured patients beyond the nearest hospital to the nearest trauma center. The chi-square test for trend shows there was a very highly statistically significant increase ($p < 0.0001$) in the percent of patients triaged to trauma centers over the time period 1990-2007.

Chart 5

New York State - Percent of Severe Trauma Inpatients Treated at Trauma Centers

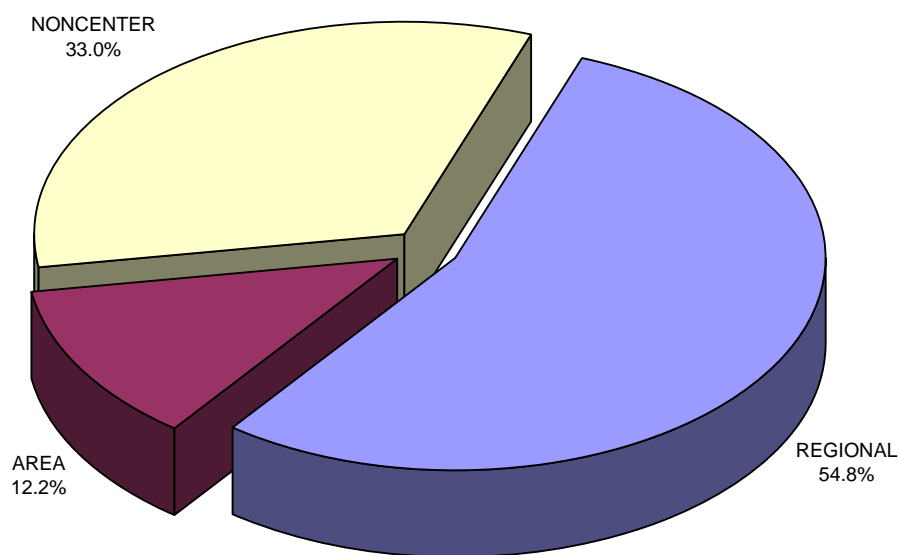


Source: 1990-2007 SPARCS

On page 27, Chart 1 titled “1990-2007 Statewide Number of Trauma Inpatients and Number of Severe Trauma Inpatients” shows 101,540 severe trauma inpatients for 2003-2006. As discussed earlier, some of these records were, after medical record review, deemed inappropriate for inclusion in the NYSTR. These exclusions reduced the total number of patients for 2003-2006 to 94,926. Among the inpatients qualifying for the 2003-2006 NYSTR, 54.8 percent were admitted to regional trauma centers and 33.0 percent were admitted to non-centers (see Chart 6). Only 12.2 percent of these patients were hospitalized in area centers.

Chart 6

Distribution of Severe Trauma Inpatients by Hospital Level: 2003-2006

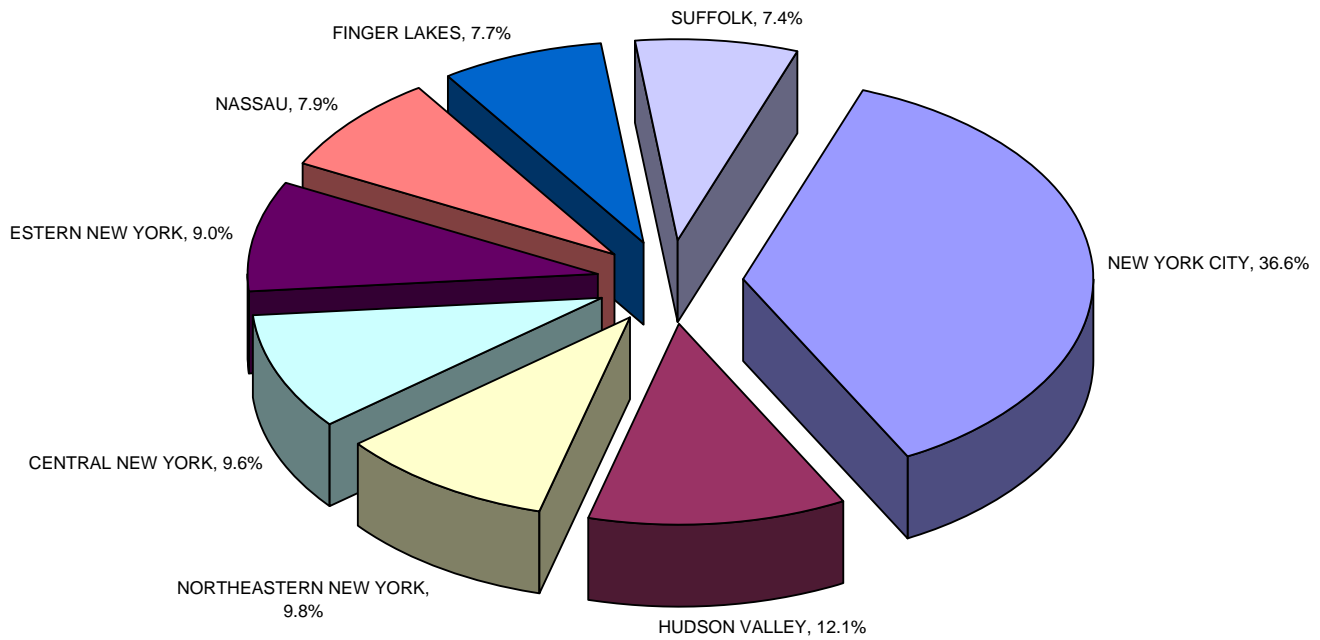


SOURCE: 2003-2006 SPARCS FILES

Chart 7 shows the distribution of inpatients qualifying for New York's 2003-2006 Registry by region. Almost 37 percent of the patients were in New York City. No other region had more than 13 percent of the total. The regions outside of New York City with the most patients were Hudson Valley (12.1percent) and Northeastern New York (9.8 percent). The regions with the fewest patients were Suffolk (7.4 percent) and Finger Lakes (7.7 percent).

Chart 7

Regional Distribution of Severe Trauma Inpatients: 2003-2006

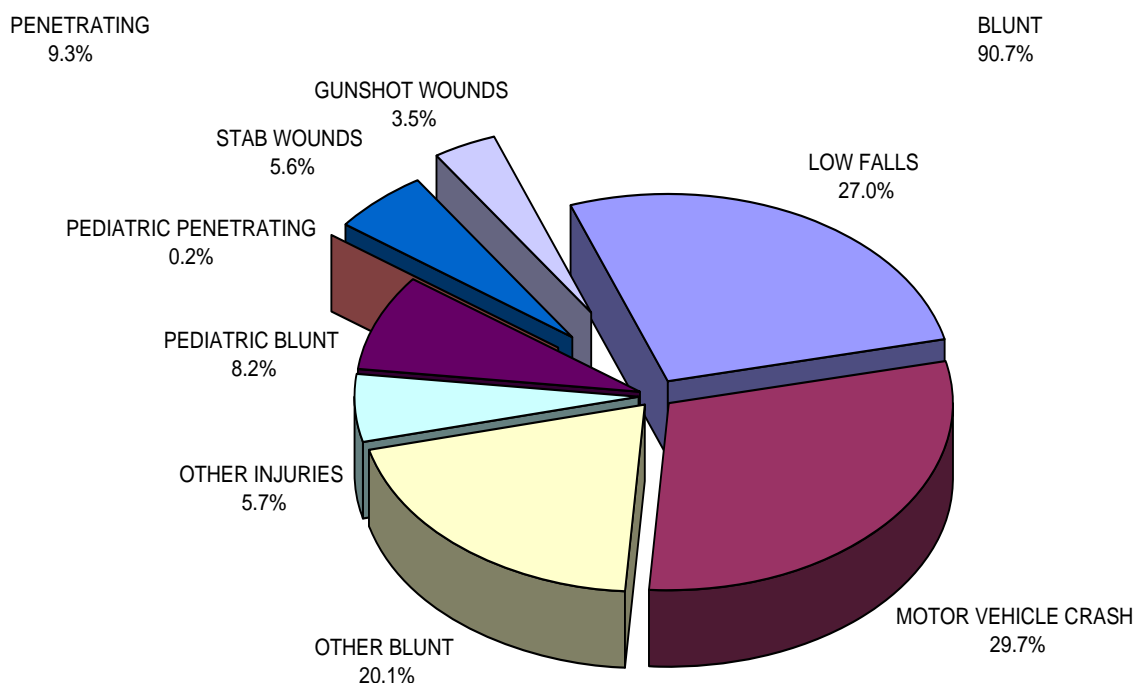


SOURCE: 2003-2006 SPARCS FILES

Of the inpatients qualifying for the 2003-2006 Registry, 90.7 percent were classified as having experienced blunt trauma (see Chart 8). The remaining 9.3 percent were classified as victims of penetrating trauma. The most common type of blunt trauma was motor vehicle crashes (29.7 percent of all trauma patients), followed by low falls (27.0 percent of all trauma patients). A total of 8.2 percent of the patients were pediatric patients (age less than 13 years) experiencing blunt injuries. A total of 5.6 percent of all adult inpatients qualifying for the Registry received stab wounds and 3.5 percent were treated for gunshot wounds. Only 0.2 percent of all 2003-2006 patients were pediatric patients with penetrating injuries (stab wounds or gunshot wounds).

Chart 8

Mechanism of Injury of Severe Trauma Inpatients: 2003-2006



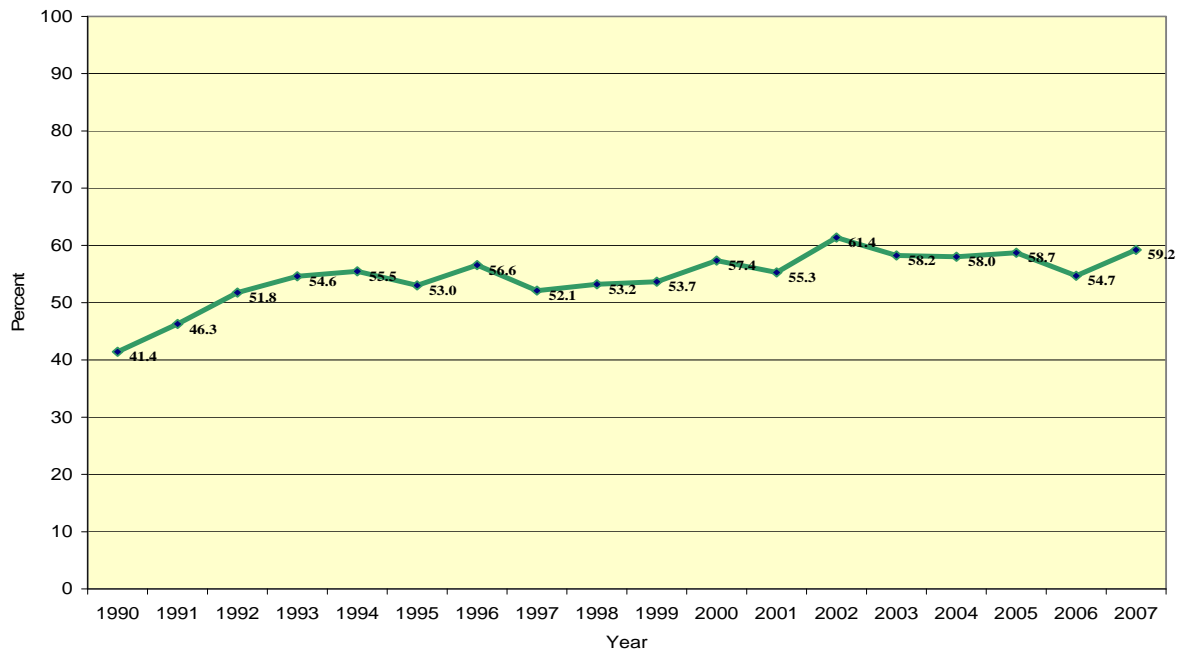
SOURCE: 2003-2006 SPARCS FILES

Percent of Inpatients Admitted to Trauma Centers by Region: 1990-2006

Evident in the following eight charts are the effect of the increased number of designated trauma centers and the influence of geography on the percentage of patients in a particular region who are triaged to trauma centers. The geographically dispersed regions of Western New York/Finger Lakes (Charts 9 and 10), Central New York (Chart 11), and Northeastern New York (Chart 12) show moderate increases in the percentage of patients triaged to centers. In these regions, 50 percent to 60 percent of the patients are triaged to centers. In New York City (Chart 16), the region with the highest density of hospitals per square mile, the triage rate to regional centers shows a moderate increase from about 60 percent to approximately 72 percent. Hudson Valley (Chart 13) and Suffolk (Chart 15) show sharp increases in the rate of triage at the time many additional centers were designated – Hudson Valley in 1998 and Suffolk in 1995. Nassau (Chart 14), the smallest region in terms of square miles, has the highest density of trauma centers in any region outside of New York City. The percentage of Nassau's severe trauma patients that was triaged to a center grew from 70 percent to 86 percent.

Chart 9

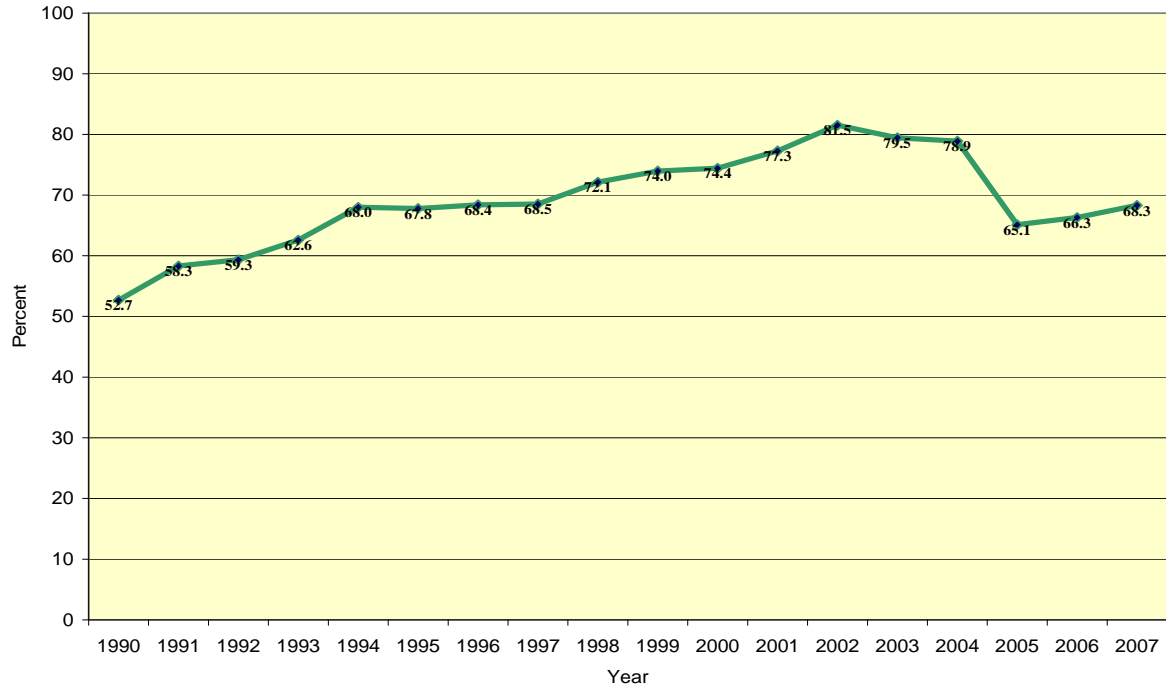
Western New York - Percent of Severe Trauma Inpatients Treated at Trauma Centers



Source: 1990-2007 SPARCS

Chart 10

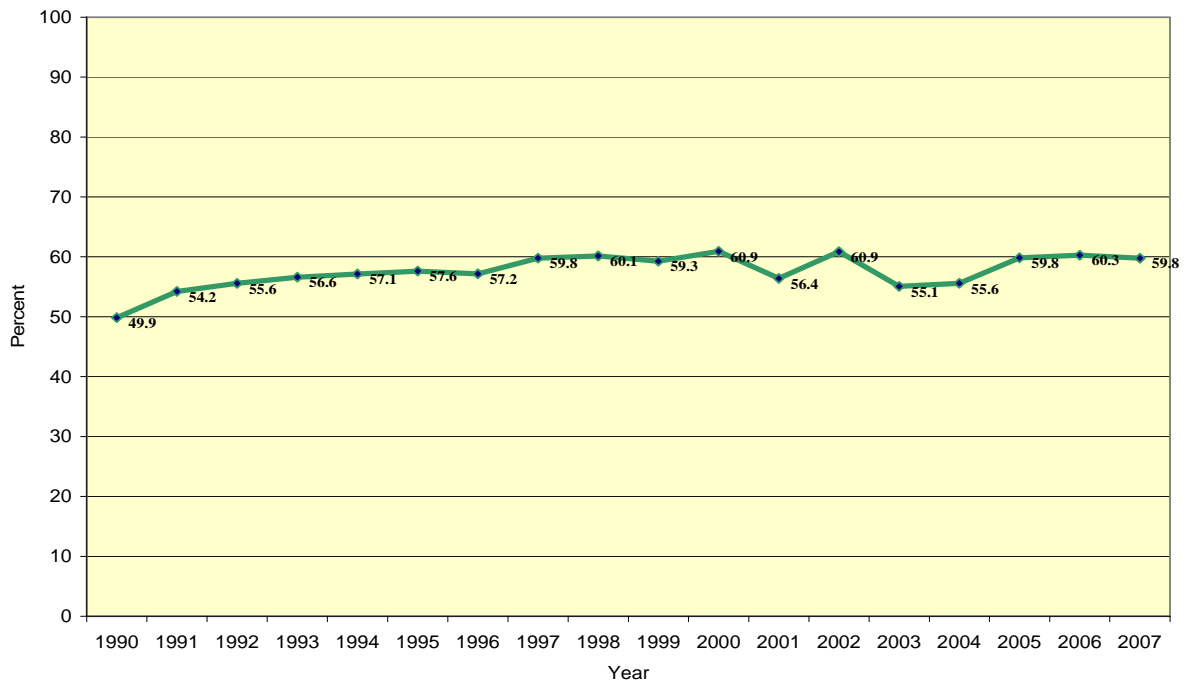
Finger Lakes - Percent of Severe Trauma Inpatients Treated at Trauma Centers



Source: 1990-2007 SPARCS

Chart 11

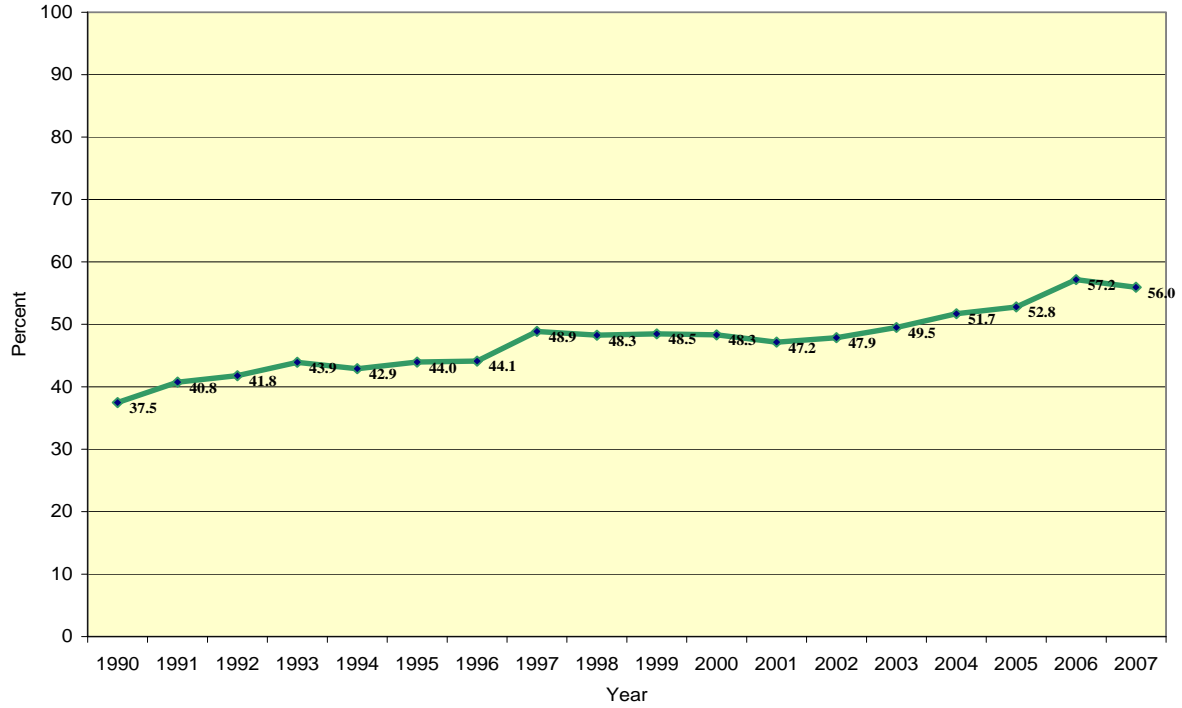
Central New York - Percent of Severe Trauma Inpatients Treated at Trauma Centers



Source: 1990-2007 SPARCS

Chart 12

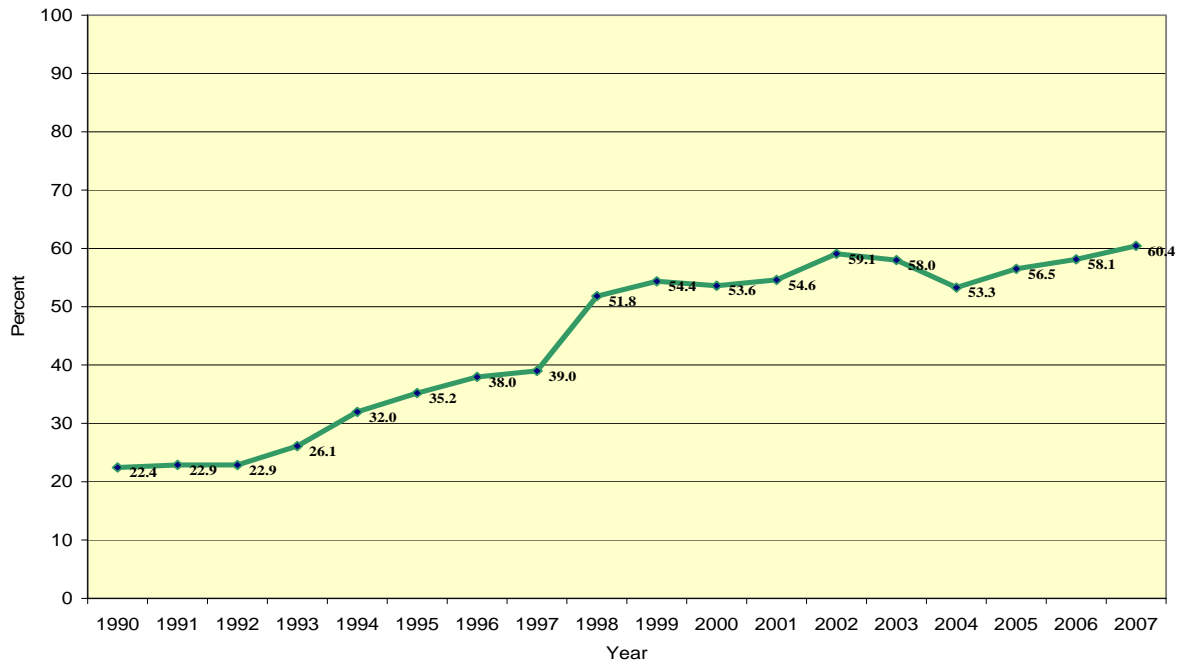
Northeastern New York - Percent of Severe Trauma Inpatients Treated at Trauma Centers



Source: 1990-2007 SPARCS

Chart 13

Hudson Valley - Percent of Severe Trauma Inpatients Treated at Trauma Centers



Source: 1990-2007 SPARCS

Chart 14

Nassau - Percent of Severe Trauma Inpatients Treated at Trauma Centers

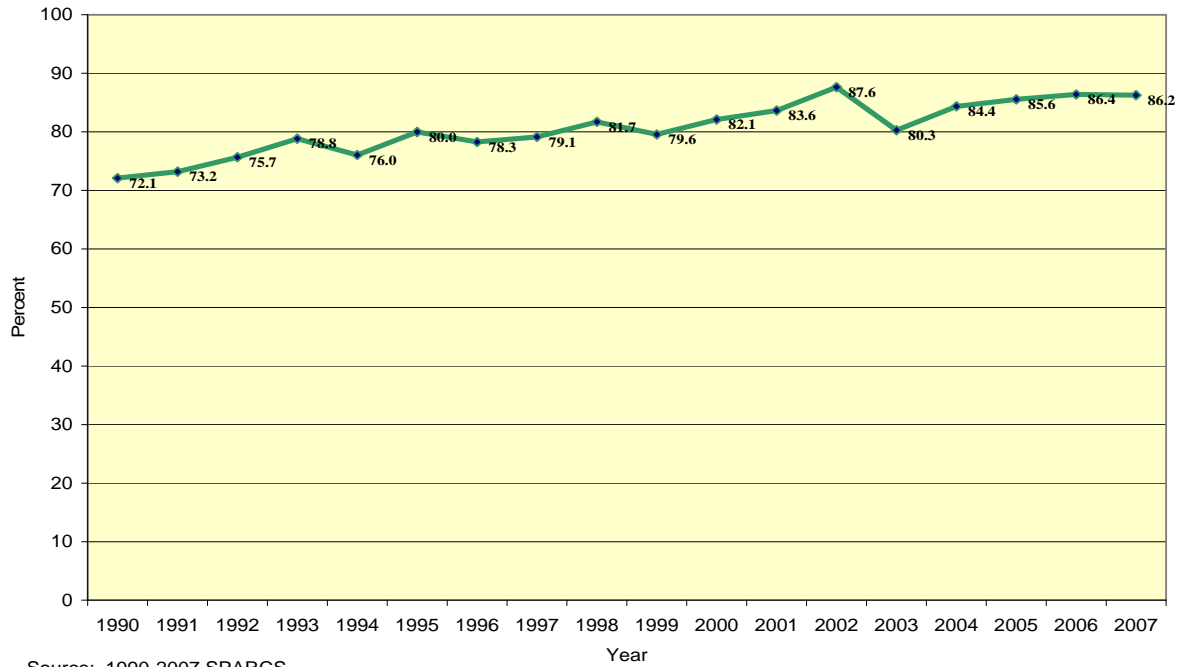


Chart 15

Suffolk - Percent of Severe Trauma Inpatients Treated at Trauma Centers

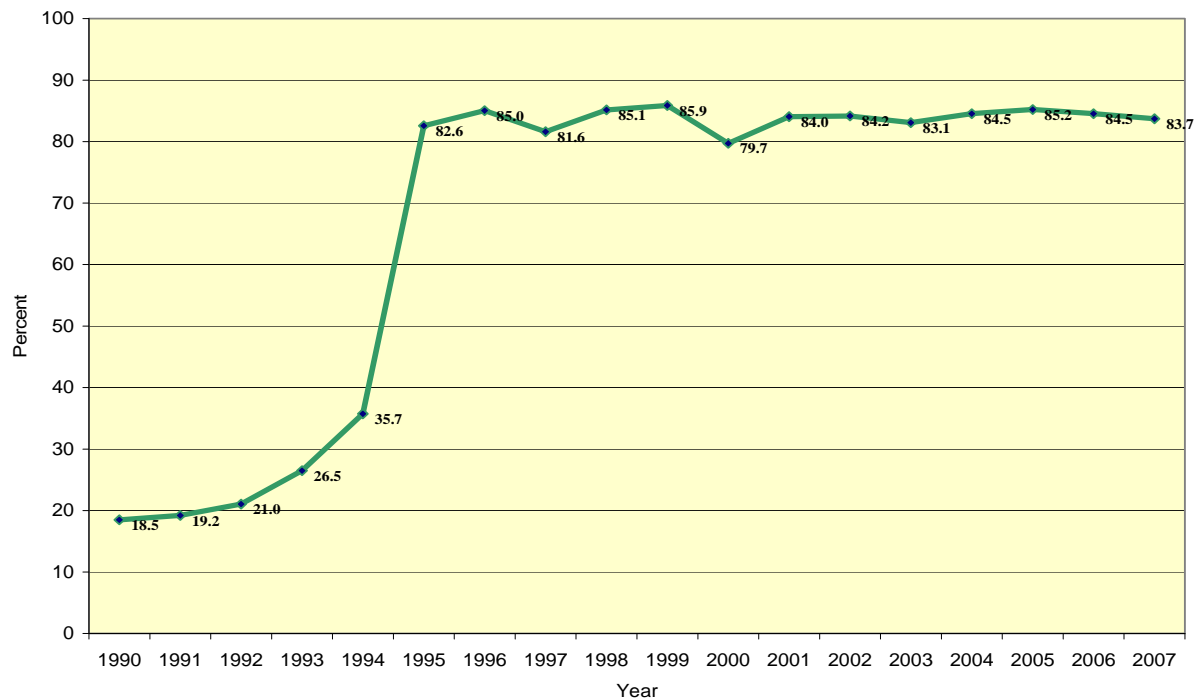
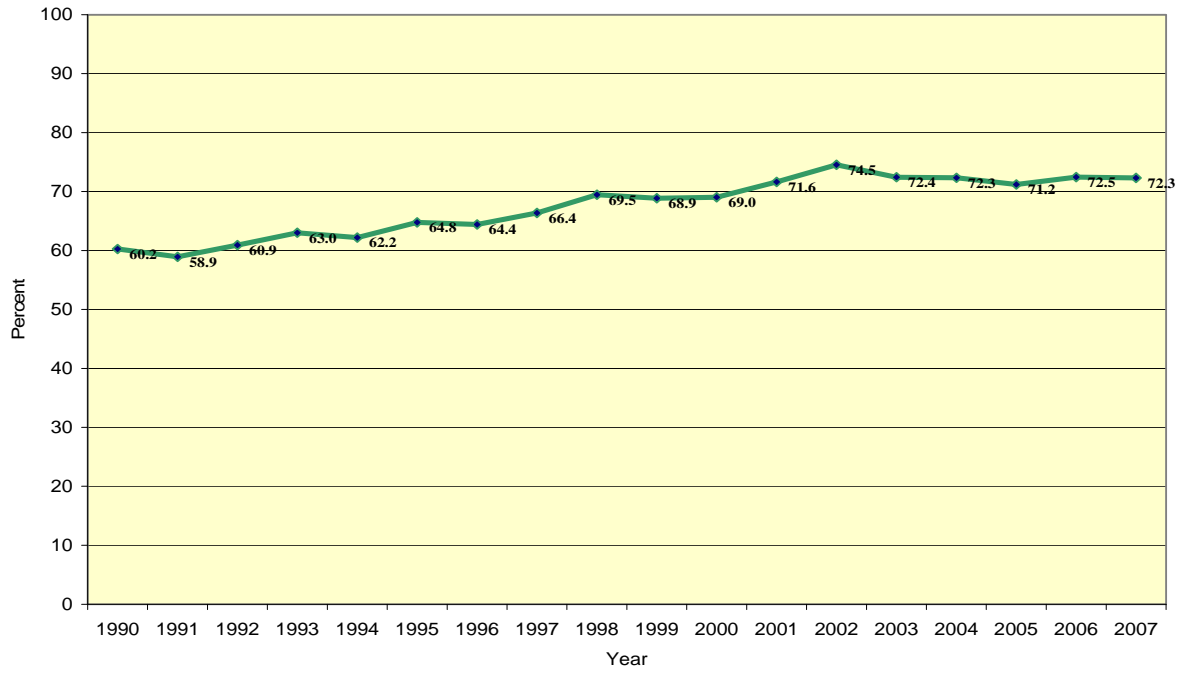


Chart 16

New York City - Percent of Severe Trauma Inpatients Treated at Trauma Centers

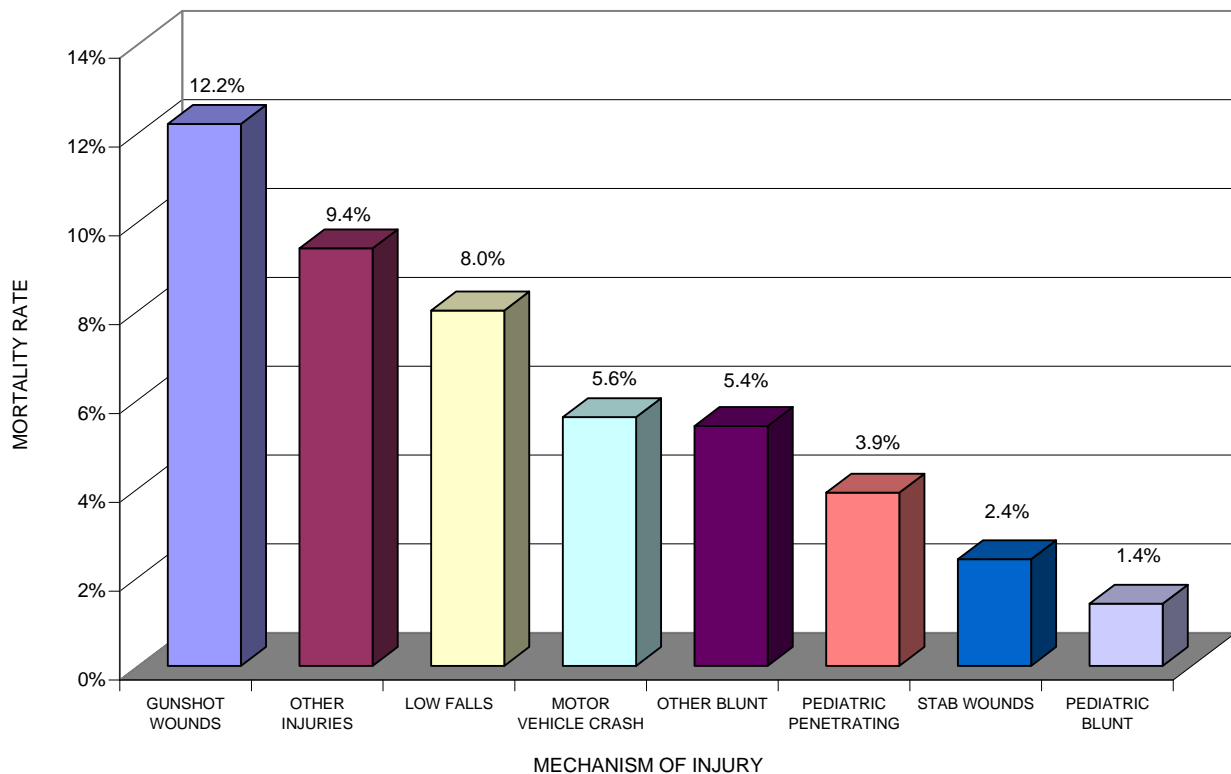


Source: 1990-2007 SPARCS

The overall statewide mortality rate for inpatients was 6.12 percent (5,814 deaths among 94,926 patients). The mechanism of injury with the highest inpatient mortality rate among these patients was gunshot wounds, with a 12.2 percent mortality rate. The mechanisms of injury with the next highest mortality rates were “other injuries” (9.4 percent), low falls (8.0 percent), motor vehicle crashes (5.6 percent), and “other blunt” injuries (5.4 percent). The mechanism of injury with the lowest mortality rate among adult trauma inpatients was stab wounds (2.4 percent). The mortality rates for pediatric patients were 3.9 percent for penetrating injuries and 1.4 percent for blunt injuries. (Chart 17)

Chart 17

Observed Mortality Rate by Mechanism of Injury
for Severe Trauma Inpatients: 2003-2006

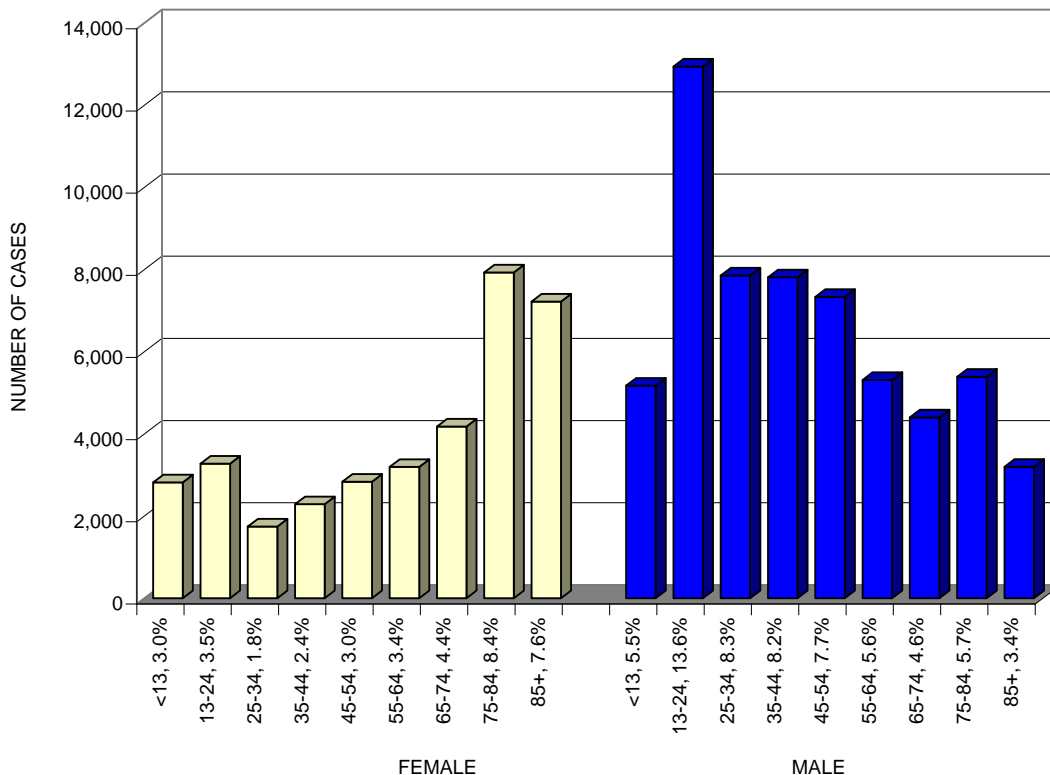


SOURCE: 2003-2006 SPARCS FILES

Among the inpatients, 62.6 percent were males. Young men aged 13-24 had the highest percentage inpatient (13.6 percent), followed by males 25-34 (8.3 percent) and males 35-44 (8.2 percent). In contrast, the most populous groups among females were the more elderly, with ages 75-84 comprising 8.4 percent of all patients, and ages 85 and higher comprising 7.6 percent. Generally, men were less likely to be in the NYSTR with increasing age, whereas women after age 65 became more likely to be included. (Chart 18)

Chart 18

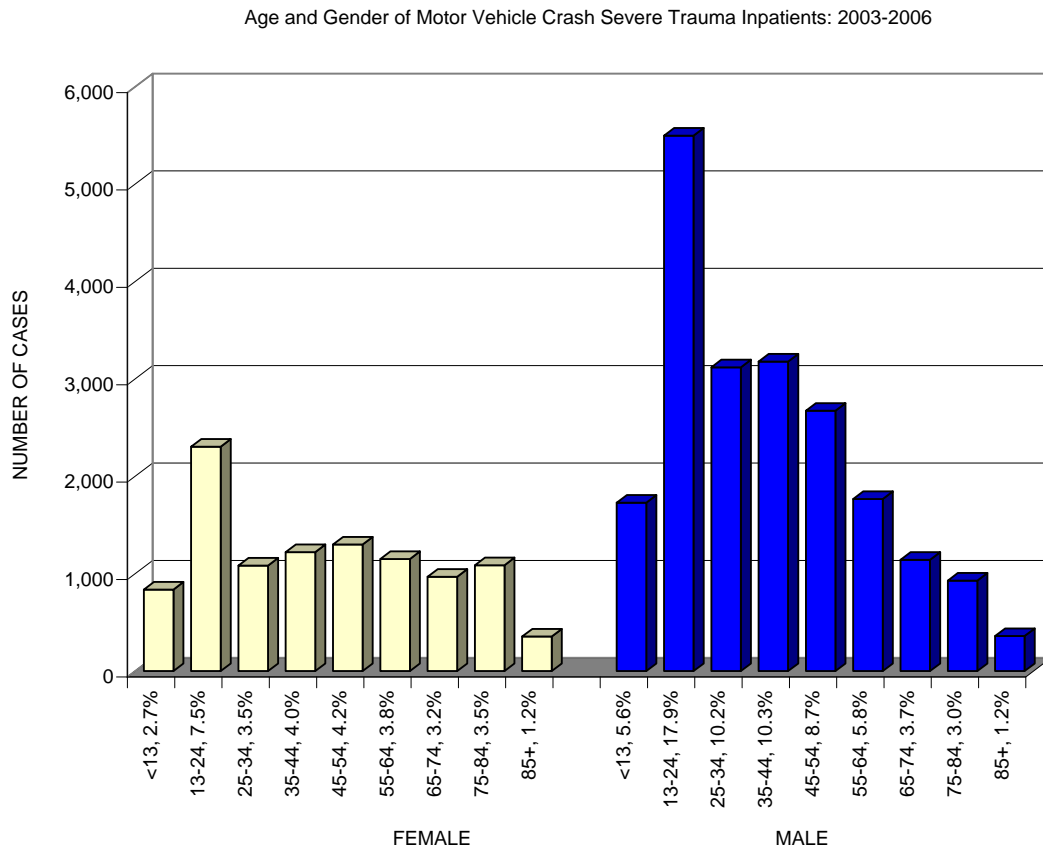
Age and Gender of Severe Trauma Inpatients: 2003-2006



SOURCE: 2003-20026 SPARCS FILES

Of the 30,719 inpatients who were victims of motor vehicle crashes, 66.4 percent were males. The percentage of males declined by age group from a high of 17.9 percent of all inpatients ages 13-24 down to 1.2 percent for ages 85 and older. Males 25-34 comprised 10.2 percent of all patients and males 35-44 comprised 10.3 percent of all patients. The number of hospitalized female inpatients who were victims of motor vehicle crashes also declined with age for the most part, but not as precipitously. More females than males 75 and older were hospitalized victims of motor vehicle crashes, whereas, for nearly every age group below 75, more men than women were hospitalized subsequent to motor vehicle crashes. (Chart 19)

Chart 19

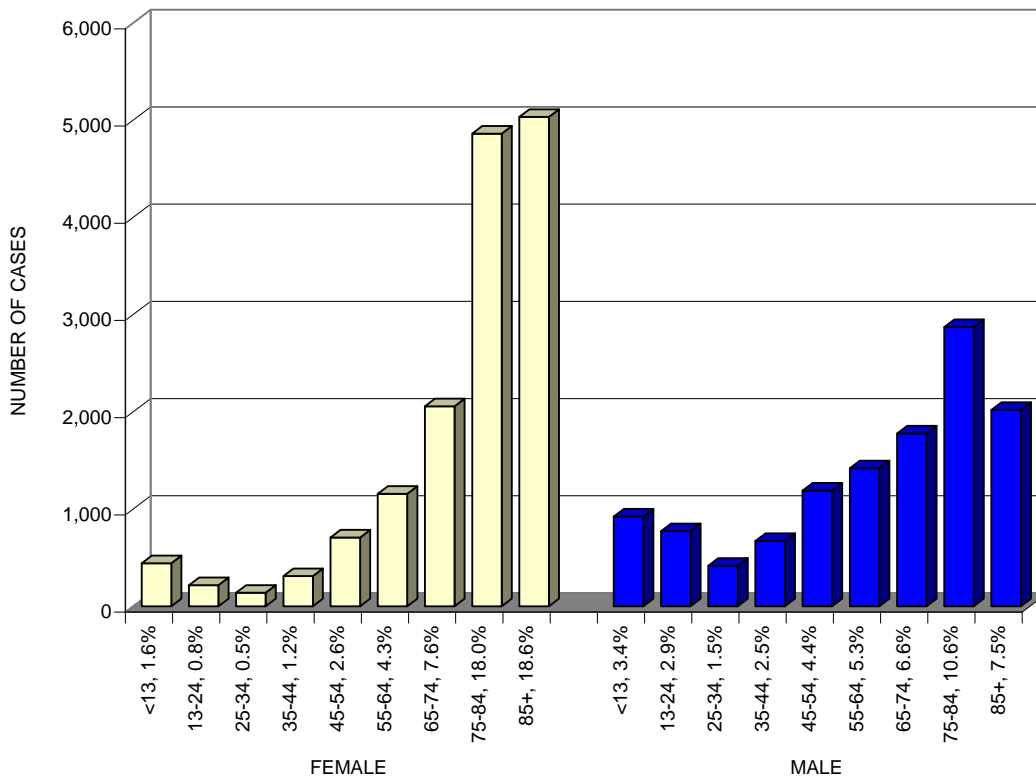


SOURCE: 2003-2006 SPARCS FILES

Of the 27,006 inpatients who were victims of low falls, 55.2 percent were women. By far the most populous age/gender groups hospitalized with low falls were women age 75-84 and 85 and above, which comprised 18.0 percent and 18.6 percent of all patients. These groups were followed by males age 75-84 (10.6 percent of all patients) and by females age 65-74 years old (7.6 percent of all patients). The number of females hospitalized with low falls rose with age, with the largest increases occurring at ages 65-75. The relationship to age was not as accentuated among men, with men of lower ages hospitalized more often with low falls than women of the same age, and not nearly as many elderly men hospitalized with low falls (see Chart 20). This phenomenon is likely a result of greater longevity among women because more women are alive to experience low falls.

Chart 20

Age and Gender of Low Falls Severe Trauma Inpatients: 2003-2006

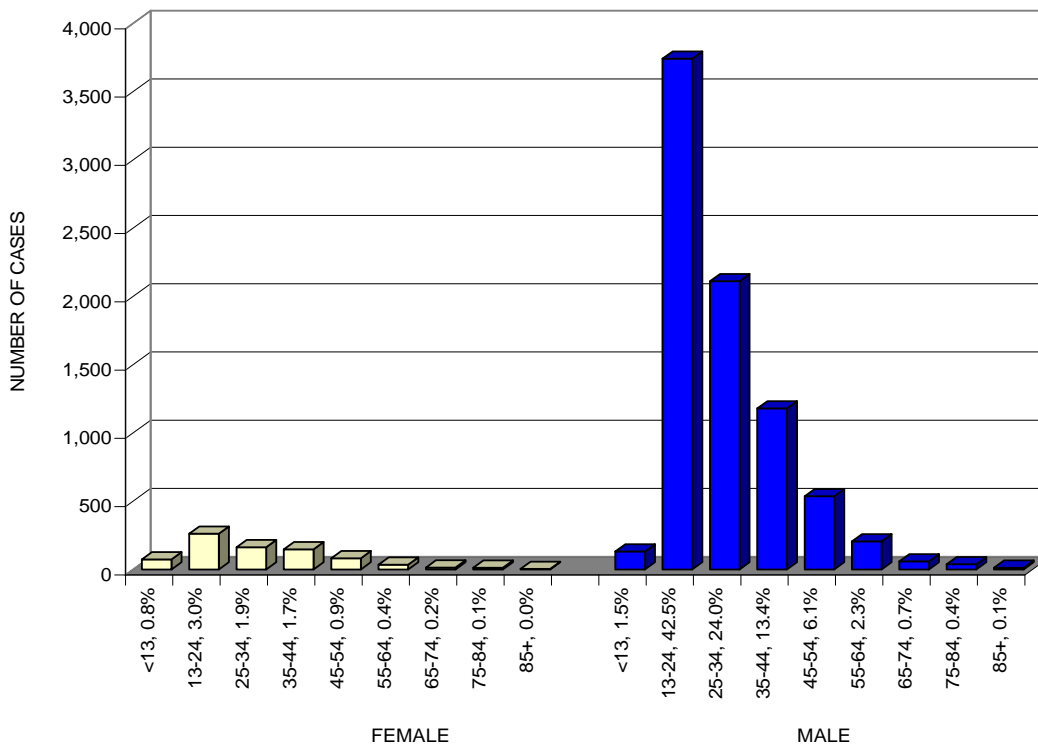


SOURCE: 2003-2006 SPARCS FILES

Of the 8,810 inpatients who were victims of penetrating injuries, 91.0 percent were males. The vast majority of these males were between ages 13-24 (42.5 percent of all patients), 25-34 (24.0 percent of all patients) and 35-44 (13.4 percent of all patients). The most common age group among women who were hospitalized victims of penetrating injuries was 13-24 (3.0 percent of all patients). (Chart 21)

Chart 21

Age and Gender of Inpatients
with Severe Trauma Penetrating Injuries: 2003-2006



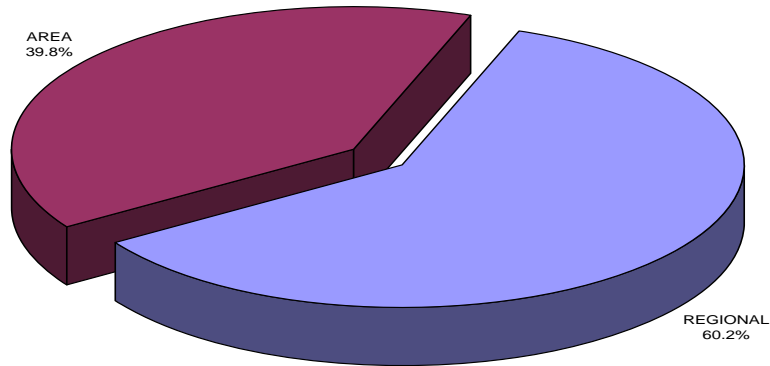
SOURCE: 2003-2006 SPARCS FILES

DESCRIPTIVE STATISTICS **DEVELOPED FROM THE NEW YORK STATE TRAUMA REGISTRY**

Chart 22 illustrates that 60.2 percent of DIE patients in trauma centers were treated at regional trauma centers; the remaining 39.8 percent of DIE patients were treated at area trauma centers.

Chart 22

Distribution of DIEs in the New York State Registry by Hospital Level: 2003-2006
(excluding New York City)

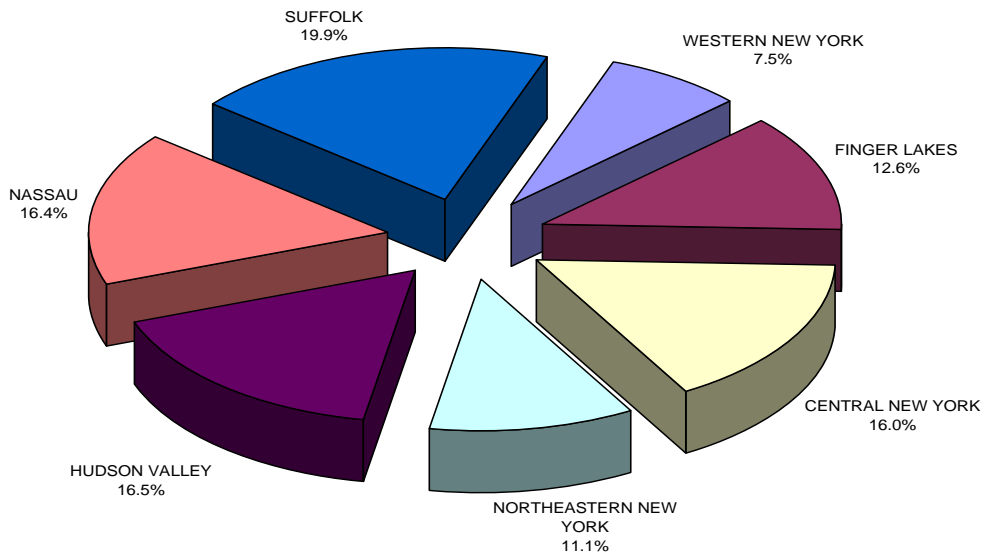


SOURCE: 2003-2006 NEW YORK STATE TRAUMA REGISTRY

The highest DIE populations were in Suffolk (19.9 percent), Hudson Valley (16.5 percent) and Nassau (16.4 percent). Western New York and Northeastern New York had the smallest DIE populations (7.5 percent and 11.1 percent, respectively) (Chart 23).

Chart 23

Distribution of DIEs in the New York State Trauma Registry by Region: 2003-2006
(excluding New York City)



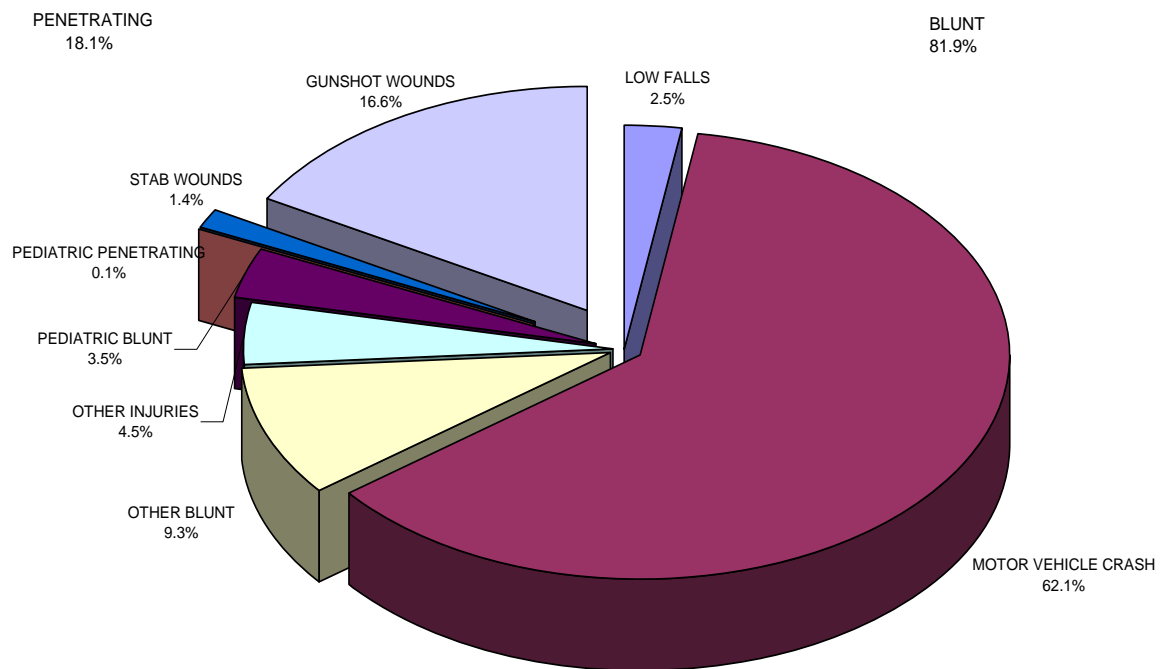
SOURCE: 2003-2006 NEW YORK STATE TRAUMA REGISTRY

Compared to the distribution for trauma inpatients, the distribution of DIE patients is more heavily weighted toward penetrating injuries (18.1 percent). Only 3.5 percent of trauma inpatients suffered gunshot wounds, compared to 16.6 percent of the DIE population.

Excluding New York City, Chart 24 shows 62.1 percent of the DIE population was injured in a motor vehicle crash compared to 29.5 percent of inpatients qualifying for the Registry. Among adult injuries, the fewest DIEs were stab wounds (1.4 percent) and low falls (2.5 percent).

Chart 24

Distribution of DIEs in the New York State Trauma Registry
by Mechanism of Injury: 2003-2006 (excluding New York City)

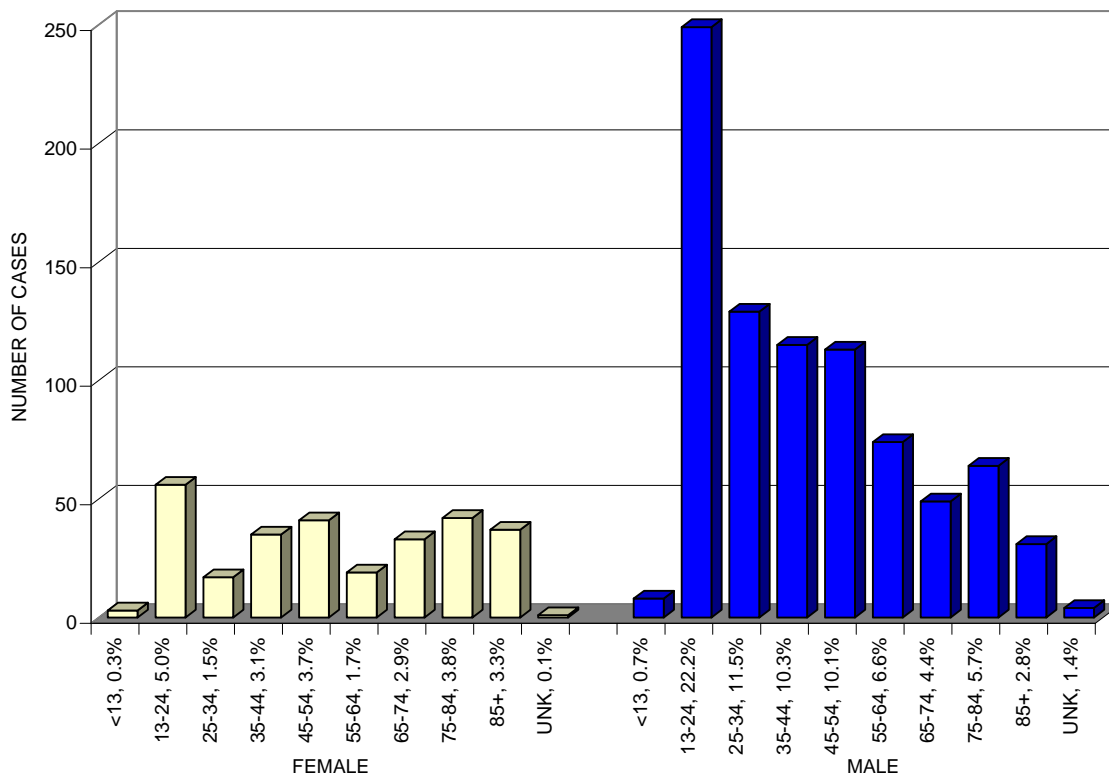


SOURCE: 2003-2006 NEW YORK STATE TRAUMA REGISTRY

Males comprised 75.7 percent of all DIEs. The male age groups with the most DIEs were 13-24 year olds (22.2 percent) and 25-34 year olds (11.5 percent). The least populous DIE age group among males was the <13 group (0.7 percent). Among women, the most populous DIE groups were young women (13-24 years old, with 5.0 percent), followed by women 75-84 (3.8 percent). (Chart 25)

Chart 25

Age and Gender of DIEs Among Trauma Patients
in the New York State Trauma Registry: 2003-2006 (excluding New York City)



SOURCE: 2003-2006 NEW YORK STATE TRAUMA REGISTRY

Tables 1 and 2 present the distribution of patients in the NYSTR by region according to level of trauma center designation (regional trauma center, area trauma center) and mechanism of injury (motor vehicle crash, low fall, other blunt injury, gunshot wound, stab wound). Among the inpatients in the models used to assess hospital performance, 79.8 percent were treated at regional centers while 20.2 percent were treated at area trauma centers. In New York City, 100 percent of the patients were treated at regional centers because there are no area centers there. After New York City, the region with the next largest percentage of patients treated at regional centers was Western New York with 94.6 percent. The region with the smallest percentage of patients treated at regional centers was Suffolk with 43.6 percent.

Among the inpatients in the models used to assess hospital performance, 44.6 percent were victims of motor vehicle crashes. For all eight regions of New York State, this mechanism of injury represented the largest percentage of severe trauma victims; however, this percentage ranged from a low of 32.7 percent in New York City to a high of 57.4 percent in Central New York. For most regions of the state, penetrating injuries (stab wounds and gunshot wounds) represent from 1.8 percent to 8.2 percent of the total patients. In New York City, these two mechanisms of injury represent 9.2 percent and 10.3 percent of the total patients.

Table 1
Distribution of New York State Inpatients by Region and Level
Five Adult Mechanisms of Injury: 2003 – 2006

Region	Regional Trauma Centers n (%)	Area Trauma Centers n (%)	Total
Western	3,753 (94.6%)	214 (5.4%)	3,967 (7.5%)
Finger Lakes	3,176 (71.5%)	1,267 (28.5%)	4,443 (8.4%)
Central	2,844 (62.1%)	1,738 (37.9%)	4,582 (8.6%)
Northeastern	3,523 (84.0%)	673 (16.0%)	4,196 (7.9%)
Hudson Valley	2,769 (51.3%)	2,634 (48.8%)	5,403 (10.2%)
Nassau	5,042 (82.9%)	1,041 (17.1%)	6,803 (11.4%)
Suffolk	2,477 (43.6%)	3,207 (56.4%)	5,684 (10.7%)
New York City	18,864 (100.0%)	0 (0.0%)	18,864 (35.5%)
Total	42,448 (79.8%)	10,774 (20.2%)	53,222 (100.0%)

Table 2
Distribution of New York State Inpatients
by Region and Five Adult Mechanisms of Injury: 2003 – 2006

Region	Motor Vehicle Crash n (%)	Other Blunt n (%)	Low Falls n (%)	Stab Wounds n (%)	Gunshot Wounds n (%)	Total
Western	1,891 (47.7%)	955 (24.1%)	547 (13.8%)	249 (6.3%)	325 (8.2%)	3,967 (7.5%)
Finger Lakes	2,325 (52.3%)	1,006 (22.6%)	669 (15.1%)	113 (2.5%)	330 (7.4%)	4,443 (8.4%)
Central	2,630 (57.4%)	993 (21.7%)	697 (15.2%)	120 (2.6%)	142 (3.1%)	4,582 (8.6%)
Northeastern	2,271 (54.1%)	934 (22.3%)	719 (17.1%)	186 (4.4%)	86 (2.1%)	4,196 (7.9%)
Hudson Valley	3,036 (56.2%)	1,183 (21.9%)	950 (17.6%)	132 (2.4%)	102 (1.9%)	5,403 (10.2%)
Nassau	2,553 (42.0%)	1,440 (23.7%)	1,761 (29.0%)	200 (3.3%)	129 (2.1%)	6,083 (11.4%)
Suffolk	2,873 (50.6%)	1,191 (21.0%)	1,309 (23.0%)	207 (3.6%)	104 (1.8%)	5,684 (10.7%)
New York City	6,167 (32.7%)	5,091 (27.0%)	3,920 (20.8%)	1,735 (9.2%)	1,951 (10.3%)	18,864 (35.44%)
Total	23,746 (44.6%)	12,793 (24.0%)	10,572 (19.9%)	2,942 (5.5%)	3,169 (6.0%)	53,222 (100.0%)

DATA ANALYSES

METHODS FOR ANALYSES OF REGISTRY DATA

Assessing Risk-Adjusted Mortality Rates for Regions and for Levels of Care

As part of the effort to understand the determinants of adverse outcomes of care and to improve the overall quality of trauma care in the State, statistical models have been developed to predict trauma inpatient mortality and mortality that occurs among trauma inpatients or emergency department patients in the NYSTR. These models have been used to assess the quality of care by region and by levels of care (regional trauma center and area trauma center). The measure of quality used is a risk-adjusted mortality rate. Following are the steps taken in the development of risk-adjusted mortality rates by region and level.

Obtaining and Cleaning the Data

Inpatients qualified for the Registry based on the nature of their injuries as represented by the diagnosis codes assigned to their records. DIEs qualified based on whether the E-code⁶ assigned to the record indicated trauma. To ensure that all appropriate inpatient records were submitted, the School of Public Health at the University at Albany, State University of New York, which serves as the data coordinator and evaluator for the project, compared the inpatient records with data from the Department of Health's SPARCS acute care database. The submissions of DIEs were matched against records in the vital statistics files to check for completeness. Any records that met the Registry definition and were not submitted by the centers were then brought to the attention of the centers that either subsequently submitted the data or justified why it was not submitted (e.g., the traumatic event occurred during a hospital admission, the event was not trauma-related, etc.). The School of Public Health edited the data and readied it for further analysis.

Predicting the Probability of Death for Each Inpatient

First, the inpatient data were subdivided into several mechanisms of injury classifications for adult patients (age \geq 13 years): three groups for blunt injuries (motor vehicle crashes, low falls and other blunt injuries) and two groups for penetrating injuries (stab wounds, gunshot wounds). Please note that pediatric patients are not included in the risk-adjusted mortality section of this report.

For each of the three blunt injury groups and two penetrating injury groups, statistical models were developed to predict the individual patient's chance of dying in the hospital after admission. Mortality was measured as a function of various physiologic and anatomic risk factors. Earlier studies had either attempted to predict mortality survival with a single statistical model for all patients or by using only two models (one for blunt injuries and one for penetrating injuries); however, these approaches did not accurately predict mortality for each of the five mechanisms of injury. Consequently, separate models were developed for each mechanism of injury.

For each outcome (inpatient mortality and inpatient/emergency department mortality), a statistical model was developed for each of the five mechanisms of injury. Each model was used to assess performance across regions and between levels of care.

Stepwise logistic regression was used to develop the models. This statistical methodology has been employed in most other studies that predict survival for trauma patients. It consists of determining

⁶ An E-code classifies environmental events, circumstances, and other conditions as the cause of injury and other adverse effects.

which of the risk factors are significantly related to in-hospital death for trauma patients and determining how to weight the predictors to obtain a predicted probability of death for each trauma inpatient.

Various types of patients whose records included trauma diagnoses were excluded from the statistical analyses. Patients with E-codes that represent late effects of injuries or surgical/medical misadventures⁷ were excluded, as were patients with a principal diagnosis of burn. Patients were excluded if they had a Glasgow Coma Scale (GCS) of three, no systolic blood pressure, no respirations, no pulse, and who subsequently died, on arrival at the hospital or upon the ambulance's arrival at the scene.

Consistent with other trauma care studies, demographic and physiologic risk factors considered included the patient's age, GCS, gender, respiratory rate, systolic blood pressure, and a measure of injury severity. Quadratic terms for the two continuous variables, age and systolic blood pressure, were also tested. Also, for the age variable, a continuous, piecewise linear function was tested. Intubation status, which had been used as a potential risk factor in the previous report, was not used because problems in coding accuracy were discovered.

The GCS is comprised of three components: eye opening, verbal response, and motor response. Some statistical models, including those for this report, analyze these components separately rather than combining them into the GCS. Verbal response and respiratory rate cannot be accurately measured in intubated patients and, for this reason, were excluded from this report's models. The eye opening, motor response, and systolic blood pressure measurements used were the first ones recorded in the ED report. If these measurements were not available in the ED report, the last recorded values in the prehospital care report were used.

Also, the MVC model included a binary variable that denoted whether the injured patient was a pedestrian (instead of a driver or passenger), and the other blunt injury model included a binary variable to denote whether the injured patient had suffered a high fall (instead of another type of blunt injury). The last two strategies were attempts to delineate the uniqueness of more types of mechanisms of injury.

Another risk factor that was considered was the patient's transfer status. Being treated at the emergency department of one hospital and then transported to a second hospital was investigated as a predictor of mortality, and as was being admitted to one hospital and then being transferred to a second hospital.

The next step consisted of identifying an anatomic measure (a measure of injury severity) to add to the demographic and physiologic variables being considered in each of the statistical models. Injury severity has been characterized in several ways in the trauma literature, all of which depend on ICD-9-CM diagnoses codes as the most basic components. The measure used was the International Classification of Diseases, Ninth Revisions-based Injury Severity Score (ICISS), developed by researchers in North Carolina⁸. The ICISS predicts that the injury severity component of a patient's mortality rate is the overall survival rate subtracted from one, where the overall survival rate is estimated as the product of the survival rates for each individual injury diagnosis in some comparable database, without regard to whatever other injury diagnoses each patient has. The survival rate for an individual injury is defined as the number of patients with that diagnosis who were discharged alive divided by the total number of patients with the diagnosis. The database used to derive the survival rate for each injury diagnosis was the federal Agency for Health Care Policy and Research Health Care Utilization Project's (HCUP) Nationwide Inpatient Sample (NIS) 2006.

⁷ A surgical/medical misadventure is an error or complication that arises from surgical or medical treatment.

⁸ Osler T, Rutledge R, Deis J, Bedrick E. ICISS: An international classification of disease-9 based injury severity score. *J Trauma*. 1996; 41:380-388.

Thus, the set of variables considered as potential predictors of mortality for each mechanism of injury were age, gender, systolic blood pressure, eye opening, motor response, ICISS, patient being treated at the emergency department of one hospital and then transported to a second hospital, and patient being admitted to one hospital and then being transferred to a second hospital. Also, pedestrian status was used as a variable in the MVC model and high fall status was used as a variable in the other blunt model.

Cases not containing all the significant variables were relatively rare, with between 2.5 percent and 4.6 percent of the cases having missing values across mechanisms of injury. These cases were included in the analyses (because their mortality rates varied across hospitals, regions, and levels of care) by imputing the values of their missing data elements using multiple imputation methods.

In keeping with typical statistical methodology, the data for each mechanism of injury were split into two halves; a model was developed for one of the halves and the significant variables from this model were used in a model for the second half. All variables that were significant in the second model were then used to create a model for all patients with that mechanism of injury. At the first two steps of this process, variables were retained if they were significantly related to mortality with a p-value less than 0.20. At the third step, variables were retained if the p-value was less than 0.05.

Predicting Mortality Rates for Regions and Levels of Care for Each Mechanism of Injury

The mortality rate for each of the eight regions of the state and the two levels of care was then predicted using the statistical model. The resulting rate is an estimate of the relative chance of survival of that group's patients, or equivalently, an estimate of what that group's mortality rate would have been if its performance had been identical to the statewide performance. This rate is referred to as the **expected or predicted mortality rate**.

Computing the Risk-Adjusted Mortality Rate for Each Mechanism of Injury

The **risk-adjusted mortality rate** represents the best estimate, based on the associated statistical model, of what the group's mortality rate would have been if the group had a mix of patients identical to the statewide mix. Thus, the risk-adjusted mortality rate has, to the extent possible, mitigated differences among groups in patient severity of illness. It arrives at a mortality rate for each provider on an identical group of patients.

The risk-adjusted mortality rate is typically calculated by dividing a group's observed mortality rate by the expected mortality rate. The **observed mortality rate** is the number of inpatient deaths in the group divided by the number of patients in the group. If the resulting ratio is larger than one, the group has a higher mortality rate than expected on the basis of its patient mix; if it is smaller than one, the group has a lower mortality rate than expected from its patient mix. The ratio is then multiplied by the overall statewide mortality rate to obtain the group's risk-adjusted rate.

Imputation methods were used to estimate values for missing variables used in the logistic regression models. Each cycle of the imputation produced an estimate of the risk-adjusted mortality rate for a particular group. The overall estimate of a group's risk-adjusted mortality rate was calculated by averaging the risk-adjusted mortality rates derived from the iterations of the imputation method.

Confidence intervals for the risk-adjusted mortality rate indicate which groups had significantly more or fewer deaths than expected given the risk factors of their patients. Groups with significantly higher rates than expected after adjusting for risk are those with confidence intervals entirely above the statewide rate. Groups with significantly lower rates than expected given the injury severity of their patients have confidence intervals entirely below the statewide rate.

Interpreting the Risk-Adjusted Mortality Rate

If the risk-adjusted mortality rate is lower than the statewide mortality rate, the group has a better performance than the state as a whole; if the risk-adjusted mortality rate is higher than the statewide mortality rate, the group has a worse performance than the state as a whole. Also, groups are designated as statistically significantly higher (lower) than the statewide rate if the confidence interval for the group's risk-adjusted rate is entirely above (below) the statewide rate. The risk-adjusted mortality rate and its confidence interval are used in this report as measures of quality of care provided by regions and levels of care.

There are reasons that a group's risk-adjusted mortality rate may not be indicative of its true quality. For example, extreme outcome rates may occur due to chance alone. This is particularly true for low-volume hospitals, for whom very high or very low mortality rates are more likely to occur than for high-volume hospitals. An attempt to prevent misinterpretation of differences caused by chance variation is the use of expected ranges (confidence intervals) in the reported results.

Differences in hospital coding of risk factors could be an additional reason that a provider's risk-adjusted rate may not be reflective of quality of care. Hospitals that have a tendency not to code some patient injuries in SPARCS are at a disadvantage relative to others because their patients' injury severity will be underestimated.

Another reason that risk-adjusted rates may be misleading is that injury severity may not be accurately estimated because important risk factors/predictors of in-hospital mortality are not contained in the statistical model for predicting mortality. This is a particular concern for regional trauma centers because non-centers, and sometimes area trauma centers, tend to triage the most seriously injured patients to regional trauma centers. These are the patients for whom injury severity is most likely to be underestimated. Although no important risk factors identified in other studies have been omitted in the risk-adjustment methodology used in this report, there remains the possibility that other, unidentified risk factors could yield a better predictive formula if they had been included in the statistical model.

Although the risk-adjusted mortality rates presented here should not be considered as definitive reflections of the quality of care, this information can be a valuable aid in identifying key issues for overall systems development and important opportunities for additional study to improve the delivery of trauma care throughout New York State.

ANALYSIS BY MECHANISM OF INJURY

Motor Vehicle Crashes

Comparison by Region

In the 2003-2006 Registry, there were 23,746 motor vehicle crash (MVC) inpatients in the logistic regression model. A total of 1,505 of these patients (6.34 percent) died in the hospital during the same admission. Appendix 3 presents the significant risk factors for mortality of trauma inpatients who were victims of MVCs, the coefficients for these risk factors, levels of statistical significance and a measure of fit of the statistical model.

Table 3 presents the number of MVC inpatients, the percentage of all MVC inpatients, the number of deaths, the observed mortality rate, the expected mortality rate and the risk-adjusted mortality rate with its 95 percent confidence interval for each region. Figure 2 presents the risk-adjusted mortality rate for each region along with its 95 percent confidence interval.

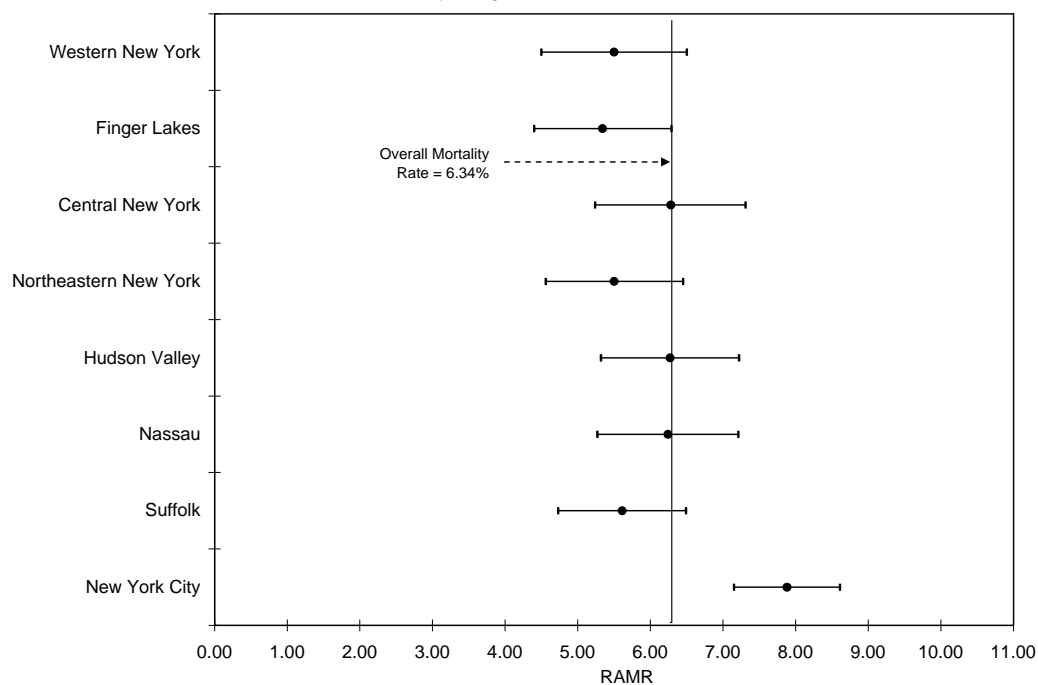
Table 3

Statistical Significance of Risk-Adjusted Mortality Rates
 Motor Vehicle Crash Injuries
 Inpatients (Regional and Area Centers)

Region	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Western	1891	7.96	123	6.50	7.49	5.50	(4.50, 6.50)	-1.55
Finger Lakes	2325	9.79	130	5.59	6.63	5.34	(4.40, 6.29)	-1.95
Central	2630	11.08	149	5.67	5.72	6.28	(5.24, 7.31)	-0.07
Northeastern	2271	9.56	137	6.03	6.95	5.50	(4.56, 6.45)	-1.64
Hudson Valley	3036	12.79	174	5.73	5.79	6.27	(5.32, 7.22)	-0.09
Nassau	2553	10.75	167	6.54	6.64	6.24	(5.27, 7.21)	-0.15
Suffolk	2873	12.10	162	5.64	6.37	5.61	(4.73, 6.49)	-1.53
New York City	6167	25.97	463	7.51	6.04	7.88	(7.15, 8.61)	4.50
Total	23746	100.00	1505	6.34	-----	-----	-----	-----

Figure 2

Inpatients with Motor Vehicle Crash Injuries (Regional and Area Centers):
 Risk-Adjusted Mortality Rates and 95% Confidence Intervals
 by Region: 2003-2006



New York City had the largest number of MVC inpatients in the model (6,167 or 26.0 percent of all patients). The region with the fewest MVC inpatients was Western New York with 1,891 patients (8.0 percent).

Observed mortality rates ranged from 5.59 percent to 7.51 percent, and expected mortality rates (a measure of relative injury severity) ranged from 5.72 percent to 7.49 percent. The risk-adjusted mortality rate, a measure of relative performance, ranged from 5.34 percent in the Finger Lakes to 7.88 percent in New York City. A comparison of the 95 percent confidence intervals for each region’s risk-adjusted mortality rate with the overall statewide in-hospital mortality rate for MVC patients demonstrates that New York City had a significantly higher mortality rate than expected (because the statewide rate of 6.34 percent is not contained in the confidence interval for New York City’s risk-adjusted mortality rate). The Finger Lakes Region had a significantly lower mortality rate than expected.

As shown in Figure 2, the lower bound of the confidence interval on New York City’s risk-adjusted mortality rate is above the statewide rate, and the upper bound of the confidence interval for the mortality rate for the Finger Lakes region is below the statewide rate of 6.34 percent.

There were 24,220 MVC inpatients in the MVC logistic regression model that included inpatients and deaths in the emergency department (DIEs). A total of 1,976 of these patients (8.16 percent) died in the emergency department or as inpatients during the same admission. Appendix 4 presents the significant risk factors for mortality of trauma inpatients and DIEs who were victims of MVCs, the coefficients for these risk factors, levels of statistical significance, and a measure of fit of the statistical model.

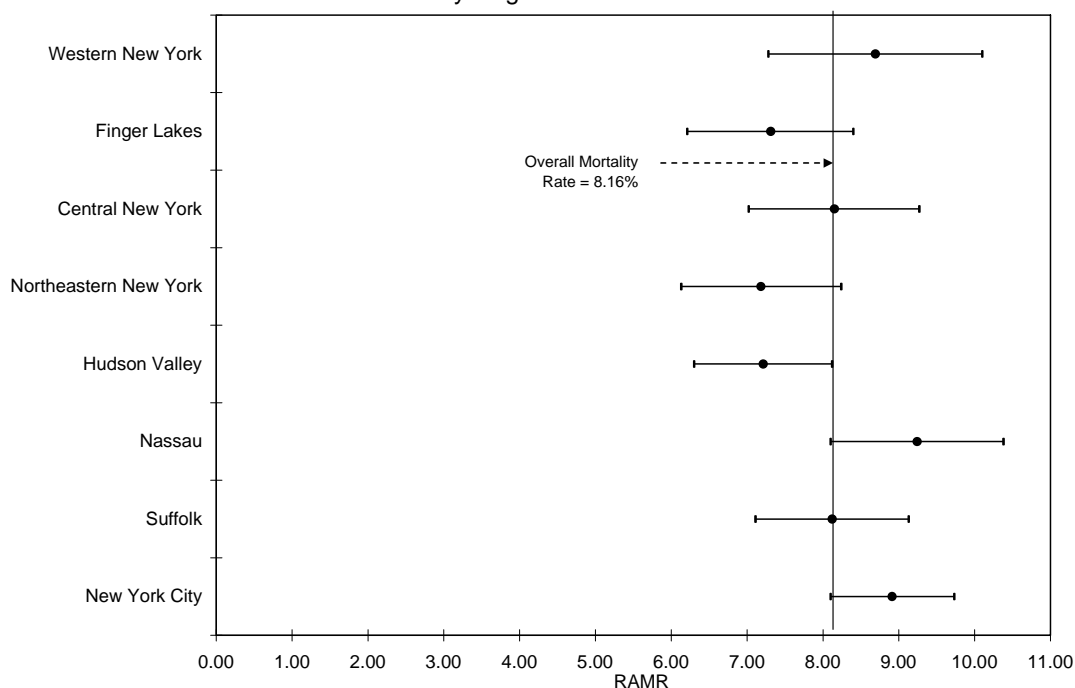
Table 4 presents the number of MVC inpatients and DIEs, the percentage of all MVC inpatients and DIEs, the number of deaths, the observed mortality rate, the expected mortality rate, and the risk-adjusted mortality rate with its 95 percent confidence interval for each region. Figure 3 presents the risk-adjusted mortality rate for each region along with its 95 percent confidence interval.

Table 4
Statistical Significance of Risk-Adjusted Mortality Rates
Motor Vehicle Crash Injuries
Deaths in the Emergency Department and Inpatients (Regional and Area Centers)

Region	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Western	1922	7.94	154	8.01	7.52	8.69	(7.28, 10.10)	0.75
Finger Lakes	2375	9.81	180	7.58	8.46	7.31	(6.21, 8.40)	-1.46
Central	2691	11.11	210	7.80	7.81	8.15	(7.02, 9.27)	0.03
Northeastern	2319	9.57	185	7.98	9.06	7.18	(6.13, 8.24)	-1.72
Hudson Valley	3113	12.85	250	8.03	9.09	7.21	(6.30, 8.12)	-1.96
Nassau	2648	10.93	262	9.89	8.74	9.24	(8.10, 10.38)	1.95
Suffolk	2969	12.26	258	8.69	8.73	8.12	(7.11, 9.13)	-0.03
New York City	6183	25.53	477	7.71	7.06	8.91	(8.10, 9.73)	1.89
Total	24220	100.00	1976	8.16	-----	-----	-----	-----

Figure 3

Deaths in the Emergency Department and Inpatients
with Motor Vehicle Crash Injuries (Regional and Area Centers):
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Region: 2003-2006



New York City had the largest number of MVC inpatients in the model (6,183 or 25.5 percent of all patients). The region with the fewest MVC inpatients was Western New York with 1,922 patients (7.9 percent).

Observed mortality rates ranged from 7.58 percent to 9.89 percent, and expected mortality rates ranged from 7.06 percent to 9.09 percent. The risk-adjusted mortality rate, ranged from 7.18 percent in Northeastern New York to 9.24 percent in Nassau. A comparison of the 95 percent confidence intervals for each region's risk-adjusted mortality rate with the overall statewide in-hospital and DIE mortality rate for MVC patients demonstrates that the Hudson Valley had a significantly lower mortality rate than expected (because the statewide rate of 8.16 percent is not contained in the confidence interval for Hudson Valley's risk-adjusted mortality rate).

Comparisons by Trauma Center Level

Table 5 presents the number of inpatients, the percentage of all inpatients, the number of deaths, the observed mortality rate, the expected mortality rate, and the risk-adjusted mortality rate with its 95 percent confidence interval for the two levels, regional and area, of trauma center care for MVC patients in 2003-2006. Figure 4 presents the risk-adjusted mortality rate and its 95 percent confidence interval for each level of trauma center designation.

Regional centers accommodated 80.0 percent of all MVC inpatients. The observed mortality rate for regional centers (6.71 percent) was considerably higher than the rate for area centers (4.87 percent); however, regional centers cared for the most severely injured patients as indicated by their expected mortality rate (6.74 percent), which was much higher than the expected rate for area centers

(4.75 percent). These rates show there is a strong tendency to triage the more seriously injured MVC patients to regional trauma centers.

After adjusting for severity of injury, regional centers had the lower risk-adjusted mortality rate (6.31 percent) compared to that of the area centers (6.50 percent). Neither of these risk-adjusted mortality rates was significantly different from expected.

Table 5
 Statistical Significance of Risk-Adjusted Mortality Rates
 Motor Vehicle Crash Injuries
 Inpatients (Regional and Area Centers)

Level	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Regional	18985	79.95	1273	6.71	6.74	6.31	(5.96, 6.66)	-0.14
Area	4761	20.05	232	4.87	4.75	6.50	(5.65, 7.35)	0.36
Total	23746	100.00	1505	6.34	-----	-----	-----	-----

Figure 4
 Inpatients with Motor Vehicle Crash Injuries (Regional and Area Centers):
 Risk-Adjusted Mortality Rates and 95% Confidence Intervals
 by Level: 2003-2006

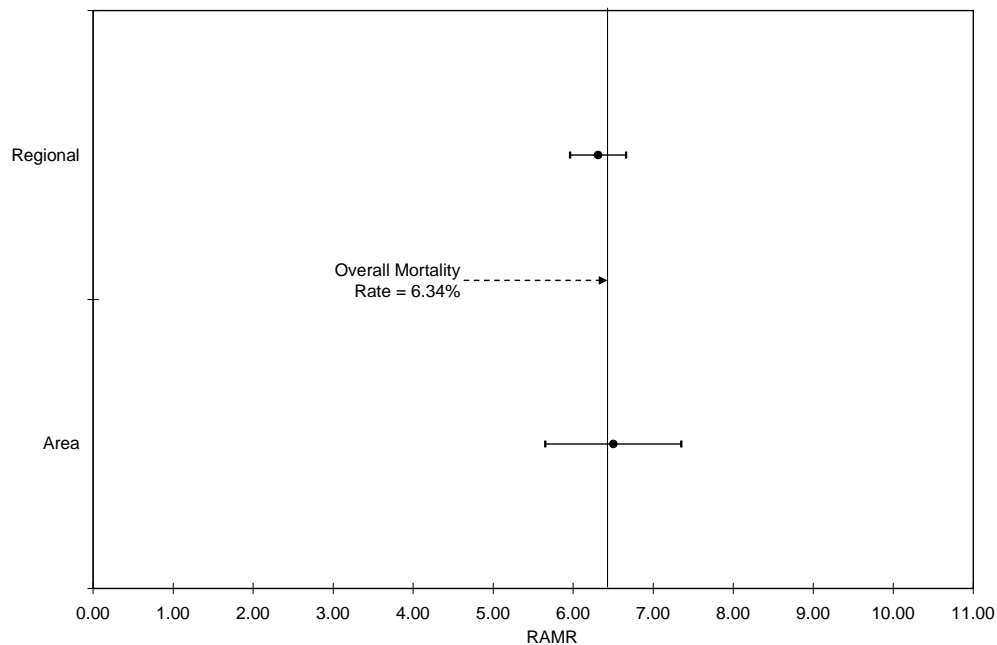


Table 6 presents the number of inpatients and DIEs, the percentage of all inpatients and DIEs, the number of deaths, the observed mortality rate, the expected mortality rate and the risk-adjusted mortality rate with its 95 percent confidence interval for the two levels, regional and area, of trauma center care for MVC patients. Figure 5 presents the risk-adjusted mortality rate and its 95 percent confidence interval for each level of trauma center designation.

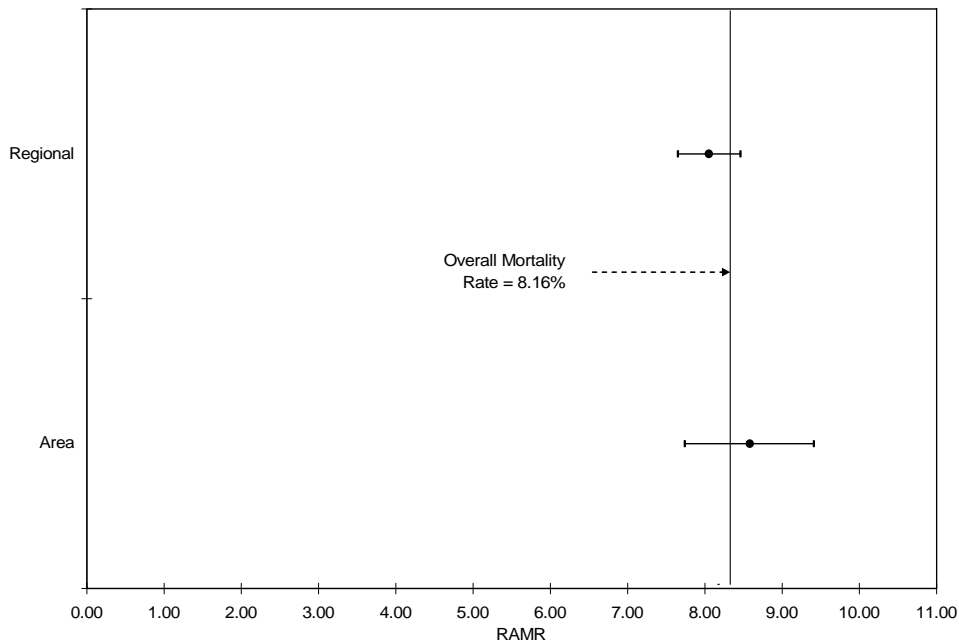
Table 6

Statistical Significance of Risk-Adjusted Mortality Rates
 Motor Vehicle Crash Injuries
 Deaths in the Emergency Department and Inpatients (Regional and Area Centers)

Level	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Regional	19275	79.58	1560	8.09	8.20	8.05	(7.65, 8.46)	-0.49
Area	4945	20.42	416	8.41	8.00	8.58	(7.74, 9.41)	0.99
Total	24220	100.00	1976	8.16	-----	-----	-----	-----

Figure 5

Deaths in the Emergency Department and Inpatients
 with Motor Vehicle Crash Injuries (Regional and Area Centers):
 Risk-Adjusted Mortality Rates and 95% Confidence Intervals
 by Level: 2003-2006



Regional centers accommodated 79.6 percent of all MVC inpatients and DIEs in the data. The observed mortality rate for regional centers (8.09 percent) was lower than the rate for area centers (8.41 percent). Also, regional centers cared for the more severely injured patients as indicated by their expected mortality rate (8.20 percent), which was higher than the expected rate for area centers (8.00 percent). After adjusting for severity of injury, the regional centers had a lower risk-adjusted mortality rate (8.05 percent) than area centers, but the difference was not significant.

Other Blunt Injuries

Comparison by Region

“Other blunt injuries” are blunt injuries that are neither motor vehicle crash-related nor low falls. Some examples are higher falls, being struck by an object or person, accidents caused by machinery or explosions, and intentionally self-inflicted injuries. There were 12,793 hospital inpatients in 2003-2006. A total of 796 of these patients (6.22 percent) died in the hospital. Appendix 5 presents the significant risk factors for mortality of trauma inpatients who suffered other blunt injuries, along with coefficients for these risk factors, levels of statistical significance, and a measure of fit of the statistical model.

Table 7 presents the number of patients, the percentage of patients, the observed mortality rate, the expected mortality rate, the risk-adjusted mortality rate and its 95 percent confidence interval. Figure 6 presents the risk-adjusted mortality rate and 95 percent confidence interval for each region.

Table 7

Statistical Significance of Risk-Adjusted Mortality Rates
Other Blunt Injuries
Inpatients (Regional and Area Centers)

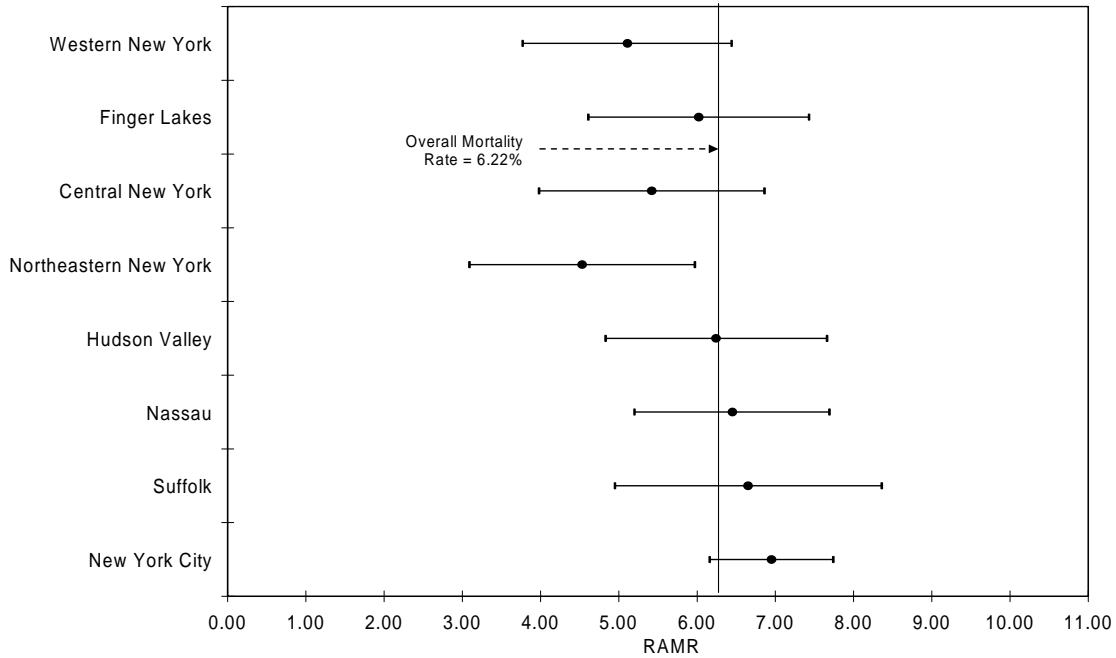
Region	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Western	955	7.47	61	6.39	7.78	5.11	(3.77, 6.44)	-1.51
Finger Lakes	1006	7.86	75	7.46	7.70	6.02	(4.61, 7.43)	-0.21
Central	993	7.76	59	5.94	6.82	5.42	(3.98, 6.86)	-1.00
Northeastern	934	7.30	42	4.50	6.18	4.53	(3.09, 5.97)	-2.08
Hudson Valley	1183	9.25	80	6.76	6.74	6.24	(4.83, 7.66)	-0.01
Nassau	1440	11.26	110	7.64	7.37	6.45	(5.20, 7.69)	0.34
Suffolk	1191	9.31	63	5.29	4.95	6.65	(4.95, 8.36)	0.48
New York City	5091	39.80	306	6.01	5.38	6.95	(6.16, 7.74)	1.88
Total	12793	100.00	796	6.22	-----	-----	-----	-----

The region with the most patients with other blunt injuries was New York City, with 5,091 patients (39.8 percent). Northeastern New York had the fewest patients with other blunt injuries (934 or 7.3 percent of the total), followed by Western New York with 955, or 7.5 percent, of the total.

Observed mortality rates for patients with other blunt injuries varied by region from 4.50 percent to 7.64 percent, and expected mortality rates ranged from 4.95 percent to 7.78 percent. Risk-adjusted mortality rates ranged from 4.53 percent in Northeastern New York (significantly lower than expected) to 6.95 percent in New York City.

Figure 6

Inpatients with Other Blunt Injuries (Regional and Area Centers):
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Region: 2003-2006



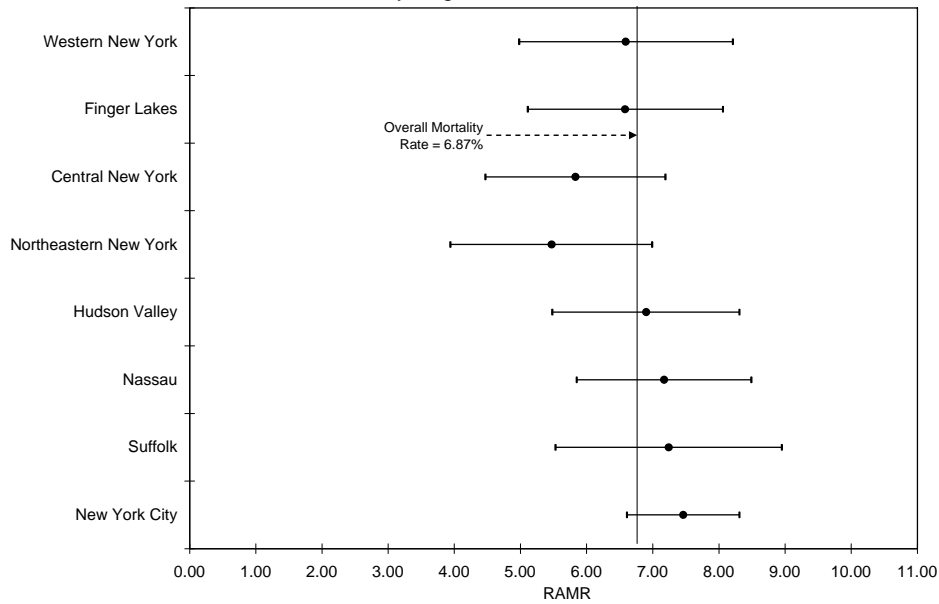
Appendix 6 presents the significant risk factors for mortality of trauma inpatients and DIEs who were victims of other blunt injuries, the coefficients for these risk factors, levels of statistical significance, and a measure of fit of the statistical model. Table 8 and Figure 7 compare performance by region, with mortality defined as death in the emergency department or as an inpatient. The most notable change between the tables is that with the expanded definition of death in Table 8, Northeastern New York no longer has a significantly lower risk-adjusted mortality rate.

Table 8
Statistical Significance of Risk-Adjusted Mortality Rates
Other Blunt Injuries
Deaths in the Emergency Department and Inpatients (Regional and Area Centers)

Region	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Western	963	7.47	69	7.17	7.46	6.59	(4.98, 8.21)	-0.26
Finger Lakes	1013	7.86	82	8.09	8.45	6.58	(5.11, 8.06)	-0.32
Central	1010	7.84	76	7.52	8.87	5.83	(4.47, 7.19)	-1.40
Northeastern	946	7.34	54	5.71	7.18	5.47	(3.94, 6.99)	-1.66
Hudson Valley	1200	9.31	97	8.08	8.05	6.90	(5.48, 8.31)	0.01
Nassau	1450	11.26	120	8.28	7.93	7.17	(5.85, 8.49)	0.43
Suffolk	1202	9.33	74	6.16	5.84	7.24	(5.53, 8.95)	0.41
New York City	5099	39.58	313	6.14	5.65	7.46	(6.61, 8.31)	1.42
Total	12883	100.00	885	6.87	-----	-----	-----	-----

Figure 7

Deaths in the Emergency Department and Inpatients with Other Blunt Injuries (Regional and Area Centers): Risk-Adjusted Mortality Rates and 95% Confidence Intervals by Region: 2003-2006



Comparison by Trauma Center Level

Table 9 contains the number of patients, percentage of patients, number of deaths, observed mortality rate, expected mortality rate and risk-adjusted mortality rate along with its 95 percent confidence interval for the two levels of care (regional trauma centers and area trauma centers) for patients with other blunt injuries. Figure 8 presents the risk-adjusted mortality rate and its 95 percent confidence interval for each level of trauma center designation. Regional centers treated 10,464 inpatients with other blunt injuries or 81.8 percent of the total.

Regional centers had the higher observed mortality rate for patients with other blunt injuries (6.41percent). The observed mortality rate at area centers was 5.37 percent. Regional centers also treated the most severely injured patients, with an expected mortality rate of 6.38 percent compared to 5.50 percent at area centers. After accounting for what was observed and what was expected to obtain risk-adjusted mortality rates, regional centers were found to have a slightly higher rate of 6.25 percent compared to that of the area centers (6.07 percent). Neither rate was statistically different from the statewide rate.

Table 9
Statistical Significance of Risk-Adjusted Mortality Rates
Other Blunt Injuries
Inpatients (Regional and Area Centers)

Level	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Regional	10464	81.79	671	6.41	6.38	6.25	(5.77, 6.73)	0.11
Area	2329	18.21	125	5.37	5.50	6.07	(4.98, 7.16)	-0.22
Total	12793	100.00	796	6.22	-----	-----	-----	-----

Figure 8

Inpatients with Other Blunt Injuries (Regional and Area Centers):
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Level: 2003-2006

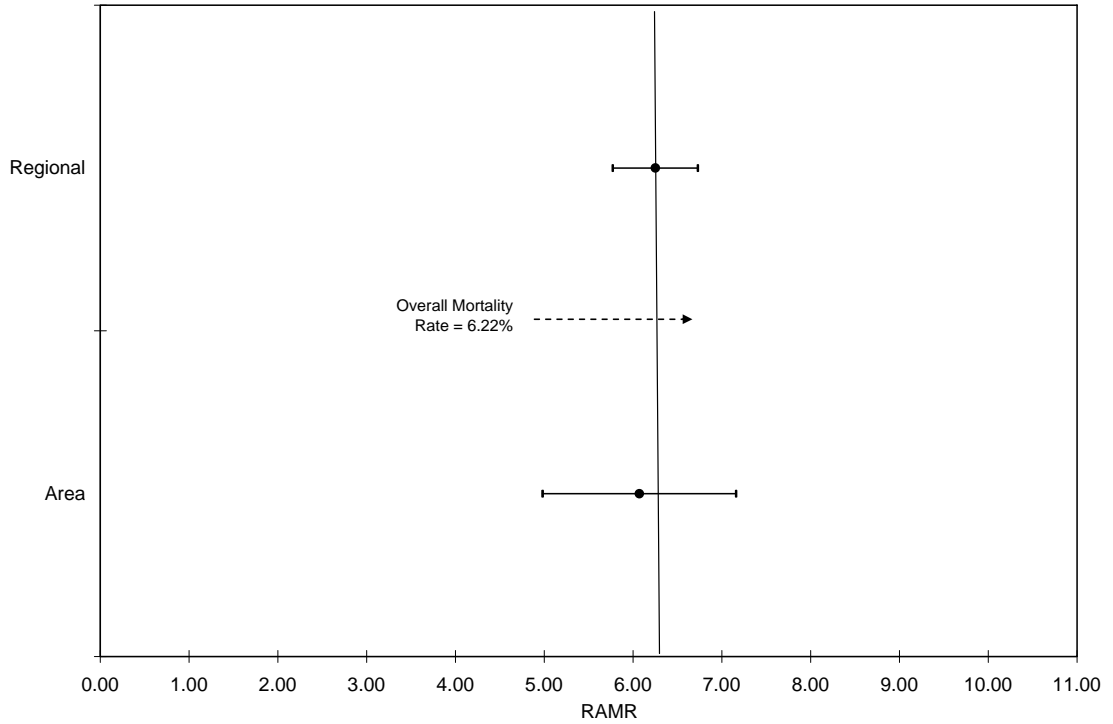


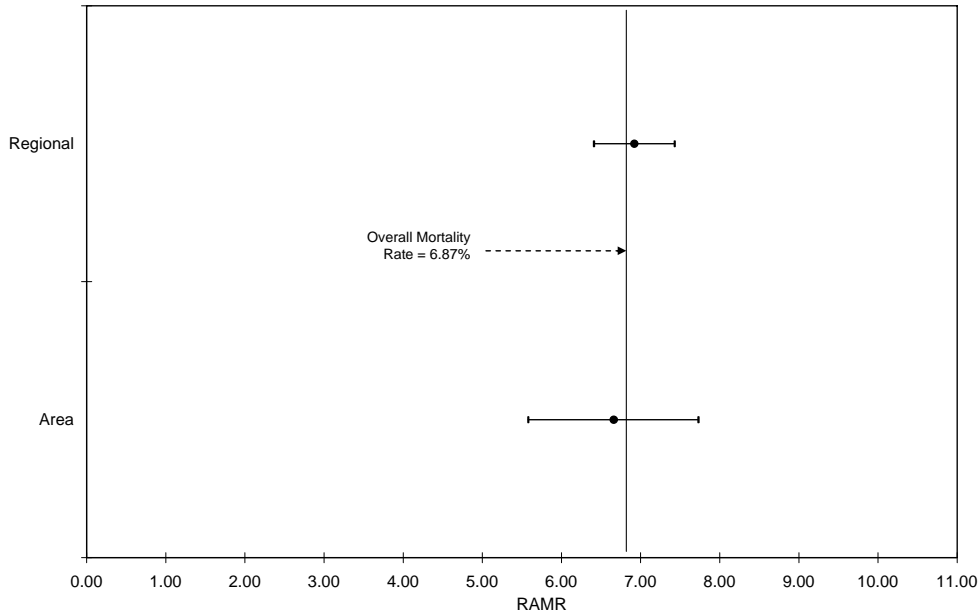
Table 10 and Figure 9 compare performance by region for other blunt injuries, with mortality defined as death in the emergency department or as an inpatient. Again, there are no significant differences by level.

Table 10
Statistical Significance of Risk-Adjusted Mortality Rates
Other Blunt Injuries
Deaths in the Emergency Department and Inpatients (Regional and Area Centers)

Level	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Regional	10521	81.67	727	6.91	6.86	6.92	(6.41, 7.43)	0.18
Area	2362	18.33	158	6.69	6.91	6.66	(5.58, 7.73)	-0.35
Total	12883	100.00	885	6.87	6.87	6.87	(6.41, 7.43)	0.18

Figure 9

Deaths in the Emergency Department and Inpatients
with Other Blunt Injuries (Regional and Area Centers):
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Level: 2003-2006



Low Falls

Comparison by Region

A low fall is defined in terms of ICD-9-CM E-codes as a fall from the same level. There were 10,572 hospital inpatients with low fall injuries (Table 11). A total of 926 of these patients (8.76 percent) died in the hospital. Appendix 7 presents the significant risk factors for mortality of trauma inpatients in the database who suffered low falls along with coefficients for these risk factors, levels of statistical significance, and measures of fit of the statistical model.

Table 11

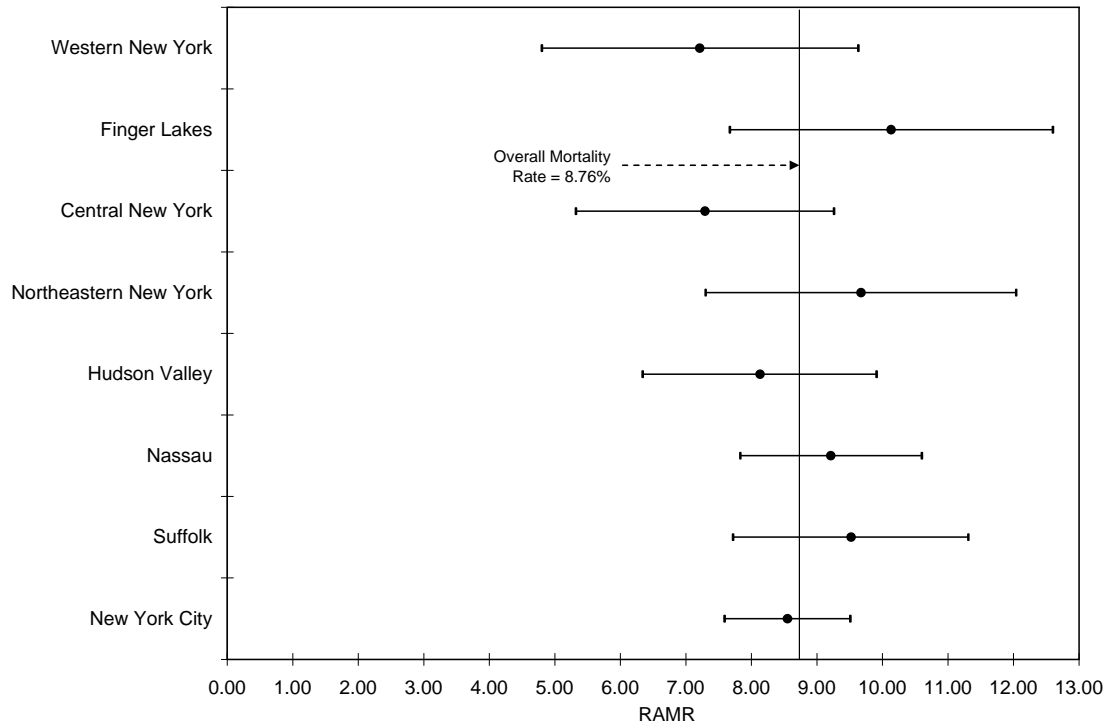
Statistical Significance of Risk-Adjusted Mortality Rates
Low Falls Injuries
Inpatients (Regional and Area Centers)

Region	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Western	547	5.17	38	6.95	8.44	7.21	(4.80, 9.63)	-1.14
Finger Lakes	669	6.33	70	10.46	9.04	10.13	(7.67, 12.60)	1.15
Central	697	6.59	57	8.18	9.83	7.29	(5.32, 9.26)	-1.35
Northeastern	719	6.80	69	9.60	8.69	9.67	(7.30, 12.04)	0.77
Hudson Valley	950	8.99	85	8.95	9.64	8.13	(6.34, 9.91)	-0.63
Nassau	1761	16.66	178	10.11	9.61	9.21	(7.83, 10.60)	0.64
Suffolk	1309	12.38	114	8.71	8.02	9.52	(7.72, 11.31)	0.84
New York City	3920	37.08	315	8.04	8.23	8.55	(7.59, 9.51)	-0.38
Total	10572	100.00	926	8.76	-----	-----	-----	-----

The observed inpatient mortality rates for patients suffering low falls ranged from 6.95 percent in Western New York to 10.46 percent in Finger Lakes. Expected mortality rates ranged from 8.01 percent in Suffolk to 9.80 percent in Central New York. Risk-adjusted mortality rates ranged from 7.21 percent in Western New York to 10.13 percent in Finger Lakes. No regions had risk-adjusted mortality rates that were either significantly lower or significantly higher than expected given the average severity of injury of their patients. (Figure 10)

Figure 10

Inpatients with Low Fall Injuries (Regional and Area Centers):
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Region: 2003-2006



Appendix 8 presents the significant risk factors for mortality of trauma inpatients and DIEs who were victims of low falls, the coefficients for these risk factors, levels of statistical significance, and a measure of fit of the statistical model. Table 12 and Figure 11 compare performance by region for low falls, with mortality defined as death in the emergency department or as an inpatient. As with inpatient deaths for low falls, no region was found to have a significantly different mortality rate from the statewide rate.

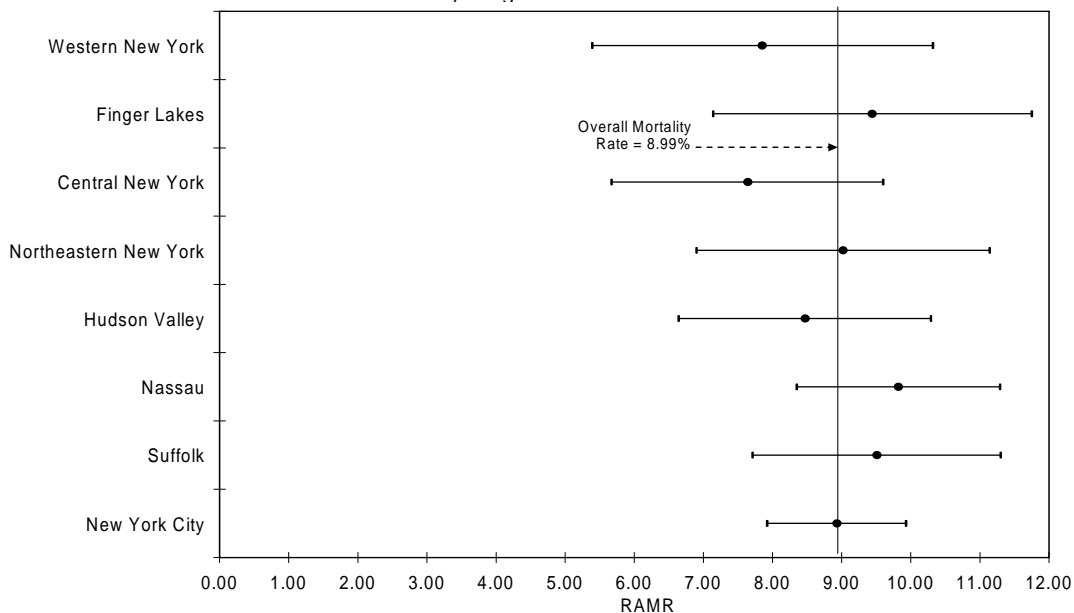
Table 12

Statistical Significance of Risk-Adjusted Mortality Rates
 Low Falls Injuries
 Deaths in the Emergency Department and Inpatients (Regional and Area Centers)

Region	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Western	552	5.21	43	7.79	8.92	7.85	(5.39, 10.32)	-0.81
Finger Lakes	671	6.33	72	10.73	10.22	9.44	(7.14, 11.75)	0.37
Central	703	6.63	63	8.96	10.55	7.64	(5.67, 9.60)	-1.25
Northeastern	725	6.84	75	10.34	10.31	9.02	(6.90, 11.14)	-0.01
Hudson Valley	953	8.99	88	9.23	9.81	8.47	(6.64, 10.29)	-0.50
Nassau	1764	16.64	180	10.20	9.34	9.82	(8.35, 11.29)	1.14
Suffolk	1311	12.37	116	8.85	8.37	9.51	(7.71, 11.30)	0.57
New York City	3921	36.99	316	8.06	8.12	8.93	(7.92, 9.93)	-0.09
Total	10600	100.00	953	8.99	-----	-----	-----	-----

Figure 11

Deaths in the Emergency Department and Inpatients
 with Low Fall Injuries (Regional and Area Centers):
 Risk-Adjusted Mortality Rates and 95% Confidence Intervals
 by Region: 2003-2006



Comparison by Trauma Center Level

Table 13 contains the number of patients, percentage of patients, number of deaths, observed mortality rate, expected mortality rate and risk-adjusted mortality rate along with its 95 percent confidence interval for the two levels of care (regional trauma centers and area trauma centers) for low falls patients. Figure 12 presents the risk-adjusted mortality rate and its 95 percent confidence interval for each level of care. Regional centers accommodated 7,579 low falls patients (71.7 percent).

Regional centers had the higher observed mortality rate for low falls patients (8.89 percent, vs. 8.42 percent for area centers); however, the expected mortality rate for regional centers (8.98 percent) was also high. The expected rate for area centers was 8.20 percent. After factoring in the observed and the expected rates for each level, regional centers had the lower risk-adjusted mortality rate (8.68 percent) relative to that of the area centers (8.98 percent). Neither rate was statistically different from the statewide rate.

Table 13
Statistical Significance of Risk-Adjusted Mortality Rates
Low Falls Injuries
Inpatients (Regional and Area Centers)

Level	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Regional	7579	71.69	674	8.89	8.97	8.68	(8.02, 9.34)	-0.21
Area	2993	28.31	252	8.42	8.21	8.98	(7.85, 10.11)	0.37
Total	10572	100.00	926	8.76	-----	-----	-----	-----

Figure 12

Inpatients with Low Fall Injuries (Regional and Area Centers):
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Level: 2003-2006

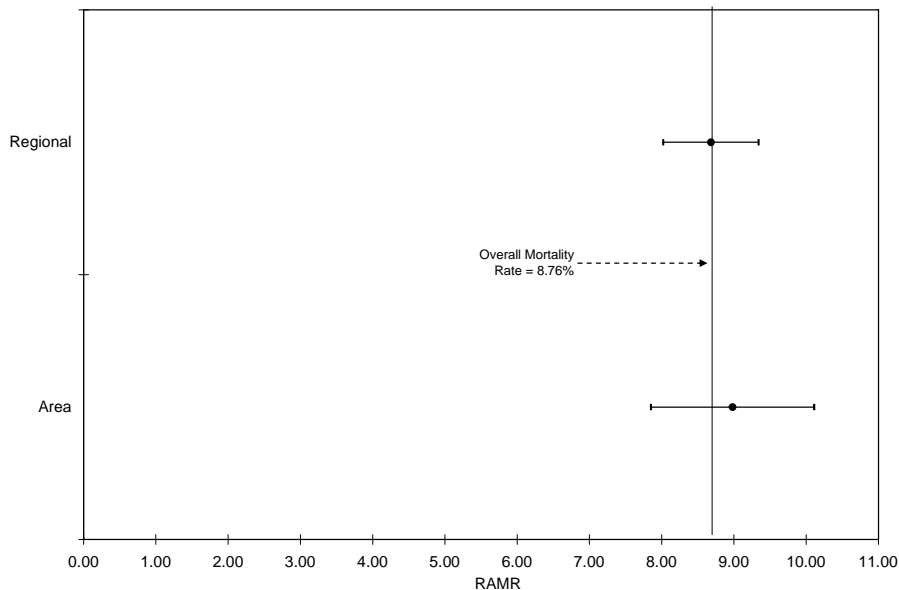


Table 14 and Figure 13 compare performance by level for low falls, with mortality defined as death in the emergency department or as an inpatient. As with inpatient deaths for low falls, the two levels did not have significantly different mortality rates.

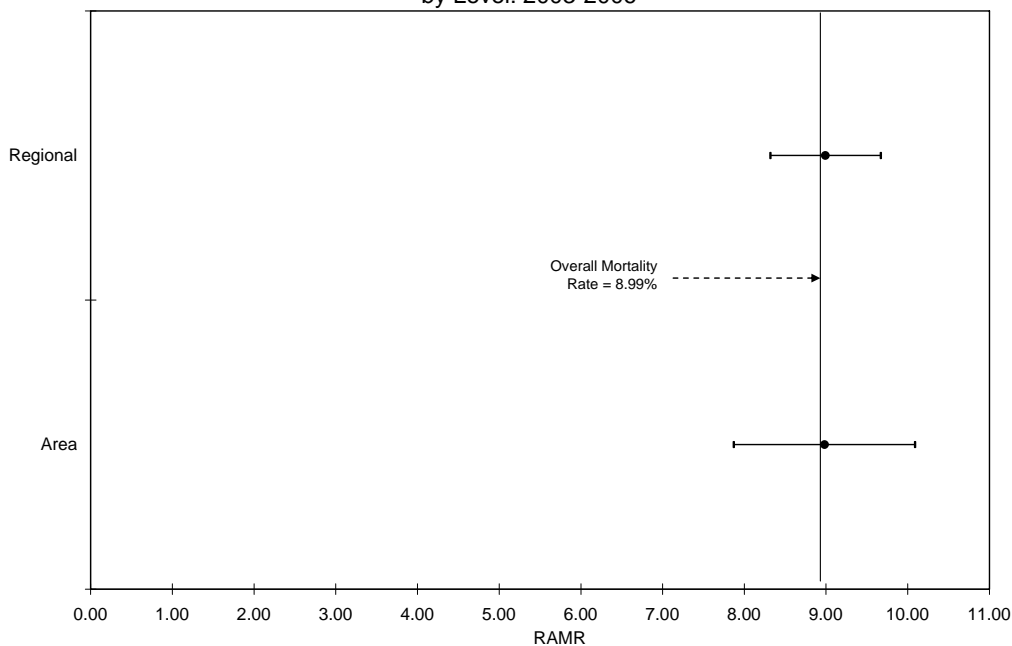
Table 14

Statistical Significance of Risk-Adjusted Mortality Rates
 Low Falls Injuries
 Deaths in the Emergency Department and Inpatients (Regional and Area Centers)

Level	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Regional	7598	71.68	692	9.11	9.10	8.99	(8.32, 9.67)	0.00
Area	3002	28.32	261	8.69	8.70	8.98	(7.87, 10.09)	0.02
Total	10600	100.00	953	8.99	-----	-----	-----	-----

Figure 13

Deaths in the Emergency Department and Inpatients
 with Low Fall Injuries (Regional and Area Centers):
 Risk-Adjusted Mortality Rates and 95% Confidence Intervals
 by Level: 2003-2006



Stab Wounds

Comparison by Region

There were 2,942 stab wound inpatients during the data period with values coded in all fields required by the logistic regression model. A total of 62 of these patients (2.11 percent) died in the hospital during the same admission. Appendix 9 presents the significant risk factors for mortality of trauma inpatients who suffered stab wounds along with coefficients for these risk factors, levels of statistical significance, and a measure of fit of the statistical model.

For inpatients with stab wounds by region, Table 15 presents the number of patients, the percentage of patients, the observed mortality rate, the expected mortality rate and the risk-adjusted mortality rate and its 95 percent confidence interval. Figure 14 presents the risk-adjusted mortality rate and its 95 percent confidence interval for each region.

The region with the most patients with stab wounds was New York City with 1,735 patients (59.0 percent). This percentage is much higher than the New York City share of the three mechanisms of injury corresponding to blunt injuries. Western New York had the second highest percentage with 8.5 percent, and the Finger Lakes Region had the lowest percentage of stab wound patients in the Registry (3.8 percent).

Observed mortality rates ranged from 0.48 percent in Suffolk to 3.03 percent in the Hudson Valley. Expected mortality rates ranged from 1.29 percent to 4.11 percent. Risk-adjusted mortality rates ranged from 0.79 percent in Suffolk to 3.08 percent in Hudson Valley. No regions had a risk-adjusted mortality rate that was statistically significantly lower or higher than expected.

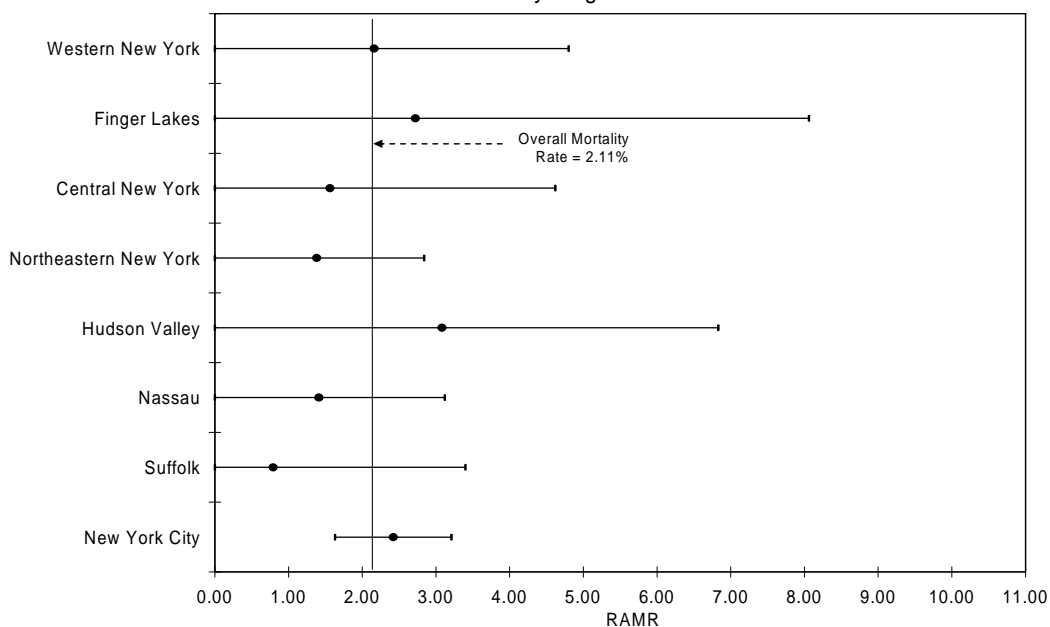
Table 15

Statistical Significance of Risk-Adjusted Mortality Rates
Stab Wound Injuries
Inpatients (Regional and Area Centers)

Region	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Western	249	8.46	4	1.61	1.56	2.16	(0.00, 4.80)	-0.11
Finger Lakes	113	3.84	2	1.77	1.38	2.72	(0.00, 8.06)	0.11
Central	120	4.08	2	1.67	2.25	1.56	(0.00, 4.62)	-0.01
Northeastern	186	6.32	5	2.69	4.11	1.38	(0.00, 2.84)	-0.75
Hudson Valley	132	4.49	4	3.03	2.08	3.08	(0.00, 6.83)	0.54
Nassau	200	6.80	4	2.00	3.00	1.41	(0.00, 3.12)	-0.57
Suffolk	207	7.04	1	0.48	1.29	0.79	(0.00, 3.40)	-0.66
New York City	1735	58.97	40	2.31	2.01	2.42	(1.63, 3.21)	0.81
Total	2942	100.00	62	2.11	-----	-----	-----	-----

Figure 14

Inpatients with Stab Wound Injuries (Regional and Area Centers):
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Region: 2003-2006



Appendix 10 presents the significant risk factors for mortality of trauma inpatients and DIEs who were victims of stab wounds, the coefficients for these risk factors, levels of statistical significance, and a measure of fit of the statistical model. Table 16 and Figure 15 compare performance by region for stab wounds, with mortality defined as death in the emergency department or as an inpatient. As with inpatient deaths for stab wounds, no region was found to have a significantly different mortality rate than the state.

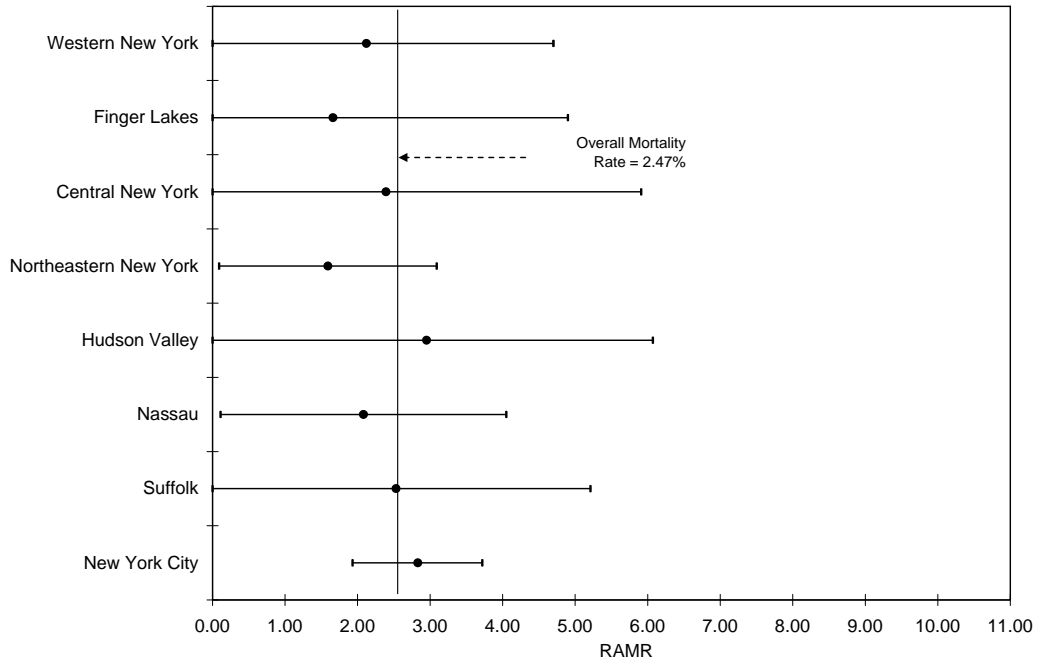
Table 16

Statistical Significance of Risk-Adjusted Mortality Rates
Stab Wounds Injuries
Deaths in the Emergency Department and Inpatients (Regional and Area Centers)

Region	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Western	249	8.43	4	1.61	1.87	2.12	(0.00, 4.70)	0.00
Finger Lakes	113	3.83	2	1.77	2.63	1.66	(0.00, 4.90)	-0.18
Central	121	4.10	3	2.48	2.56	2.39	(0.00, 5.91)	0.32
Northeastern	187	6.33	6	3.21	5.00	1.59	(0.09, 3.09)	-0.93
Hudson Valley	133	4.50	5	3.76	3.15	2.95	(0.00, 6.07)	0.24
Nassau	202	6.84	6	2.97	3.53	2.08	(0.11, 4.05)	-0.17
Suffolk	211	7.14	5	2.37	2.31	2.53	(0.00, 5.21)	-0.10
New York City	1738	58.84	42	2.42	2.11	2.83	(1.93, 3.72)	0.80
Total	2954	100.00	73	2.47	-----	-----	-----	-----

Figure 15

Deaths in the Emergency Department and Inpatients with Stab Wound Injuries (Regional and Area Centers): Risk-Adjusted Mortality Rates and 95% Confidence Intervals by Region: 2003-2006



Comparison by Trauma Center Level

Table 17 contains the number of patients, the percentage of patients, number of deaths, observed mortality rate, expected mortality rate and risk-adjusted mortality rate along with its 95 percent confidence interval for the two levels of trauma center designation (regional and area) for patients with stab wounds. Figure 16 presents the risk-adjusted mortality rate and its 95 percent confidence interval for each level of designation. Regional centers treated 2,517 inpatients with stab wounds (85.6 percent of the total), while area centers treated the other 425 inpatients (14.4 percent).

The observed mortality rate was higher for regional centers (2.22 percent) than the observed rate for area centers (1.41 percent). Regional centers had the higher expected mortality rate of 2.24 percent while the area expected rate was 1.33 percent.

The lower risk-adjusted mortality rate occurred among regional centers (2.09 percent). The risk-adjusted rate for the area centers was 2.24 percent. Neither of these rates was significantly different from the overall statewide rate of 2.11 percent.

Table 17
Statistical Significance of Risk-Adjusted Mortality Rates
Stab Wounds Injuries
Inpatients (Regional and Area Centers)

Level	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Regional	2517	85.55	56	2.22	2.24	2.09	(1.52, 2.67)	0.04
Area	425	14.45	6	1.41	1.33	2.24	(0.12, 4.35)	0.01
Total	2942	100.00	62	2.11	-----	-----	-----	-----

Figure 16

Inpatients with Stab Wound Injuries (Regional and Area Centers):
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Level: 2003-2006

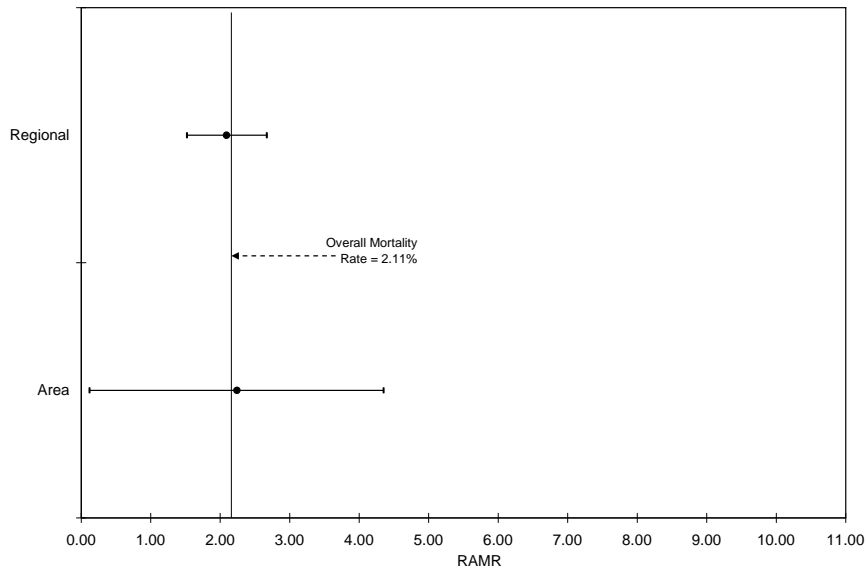


Table 18 and Figure 17 compare performance by level for stab wounds, with mortality defined as death in the emergency department or as an inpatient. As with inpatient deaths for stab wounds, the two levels of care did not have significantly different risk-adjusted mortality rates.

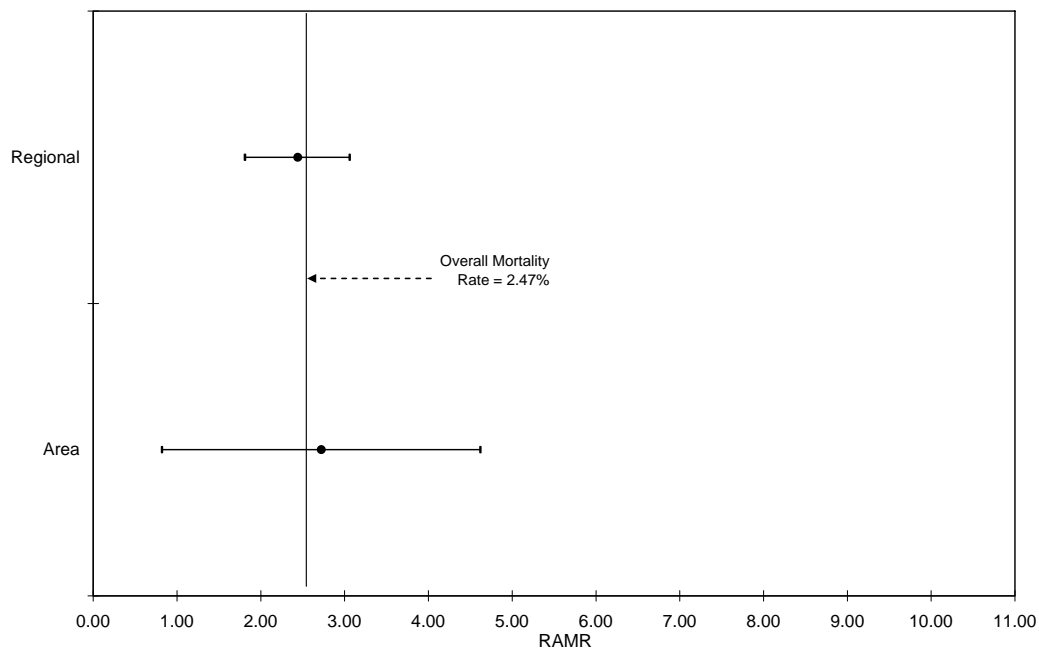
Table 18

Statistical Significance of Risk-Adjusted Mortality Rates
Stab Wounds Injuries
Deaths in the Emergency Department and Inpatients (Regional and Area Centers)

Level	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Regional	2525	85.48	63	2.50	2.53	2.44	(1.81, 3.06)	-0.03
Area	429	14.52	10	2.33	2.12	2.72	(0.82, 4.62)	0.19
Total	2954	100.00	73	2.47	-----	-----	-----	-----

Figure 17

Deaths in the Emergency Department and Inpatients
with Stab Wound Injuries (Regional and Area Centers):
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Level: 2003-2006



Gunshot Wounds

Comparison by Region

There were 3,169 gunshot wound inpatients in the logistic regression model. A total of 426 of these patients (13.4 percent) died in the hospital during the same admission. Appendix 11 presents the significant risk factors for mortality of trauma inpatients who suffered gunshot wounds along with coefficients for these risk factors, levels of statistical significance, and a measure of fit of the statistical model.

For inpatients with gunshot wounds in each region, Table 19 presents the number of patients, the percentage of patients, the observed mortality rate, the expected mortality rate and the risk-adjusted mortality rate and its 95 percent confidence interval. Figure 18 presents the risk-adjusted mortality rate and its 95 percent confidence interval for each region.

New York City accounted for an overwhelming majority of gunshot wound patients (1,951 or 61.6 percent). Finger Lakes had the second highest percentage with 10.4 percent, and Northeastern New York accounted for only 2.7 percent of inpatients suffering from gunshot wounds.

Observed mortality rates varied across regions from 12.51 percent to 17.61 percent, and expected mortality rates ranged from 11.15 percent to 19.45 percent. The region with the lowest risk-adjusted mortality rate was Northeastern New York with 9.45 percent. Suffolk had the highest risk-adjusted mortality rate (16.23 percent). No region had a risk-adjusted mortality rate that was significantly different from the statewide average.

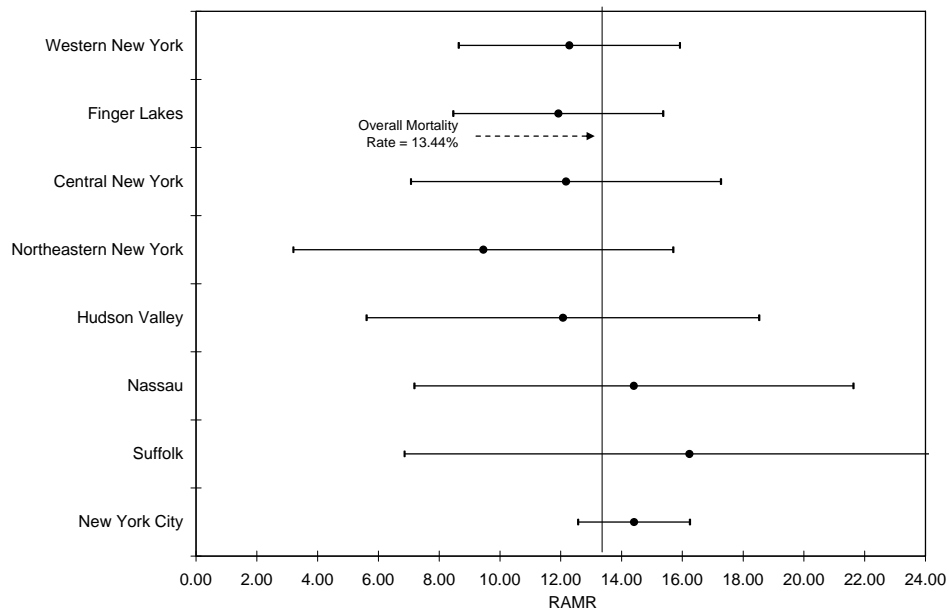
Table 19

Statistical Significance of Risk-Adjusted Mortality Rates
Gunshot Wound Injuries
Inpatients (Regional and Area Centers)

Region	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Western	325	10.26	48	14.77	16.16	12.28	(8.64, 15.91)	-0.55
Finger Lakes	330	10.41	50	15.15	17.09	11.92	(8.47, 15.39)	-0.77
Central	142	4.48	25	17.61	19.45	12.17	(7.07, 17.27)	-0.38
Northeastern	86	2.71	11	12.79	18.20	9.45	(3.20, 15.70)	-1.06
Hudson Valley	102	3.22	16	15.69	17.47	12.07	(5.63, 18.62)	-0.26
Nassau	129	4.07	18	13.95	13.02	14.40	(7.17, 21.62)	0.21
Suffolk	104	3.28	14	13.46	11.15	16.23	(6.84, 25.47)	0.58
New York City	1951	61.57	244	12.51	11.66	14.41	(12.57, 16.25)	1.05
Total	3169	100.00	426	13.44	-----	-----	-----	-----

Figure 18

Inpatients with Gunshot Wound Injuries (Regional and Area Centers):
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Region: 2003-2006



Appendix 12 presents the significant risk factors for mortality of trauma inpatients and DIEs who were victims of gunshot wounds, the coefficients for these risk factors, levels of statistical significance, and a measure of fit of the statistical model. Table 20 and Figure 19 compare performance by region for gunshot wounds, with mortality defined as death in the emergency department or as an inpatient. As with inpatient deaths for gunshot wounds, no region was found to have a mortality rate significantly different from that of the state.

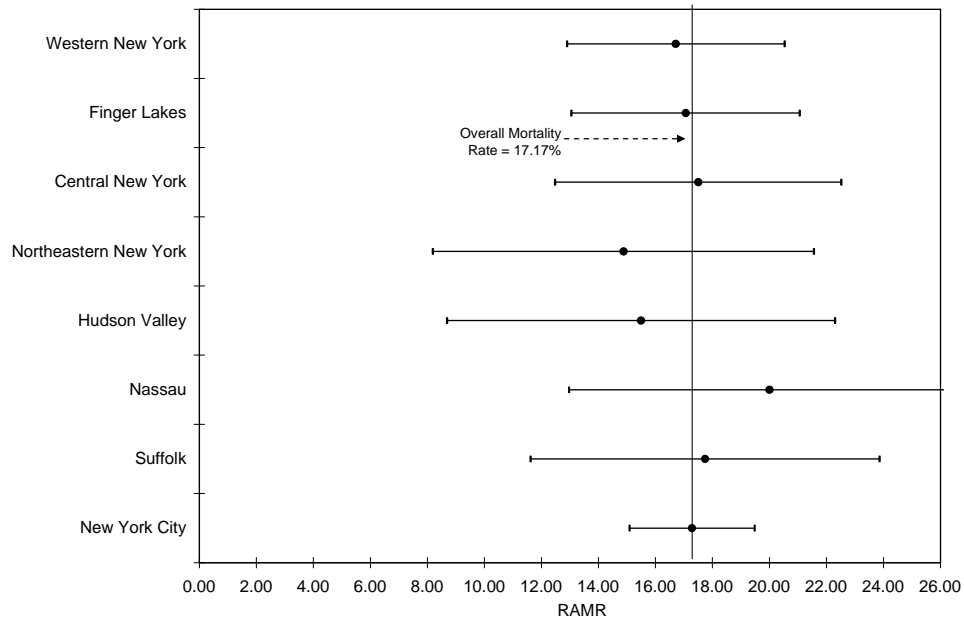
Table 20

Statistical Significance of Risk-Adjusted Mortality Rates
Gunshot Wounds Injuries
Deaths in the Emergency Department and Inpatients (Regional and Area Centers)

Region	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Western	356	10.75	79	22.19	22.80	16.71	(12.90, 20.53)	-0.17
Finger Lakes	355	10.72	75	21.13	21.27	17.06	(13.05, 21.06)	0.02
Central	168	5.07	51	30.36	29.79	17.50	(12.48, 22.52)	0.09
Northeastern	97	2.93	22	22.68	26.18	14.88	(8.19, 21.56)	-0.55
Hudson Valley	109	3.29	23	21.10	23.39	15.49	(8.69, 22.30)	-0.37
Nassau	146	4.41	35	23.97	20.59	20.00	(12.97, 27.03)	0.82
Suffolk	126	3.80	36	28.57	27.66	17.74	(11.62, 23.86)	0.14
New York City	1956	59.04	248	12.68	12.60	17.28	(15.09, 19.48)	0.08
Total	3313	100.00	569	17.17	-----	-----	-----	-----

Figure 19

Deaths in the Emergency Department and Inpatients
with Gunshot Wound Injuries (Regional and Area Centers):
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Region: 2003-2006



Comparison by Trauma Center Level

Table 21 contains the number of patients, percentage of patients, number of deaths, observed mortality rate, expected mortality rate and risk-adjusted mortality rate along with its 95 percent confidence interval for the different levels of care for gunshot wound patients. Figure 20 presents the risk-adjusted mortality rate and its 95 percent confidence interval for each level of care. Regional centers treated 2,903 inpatients with gunshot wounds (91.6 percent of the total). Area centers treated 266 inpatients (8.4 percent of the total).

The observed mortality rate was higher for area centers (16.92 percent) than for regional centers (13.12 percent). The risk-adjusted mortality rates were 16.29 percent for area centers and 13.17 percent for regional trauma centers. Neither rate was significantly different from the overall statewide rate.

Table 21

Statistical Significance of Risk-Adjusted Mortality Rates
Gunshot Wounds Injuries
Inpatients (Regional and Area Centers)

Level	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Regional	2903	91.61	381	13.12	13.40	13.17	(11.83, 14.51)	-0.37
Area	266	8.39	45	16.92	13.96	16.29	(11.29, 21.29)	1.20
Total	3169	100.00	426	13.44	-----	-----	-----	-----

Figure 20

Inpatients with Gunshot Wound Injuries (Regional and Area Centers):
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Level: 2003-2006

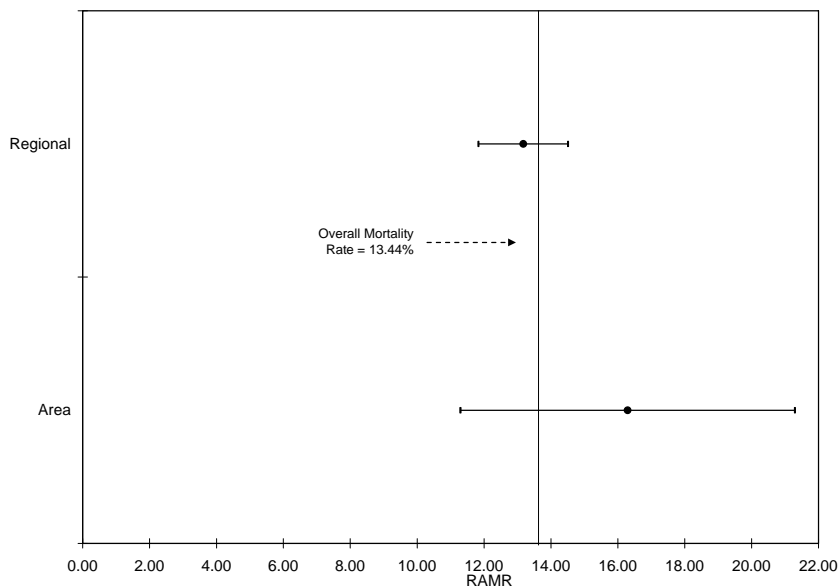


Table 22 and Figure 21 compare performance by region for gunshot wounds, with mortality defined as death in the emergency department or as an inpatient. As with inpatient deaths for gunshot wounds, the risk-adjusted mortality rates for the two levels of care were not found to be different from the statewide rate.

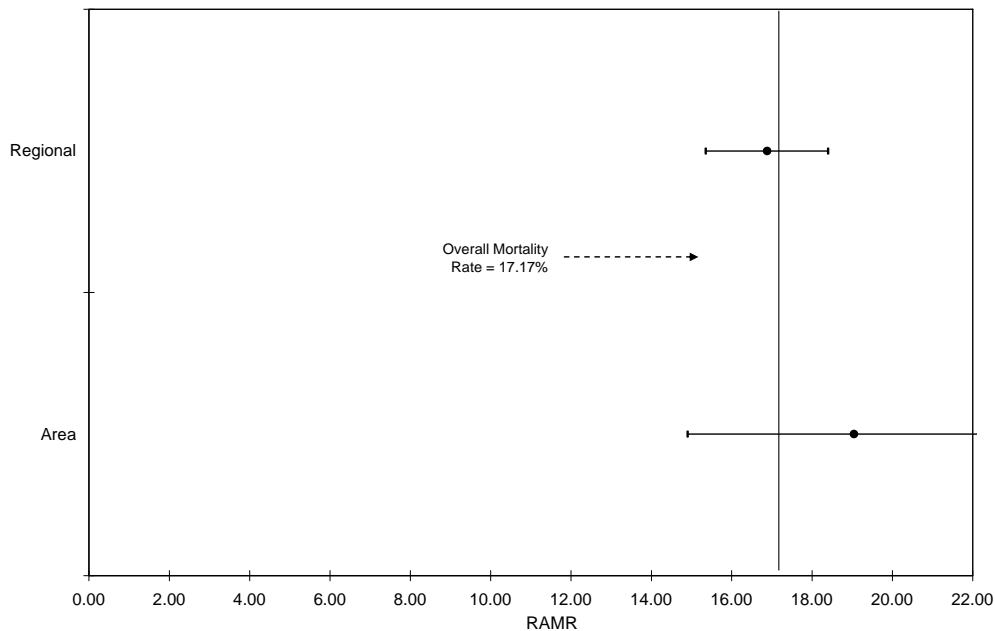
Table 22

Statistical Significance of Risk-Adjusted Mortality Rates
 Gunshot Wounds Injuries
 Deaths in the Emergency Department and Inpatients (Regional and Area Centers)

Level	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Regional	3005	90.70	482	16.04	16.32	16.88	(15.35, 18.40)	-0.35
Area	308	9.30	87	28.25	25.48	19.04	(14.90, 23.17)	0.91
Total	3313	100.00	569	17.17	-----	-----	-----	-----

Figure 21

Deaths in the Emergency Department and Inpatients
 with Gunshot Wound Injuries (Regional and Area Centers):
 Risk-Adjusted Mortality Rates and 95% Confidence Intervals
 by Level: 2003-2006



All Patients

Comparison by Region

Table 23 and Figure 22 compare regions across all mechanisms of injury by summing expected and observed deaths and then testing for statistical differences between each region and the entire state. Western New York (RAMR= 5.96 percent) and Northeastern New York (RAMR = 6.00 percent) both had significantly lower mortality than the statewide value of 6.91percent. New York City (RAMR = 7.71 percent) had a significantly higher mortality than the statewide rate.

Table 23

Statistical Significance of Risk-Adjusted Mortality Rates
Five Adult Mechanisms of Injury Combined
Inpatients (Regional and Area Centers)

Region	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Western	3967	7.45	274	6.91	8.03	6.00	(5.28, 6.73)	-2.52
Finger Lakes	4443	8.35	327	7.36	7.88	6.52	(5.80, 7.24)	-1.21
Central	4582	8.61	292	6.37	6.92	6.43	(5.68, 7.18)	-1.39
Northeastern	4196	7.88	264	6.29	7.18	6.12	(5.37, 6.87)	-2.15
Hudson Valley	5403	10.15	359	6.64	6.80	6.82	(6.10, 7.53)	-0.42
Nassau	6083	11.43	477	7.84	7.69	7.12	(6.47, 7.76)	0.41
Suffolk	5684	10.68	354	6.23	6.35	6.84	(6.12, 7.56)	-0.34
New York City	18864	35.45	1368	7.25	6.53	7.75	(7.34, 8.17)	3.82
Total	53222	100.00	3715	6.98	-----	-----	-----	-----

Figure 22

Inpatients Five Adult Mechanisms of Injury - Regional and Area Centers:
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Region: 2003-2006

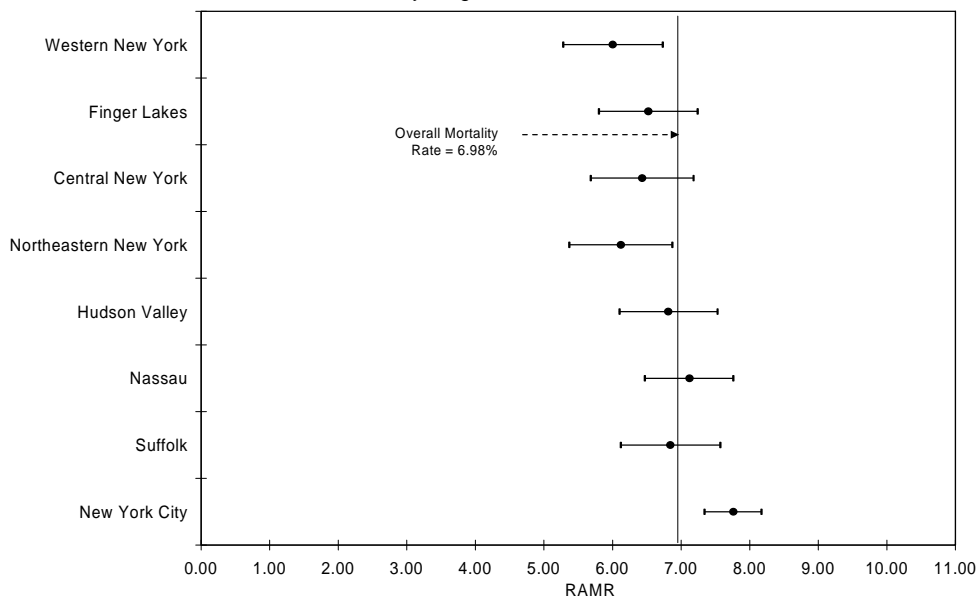


Table 24 and Figure 23 compare performance by region across all mechanisms of injury, with mortality defined as death in the emergency department or as an inpatient. For this measure of mortality, Northeastern New York (RAMR = 7.29 percent) had a significantly lower risk-adjusted mortality rate than the statewide mortality rate of 8.26 percent, and Nassau (RAMR = 9.08 percent) had a significantly higher risk-adjusted mortality rate than the statewide value.

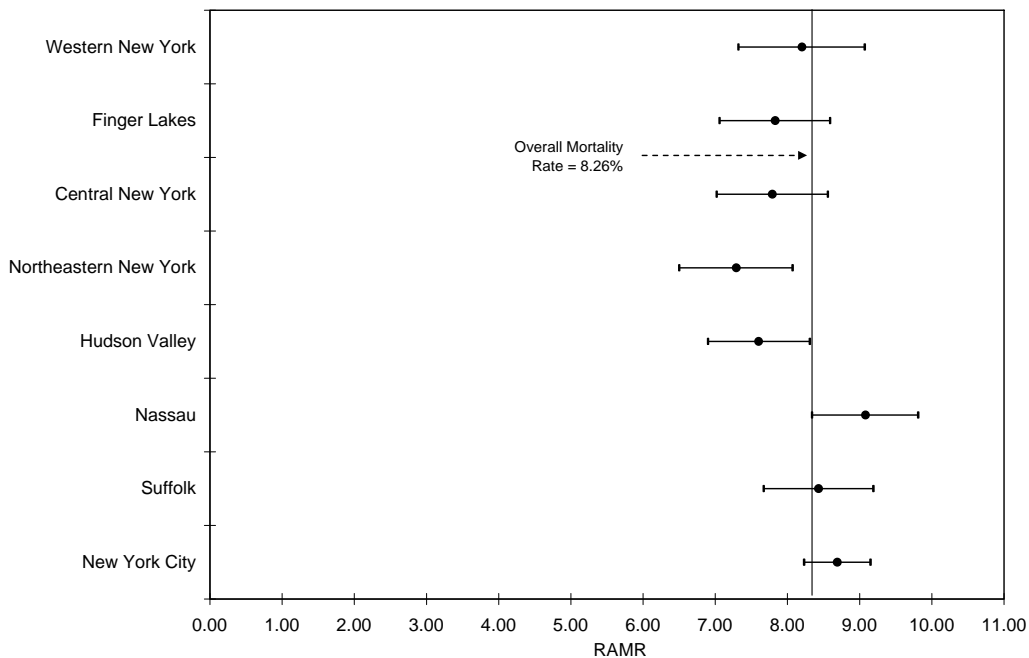
Table 24

Statistical Significance of Risk-Adjusted Mortality Rates
Five Adult Mechanisms of Injury Combined
Deaths in the Emergency Department and Inpatients (Regional and Area Centers)

Region	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Western	4042	7.49	349	8.63	8.70	8.20	(7.32, 9.07)	-0.10
Finger Lakes	4527	8.39	411	9.08	9.58	7.83	(7.06, 8.59)	-1.07
Central	4693	8.70	403	8.59	9.10	7.79	(7.02, 8.56)	-1.15
Northeastern	4274	7.92	342	8.00	9.06	7.29	(6.50, 8.07)	-2.32
Hudson Valley	5508	10.21	463	8.41	9.13	7.60	(6.90, 8.31)	-1.76
Nassau	6210	11.51	603	9.71	8.83	9.08	(8.34, 9.81)	2.28
Suffolk	5819	10.78	489	8.40	8.23	8.43	(7.67, 9.19)	0.45
New York City	18897	35.00	1396	7.39	7.02	8.69	(8.23, 9.15)	1.89
Total	53970	100.00	4456	8.26	-----	-----	-----	-----

Figure 23

Deaths in the Emergency Department and Inpatients
Five Adult Mechanisms of Injury - Regional and Area Centers -
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Region: 2003-2006



Comparison by Trauma Center Level

Table 25 and Figure 24 compare the performance of regional trauma centers and area trauma centers against the statewide performance. Neither level of care was shown to be statistically significantly different from the statewide average.

Table 25

Statistical Significance of Risk-Adjusted Mortality Rates
Five Adult Mechanisms of Injury Combined
Inpatients (Regional and Area Centers)

Level	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Regional	42448	79.76	3055	7.20	7.24	6.94	(6.69, 7.19)	-0.30
Area	10774	20.24	660	6.13	5.97	7.17	(6.61, 7.72)	0.66
Total	53222	100.00	3715	6.98	-----	-----	-----	-----

Figure 24

Inpatients Five Adult Mechanisms of Injury - Regional and Area Centers:
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Level: 2003-2006

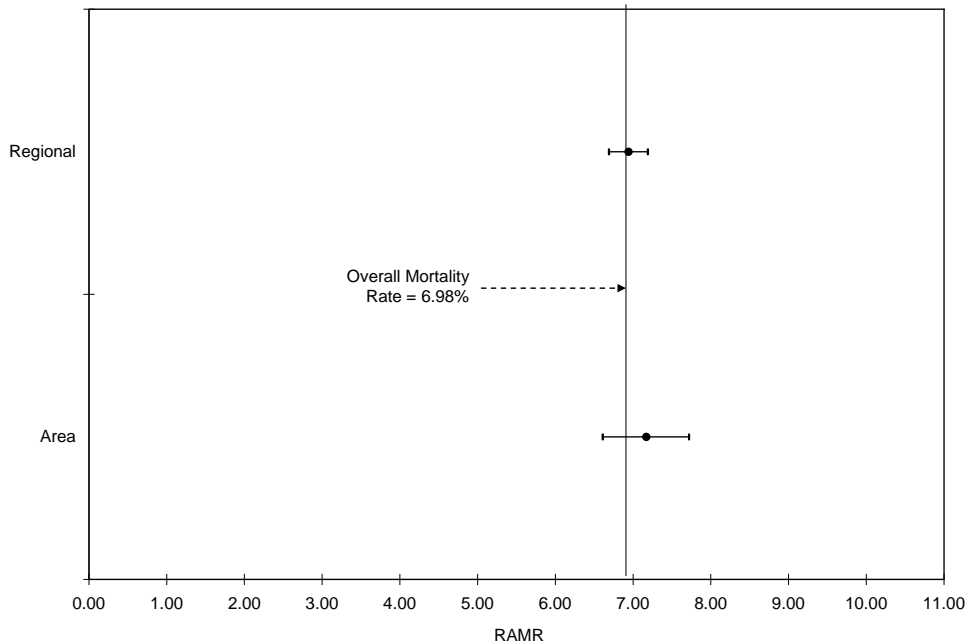


Table 26 and Figure 25 present risk-adjusted mortality rates for level of designation when DIEs have been included in addition to inpatient deaths. As indicated, the respective rates for regional trauma centers and area trauma centers were 8.15 percent and 8.41 percent. Neither level's rate was statistically significantly different from the statewide rate.

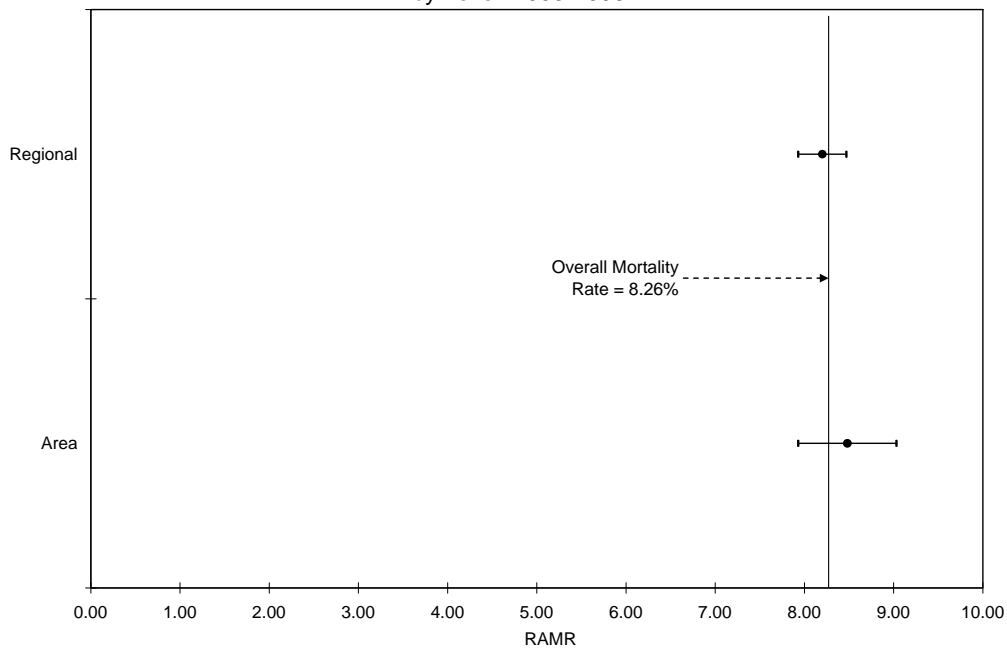
Table 26

Statistical Significance of Risk-Adjusted Mortality Rates
 Five Adult Mechanisms of Injury Combined
 Deaths in the Emergency Department and Inpatients (Regional and Area Centers)

Level	Number Of Patients	Percent Of Patients	Number Of Deaths	Observed Mortality Rate	Expected Mortality Rate	Risk-Adjusted Mortality Rate	Confidence Interval For RAMR	Z Score
Regional	42924	79.53	3524	8.21	8.27	8.20	(7.93, 8.47)	-0.40
Area	11046	20.47	932	8.44	8.22	8.48	(7.93, 9.03)	0.79
Total	53970	100.00	4456	8.26	-----	-----	-----	-----

Figure 25

Deaths in the Emergency Department and Inpatients
 Five Adult Mechanisms of Injury - Regional and Area Centers -
 Risk-Adjusted Mortality Rates and 95% Confidence Intervals
 by Level: 2003-2006



TRENDS IN VOLUME OF CASES AND MORTALITY RATES FOR 1999-2006

The following charts look at the trends in the number of trauma cases and the associated mortality during 1999-2006. This information is derived from SPARCS for all levels of hospitals (regional, area, and non-center). Source data are limited to severe injuries among the five adult mechanisms of injury – motor vehicle crashes, other blunt, low falls, stab wounds, and gunshot wounds.

Chart 26 shows that the number of these cases increased from 16,770 in 1999 to 22,357 in 2006, an increase of 33.3 percent in seven years.

Chart 26

Number of Cases
Five Adult Mechanisms of Injury
Severe Injuries
1999-2006 SPARCS

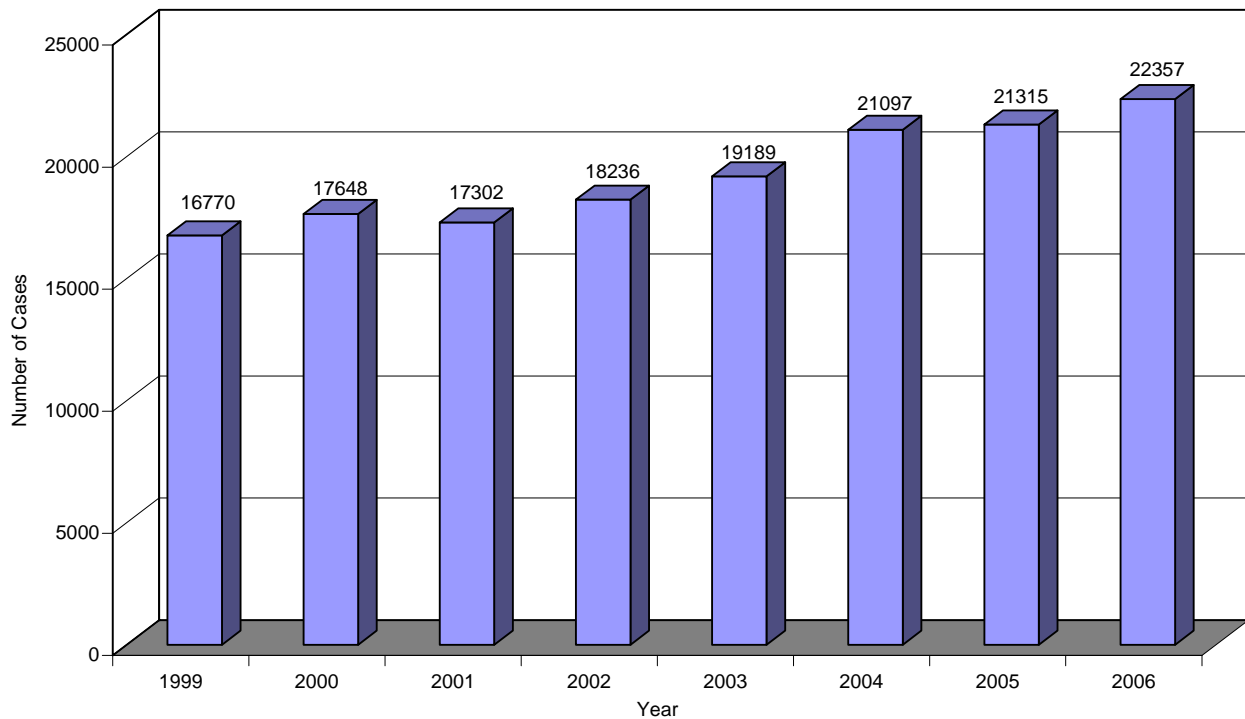


Chart 27 shows that the number of these cases that were treated at regional or area centers increased from 10,920 in 1999 to 15,040 in 2006, an increase of 37.7 percent.

Chart 27

Number in Trauma Centers
Five Adult Mechanisms of Injury
Severe Injuries
1999-2006 SPARCS

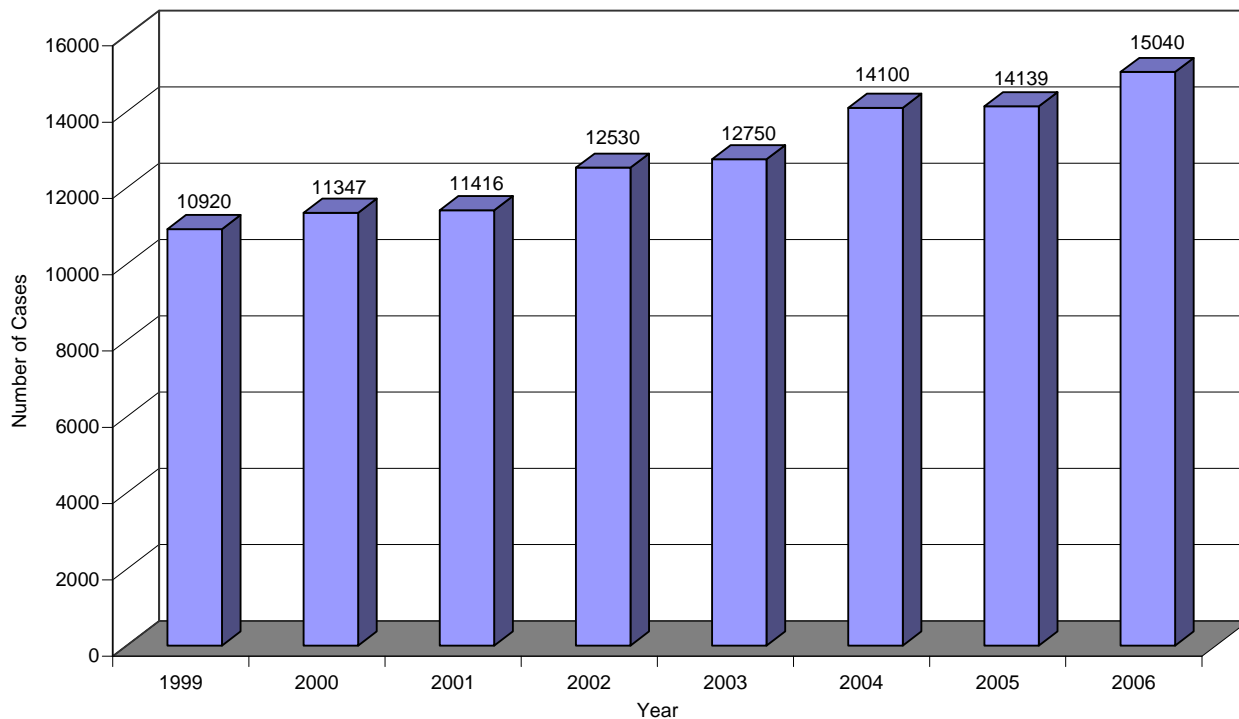


Chart 28 shows that the percent of serious injuries that were treated at trauma centers has remained fairly constant over this time period, ranging from a low of 64.3 percent in 2000 to 68.7 percent in 2002.

Chart 28

Percent in Trauma Centers
Five Adult Mechanisms of Injury
Severe Injuries
1999-2006 SPARCS

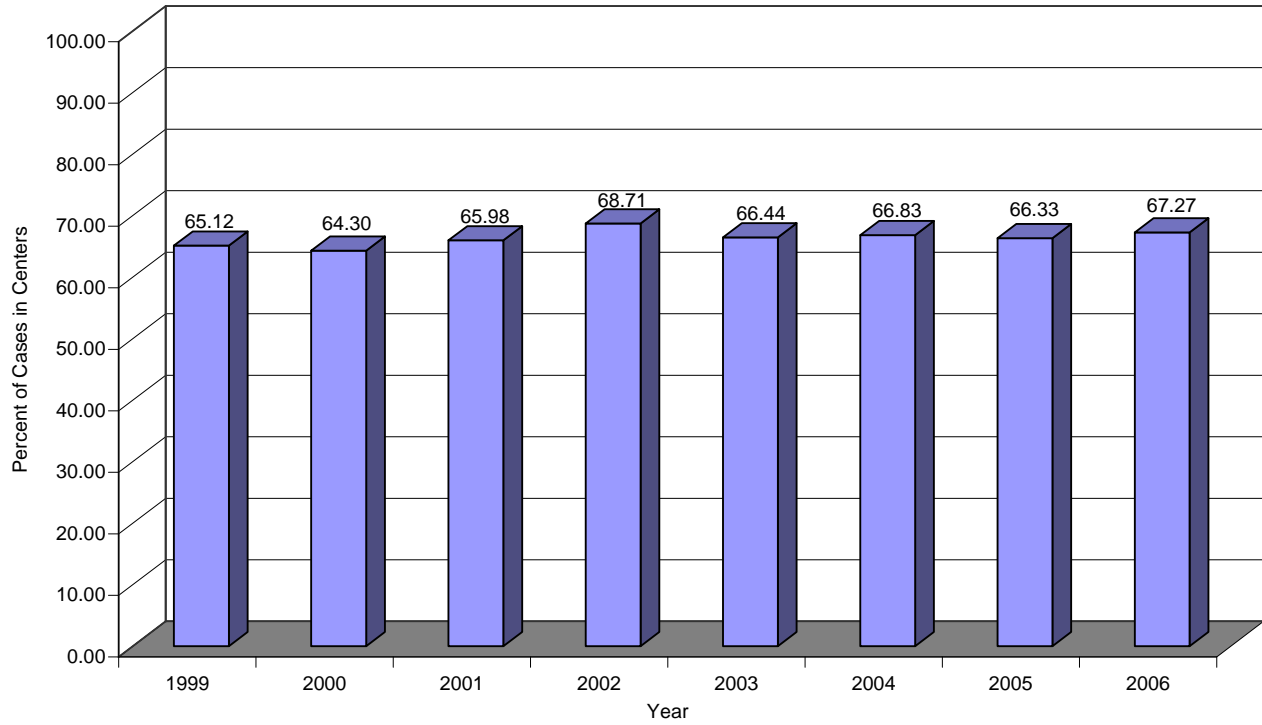


Chart 29 shows the reduction in crude mortality for severe injuries among these five adult mechanisms of injury. The crude mortality decreased from 8.3 percent in 1999 to 6.6 percent in 2006.

Chart 29

Mortality Rate in Trauma Centers
Five Adult Mechanisms of Injury (combined)
Severe Injuries
1999-2006 SPARCS

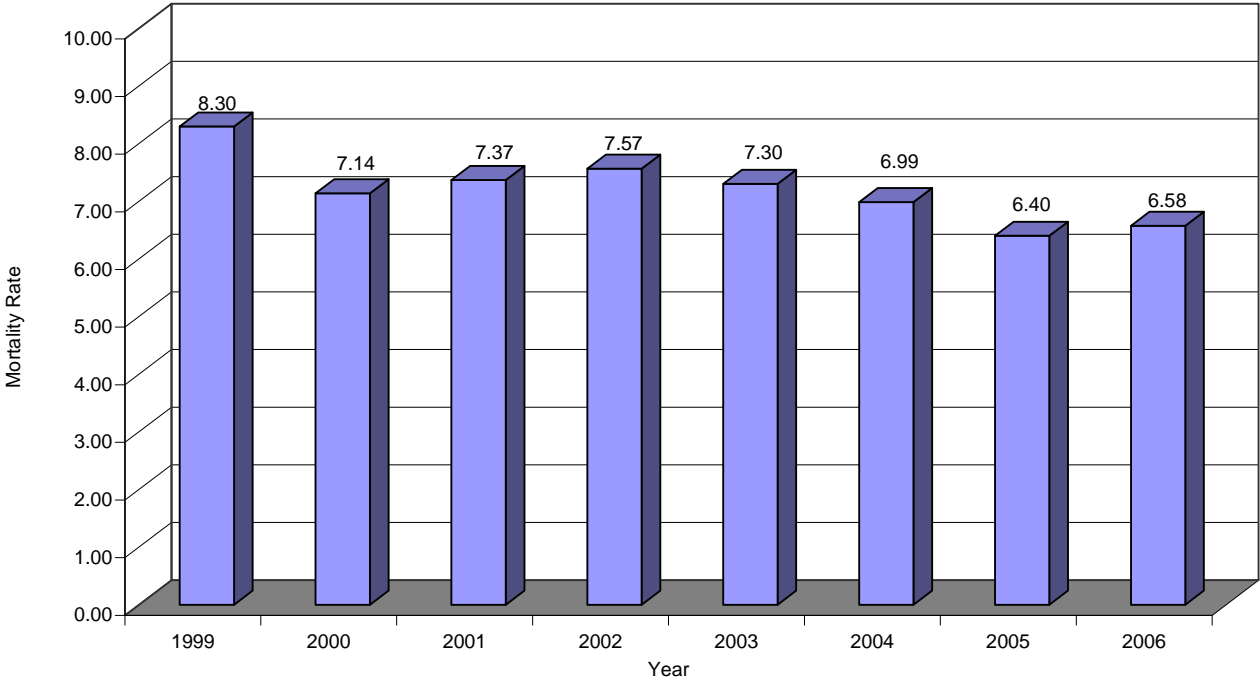


Chart 30 indicates that there were substantial decreases in mortality between 1999 and 2006 for patients with gunshot wounds (from 13.38 percent to 11.31 percent), stab wounds (from 3.08 percent to 2.26 percent), motor vehicle crashes (from 8.55 percent to 6.10 percent), and other blunt injuries (from 7.87 percent to 5.87 percent).

Chart 30

Mortality Rate in Trauma Centers
 Motor Vehicle Crash, Other Blunt, Low Falls, Stab Wounds, Gunshot Wounds
 1999-2006 SPARCS

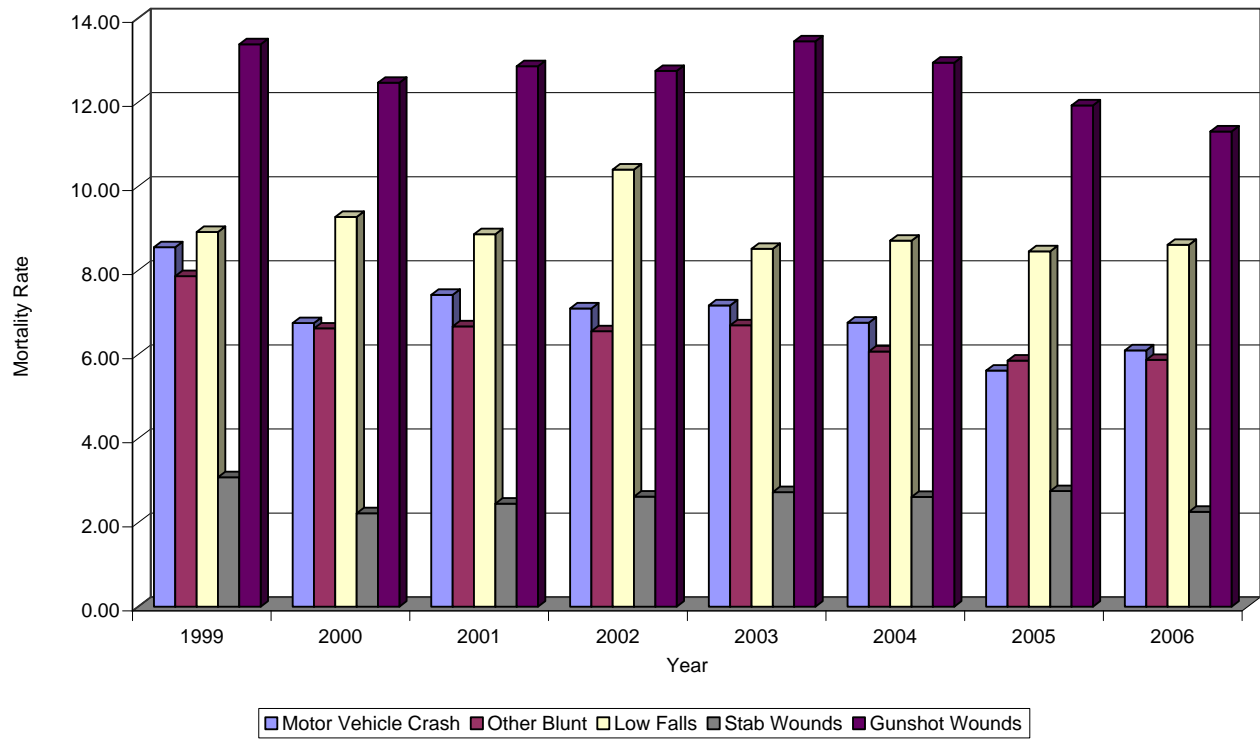


Chart 31 shows a clear reduction in crude mortality occurring for most age groups, other than those patients age 85 years and older, over this time period.

Chart 31

Mortality Rate by Age Group in Centers
 Five Adult Mechanisms of Injury (combined)
 1999-2006 SPARCS

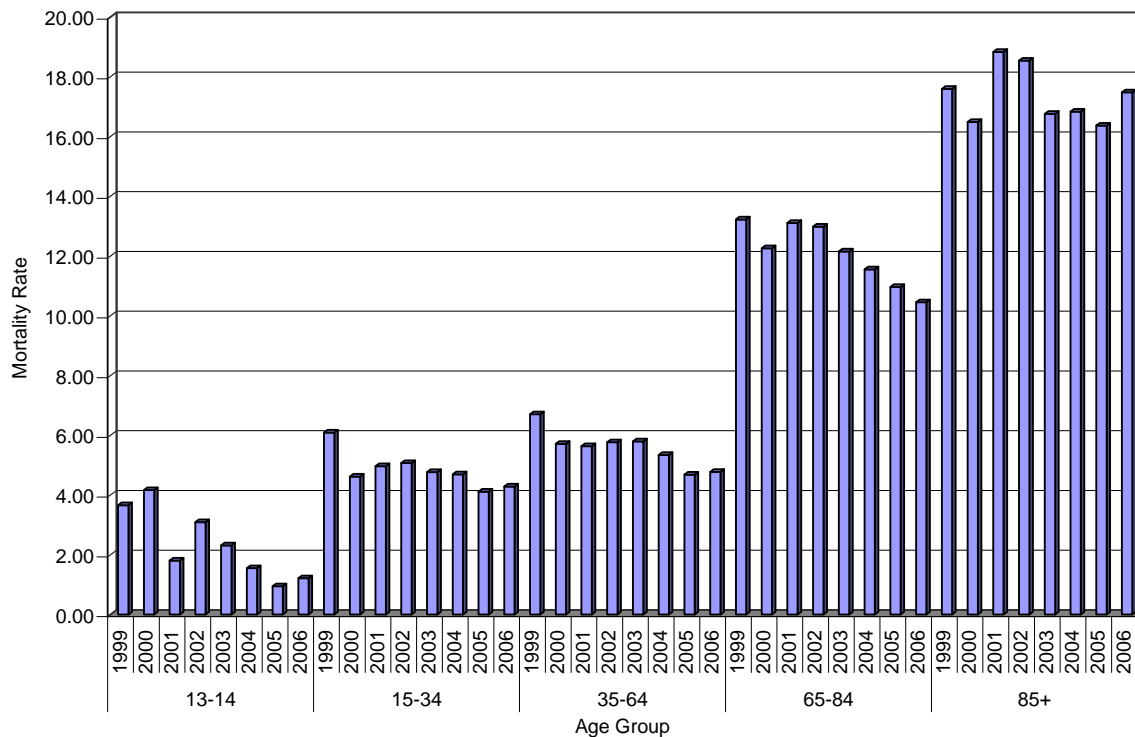


Chart 32 shows changes in the number of patients per mechanism. The three blunt injury mechanisms – motor vehicle crash, other blunt injuries, and low falls – show growth over these six years. Of particular note is the increase in the number of low falls patients. The number of patients in the two penetrating injury mechanisms has remained fairly stable during this time period.

Chart 32

Number of Cases
 Motor Vehicle Crash, Other Blunt, Low Falls, Stab Wounds, Gunshot Wounds
 1999-2006 SPARCS

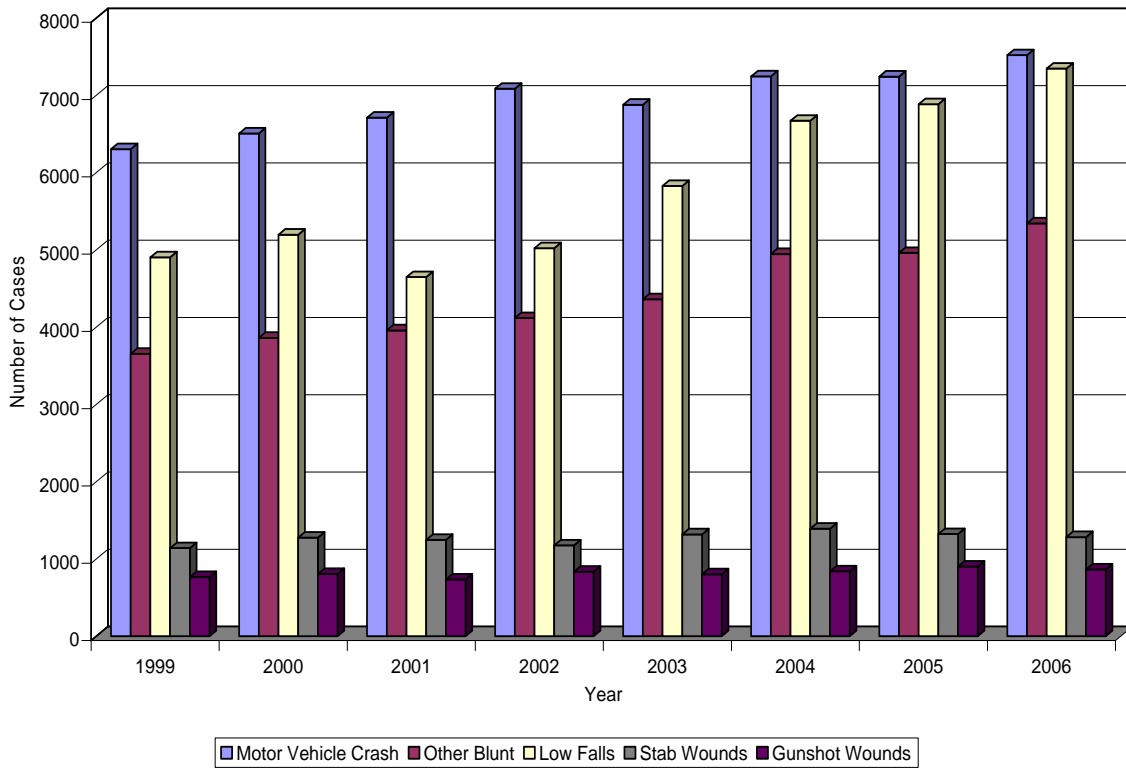
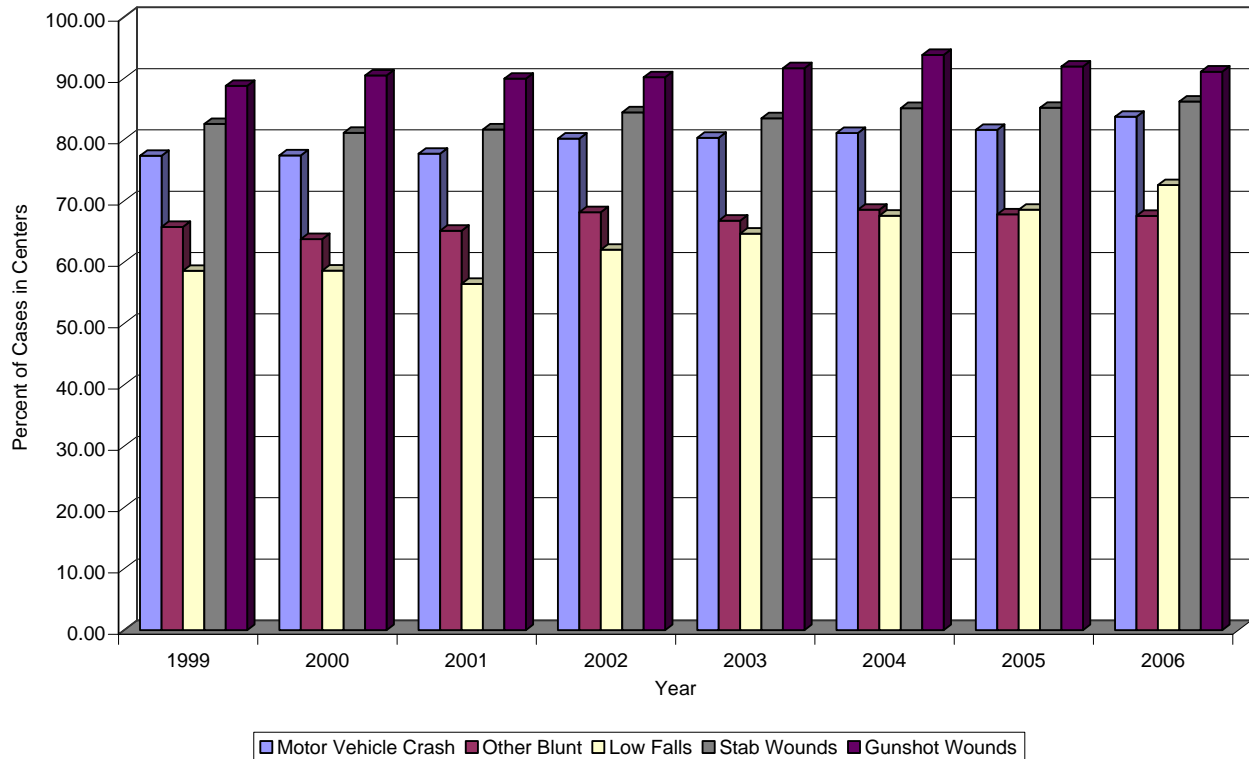


Chart 33 indicates that there were small increases in the percentage of patients referred to trauma centers for low falls (58.59 percent in 1999 to 72.58 percent in 2006) and motor vehicle crashes (77.36 percent in 1999 to 83.72 percent in 2006).

Chart 33

Percent in Trauma Centers
 Motor Vehicle Crash, Other Blunt, Low Falls, Stab Wounds, Gunshot Wounds
 1999-2006 SPARCS



Trends in Risk-Adjusted Mortality Rates for Mechanisms of Injury

To assess the change in mortality from 2003-2006, a variable representing year was added to each mechanism of injury's logistic regression model. Among the inpatient-only models, the coefficient for this additional variable was negative (indicative of decreasing mortality over the four years) for four of the five models. The p-value of the variable was significant ($p < 0.05$) for two of these four mechanisms, motor vehicle crash and other blunt. The odds ratio for the motor vehicle crash models was 0.895; for the other blunt model it was 0.893. These values are indicative of a drop in mortality of 10 percent to 11 percent for each year for these two MOIs. There were no significant changes in either direction for the other three MOIs.

This same evaluation was conducted for the inpatient plus DIE models. In this group, the coefficient for the variable representing the years 2003-2006 was negative for two of the five mechanisms – motor vehicle crash and other blunt. For motor vehicle crash, the p-value was significant. The odds ratio for year in the motor vehicle crash model for inpatients plus DIEs was 0.943, indicating a 6 percent drop in mortality by year. There were no significant changes in either direction for the other four MOIs.

2003-2006 HOSPITAL OUTCOMES

Table 27 presents the 2003-2006 results for hospitals treating trauma inpatients. The table contains the number of discharges, the number of inpatient deaths, the observed mortality rate, the expected mortality rate, the risk-adjusted mortality rate, and a 95 percent confidence interval for the risk-adjusted mortality rate. Table 28 presents the same information, except that the measure of mortality is death in the hospital's emergency department or as an inpatient.

A statistical model was developed for each of the five mechanisms of injury. The statistics for each of these models are shown in Appendices 3, 5, 7, 9 and 11 for inpatient deaths, and Appendices 4, 6, 8, 10 and 12 for in-hospital deaths. The predicted or expected probability of death from the model appropriate for each individual patient was used to assess hospital-level performance for all adult trauma patients. For each hospital, these predicted values were then combined and used with the hospital's overall observed mortality rate to calculate the hospital's risk-adjusted mortality rate.

Key terms used in the Tables are as follows:

- **Observed Mortality Rate (OMR)** – The number of observed deaths divided by the number of patients.
- **Expected Mortality Rate (EMR)** – The sum of the predicted probabilities of death for all patients divided by the total number of patients.
- **Risk-Adjusted Mortality Rate (RAMR)** – The best estimate, based on the statistical model, of what the provider's mortality rate would have been if the provider had a mix of patients identical to the statewide mix.

Confidence intervals and z-scores for the risk-adjusted mortality rate indicate which hospitals had significantly more or fewer deaths than expected, given the risk factors of their patients. Hospitals with significantly higher rates than expected are those with confidence intervals entirely above the statewide rate. Hospitals with significantly lower rates than expected given the severity of illness of their patients before treatment have confidence intervals entirely below the statewide rate.

The overall mortality rate for the 53,222 adults treated at the 46 trauma centers in the statistical models used to assess performance for inpatients only was 6.98 percent. Observed mortality rates ranged from 0.00 percent to 9.45 percent. The risk-adjusted mortality rate used to measure performance for all hospitals ranged from 0.00 percent to 13.23 percent.

The overall mortality rate for the 53,970 adults treated at the 46 trauma centers was 8.26 percent. Observed mortality rates ranged from 0.00 percent to 11.70 percent. The risk-adjusted mortality rate ranged from 0.00 percent to 11.19 percent.

Three hospitals (Erie County Medical Center, Albany Medical Center, and University Hospital – Stony Brook) had inpatient mortality rates that significantly lower than the statewide rate. Five hospitals (Good Samaritan Hospital Medical Center, St. Barnabas, City Hospital Center at Elmhurst, Jamaica Hospital Medical Center, and SVCMC-Mary Immaculate) had inpatient mortality rates significantly higher than the statewide rate.

Three hospitals (Mary Imogene Bassett Hospital, Westchester Medical Center, and Long Island Jewish Medical Center [pediatric patients only]) had in-hospital mortality rates significantly lower than the statewide rate, and two hospitals (Nassau University Medical Center and Brookdale Hospital Medical Center) had rates significantly higher than the statewide rate.

Table 27
Statistical Significance of Risk-Adjusted Mortality Rates
Inpatients (Five Adult Mechanisms of Injury Combined)
Statewide Mortality Rate = 6.98%

Hospital (PFI # : Name)	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR
<u>Western New York</u>						
<i>Regional Centers</i>						
0208:Women and Children's Hospital of Buffalo	255	1	0.39	1.05	2.61	(0.00, 11.23)
0210:Erie County Medical Center	3498	266	7.60	8.76	6.06	(5.32, 6.80)
<i>De-designated hospital⁹</i>						
0103:Woman's Christian Association	214	7	3.27	4.39	5.21	(0.72, 9.69)
<u>Finger Lakes</u>						
<i>Regional Center</i>						
0413:Strong Memorial Hospital	3176	247	7.78	8.10	6.71	(5.85, 7.56)
<i>Area Centers</i>						
0116:Arnot Ogden Medical Center	754	47	6.23	7.98	5.45	(3.82, 7.09)
<i>De-designated hospital</i>						
0411:Rochester General Hospital	513	33	6.43	6.40	7.01	(4.47, 9.55)
<u>Central New York</u>						
<i>Regional Center</i>						
0635:University Hospital SUNY Health Science Center	2844	172	6.05	6.95	6.07	(5.15, 7.00)
<i>Area centers</i>						
0058:United Health Services Inc-Wilson Hospital	1078	68	6.31	6.74	6.53	(4.92, 8.14)
0598:St. Elizabeth Medical Center	660	52	7.88	7.07	7.77	(5.57, 9.98)
<u>Northeastern New York</u>						
<i>Regional Center</i>						
0001:Albany Medical Center Hospital	3523	230	6.53	7.52	6.06	(5.26, 6.86)
<i>Area centers</i>						
0135:Champlain Valley Physicians' Hospital MC	242	9	3.72	3.48	7.45	(1.91, 12.99)
0746:Mary Imogene Bassett Hospital	431	25	5.80	6.51	6.22	(3.61, 8.83)
<u>Hudson Valley</u>						
<i>Regional Center</i>						
1139:Westchester Medical Center	2769	204	7.37	7.85	6.55	(5.64, 7.47)
<i>Area Centers</i>						
0180:St. Francis Hospital	1284	72	5.61	4.86	8.05	(6.12, 9.97)
0776:Nyack Hospital	511	26	5.09	5.69	6.24	(3.67, 8.80)
0779:Good Samaritan Hospital of Suffern	466	34	7.30	7.93	6.42	(4.14, 8.70)
1072:Sound Shore Medical Center of Westchester	373	23	6.17	5.88	7.32	(4.11, 10.53)

⁹ Hospitals listed in this report as "de-designated" were designated as a regional or area center at some time during 2003-2006 but are currently not designated as a trauma center.

Hospital (PFI # : Name)	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR
<u>Nassau</u>						
<i>Regional Centers</i>						
0511:Winthrop University Hospital	1088	71	6.53	6.44	7.07	(5.37, 8.78)
0528:Nassau University Medical Center	2033	170	8.36	7.51	7.77	(6.57, 8.96)
0541:North Shore University Hospital	1921	166	8.64	9.12	6.61	(5.58, 7.65)
<i>Area centers</i>						
0513:Mercy Medical Center	503	31	6.16	5.18	8.30	(5.20, 11.40)
0527:South Nassau Communities Hospital	538	39	7.25	8.13	6.23	(4.17, 8.28)
<u>Suffolk</u>						
<i>Regional Center</i>						
0245:University Hospital	2477	160	6.46	7.94	5.68	(4.78, 6.58)
<i>Area Centers</i>						
0885:Brookhaven Memorial Hospital MC Inc	838	54	6.44	4.92	9.14	(6.59, 11.68)
0913:Huntington Hospital	643	23	3.58	4.86	5.14	(2.88, 7.40)
0924:Southside Hospital	688	44	6.40	5.52	8.08	(5.58, 10.59)
0925:Good Samaritan Hospital Medical Center	1038	73	7.03	5.20	9.44	(7.19, 11.68)
<u>New York City</u>						
<i>Regional Centers</i>						
1165:Jacobi Medical Center	1647	104	6.31	5.75	7.67	(6.15, 9.18)
1172:Lincoln Medical & Mental Health Center	1056	65	6.16	5.47	7.85	(5.87, 9.83)
1176:St. Barnabas Hospital	1164	110	9.45	6.98	9.45	(7.63, 11.27)
1286:Brookdale Hospital Medical Center	1108	93	8.39	7.01	8.36	(6.60, 10.11)
1301:Kings County Hospital Center	1515	92	6.07	6.05	7.01	(5.53, 8.49)
1304:Lutheran Medical Center	1636	118	7.21	7.20	7.00	(5.70, 8.29)
1438:Bellevue Hospital Center	1351	93	6.88	6.51	7.38	(5.84, 8.93)
1445:Harlem Hospital Center	679	37	5.45	6.14	6.19	(4.08, 8.30)
1458:New York Presbyterian Hospital at New York Weill Cornell Center	1361	94	6.91	7.42	6.50	(5.14, 7.86)
1464:New York Presbyterian Hospital at Columbia Presbyterian Center	26	1	3.85	2.17	13.23	(0.00, 58.77)
1469:St. Luke's Roosevelt Hospital at St. Luke's Hospital Division	682	54	7.92	6.99	7.91	(5.70, 10.11)
1471:SVCMC-St. Vincent's Manhattan	798	44	5.51	4.95	7.77	(5.36, 10.18)
1626:City Hospital Center at Elmhurst	1671	143	8.56	6.39	9.35	(7.78, 10.93)
1629:Jamaica Hospital Medical Center	1108	83	7.49	5.80	9.02	(7.01, 11.03)
1630:Long Island Jewish Medical Center	103	0	0.00	1.01	0.00	(0.00, 17.40)
1637:New York Hospital MC of Queens	1177	76	6.46	7.40	6.09	(4.67, 7.51)
1738:SVCMC-St. Vincent's Staten Island	505	45	8.91	7.95	7.82	(5.43, 10.22)
1740:Staten Island University Hospital-North	735	62	8.44	7.37	7.99	(5.92, 10.05)
3013:SVCMC-Mary Immaculate	542	54	9.96	7.13	9.75	(7.03, 12.46)

Table 28
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for New York State
Deaths in the Emergency Department and Inpatients (Five Adult Mechanisms of Injury): 2003 – 2006
(Statewide Mortality Rate = 8.26%)

Hospital (PFI # : Name)	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR
<u>Western New York</u>						
<i>Regional centers</i>						
0208:Women and Children's Hospital of Buffalo	256	2	0.78	1.38	4.69	(0.00, 13.84)
0210:Erie County Medical Center	3568	336	9.42	9.34	8.32	(7.42, 9.22)
<i>De-designated hospital</i>						
0103:Woman's Christian Association	218	11	5.05	6.70	6.22	(2.11, 10.33)
<u>Finger Lakes</u>						
<i>Regional center</i>						
0413:Strong Memorial Hospital	3232	303	9.38	9.99	7.75	(6.86, 8.64)
<i>Area centers</i>						
0116:Arnot Ogden Medical Center	770	63	8.18	8.33	8.12	(6.01, 10.22)
<i>De-designated hospital</i>						
0411:Rochester General Hospital	525	45	8.57	8.91	7.94	(5.50, 10.38)
<u>Central New York</u>						
<i>Regional center</i>						
0635:University Hospital SUNY Health Science Center	2900	228	7.86	8.86	7.33	(6.36, 8.30)
<i>Area centers</i>						
0058:United Health Services Inc-Wilson Hospital	1117	107	9.58	9.01	8.77	(7.06, 10.49)
0598:St. Elizabeth Medical Center	676	68	10.06	10.28	8.08	(6.09, 10.08)
<u>Northeastern New York</u>						
<i>Regional center</i>						
0001:Albany Medical Center Hospital	3587	294	8.20	9.14	7.41	(6.55, 8.27)
<i>Area centers</i>						
0135:Champlain Valley Physicians' Hospital MC	249	16	6.43	6.06	8.76	(4.06, 13.47)
0746:Mary Imogene Bassett Hospital	438	32	7.31	10.19	5.92	(3.74, 8.10)
<u>Hudson Valley</u>						
<i>Regional center</i>						
1139:Westchester Medical Center	2814	248	8.81	10.72	6.79	(5.93, 7.65)
<i>Area centers</i>						
0180:St. Francis Hospital	1316	104	7.90	6.71	9.72	(7.80, 11.65)
0776:Nyack Hospital	516	31	6.01	7.71	6.43	(4.02, 8.84)
0779:Good Samaritan Hospital of Suffern	476	44	9.24	8.14	9.38	(6.47, 12.28)
1072:Sound Shore Medical Center of Westchester	386	36	9.33	8.86	8.69	(5.70, 11.69)

Hospital (PFI # : Name)	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR
<u>Nassau</u>						
<i>Regional centers</i>						
0511:Winthrop University Hospital	1101	84	7.63	8.24	7.64	(5.95, 9.33)
0528:Nassau University Medical Center	2111	247	11.70	8.63	11.19	(9.77, 12.62)
0541:North Shore University Hospital	1940	185	9.54	9.70	8.12	(6.92, 9.32)
<i>Area centers</i>						
0513:Mercy Medical Center	512	40	7.81	7.09	9.10	(6.13, 12.07)
0527:South Nassau Communities Hospital	546	47	8.61	9.35	7.60	(5.32, 9.88)
<u>Suffolk</u>						
<i>Regional center</i>						
0245:University Hospital	2518	201	7.98	8.53	7.73	(6.64, 8.81)
<i>Area centers</i>						
0885:Brookhaven Memorial Hospital Medical Center Inc	875	91	10.40	9.01	9.53	(7.51, 11.55)
0913:Huntington Hospital	660	40	6.06	7.12	7.03	(4.72, 9.34)
0924:Southside Hospital	707	63	8.91	8.49	8.67	(6.44, 10.89)
0925:Good Samaritan Hospital Medical Center	1059	94	8.88	7.38	9.93	(7.86, 12.00)
<u>New York City</u>						
<i>Regional centers</i>						
1165:Jacobi Medical Center	1652	109	6.60	6.60	8.25	(6.65, 9.85)
1172:Lincoln Medical & Mental Health Center	1056	65	6.16	5.30	9.58	(7.16, 12.00)
1176:St. Barnabas Hospital	1166	112	9.61	7.87	10.07	(8.15, 11.99)
1286:Brookdale Hospital Medical Center	1115	96	8.61	6.43	11.06	(8.77, 13.34)
1301:Kings County Hospital Center	1515	92	6.07	7.25	6.92	(5.46, 8.38)
1304:Lutheran Medical Center	1637	119	7.27	7.94	7.56	(6.16, 8.95)
1438:Bellevue Hospital Center	1351	93	6.88	7.08	8.03	(6.35, 9.72)
1445:Harlem Hospital Center	679	37	5.45	6.29	7.15	(4.71, 9.60)
1458:New York Presbyterian Hospital at New York Weill Cornell Center	1372	105	7.65	7.51	8.42	(6.74, 10.10)
1464:New York Presbyterian Hospital at Columbia Presbyterian Center	26	1	3.85	3.15	10.58	(0.00, 46.93)
1469:St. Luke's Roosevelt Hospital at St. Luke's Hospital Division	682	54	7.92	6.63	9.86	(7.10, 12.62)
1471:SVCMC-St. Vincent's Manhattan	798	44	5.51	5.38	8.46	(5.84, 11.09)
1626:City Hospital Center at Elmhurst	1673	145	8.67	7.23	9.90	(8.25, 11.55)
1629:Jamaica Hospital Medical Center	1110	84	7.57	6.48	9.64	(7.51, 11.78)
1630:Long Island Jewish Medical Center	103	0	0.00	2.95	0.00	(0.00, 7.05)
1637:New York Hospital MC of Queens	1179	78	6.62	7.35	7.43	(5.71, 9.16)
1738:SVCMC-St. Vincent's Staten Island	506	46	9.09	8.01	9.37	(6.52, 12.21)
1740:Staten Island University Hospital-North	735	62	8.44	8.44	8.26	(6.11, 10.40)
3013:SVCMC-Mary Immaculate	542	54	9.96	7.84	10.49	(7.54, 13.44)

COMPARISON OF TRAUMA MORTALITY RATES BETWEEN NEW YORK STATE AND THE UNITED STATES

A gauge of the performance of New York's trauma system during 2003-2006 is a comparison with national trauma outcomes. The following data is taken from the CDC.¹⁰

Death data come from a national mortality database compiled by CDC's National Center for Health Statistics. This database contains information from death certificates filed in state vital statistics offices and includes causes of death reported by attending physicians, medical examiners and coroners. It also includes demographic information about decedents reported by funeral directors, who obtain that information from family members and other informants. Population data come from the Bureau of the Census. These data are based on information gathered in censuses and on estimation procedures conducted in non-census years.

The following is a comparison of outcomes in New York and the United States of three groups of trauma patients (motor vehicle crash, falls, and gunshot wounds) that comprise approximately three-quarters of all traumatic injuries contained in the NYSTR.

Table 29 presents, for motor vehicle crashes in New York State and the United States in 2006, the mortality rate per 100,000 population, the age-adjusted mortality rate per 100,000 population (based on 2000 data), and the level of significance (p-value) of the difference in age-adjusted rates between New York and the United States. It was not possible to report risk-adjusted mortality rates for New York and the United States that adjusted for patients' physiologic and anatomic risk factors as well as for age, because these data were not available for the United States as a whole.

As indicated, the rate of MVC deaths per 100,000 population in the United States in 2006 was considerably higher than the rate in New York State, as was the age-adjusted rate per 100,000 population. For example, the age-adjusted mortality rate per 100,000 population for MVCs in the United States was 14.97 percent, whereas it was only 8.05 percent in New York State. The difference between these two rates was significant ($p < 0.0001$).

Table 29

Mortality Rate per 100,000 Population for MVCs
United States vs. New York State: 2006

	Population	Deaths	Mortality Rate/100,000 Population	Age-Adjusted* Mortality Rate/ 100,000 Population	p-value for Difference in Age-Adjusted* Mortality Rates
United States	298,754,819	45,316	15.17	14.97	<0.0001
New York State	19,281,988	1,599	8.29	8.05	

¹⁰ Center for Disease Control and Prevention (CDC), National Center for Injury Prevention and Control, Web-Based Injury Statistics Query and Reporting System (WISQARS) at www.cdc.gov/ncipc/wisqars

Studies in other states have demonstrated that the mortality rate per capita for MVCs in a region is inversely related to the population density of the region. This may, in part, explain why New York's mortality rate per 100,000 population is so much lower than that of the United States. However, the relative population density of New York and the United States were not substantially different in 2003 and 2006. Consequently, a valid measure of the recent impact of New York's trauma system on MVC mortality is to compare the percentage change in age-adjusted mortality per 100,000 population in New York with the percentage change in the United States. The appropriate time period to ascertain the recent impact of the trauma system is 2003 to 2006, the latest available data. This is done in Table 30.

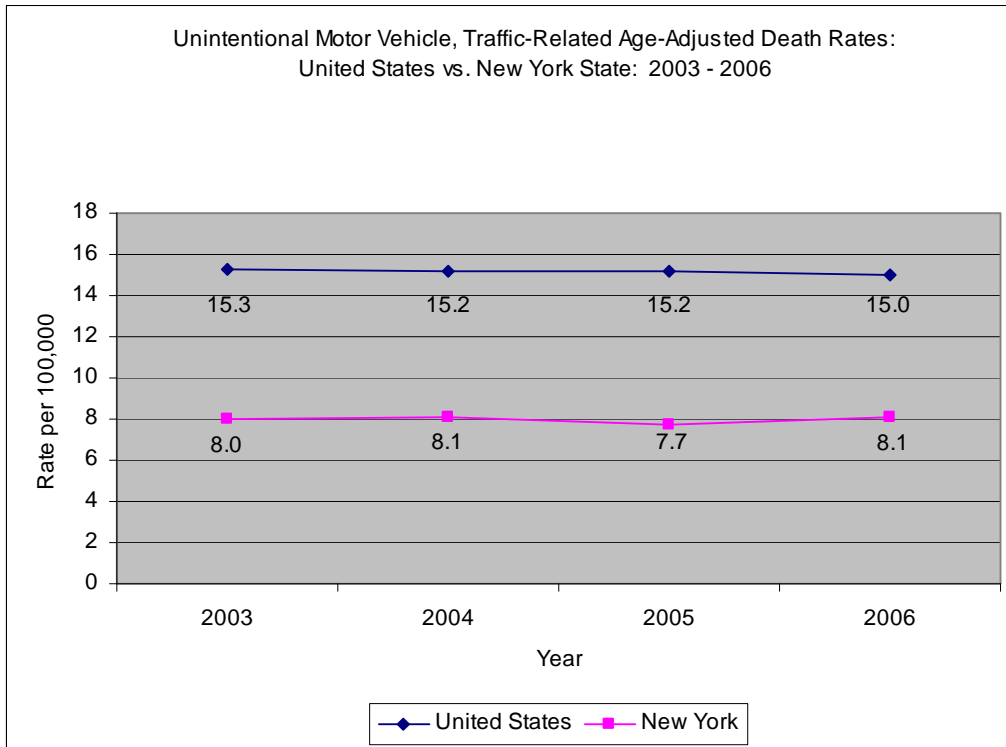
Table 30

Change in Deaths per 100,000 Population for MVCs
United States vs. New York State: 2003 to 2006

	Age- Adjusted* Mortality Rate: 2003	Age-Adjusted* Mortality Rate: 2006	Percent Change	p-value for Difference in Percent Change
United States	15.30	14.97	-2.2	<0.0001
New York State	8.03	8.05	0.3	

Chart 34 presents the mortality rates per 100,000 population for New York and the United States from 2003 through 2006. As demonstrated in Table 31, the mortality rate in the United States changed from 15.30 per 100,000 in 2003 to 14.97 per 100,000 in 2006, an decrease of 2.2 percent. During the same time period in New York, the mortality rate per 100,000 changed from 8.03 to 8.05, an increase of 0.3 percent. The change in mortality rate per 100,000 in New York was found to be significantly different from the change in the United States ($p < 0.0001$).

Chart 34



* Adjusted using population of the United States in 2000

Table 31 presents, for falls in New York State and the United States in 2006, the mortality rate per 100,000 population, the age-adjusted mortality rate per 100,000 population (based on 2000 data), and the level of significance (p-value) of the difference in age-adjusted rates between New York and the United States.

As indicated in Table 31 the mortality rate for low falls per 100,000 population in the United States in 2006 was higher than the rate in New York (6.59 vs. 4.97, respectively). This difference was statistically significant ($p < 0.0001$).

Table 31

Deaths per 100,000 Population for Falls
United States vs. New York State: 2006

	Population	Deaths	Mortality Rate /100,000 Population	Age-Adjusted* Mortality Rate /100,000	p-value for Difference in Age-Adjusted* Mortality Rates
United States	298,754,819	20,823	6.97	6.59	<0.0001
New York State	19,281,988	1,069	5.54	4.97	

Table 32 presents the age-adjusted mortality rates per 100,000 population for low falls in New York and for the United States in 2003 and 2006, as well as the percentage changes over these time periods, and the level of significance of the difference in rates of change between the United States and New York. This table also demonstrates that the mortality rate per 100,000 population in the United States rose from 5.82 in 2003 to 6.59 in 2006, an increase of 13.2 percent. During the same time period, the rate in New York fell from 4.99 to 4.97, a decrease of 0.3 percent. The difference in the rates of change was statistically significant ($p < 0.0001$).

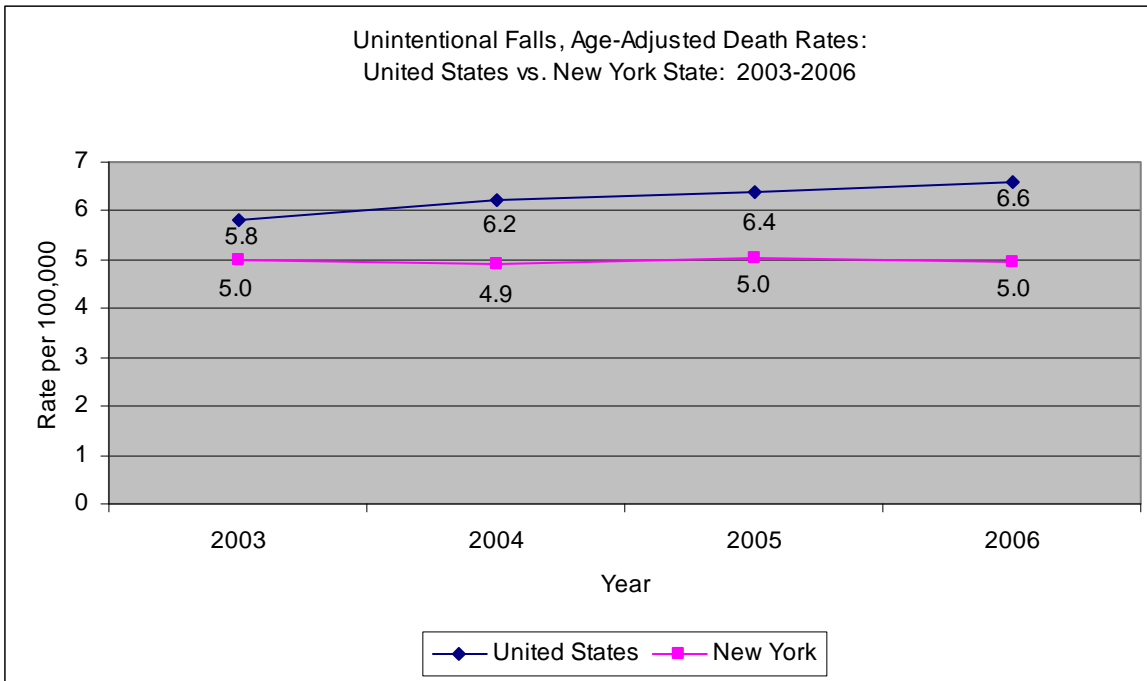
Table 32

Change in Deaths per 100,000 Population for Falls
United States vs. New York State: 2003 to 2006

	Age-Adjusted* Mortality Rate: 2003	Age-Adjusted* Mortality Rate: 2006	Percent Change	p-value for Difference in Percent Change
United States	5.82	6.59	13.2	<0.0001
New York State	4.99	4.97	-0.3	

Chart 35 presents the mortality rates per 100,000 population for New York and the United States for all years between 2003 and 2006.

Chart 35



*Adjusted using population of the United States in 2000

Table 33 presents, for firearms¹¹ in New York State and the United States in 2006, the mortality rate per 100,000 population, the age-adjusted mortality rate per 100,000 population (based on 2000 data), and the level of significance (p-value) of the difference in age-adjusted rates between New York and the United States.

As indicated in Table 34, the age-adjusted mortality rate of firearms per 100,000 population in the United States in 2006 was 10.20, substantially higher than the comparable rate in New York (5.10), and this difference was statistically significant (p < 0.0001).

Table 33

Deaths per 100,000 Population for Firearms
United States vs. New York State: 2006

	Population	Deaths	Mortality Rate /100,000 Population	Age-Adjusted Mortality Rate/100,000	p-value for Difference in Age-Adjusted Mortality Rates
United States	298,754,819	30,896	10.34	10.20	<0.0001
New York State	19,281,988	1,002	5.20	5.10	

Table 34 presents the age-adjusted mortality rates per 100,000 population for firearms in New York and for the United States in 2003 and 2006, as well as the percentage changes during this time, and the level of significance of the difference in rates of change between the United States and New York. Also, Chart 36 presents the mortality rates per 100,000 population for New York and the United States for all years between 2003 and 2006.

Chart 36 demonstrates that the mortality rate for firearms per 100,000 population in the United States decreased from 10.27 in 2003 to 10.20 in 2006, a decrease of 0.6 percent. During the same time period, the rate decreased in New York from 5.31 to 5.10, a decrease of 4.1 percent. The difference in New York’s rate and the U.S. rate was statistically significant (p < 0.0001). It appears that the quality assurance and improvement efforts associated with New York’s trauma system and Registry may have resulted in a substantially higher decrease in population mortality than was experienced nationwide.

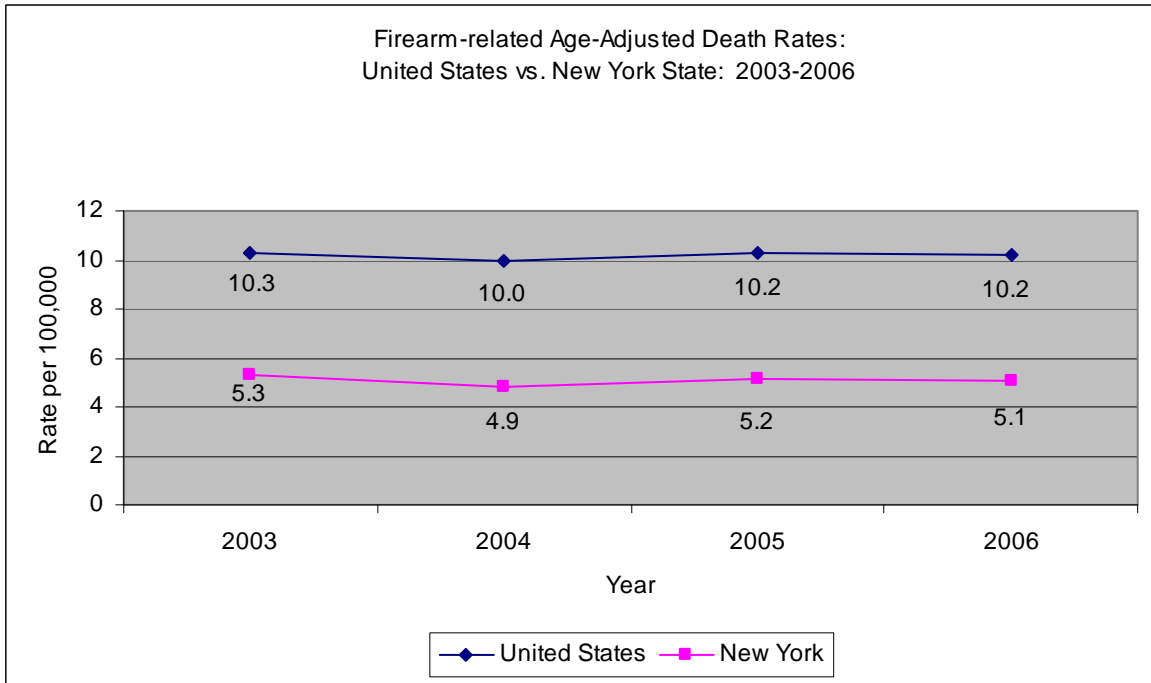
Table 34

Change in Deaths per 100,000 Population for Firearms
(United States vs. New York State: 2003 to 2006)

	Age- Adjusted* Mortality Rate: 2003	Age-Adjusted* Mortality Rate: 2006	Percent Change	p-value for Difference in Percent Change
United States	10.27	10.20	-0.6	<0.0001
New York State	5.31	5.10	-4.1	

¹¹ The CDC database uses the grouping “firearms” which is comparable to the NYSTR’s “gunshot wounds.”

Chart 36



* Adjusted using population of the United States in 2000

DISCUSSION

This report describes and assesses the quality of the New York State trauma system in the years 2003-2006. It is intended for use by trauma clinicians and administrators to identify areas and issues for additional study to enhance systems development and clinical quality improvement. This report also can be used by the public to learn more about the trauma system in New York.

The following descriptive statistics present information (1) on all trauma patients with serious enough injuries to qualify for the NYSTR, even those in non-centers, that are derived from SPARCS, and (2) on patients treated in trauma centers, based on data from the NYSTR.

Descriptive Statistics for All Seriously Injured Trauma Inpatients (from SPARCS)

The following statements apply to all patients with high-risk injuries who qualify for the NYSTR, including patients from non-centers who are not contained in the Registry.

- 37 percent of the patients were in New York City
 - No other region had more than 13 percent of the total
- 90.7 percent were classified as having experienced blunt trauma
 - The most common type of blunt trauma was motor vehicle crashes (29.7 percent) followed by low falls (27.0 percent)
- 8.2 percent were pediatric patients (age<13 years) with blunt injuries
- 5.6 percent of all inpatients qualifying for the Registry were adults who suffered stab wounds
- 3.5 percent were treated for gunshot wounds
- 0.2 percent were pediatric patients with penetrating injuries
- 62.6 percent were males
 - Males 13-24 were the highest percentage of trauma inpatients (13.6 percent), followed by males 25-34 (8.3 percent) and by males 35-44 (8.2 percent)
- The most populous groups among females were the more elderly
 - Ages 75-84 (8.4 percent); ages 85+ (7.6 percent)
- 30,719 were victims of motor vehicle crashes
 - 66.4 percent were males
 - More females than males 65 and older were hospitalized for motor vehicle crashes; whereas, for nearly every age group below 65, more men than women were hospitalized

- 27,006 inpatients were victims of low falls
 - 55.2 percent were women
 - The most populous age/gender groups hospitalized with low falls were women 75-84 (18.0 percent) and 85+ (18.6 percent)
 - These groups were followed by males 75- 84 (10.6 percent) and females 65-74 (7.6 percent)
- 8,810 inpatients were victims of penetrating injuries
 - 91.0 percent were males
 - The vast majority of these males were ages 13-24 (42.5 percent), 25-34 (24.0 percent) and 35-44 (13.4 percent)
- The overall statewide mortality rate was 6.12 percent
 - 5,814 deaths among 94,926 patients
 - Gunshot wounds had the highest inpatient mortality rate (12.2 percent)
 - Next highest mortality rates were “other injuries” (9.4 percent), low falls (8.0 percent), motor vehicle crashes (5.6 percent), and other blunt injuries (5.4 percent)

Descriptive Statistics for All Trauma Inpatients (Treated in Trauma Centers)

The following statements apply to patients in the NYSTR:

- The levels of designation are regional trauma center and area trauma center
 - 79.8 percent treated at regional centers
 - In New York City, all the patients were treated at regional centers because there are no area centers in the region.
 - The region with the next largest percentage of patients treated at regional centers was Western New York (94.6 percent).
 - The region with the smallest percentage treated at regional centers was Suffolk (43.6 percent).
- 44.6 percent were victims of motor vehicle crashes
 - For all eight regions, motor vehicle crashes represented the largest percentage of severe trauma victims.
 - This percentage ranged from a low of 32.7 percent in New York City to a high of 57.4 percent in Central New York.
- For most regions of the state, penetrating injuries (stab wounds and gunshot wounds) represent from 1.8 percent to 8.2 percent of the total patients.
- In New York City, these two mechanisms of injury represent 9.2 percent and 10.3 percent of patients.

Significant Mortality Results by Region and Level

Mortality rates for trauma patients were evaluated and compared according to region of the state and to level of care. Two types of mortality were examined: inpatient mortality and in-hospital mortality (inpatient mortality or death in the emergency department). The mortality data were risk-adjusted to account for differences in patient injury severity.

- There were no significant differences among levels of care for any mechanism of injury or for all mechanisms combined, for either inpatient mortality or in-hospital mortality.
- Among motor vehicle crash inpatients:
 - New York City had a risk-adjusted rate of 7.88 percent that was significantly higher than the statewide rate (6.34 percent)
- Among inpatients treated for other blunt injuries:
 - Patients treated in Northeastern New York had a significantly lower risk-adjusted mortality rate (4.53 percent) than the statewide rate (6.22 percent)
- For all inpatients combined:
 - Western New York inpatients (6.00 percent) and Northeastern New York inpatients (6.12 percent) had risk-adjusted rates that were significantly lower than the statewide rate of 6.98 percent
 - New York City patients had a risk-adjusted rate (7.75 percent) that was significantly higher than the statewide rate of 6.98 percent
- Among motor vehicle crash DIEs/inpatients:
 - Hudson Valley had a risk-adjusted mortality rate (7.21 percent) that was significantly lower than the statewide rate of 8.16 percent.
- For all DIEs/inpatients combined:
 - Northeastern New York had a risk-adjusted rate (7.29 percent) that was significantly lower than the statewide rate of 8.26 percent.
 - Nassau (9.08 percent) had a risk-adjusted rate that was significantly higher than the statewide rate of 8.26 percent.

Individual Hospital Outcomes

- Mortality rate for 53,222 adult inpatients treated at 46 trauma centers was 6.98 percent.
 - Observed mortality rates ranged from 0.00 percent to 9.45 percent.
 - Risk-adjusted mortality rates used to measure performance for all hospitals ranged from 0.00 percent to 13.23 percent.
 - 3 hospitals (Erie County Medical Center, Albany Medical Center and University Hospital Stony Brook) had inpatient mortality rates significantly lower than the statewide rate of 6.98 percent.
 - 5 hospitals (Good Samaritan Hospital Medical Center in Suffolk, St. Barnabas, City Hospital Center at Elmhurst, Jamaica Hospital Medical Center, and SVCMC-Mary Immaculate) had inpatient mortality rates significantly higher than the statewide rate of 6.98 percent.

- Mortality rate for the 53,970 adults treated at 46 centers in the data used to assess performance for deaths in the emergency department and inpatients was 8.26 percent.
 - Observed mortality rates ranged from 0.00 percent to 11.70 percent.
 - Risk-adjusted mortality rates ranged from 0.00 percent to 11.19 percent.
 - 3 hospitals (Mary Imogene Bassett Hospital, Westchester Medical Center and Long Island Jewish Medical Center [pediatric patients only]) had in-hospital mortality rates significantly lower than the statewide rate of 8.26 percent.
 - 2 hospitals (Nassau University Medical Center and Brookdale Hospital Medical Center) had rates that were significantly higher than the statewide rate of 8.26 percent.

Trends in Risk-Adjusted Mortality Rates for Mechanisms of Injury

There was a significant 10 percent decrease by year in risk-adjusted inpatient mortality for motor vehicle crash and for other blunt inpatients. There was a significant 6 percent decrease in risk-adjusted DIE/inpatient mortality for motor vehicle crashes. There were no significant changes in the risk-adjusted mortality in either direction for the other MOIs in the inpatient or in the DIE/inpatient groups.

Comparison of Trauma Mortality Rates Between New York State and the United States

Probably the best gauge of the performance of New York’s trauma system in the past several years is a comparison with national trauma outcomes data from the CDC.¹² The following is a comparison of outcomes in New York and the United States of three groups of trauma patients (motor vehicle crash, falls, and firearm¹³ injuries) that comprise approximately three-quarters of all traumatic injuries contained in New York’s Registry.

- Motor Vehicle Crashes
 - Age-adjusted mortality rate per 100,000 population for MVCs in the United States was 14.97 percent, whereas it was only 8.05 percent in New York State. The difference between these two rates was statistically significant ($p < 0.0001$).
- Falls
 - Mortality rate for falls per 100,000 population in the United States in 2006 was higher than the rate in New York (6.59 vs. 4.97, respectively). This difference was statistically significant ($p < 0.0001$).
- Firearms
 - Age-adjusted mortality rate of firearms per 100,000 population in the United States in 2006 was 10.20, significantly higher than the comparable rate in New York (5.20), ($p < 0.0001$).

¹² Centers for Disease Control and Prevention (CDC), National Center for Injury Prevention and Control (NCIPC), Web-Based Injury Statistics Query and Reporting System (WISQARS), www.cdc.gov/ncipc/wisqars

¹³ The CDC database uses the grouping “firearms” which is comparable to the NYSTR’s “gunshot wounds.”

LIMITATIONS OF THIS REPORT

There are several caveats/limitations of the report that could have an impact on the reported findings.

- (1) There may be other missing variables in the risk-adjustment process. The risk-adjusted outcomes are dependent on the variables used in the risk-adjustment process, and ideally this set of variables is comprehensive in that it contains all patient characteristics that have a bearing on the outcome (in-hospital mortality). However, one of the variables used in the last statewide trauma report (intubation in the ambulance or in the hospital) was not available for use in this report because reporting problems were identified. This risk factor is rarely, if ever, used in the literature as a predictor of trauma patient mortality. Nevertheless, to the extent that it would have been a significant independent predictor of mortality and there were differences across hospitals in intubation rates, hospitals with higher rates would be at a disadvantage in the risk-adjustment process because hospitals with sicker patients have risk-adjusted mortality rates that are lower than their observed rates. By the same token, any other patient risk factors that are not contained in the statistical models but are significant independent predictors of mortality could skew the results. We do not think this threatens the validity of the results because the set of patient risk factors used in the study is quite comprehensive in relation to what has been used in other studies.
- (2) There is no formal auditing process. Ideally, the data reported to the DOH would be audited for accuracy by reviewing medical records, but there are no funds for this expensive and time-consuming process. It should be noted that the American College of Surgeons database is not audited. An advantage of the New York database is that completeness of data (all trauma patients in participating hospitals are included) is assured by matching registry data to SPARCS, New York's hospital discharge database.
- (3) Process outcome links have not yet been established. In a quality improvement initiative of this nature, there is ideally a link established between outcomes and processes of care, whereby effective processes of care can be demonstrated to be more prevalent in hospitals with better outcomes and less prevalent in hospitals with worse outcomes. This has not yet been done, but the Department of Health intends to conduct site visits in the future. Also, it is frequently difficult to establish process-outcome links, in part because it is difficult to identify effective processes. Furthermore, it is more complicated in trauma research because of the heterogeneity of injuries experienced by trauma patients.
- (4) Distance of transport may be a confounding factor. When transport times are longer, the most seriously injured patients are more likely to die in transport rather than in a hospital emergency room or as an inpatient. With shorter transport times, unsalvageable patients may die either in the ED, or shortly after being admitted. Thus, hospitals with shorter transport times may be more likely to have deaths that are reflected in the risk-adjusted mortality rates in this report.

We have attempted to minimize this potential bias by reporting risk-adjusted emergency department/inpatient mortality rates in addition to risk-adjusted inpatient mortality rates.

APPENDICES

Appendix 1

ICD-9-CM Codes for Inclusion in the New York State Trauma Registry (effective January 1, 2007)

800	.00-.06	.09-.16	.19-.26	.29-.36	.39-.46	.49-.56	.59-.66	.69-.76	.79-.86	.89-.96	.99
801	.00-.06	.09-.16	.19-.26	.29-.36	.39-.46	.49-.56	.59-.66	.69-.76	.79-.86	.89-.96	.99
802	.7										
803	.00-.01	.03-.05	.12-.15	.20-.25	.33-.35	.43-.45	.52-.55	.62-.65	.72-.75	.82-.85	.92-.95
804	.03-.05	.10-.16	.19-.26	.29-.36	.39-.46	.49-.56	.59-.66	.69-.76	.79-.86	.89-.96	.99
805	.01-.08	.10-.18	.3	.5	.6	.7	.8				
806	.00-.39	.4	.5	.60-.62	.69-.72	.79	.8	.9			
807	.04-.19	.4	.5	.6							
808	.1	.3	.43	.51-.53	.59	.9					
819	.0	.1									
821	.00-.01	.10-.11	.20-.23	.29-.33	.39						
823	.10	.12	.30	.32	.90	.92					
824	.1	.3	.5	.7	.9						
828	.0	.1									
836	.51-.52	.61-.64	.69								
839	.01-.08	.11-.18	.20-.21	.30-.31	.40-.42	.51-.52	.59	.8			
850	.2	.3	.4								
851	.00-.06	.09-.16	.19-.26	.29-.36	.39-.46	.49-.56	.59-.66	.69-.76	.79-.86	.89-.96	.99
852	.00-.06	.09-.16	.19-.26	.29-.36	.39-.46	.49-.56	.59				
853	.00-.06	.09-.16	.19								
854	.03-.05	.10-.16	.19								
860	.0	.1	.2	.3	.4	.5					
861	.00-.03	.10-.13	.20-.22	.30-.32							
862	.0	.1	.21-.22	.29	.31-.32	.39	.8	.9			
863	.0	.1	.20-.21	.29-.31	.39-.46	.49-.56	.59	.80-.85	.89-.95	.99	
864	.02-.05	.10-.15	.19								
865	.01-.04	.09	.11-.14	.19							
866	.02-.03	.11-.13									
867	.1	.2	.3	.4	.5						
868	.01-.04	.09-.14	.19								
874	.00-.02	.10-.12	.4	.5							
887	.0	.1	.2	.3	.4	.5	.6	.7			
896	.0	.1	.2	.3							
897	.0	.1	.2	.3	.4	.5	.6	.7			
900	.00-.03	.1	.81-.82	.89	.9						
901	.0	.1	.2	.3	.40-.42	.81-.83	.89	.9			
902	.0	.10-.11	.19-.27	.29	.31-.34	.39-.42	.49-.56	.59	.81-.82	.87	.89
903	.01-.02										
904	.0	.1									
925	.1	.2									
927	.00-.03	.09-.11	.21	.8	.9						
928	.00-.01	.10-.11	.20-.21	.8	.9						
950	.0	.1	.2	.3	.9						
952	.00-.19	.2	.3	.4	.8	.9					
953	.0	.1	.2	.4							
954	.8	.9									
955	.8										
956	.0	.8									
958	.4	.90-.93	.99								

Appendix 2

Hospitals Participating in the New York State Trauma Registry in 2003-2006

Region: Western New York

Level Hospital Name

Regional Women's and Children's Hospital of Buffalo
Area Erie County Medical Center
Woman's Christian Association (de-designated¹⁴ September 12, 2005)

Region: Finger Lakes

Level Hospital Name

Regional Strong Memorial Hospital
Area Arnot Ogden Medical Center (de-designated November 1, 2008)
Rochester General Hospital (de-designated December 1, 2004)

Region: Central New York

Level Hospital Name

Regional University Hospital SUNY Health Science Center
Area St. Elizabeth Medical Center
United Health Services Hospitals, Inc.-Wilson Hospital Division

Region: Northeastern New York

Level Hospital Name

Regional Albany Medical Center Hospital
Area Champlain Valley Physicians' Hospital Medical Center
Mary Imogene Bassett Hospital

Region: Hudson Valley

Level Hospital Name

Regional Westchester Medical Center
Area Good Samaritan Hospital of Suffern
Nyack Hospital
Sound Shore Medical Center of Westchester
St. Francis Hospital

¹⁴ Hospitals listed in this report as "de-designated" were designated as a regional or area center at some time during 2003-2006 but are currently not designated as a trauma center.

Hospitals Participating in the New York State Trauma Registry
in 2003-2006

Region: Nassau
 Level Hospital Name

 Regional Nassau University Medical Center
 North Shore University Hospital
 Winthrop University Hospital
 Area Mercy Medical Center (de-designated September 1, 2007)
 South Nassau Communities Hospital

Region: Suffolk
 Level Hospital Name

 Regional University Hospital
 Area Brookhaven Memorial Hospital Medical Center, Inc.
 Good Samaritan Hospital Medical Center
 Huntington Hospital
 Southside Hospital

Region: New York City
 Level Hospital Name

 Regional Bellevue Hospital Center
 Brookdale Hospital Medical Center
 City Hospital Center at Elmhurst
 Harlem Hospital Center
 Jacobi Medical Center
 Jamaica Hospital Medical Center
 Kings County Hospital Center
 Lincoln Medical & Mental Health Center
 Long Island Jewish Medical Center – Schneider’s Children’s Hospital
 Lutheran Medical Center
 New York Hospital at Medical Center of Queens
 New York Presbyterian Hospital - Columbia Presbyterian Center
 New York Presbyterian Hospital at New York Weill Cornell Center
 SVCMC-Mary Immaculate (closed February 14, 2009)
 SVCMC-St. Vincent’s Manhattan
 Richmond University Medical Center
 St. Barnabas Hospital
 St. Luke’s Roosevelt Hospital at St. Luke’s Hospital Division
 Staten Island University Hospital-North

Appendix 3

Independent Risk Factors for Inpatient Mortality for Motor Vehicle Crash Inpatients in New York State: 2003 - 2006

Risk Factor	Parameter Estimate	p-value	Odds Ratio
Male gender	0.396691	<.0001	1.487
Transfer after admission to referring hospital	-0.586026	0.0011	0.557
Pedestrian *	0.405303	<.0001	1.500
Motor response on arrival at final hospital = 1	1.673603	<.0001	5.331
Motor response on arrival at final hospital = 2,3,4,5	1.263105	<.0001	3.536
Age	0.028193	<.0001	1.029
Age greater than 60	0.053742	<.0001	1.055
Systolic blood pressure on arrival at the final hospital	-0.030955	<.0001	0.970
Systolic blood pressure squared	0.000079330	<.0001	1.000
ICISS ¹⁵	-5.718108	<.0001	0.003

Intercept = 1.374740

C = 0.938

*Odds relative to non-pedestrians

¹⁵ For an explanation of ICISS, see Footnote #5.

Appendix 4

Independent Risk Factors for Inpatient Mortality for Motor Vehicle Crash Deaths in the Emergency Department and Inpatients in New York State: 2003 - 2006

Risk Factor	Parameter Estimate	p-value	Odds Ratio
Male gender	0.317407	<.0001	1.374
Transfer from emergency department of referring hospital *	-0.305676	0.0021	0.737
Transfer after admission to referring hospital	-0.971136	<.0001	0.379
Pedestrian	0.378394	<.0001	1.460
Eye response on arrival at final hospital = 1	1.438405	<.0001	4.214
Eye response on arrival at final hospital = 2	1.000079	<.0001	2.718
Eye response on arrival at final hospital = 3	0.502456	0.0023	1.653
Motor response on arrival at final hospital = 1,2,3	2.154265	<.0001	8.622
Motor response on arrival at final hospital = 4,5	1.367587	<.0001	3.926
Age	0.016376	<.0001	1.017
Age greater than 50	0.051924	<.0001	1.053
Systolic blood pressure on arrival at the final hospital	-0.038197	<.0001	0.963
Systolic blood pressure squared	0.000093647	<.0001	1.000

Intercept = -1.983847

C = 0.913

*Odds relative to patients not transported from the emergency department of another hospital

Appendix 5

Independent Risk Factors for Inpatient Mortality for
Other Blunt Inpatients in New York State: 2003 - 2006

Risk Factor	Parameter Estimate	p-value	Odds Ratio
Male gender	0.477707	<.0001	1.612
Transfer from emergency department of referring hospital *	-0.376323	0.0215	0.686
Fall from stairs, steps, ladder, scaffolding; out of building or structure; into hole or opening; from playground equipment, cliff, high place	0.327136	0.0209	1.387
Motor response on arrival at final hospital = 1,2,3	2.502556	<.0001	12.214
Motor response on arrival at final hospital = 4	1.825854	<.0001	6.208
Motor response on arrival at final hospital = 5	1.087840	<.0001	2.968
Age	-0.024792	0.0801	0.976
Age squared	0.000728	<.0001	1.001
Systolic blood pressure on arrival at the final hospital	-0.024382	<.0001	0.976
Systolic blood pressure squared	0.000068626	0.0002	1.000
ICISS ¹⁶	-5.466776	<.0001	0.004

Intercept = 0.874669

C = 0.945

*Odds relative to patients not transported from the emergency department of another hospital

¹⁶ For an explanation of ICISS, see Footnote #5.

Appendix 6

Independent Risk Factors for Inpatient Mortality for Other Blunt Deaths in the Emergency Department and Inpatients in New York State: 2003 - 2006

Risk Factor	Parameter Estimate	p-value	Odds Ratio
Male gender	0.443571	<.0001	1.558
Transfer from emergency department of referring hospital *	-0.488820	0.0008	0.613
Fall from stairs, steps, ladder, scaffolding; out of building or structure; into hole or opening; from playground equipment, cliff, high place	0.407132	0.0005	1.503
Eye response on arrival at final hospital = 1,2,3	0.797721	<.0001	2.220
Motor response on arrival at final hospital = 1,2,3	3.238909	<.0001	25.506
Motor response on arrival at final hospital = 4	1.931975	<.0001	6.903
Motor response on arrival at final hospital = 5	1.191647	<.0001	3.292
Age	0.034726	<.0001	1.035
Age greater than 65	0.053710	<.0001	1.055
Systolic blood pressure on arrival at the final hospital	-0.027554	<.0001	0.973
Systolic blood pressure squared	0.000078109	<.0001	1.000

Intercept = -4.485425

C = 0.920

*Odds relative to patients not transported from the emergency department of another hospital

Appendix 7

Independent Risk Factors for Inpatient Mortality for
Low Fall Inpatients in New York State: 2003 – 2006

Risk Factor	Parameter Estimate	p-value	Odds Ratio
Male gender	0.597932	<.0001	1.818
Eye response on arrival at final hospital = 1,2,3	0.505347	0.0135	1.658
Motor response on arrival at final hospital = 1,2	2.039095	<.0001	7.684
Motor response on arrival at final hospital = 3,4,5	0.946837	<.0001	2.578
Age	0.049608	<.0001	1.050
ICISS ¹⁷	-0.300605	0.8118	0.740
ICISS squared	-4.456219	<.0001	0.012

Intercept = - 2.989705

C = 0.847

¹⁷ For an explanation of ICISS, see Footnote #5.

Appendix 8

Independent Risk Factors for Inpatient Mortality for Low Fall
Deaths in the Emergency Department and Inpatients in New York State:
2003 - 2006

Risk Factor	Parameter Estimate	p-value	Odds Ratio
Male gender	0.621585	<.0001	1.862
Eye response on arrival at final hospital = 1,2,3	0.822787	0.0012	2.277
Motor response on arrival at final hospital = 1,2,3	2.661178	<.0001	14.313
Motor response on arrival at final hospital =4	1.552816	0.0002	4.725
Motor response on arrival at final hospital =5	0.937399	<.0001	2.553
Age	0.048018	<.0001	1.049

Intercept = -6.735358

C = 0.801

Appendix 9

Independent Risk Factors for Inpatient Mortality for
Stab Wound Inpatients in New York State: 2003 - 2006

Risk Factor	Parameter Estimate	p-value	Odds Ratio
Motor response on arrival at final hospital = 1,2,3	2.737416	<.0001	15.447
Motor response on arrival at final hospital = 4,5	1.255502	0.0251	3.510
Systolic blood pressure on arrival at the final hospital	-0.009830	0.0101	0.990
ICISS ¹⁸	-5.609640	<.0001	0.004

Intercept = 0.972247

C = 0.928

¹⁸ For an explanation of ICISS, see Footnote #5.

Appendix 10

Independent Risk Factors for Inpatient Mortality for Stab Wound
Deaths in the Emergency Department and Inpatients in New York State:
2003- 2006

Risk Factor	Parameter Estimate	p-value	Odds Ratio
Motor response on arrival at final hospital = 1,2,3	3.489439	<.0001	32.768
Motor response on arrival at final hospital = 4,5	1.461510	0.0046	4.312
Age	0.043743	<.0001	1.045
Systolic blood pressure on arrival at the final hospital	-0.041724	<.0001	0.959
Systolic blood pressure squared	0.000129	0.0049	1.000

Intercept = -3.199986

C = 0.909

Appendix 11

Independent Risk Factors for Inpatient Mortality for Gunshot Wound Inpatients in New York State: 2003 - 2006

Risk Factor	Parameter Estimate	p-value	Odds Ratio
Motor response on arrival at final hospital = 1	2.703346	<.0001	14.930
Motor response on arrival at final hospital = 2,3	2.094018	<.0001	8.117
Motor response on arrival at final hospital = 4,5	0.930953	<.0001	2.537
Age	0.029720	<.0001	1.030
Systolic blood pressure on arrival at the final hospital	-0.033330	<.0001	0.967
Systolic blood pressure squared	0.000089668	0.0077	1.000
ICISS ¹⁹	-2.622067	0.0394	0.073
ICISS squared	-2.481947	0.0310	0.084

Intercept = 2.160960
C = 0.943

¹⁹ For an explanation of ICISS, see Footnote #5.

Appendix 12

Independent Risk Factors for Inpatient Mortality for Gunshot Wound
Deaths in the Emergency Department and Inpatients in New York State:
2003 - 2006

Risk Factor	Parameter Estimate	p-value	Odds Ratio
Transfer after admission to referring hospital	-1.473660	0.171	0.229
Motor response on arrival at final hospital = 1	3.836783	<.0001	46.376
Motor response on arrival at final hospital = 2,3	3.529327	<.0001	34.101
Motor response on arrival at final hospital = 4,5	1.835201	<.0001	6.266
Age	0.024442	<.0001	1.025
Systolic blood pressure on arrival at the final hospital	-0.040905	<.0001	0.960
Systolic blood pressure squared	0.000112	0.0001	1.000

Intercept = -0.435104

C = 0.905