

**The New York State Trauma System:
2007-2009
Executive Summary**

New York State Department of Health

Table of Contents

EXECUTIVE SUMMARY	iii
Demographics and Other Descriptive Statistics	iii
Descriptive Statistics for All Seriously Injured Trauma Inpatients in SPARCS.....	iii
Descriptive Statistics for All Seriously Injured Trauma Inpatients in the NYSTR	xi
Significant Mortality Results by Region and Level of Trauma Center Designation.....	xii
Levels of Trauma Center Designation.....	xii
Regional Differences: Inpatient Mortality.....	xii
Individual Hospital Outcomes	xii
Recent Changes in Trauma Mortality in New York	xiii
Trends in Risk-Adjusted Mortality Rates for Mechanisms of Injury	xv
Comparison of Recent Trauma Mortality Rates in New York and the United States	xv
Motor Vehicle Crashes.....	xvi
Falls.....	xvi
Firearms	xvi

EXECUTIVE SUMMARY

This report describes and assesses the quality of the New York State trauma system in the years 2007-2009. It is intended for use by trauma clinicians and administrators to identify important 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 State 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

When it was initially established in 1993, the New York State Trauma Registry (NYSTR) was designed to include data on trauma inpatients who are 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 set of ICD-9-CM diagnosis codes that define these patients). These data were collected from all hospitals in New York State – regional and area trauma centers as well as from non-centers; however, since 1999 the NYSTR contains complete data for trauma centers only. This is the reason the current report combines data from the NYSTR with SPARCS data.

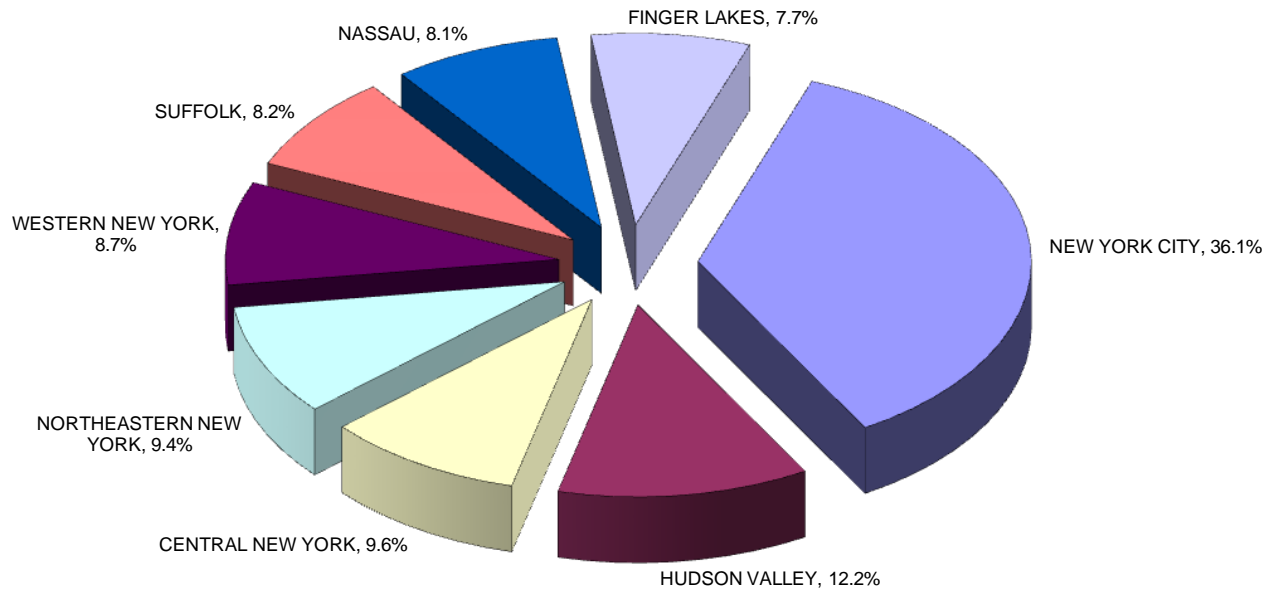
The following descriptive statistics presents information (1) on all trauma patients with serious enough injuries to qualify for the Registry, even those in non-centers, that are derived from SPARCS, and (2) on patients treated in trauma centers, based on data from the NYSTR.

Descriptive Statistics for All Seriously Injured Trauma Inpatients in SPARCS

According to New York's SPARCS data, the total 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 2009. A total of 151,855 trauma patients were admitted to New York State hospitals in 2009, a decrease of 1.4 percent from the 154,054 trauma inpatients admitted in 1990. The number of patients qualifying for inclusion in the NYSTR in 2009 was 28,602 or 4,038 more patients than in 1990 (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 about 16 percent.

The following data apply to all patients with high-risk injuries that qualify for the NYSTR in the time period 2007-2009, including patients from non-centers who are not contained in the Registry. About 36 percent of the patients were in New York City. No other region had more than 13 percent of the total.

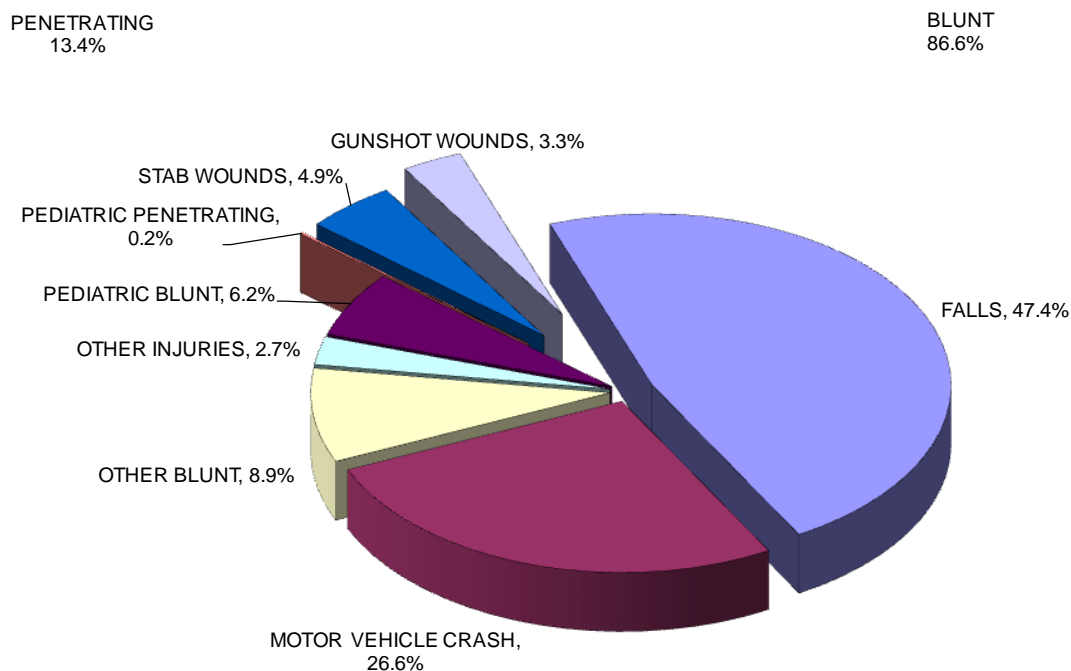
Regional Distribution of Severe Trauma Inpatients: 2007-2009



SOURCE: 2007-2009 SPARCS FILES

Of the inpatients qualifying for the 2007-2009 Registry, 86.6 percent were classified as having experienced blunt trauma. The remaining 13.4 percent were classified as victims of penetrating trauma. The most common type of blunt trauma was falls (47.4 percent of all trauma patients), followed by motor vehicle crash (26.6 percent of all trauma patients). A total of 6.2 percent of the patients were pediatric patients (age less than 13 years) experiencing blunt injuries. A total of 4.9 percent of all inpatients qualifying for the Registry were adults who suffered stab wounds; 3.3 percent were treated for gunshot wounds. Only 0.2 percent of all 2007-2009 patients were pediatric patients with penetrating injuries (stab wounds or gunshot wounds).

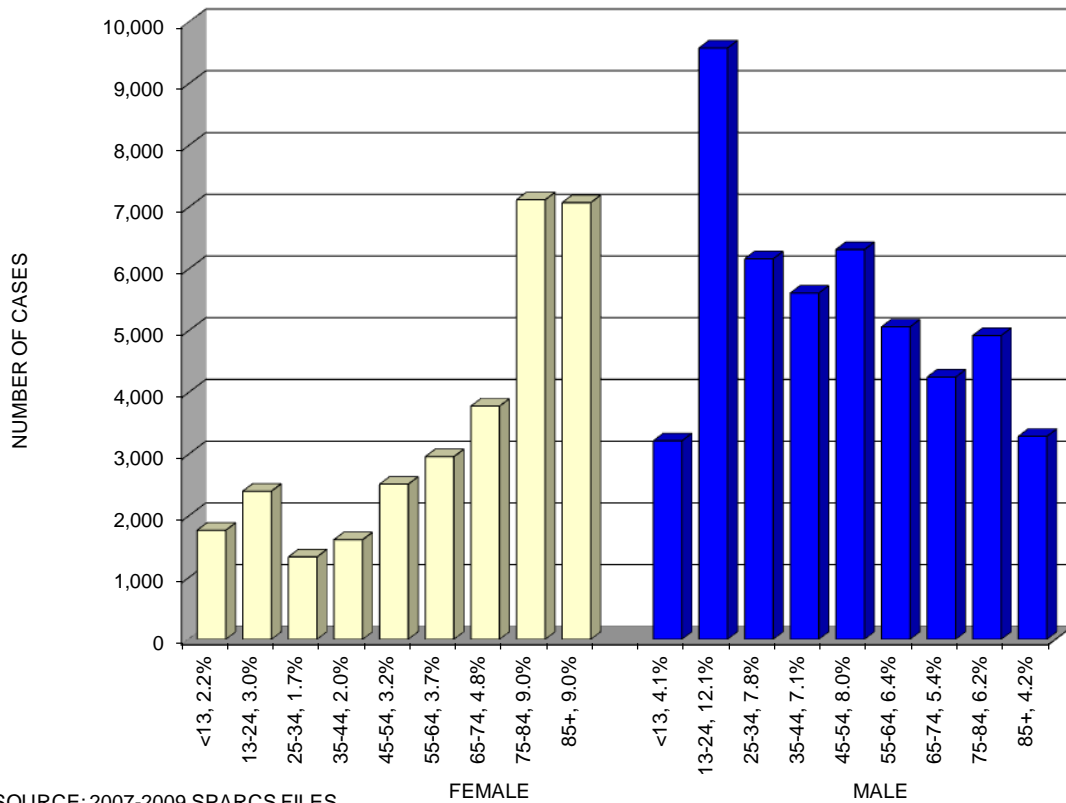
Mechanism of Injury of Severe Trauma Inpatients: 2007-2009



SOURCE: 2007-2009 SPARCS FILES

Among the inpatients qualifying for the 2007-2009 Registry, 61.3 percent were males. The age group among males with the highest percentage of trauma inpatients was 13-24 (12.1 percent), followed by males 45-54 (8.0 percent of all patients) and by males 25-34 (7.8 percent of all patients). Whereas, the most common age ranges for men in the Registry were the younger groups, the most populous groups among females were the more elderly with the two groups of ages 75-84 and ages 85 and higher, each comprising 9.0 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 to be in the Registry than younger women.

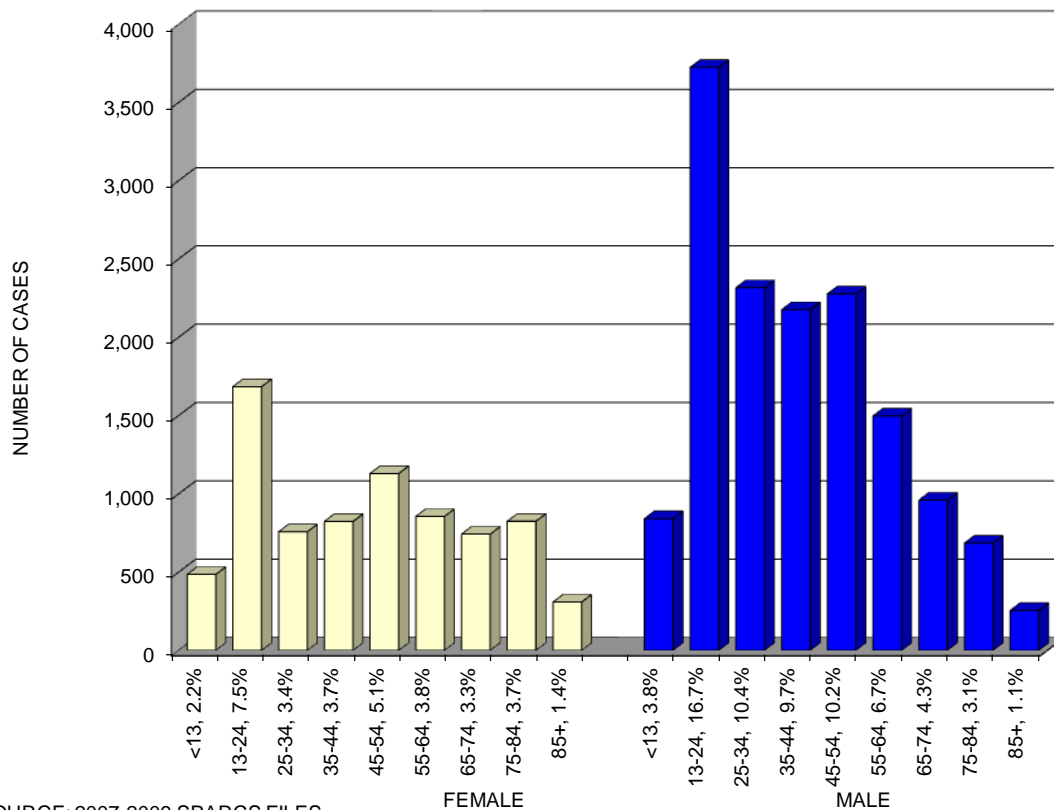
Age and Gender of Severe Trauma Inpatients: 2007-2009



SOURCE: 2007-2009 SPARCS FILES

Of the 22,334 inpatients qualifying for the 2007-2009 Registry who were victims of motor vehicle crashes, 65.9 percent were males. Females and males 75 and older were hospitalized victims of motor vehicle crashes at approximately the same rates; whereas, for nearly every age group below 75, more men than women were hospitalized subsequent to motor vehicle crashes.

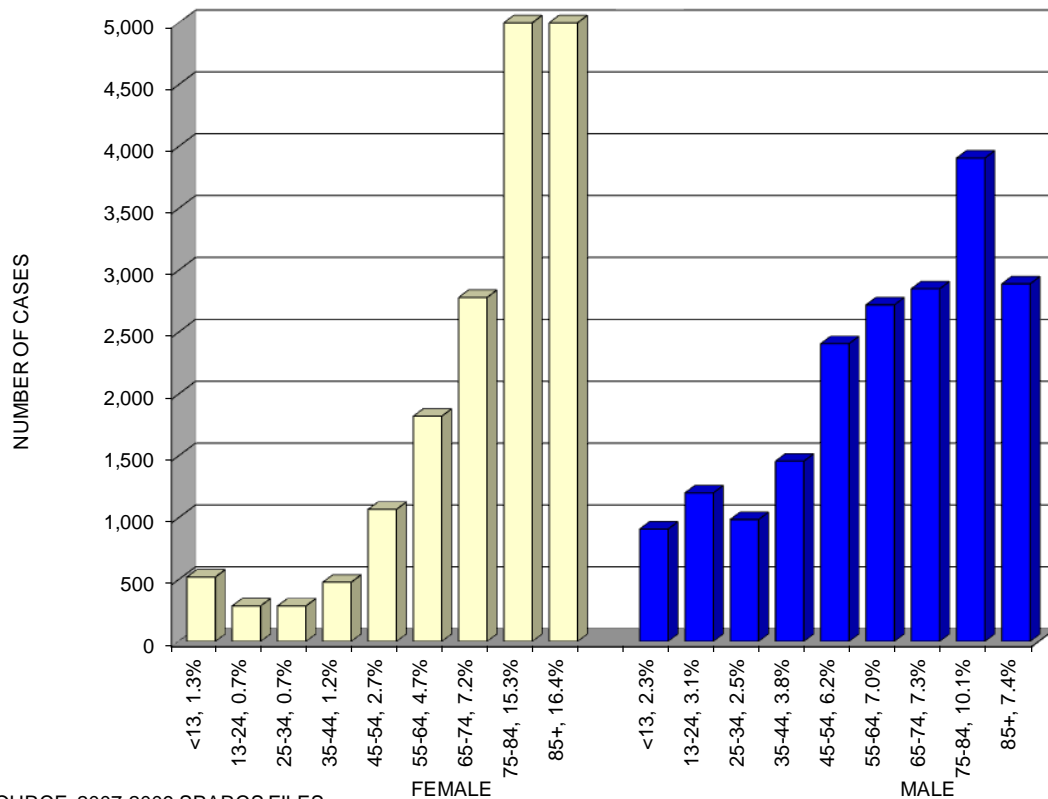
Age and Gender of Motor Vehicle Crash Severe Trauma Inpatients: 2007-2009



SOURCE: 2007-2009 SPARCS FILES

For the 38,851 inpatients who were victims of falls, 50.3 percent were women. By far the most populous age/gender groups hospitalized with falls were women age 75-84 and 85 and above, who comprised 15.3 percent and 16.4 percent of falls patients. These groups were followed by males between 75 and 84 (10.1 percent of all patients) and males age 85 and above (7.4 percent of all patients). The number of females hospitalized with falls rose with age, with the largest increases occurring at ages 55, 65 and 75. The relationship with age was not as accentuated among men, with men of lower ages hospitalized more often with falls than women of the same age, and not nearly as many elderly men hospitalized with falls. This phenomenon is likely a result of greater longevity among women.

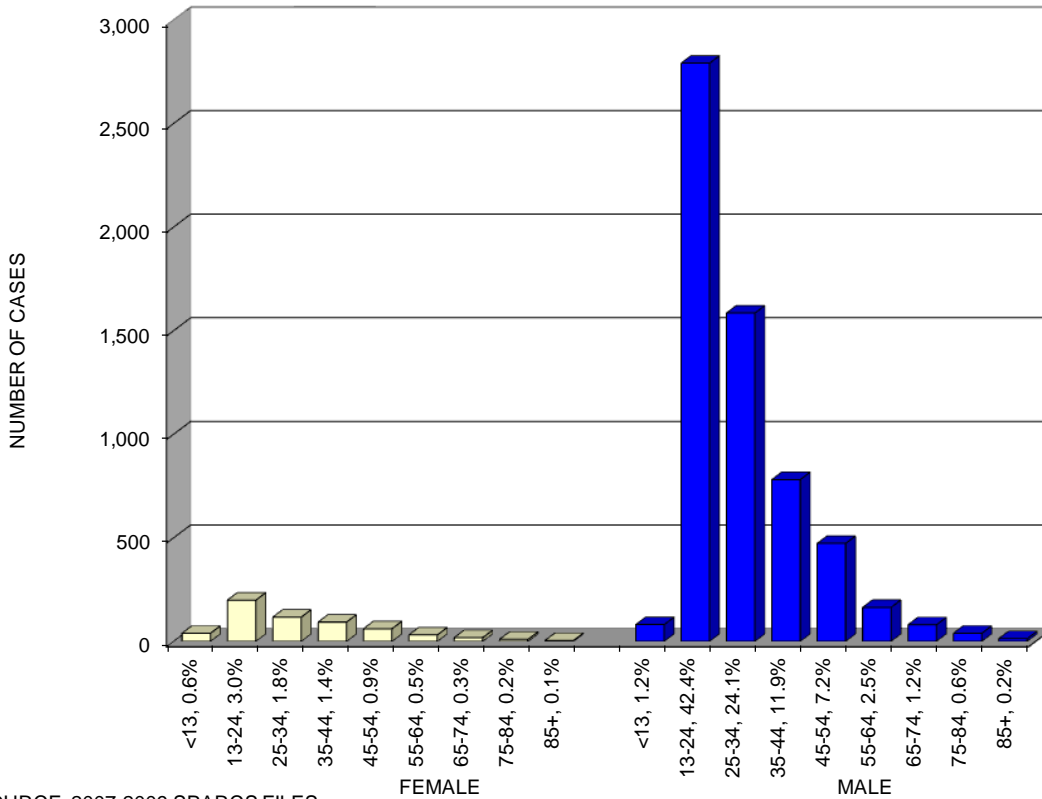
Age and Gender of Falls Severe Trauma Inpatients: 2007-2009



SOURCE: 2007-2009 SPARCS FILES

Of the 6,579 inpatients qualifying for the 2007-2009 Registry who were victims of penetrating injuries, 91.3 percent were males. The vast majority of these males were between ages 13 and 24 (42.4 percent of all patients), 25-34 (24.1 percent of all patients), and 35-44 (11.9 percent of all patients). The most common age group among women who were hospitalized victims of penetrating injuries was 13 to 24 (3.0 percent of all patients).

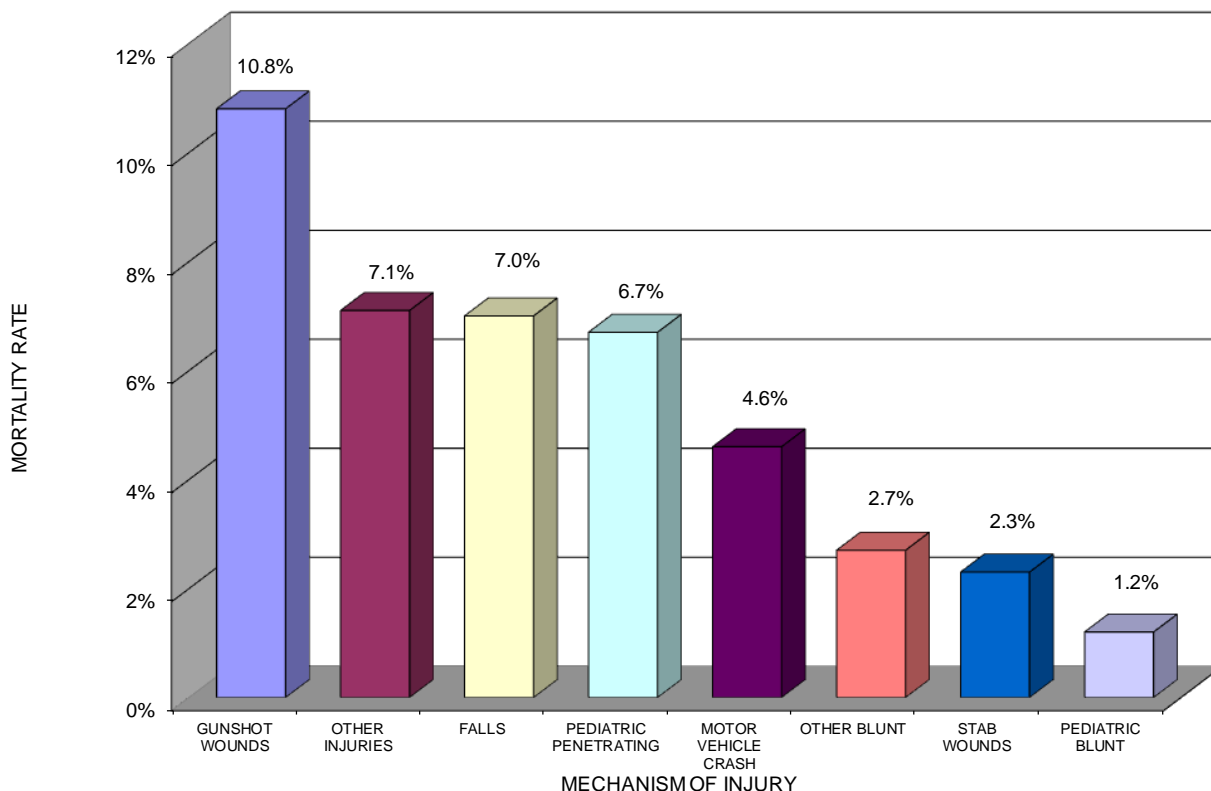
Age and Gender Penetrating Injuries Severe Trauma Inpatients: 2007-2009



SOURCE: 2007-2009 SPARCS FILES

The overall statewide mortality rate for inpatients qualifying for inclusion in the 2007-2009 Registry was 5.5 percent (4,357 deaths among 78,959 patients). The mechanism of injury with the highest inpatient mortality rate among these patients was gunshot wounds, with a 10.8 percent mortality rate. The mechanisms of injury with the next highest mortality rates were “other injuries” (7.1 percent), falls (7.0 percent), motor vehicle crashes (4.6 percent), and other blunt injuries (2.7 percent). The mechanism of injury with the lowest mortality rate among adult trauma inpatients qualifying for the Registry was stab wounds (2.3 percent). The mortality rates for pediatric patients were 6.7 percent for penetrating injuries and 1.2 percent for blunt injuries.

Observed Mortality Rate by Mechanism of Injury
for Severe Trauma Inpatients: 2007-2009



SOURCE: 2007-2009 SPARCS FILES

**Descriptive Statistics for All Seriously Injured Trauma Inpatients in the NYSTR
(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, fall, other blunt injury, gunshot wound, stab wound). Among the inpatients in the models used to assess hospital performance, 82.4 percent were treated at regional centers while 17.6 percent were treated at area trauma centers. In Western New York, the Finger Lakes, and New York City, 100 percent of the patients were treated at regional centers since there are no area centers in those regions. The region with the next largest percent of patients treated at regional centers was Nassau with 88.8 percent. The region with the smallest percent of patients treated at regional centers was Suffolk with 40.7 percent.

**Distribution of New York State Inpatients by Region and Level
Five Adult Mechanisms of Injury: 2007 – 2009**

Region	Regional Trauma Centers n (%)	Area Trauma Centers n (%)	Total
Western	3,544 (100.0%)	0 (0.0%)	3,544 (7.2%)
Finger Lakes	3,222 (100.0%)	0 (0.0%)	3,222 (6.6%)
Central	2,903 (62.0%)	1,777 (38.0%)	4,680 (9.6%)
Northeastern	3,428 (84.1%)	648 (15.9%)	4,076 (8.3%)
Hudson Valley	2,955 (55.1%)	2,405 (44.9%)	5,360 (11.0%)
Nassau	4,924 (88.8%)	623 (11.2%)	5,547 (11.3%)
Suffolk	2,163 (40.7%)	3,158 (59.3%)	5,321 (10.9%)
New York City	17,190 (100.0%)	0 (0.0%)	17,190 (35.1%)
Total	40,329 (82.4%)	8,611 (17.6%)	48,940 (100.0%)

Among the inpatients in the models used to assess hospital performance, 39.7 percent were victims of falls. This percentage ranged from a low of 29.5 percent in Western New York to a high of 53.5 percent in Nassau. Among the eight regions in New York State, penetrating injuries (stab wounds and gunshot wounds) ranged from 4.7% (Nassau) to 21.6% (New York City) of the total patients.

**Distribution of New York State Inpatients
by Region and Five Adult Mechanisms of Injury: 2007 – 2009**

Region	Motor Vehicle Crashes n (%)	Other Blunt Injuries n (%)	Falls n (%)	Stab Wounds n (%)	Gunshot Wounds n (%)	Total
Western	1,617 (45.6%)	361 (10.2%)	1,044 (29.5%)	239 (6.7%)	283 (8.0%)	3,544 (7.2%)
Finger Lakes	1,555 (48.3%)	250 (7.8%)	1,061 (32.9%)	188 (5.8%)	168 (5.2%)	3,222 (6.6%)
Central	2,223 (47.5%)	412 (8.8%)	1,696 (36.2%)	209 (4.5%)	140 (3.0%)	4,680 (9.6%)
Northeastern	1,865 (45.8%)	360 (8.8%)	1,594 (39.1%)	155 (3.8%)	102 (2.5%)	4,076 (8.3%)
Hudson Valley	2,551 (47.6%)	453 (8.5%)	2,067 (38.6%)	214(4.0%)	75 (1.4%)	5,360 (11.0%)
Nassau	1,948 (35.1%)	367 (6.6%)	2,969 (53.5%)	152 (2.7%)	111 (2.0%)	5,547 (11.3%)
Suffolk	2,258 (42.4%)	428 (8.0%)	2,362 (44.4%)	179 (3.4%)	94 (1.8%)	5,321 (10.9%)
New York City	4,661 (27.1%)	2,165 (12.6%)	6,644 (38.7%)	2,155 (12.5%)	1,565 (9.1%)	17,190 (35.1%)
Total	18,678 (38.2%)	4,796 (9.8%)	19,437 (39.7%)	3,491 (7.1%)	2,538 (5.2%)	48,940 (100.0%)

Significant Mortality Results by Region and Level of Trauma Center Designation

Inpatient mortality rates for trauma patients were evaluated and compared according to region of the state (Western New York, Finger Lakes, Central New York, Northeastern New York, Hudson Valley, Nassau, Suffolk, New York City) and according to level of trauma center designation (regional trauma center, area trauma center). The 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), intubation status, 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.

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 inpatient mortality.

Regional Differences: Inpatient Mortality

Among motor vehicle crash inpatients, the overall inpatient mortality rate was 5.17 percent. Trauma inpatients in New York City had a risk-adjusted rate of 6.03 percent that was significantly higher than the statewide rate.

Among inpatients treated for gunshot wounds, the overall inpatient mortality rate was 11.82 percent. Inpatients treated in Western New York had a significantly lower risk-adjusted mortality rate (7.76 percent).

There were no significant differences among regions for any of the other mechanisms of injury (falls, other blunt injuries, stab wounds).

For all inpatients combined, the inpatient mortality rate was 6.19 percent. Western New York inpatients (5.40 percent), Finger Lakes inpatients (5.28 percent) and Northeastern New York inpatients (5.44 percent) had risk-adjusted rates that were significantly lower than this, and Nassau inpatients (6.98 percent) and New York City inpatients (6.66 percent) had risk-adjusted rates that were significantly higher than the statewide rate of 6.19 percent.

Individual Hospital Outcomes

The overall mortality rate for the 48,940 adult inpatients treated at all 40 trauma centers in the data used to assess performance for inpatients was 6.19 percent. Observed mortality rates ranged from 0.00 percent to 8.86 percent. The risk-adjusted mortality rates used to measure performance for all hospitals ranged from 0.00 percent to 8.88 percent.

Four hospitals (Albany Medical Center Hospital, Stony Brook University Medical Center, Strong Memorial Hospital, and New York-Presbyterian/Weill Cornell Medical Center) had inpatient risk-adjusted mortality rates that were significantly lower than the statewide mean. Two hospitals (Lutheran Medical Center and Jamaica Hospital Medical Center) had inpatient risk-adjusted mortality rates that were significantly higher than the statewide mean.

It should be noted that previous reports on New York State's trauma system included risk-adjustment models that predicted in-hospital mortality in addition to models that predicted inpatient mortality. In-hospital mortality includes deaths in the emergency department as well as inpatient deaths. The in-hospital mortality models were not developed for the time period 2007-2009 since it

could not be confirmed that all deaths in the emergency department (DIEs) were reported to the NYSTR from the New York City region. Confirmation was impossible due to lack of access to the NYC vital statistics file.

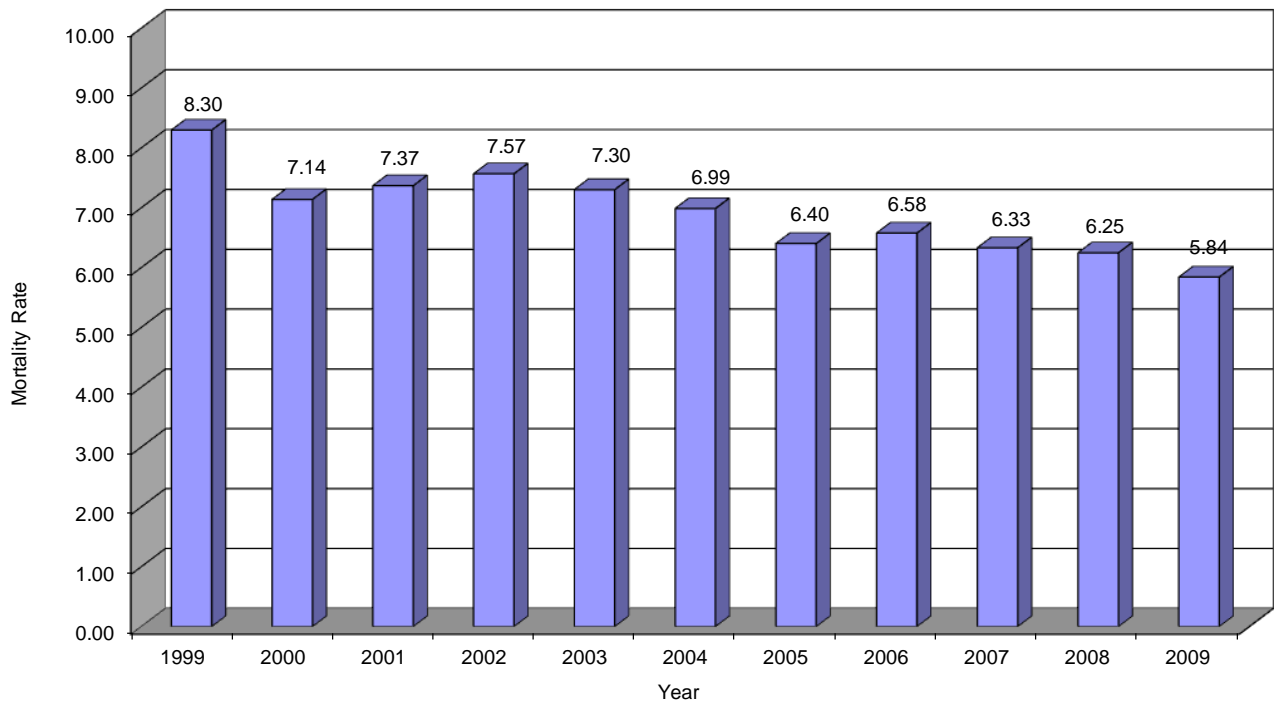
A region in which patients move more quickly from the emergency department to the inpatient setting or from the scene to the inpatient setting (e.g., because of shorter travel times) is likely to have a higher risk-adjusted inpatient mortality rate since more deaths are counted as inpatient deaths. Thus, the quicker transition of patients to the inpatient setting can result in a bias against the hospital/region.

Consequently, a caveat regarding the identification of regions and hospitals that were identified as outliers in either direction is that it would have been desirable to determine if they had remained an outlier if in-hospital mortality had been used as a second outcome measure.

Recent Changes in Trauma Mortality in New York

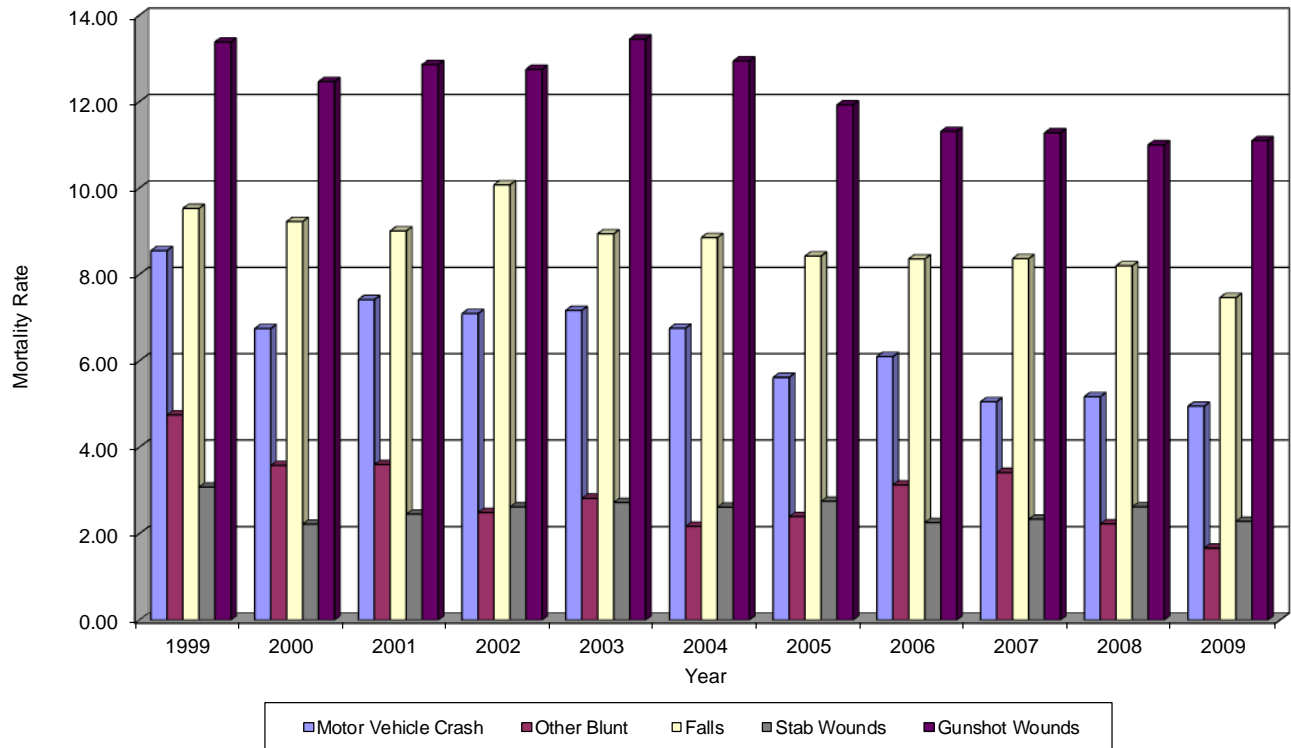
For the five adult mechanisms of injury (motor vehicle crashes, falls, other blunt injuries, stab wounds, gunshot wounds) combined, the inpatient mortality rate decreased from 8.30 percent in 1999 to 5.84 percent in 2009.

Mortality Rate in Trauma Centers
Five Adult Mechanisms of Injury (combined)
Severe Injuries
1999-2009 SPARCS

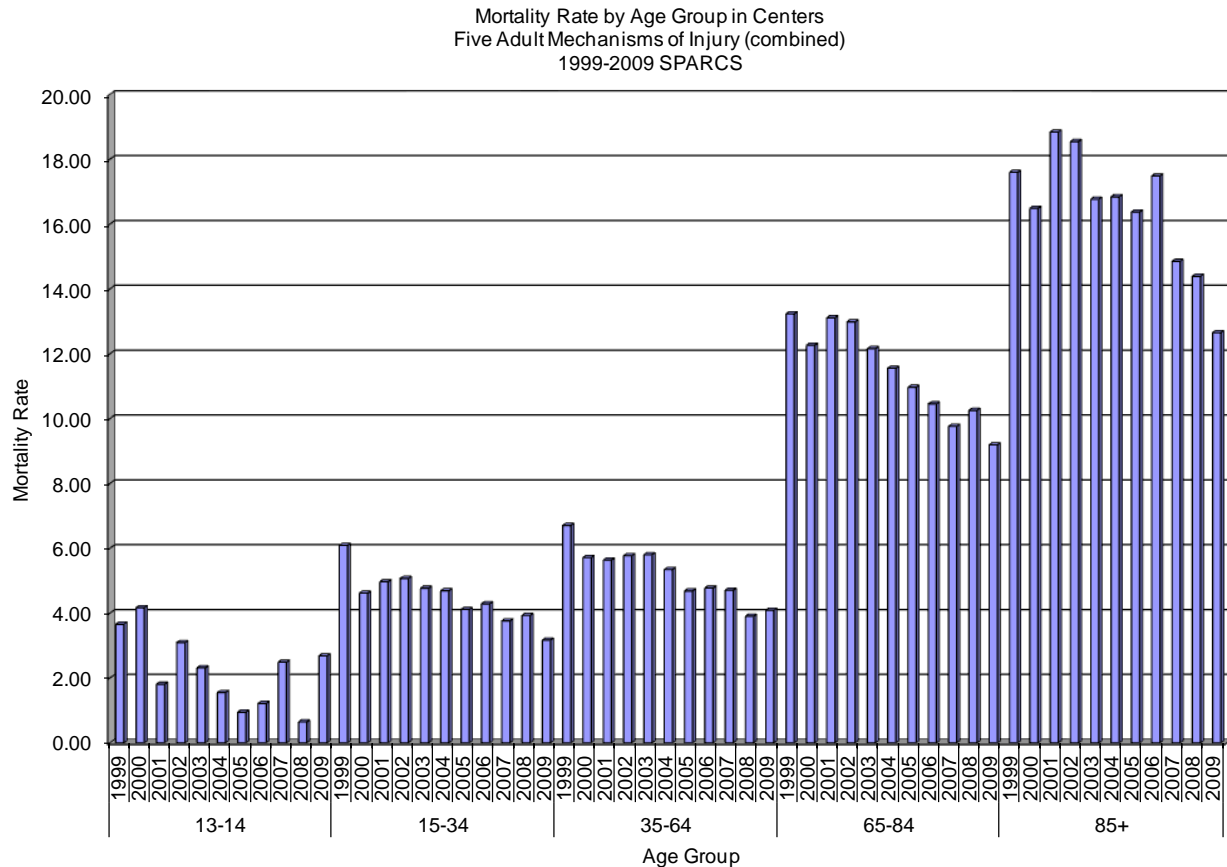


There were substantial decreases in mortality between 1999 and 2009 for patients with gunshot wounds (from 13.38 percent to 11.10 percent), falls (from 9.53 percent to 7.47 percent), stab wounds (from 3.08 percent to 2.29 percent), motor vehicle crashes (from 8.55 percent to 4.95 percent) and other blunt injuries (from 4.75 percent to 1.67 percent).

Mortality Rate in Trauma Centers
 Motor Vehicle Crash, Other Blunt, Falls, Stab Wounds, Gunshot Wounds
 1999-2009 SPARCS



As is clear in the following chart, this reduction in crude mortality¹ has occurred for all age groups over this time period.



Trends in Risk-Adjusted Mortality Rates for Mechanisms of Injury

Over the time period of 2007-2009, there was a significant 8.7% decrease in risk-adjusted inpatient mortality for falls inpatients. There was a significant 36.1% decrease in risk-adjusted inpatient mortality for other blunt inpatients. There were no significant changes in the risk-adjusted mortality in either direction for the other inpatient MOIs.

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.² 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 firearms³) that comprise approximately three-quarters of all traumatic injuries contained in New York’s Registry.

¹ Crude mortality is the total number of deaths divided by the total number of patients.

² Center 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.

³ New York State analyzes a group of injuries labeled “gunshot wounds” that is comparable to the CDC’s grouping of “firearms”.

Motor Vehicle Crashes

The rate of motor vehicle crash (MVC) deaths per 100,000 population in the United States in 2007 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 14.39 percent, compared to 7.41 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 15.32 per 100,000 in 2003 to 14.39 per 100,000 in 2007, a decrease of 6.0 percent. During the same time period in New York, the mortality rate per 100,000 changed from 8.05 to 7.41, a decrease of 8.0 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 2007 was higher than the rate in New York (7.08 vs. 5.37, respectively). This difference was statistically significant ($p < 0.0001$).

The mortality rate per 100,000 population in the United States rose from 5.87 in 2003 to 7.08 in 2007, an increase of 20.5 percent. During the same time period, the rate in New York rose from 5.02 to 5.37, an increase of 7.0 percent. Both the United States' and New York's rates 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 2007 was 10.23, significantly higher than the comparable rate in New York (5.00) ($p < 0.0001$).

The mortality rate for firearms per 100,000 population in the United States decreased slightly from 10.28 in 2003 to 10.23 in 2007, a decrease of 0.5 percent. During the same time period, the rate decreased in New York from 5.32 to 5.00, a decrease of 6.1 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.