The New York State Trauma System:

1999-2002

New York State Department of Health

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EXECUTIVE SUMMARY

This is the third report based on the New York State Trauma Registry. The first report was based on data from 1994-1995, the second report was based on data from 1996-1998, and this report includes data from 1999-2002.

The report 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. Also, it can be used by the public to learn more about the trauma system in New York.

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 that 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). These data were collected from all hospitals in New York State – regional and area trauma centers as well as from community hospitals. However, since 1999, the NYSTR contains complete data for trauma centers only.

The following descriptive statistics present information (1) on all trauma patients with serious enough injuries to qualify for the Registry, even those in noncenters, that are derived from New York's Statewide Planning and Research Cooperative System (SPARCS), the acute care database in the state that contains data on all inpatient discharges, 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 New York's SPARCS data, the total number of trauma patients admitted to New York State hospitals declined between the years 1990 and 1999 and then increased between 1999 and 2004. A total of 147,930 patients were admitted to New York State hospitals in 2004, a decrease of 4.0% from the 154,054 trauma inpatients admitted in 1990. The number of patients qualifying for inclusion in the New York State Trauma Registry in 2004 was 25,803, approximately 1,300 more patients than in 1990 (24,564 patients).

The following data apply to all 80,011 patients qualifying for the NYSTR in the time period 1999-2002. Approximately 36% of the patients were in New York City. No other region had more than 13% of the total. The regions outside of New York City with the most patients were Hudson Valley (12.5%) and Central New York (10.2%). The regions with the fewest patients were Nassau (7.1%) and Suffolk (7.2%). Of the inpatients qualifying for the 1999-2002 Registry, 89.9% were classified as having experienced blunt trauma. The remaining 10.1% were classified as victims of penetrating trauma. The most common type of blunt trauma was motor vehicle crashes (32.4% of all trauma patients), followed by low falls (20.6% of all trauma patients). A total of 9.9% of the patients were pediatric patients (age less than 13 years) experiencing blunt injuries. A total of 6.0% of all adult inpatients qualifying for the Registry received stab wounds and 3.9% were treated for gunshot wounds. Only 0.3% of all 1999-2002 patients were pediatric patients with penetrating injuries (stab wounds or gunshot wounds).

Among the inpatients qualifying for the 1999-2002 Registry, 63.5% were males. The age group among males with the highest percentage of trauma inpatients was 13-24 (14.2%), followed by males 25-34 (9.4% of all patients) and by males 35-44 (9.1% of all patients). Whereas, the most common age ranges for men in the trauma Registry were the younger groups, the most populous groups among females were the more elderly, with ages 75-84 comprising 7.7% of all patients, and ages 85 and higher comprising 6.8% 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.

Of the 28,888 inpatients qualifying for the 1999-2002 Registry who were victims of motor vehicle crashes, 65.6% were males. More females than males 65 and older were hospitalized victims of motor vehicle crashes, whereas, for nearly every age group below 65, more men than women were hospitalized subsequent to motor vehicle crashes.

For the 17,669 inpatients who were victims of low falls, 9,638 (54.6%) were women. By far the most populous age/sex groups hospitalized with low falls were women age 75-84 and 85 and above, which comprised 17.4% and 18.4% of all patients. These groups were followed by females between ages 65 and 74 years old (7.9% of all patients), and by males between 75 and 84 (9.1% of all patients). The number of females hospitalized with low falls rose with age, with the largest increases occurring at ages 65 and 75. The relationship with 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 obviously partly a result of greater longevity among women.

Of the 8,104 inpatients qualifying for the 1999-2002 Registry who were victims of penetrating injuries, 7,337 (90.5%) were males. The vast majority of these males were between ages 13 and 24 (41.3% of all patients), 25-34 (24.1% of all patients), and 35-44 (14.3% of all patients). The most common age group among women who were hospitalized victims of penetrating injuries was 13 to 24 (3.1% of all patients).

The overall statewide mortality rate for inpatients qualifying for inclusion in the 1999-2002 Registry was 6.40% (5,119 deaths among 80,011 patients). The mechanism of injury with the highest inpatient mortality rate among these patients was gunshot wounds, with a 12.5% mortality rate. The mechanisms of injury with the next highest mortality rates were “other injuries” (9.6%), low falls (7.8%), motor vehicle crashes (6.4%), and “other blunt” injuries (6.0%). The mechanism of injury with the lowest mortality rate among adult trauma inpatients qualifying for the Registry was stab wounds (2.5%). The mortality rates for pediatric patients were 5.8% for penetrating injuries and 1.7% for blunt injuries.

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 care (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, 78.3% were treated at regional centers while 21.7% were treated at area trauma centers. In New York City, 100% of the patients were treated at regional centers since there are no area centers in the region. After New York City, the region with the next largest percent of patients treated at regional centers was Western New York with 91.8%. The region with the smallest percent of patients treated at regional centers was Suffolk with 46.3%.

Distribution of New York State Inpatients by Region and Level
Five Adult Mechanisms of Injury: 1999 – 2002

Region	Regional Trauma Centers N (%)	Area Trauma Centers N (%)	Total
WNY	3,060 (91.8%)	272 (8.2%)	3,332 (100.0)
FIN	2,348 (59.0%)	1,631 (41.0%)	3,979 (100.0)
CNY	2,622 (58.0%)	1,898 (42.0%)	4,520 (100.0)
NNY	2,509 (80.5%)	608 (19.5%)	3,117 (100.0)
HUD	2,644 (57.2%)	1,979 (42.8%)	4,623 (100.0)
NAS	3,492 (78.3%)	968 (21.7%)	4,460 (100.0)
SUF	1,938 (46.3%)	2,251 (53.7%)	4,189 (100.0)
NYC	16,000 (100.0%)	0 (0.0%)	16,000 (100.0)
Total	34,613 (78.3%)	9,607 (21.7%)	44,220 (100.0)

WNY = Western New York
FIN = Finger Lakes
CNY = Central New York
NNY = Northeastern New York
HUD = Hudson Valley
NAS = Nassau
SUF = Suffolk
NYC = New York City

Among the inpatients in the models used to assess hospital performance, 47.1% 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 34.1% in New York City to a high of 58.1% in Hudson Valley. For most regions of the state, penetrating injuries (stab wounds and gunshot wounds) represent from 1.6% to 6.6% of the total patients. In New York City, these two mechanisms of injury represent 16.2% and 11.7% of the total patients.

Distribution of New York State Inpatients
by Region and Mechanism of Injury: 1999 – 2002

Region	Motor Vehicle Crash N (%)	Other Blunt N (%)	Low Falls N (%)	Stab Wounds N (%)	Gunshot Wounds N (%)	Total
WNY	1,836 (55.1%)	796 (23.9%)	332 (10.0%)	149 (4.5%)	219 (6.6%)	3,332 (100.0)
FIN	2,069 (52.0%)	880 (22.1%)	594 (14.9%)	207 (5.2%)	229 (5.8%)	3,979 (100.0)
CNY	2,428 (53.7%)	998 (22.1%)	700 (15.5%)	228 (5.0%)	166 (3.7%)	4,520 (100.0)
NNY	1,802 (57.8%)	682 (21.9%)	416 (13.3%)	128 (4.1%)	89 (2.9%)	3,117 (100.0)
HUD	2,686 (58.1%)	998 (21.6%)	640 (13.8%)	204 (4.4%)	95 (2.1%)	4,623 (100.0)
NAS	2,122 (47.6%)	990 (22.2%)	1,050 (23.5%)	186 (4.2%)	112 (2.5%)	4,460 (100.0)
SUF	2,423 (57.8%)	872 (20.8%)	669 (16.0%)	156 (3.7%)	69 (1.6%)	4,189 (100.0)
NYC	5,460 (34.1%)	3,815 (23.8%)	2,259 (14.1%)	2,587 (16.2%)	1,879 (11.7%)	16,000 (100.0)
Total	20,826 (47.1%)	10,031 (22.7%)	6,660 (15.1%)	3,845 (8.7%)	2,858 (6.5%)	44,220 (100.0)

Significant Mortality Results by Region and Level

In-hospital 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 care (regional trauma center, area trauma center). Also, 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 before comparing performance across regions and levels of care. Risk factors used in the risk-adjustment process included age, gender, systolic blood pressure, intubation and respiratory assistance status, two components of the Glasgow Coma Scale (eye opening and motor score), and a measure of anatomic injury severity.

Levels of Care

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. There were also no differences when data from New York City, which has no area trauma centers, were removed.

Regional Differences: Inpatient Mortality

Among motor vehicle crash patients, the overall inpatient mortality rate was 7.16%. Trauma inpatients in Central New York (5.64%) had a risk-adjusted mortality rate that was significantly lower than this and inpatients in New York City (8.63%) had a risk-adjusted rate that was significantly higher than the statewide rate.

Among patients treated for other blunt injuries, the overall inpatient mortality rate was 6.68%. Patients treated in Western New York had a significantly lower risk-adjusted mortality rate (4.39%).

For all patients combined, the inpatient mortality rate was 7.22%. Western New York inpatients (5.74%) and Central New York patients (5.99%) had risk-adjusted rates that were significantly lower than this, and New York City patients had a risk-adjusted rate (8.20%) 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 8.33%. Trauma patients who were admitted to the hospital or who died in the emergency department in Central New York (7.01%) had a risk-adjusted mortality rate that was significantly lower than this; patients in New York City (9.26%) had a risk-adjusted rate that was significantly higher than the statewide rate.

For all patients combined, the overall in-hospital mortality rate was 8.06%. Central New York patients had a risk-adjusted rate (6.82%) that was significantly lower than this; New York City patients had a risk-adjusted rate (8.70%) that was significantly higher.

Individual Hospital Outcomes

The overall mortality rate for the 44,220 adults treated at all fifty trauma centers in the data used to assess performance for inpatients only was 7.22 percent. Observed mortality rates ranged from 0.00 percent to 13.73 percent. The risk-adjusted mortality rate used to measure performance for all hospitals ranged from 0.00 percent to 16.34 percent.

The overall mortality rate for the 44,616 adults treated at all fifty trauma centers in the data used to assess performance for deaths in the emergency department and inpatients was 8.06 percent.

Observed mortality rates ranged from 0.00 percent to 21.43 percent. The risk-adjusted mortality rate used to measure performance for all hospitals ranged from 0.00 percent to 11.52 percent.

Five hospitals (Erie County Medical Center, Winthrop University Hospital, North Shore University Hospital, University Hospital SUNY Health Science Center, and New York Hospital at Medical Center of Queens) had inpatient mortality rates that were significantly lower than the statewide mean. Four hospitals (Southside Hospital, Kings County Hospital Center, St. Luke's Roosevelt Hospital, and City Hospital Center at Elmhurst) had inpatient mortality rates that were significantly higher than the statewide mean.

Two hospitals (United Health Services Hospitals-Wilson Hospital Division, University Hospital SUNY Health Science Center) had in-hospital (inpatient or emergency department) mortality rates that were significantly lower than the statewide mean, and two hospitals (Southside Hospital, Kings County Hospital Center) had rates that were significantly higher.

Recent Changes in Trauma Risk-Adjusted Mortality in New York

In the following discussion,, risk-adjusted mortality is tracked for trauma center patients in the years 1996-2002. The risk-adjusted mortality rate for inpatients in the Registry decreased from 7.44% in 1996 to 6.60% in 1997, then increased to 7.01% in 1998, and then went up and down from 7.68% in 1999 to 7.33% in 2000 to 7.68% in 2001 to 7.23% in 2002.

The risk-adjusted mortality rate for inpatient/emergency department mortality in the Registry rose and fell frequently between 1996 and 2002, but in general was lower in the later years. All rates were above 8% in the first four years, and below 8% for the last three years of the time period, with the lowest rate (7.63%) occurring in the most recent year (2002). In contrast, the risk-adjusted mortality rate was 8.85% in 1996.

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. The following data are taken from the Center for Disease Control (CDC), National Center for Injury Prevention and Control, Web-Based Injury Statistics Query and Reporting System (WISQARS), www.cdc.gov/ncipc/wisqars. 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 firearm injuries) 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 2002 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 15.42%, whereas it was only 8.44% 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. However, the relative population density of New York and the United States were not substantially different in 1999 and 2002. Consequently, a valid measure of the recent impact of New York's trauma system on MVC mortality is to compare the percent change in age-adjusted mortality per 100,000 in New York with the percent change in the United States. The appropriate time period to ascertain the recent impact of the trauma system is 1999 to 2002, the latest available year of data.

The mortality rate in the United States changed from 14.81 per 100,000 in 1999 to 15.42 per 100,000 in 2002, an increase of 4.1%. During the same time period in New York, the mortality rate per 100,000 changed from 8.80 to 8.44, a decease of 4.0%. The change in mortality rate per 100,000 in New York was found to be significantly different than the change in the United States ($p<0.0001$), indicating that recent quality assurance and quality improvement efforts related to New York's trauma system and Trauma Registry appear to have resulted in mortality reductions for MVCs that are higher than those experienced in the United States. In fact, if New York had experienced the same increase as was experienced in the US, New York's age-adjusted mortality rate per 100,000 in 2002 would have been 9.16 per 100,000, which would have resulted in an additional 58 deaths in 2002.

Falls

The mortality rate for falls per 100,000 population in the United States in 2002 was slightly higher than the rate in New York (2.59 vs. 2.28, respectively). This difference was statistically significant ($p=0.0039$). It is notable that the age-adjusted rates for New York and the United States were much lower than the unadjusted rates, no doubt because the population has aged considerably since 1940, the year CDC used as the base for the age adjustments.

However, the mortality rate per 100,000 population in the United States rose from 2.31 in 1999 to 2.59 in 2002, an increase of 12.1%. During the same time period, the rate fell in New York from 2.35 to 2.28, an decrease of 2.9%. New York's rate decreased while the rate in the United States increased, and the difference was statistically significant ($p<0.0001$). It should be noted that the increase in the United States during the 1999-2002 time period is likely to be related to the aging of our nation's population.

Firearms

The age-adjusted mortality rate of firearms per 100,000 population in the United States in 2002 was 10.31, substantially higher than the comparable rate in New York (5.37), and this difference was statistically significant ($p <0.0001$).

The mortality rate for firearms per 100,000 population in the United States increased from 10.24 in 1999 to 10.31 in 2002, an increase of 1.0%. During the same time period, the rate decreased in New York from 5.66 to 5.37, a decrease of 5.0%. The change in New York was found to be statistically significantly different than the change in the United States ($p<0.0001$). As with motor vehicle crashes, 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.

INTRODUCTION

In the past several years, New York State has worked to improve trauma care in the state. In 1990, the state established minimum standards for trauma centers, and thirty-six hospitals were subsequently designated as centers. As of 2006, a total of forty-four trauma centers exist in New York State. Twenty-five of these centers are 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 the forty-four trauma centers. Patients in the Registry include trauma-related deaths on arrival at the hospital (DOAs), trauma-related deaths in the emergency department (DIEs), and trauma inpatient admissions with diagnoses identified by the State Trauma Advisory Committee as having sufficiently high injury severity to be worthy of study. Trauma patients from these hospitals are included in the Registry if their injury severity is sufficiently high, as defined by the ICD-9-CM codes in Appendix 1. The trauma centers in New York in 1999-2002 are listed by region and level (regional trauma center, area trauma center) in Appendix 2.

The Registry uses a data entry package (either Trauma One or National Trauma Registry, American College of Surgeons (NTRACS)), to standardize the information obtained from each participating hospital and to facilitate the analysis of the information obtained. Each regional and area trauma center has access to this package and enters its own data in the system. Area centers forward their data to regional centers, who in turn forward the entire region's data to the evaluator at the Department of Health Policy, Management and Behavior of the SUNY-Albany 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, and 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 Regions and Upstate Trauma Centers

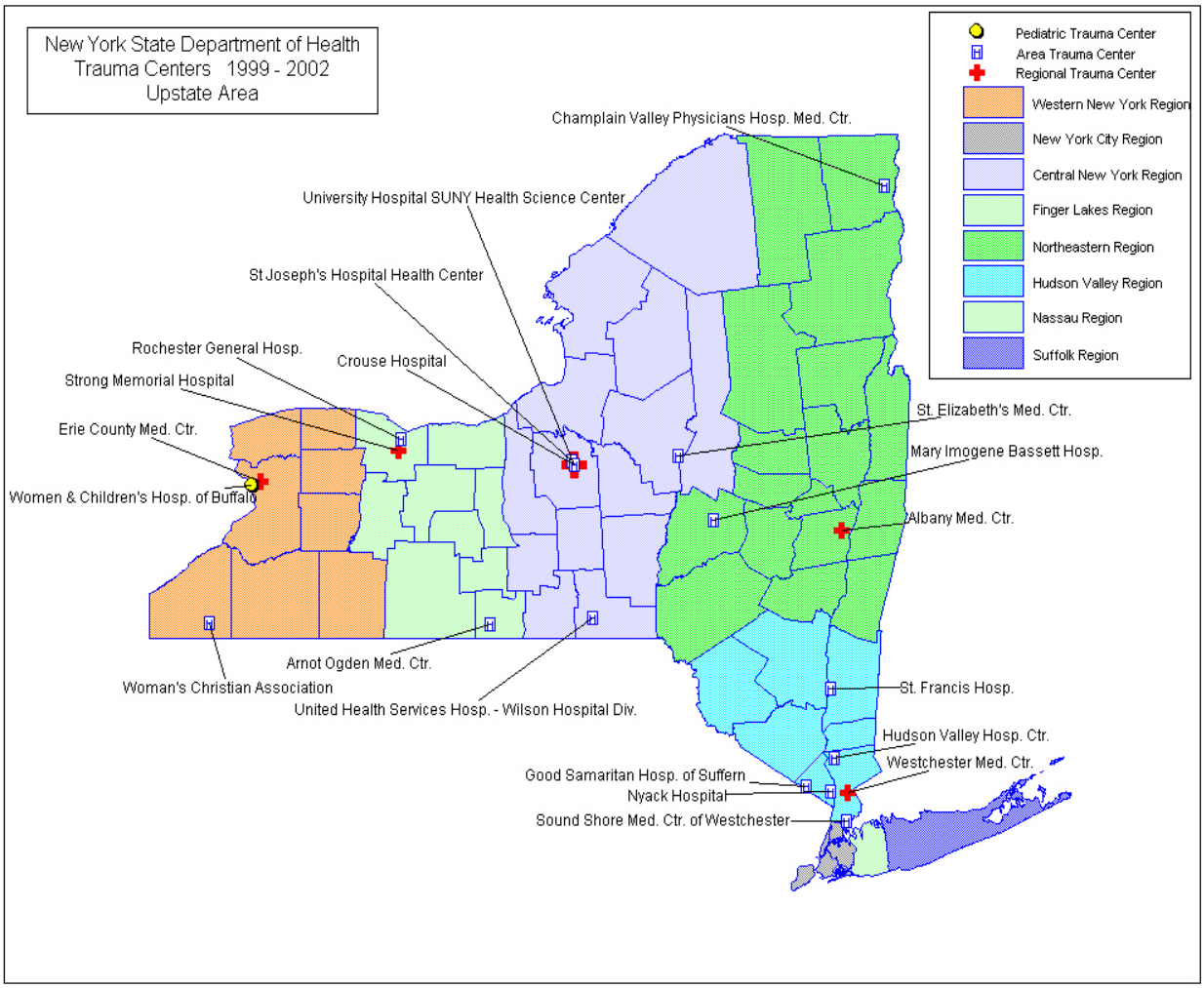
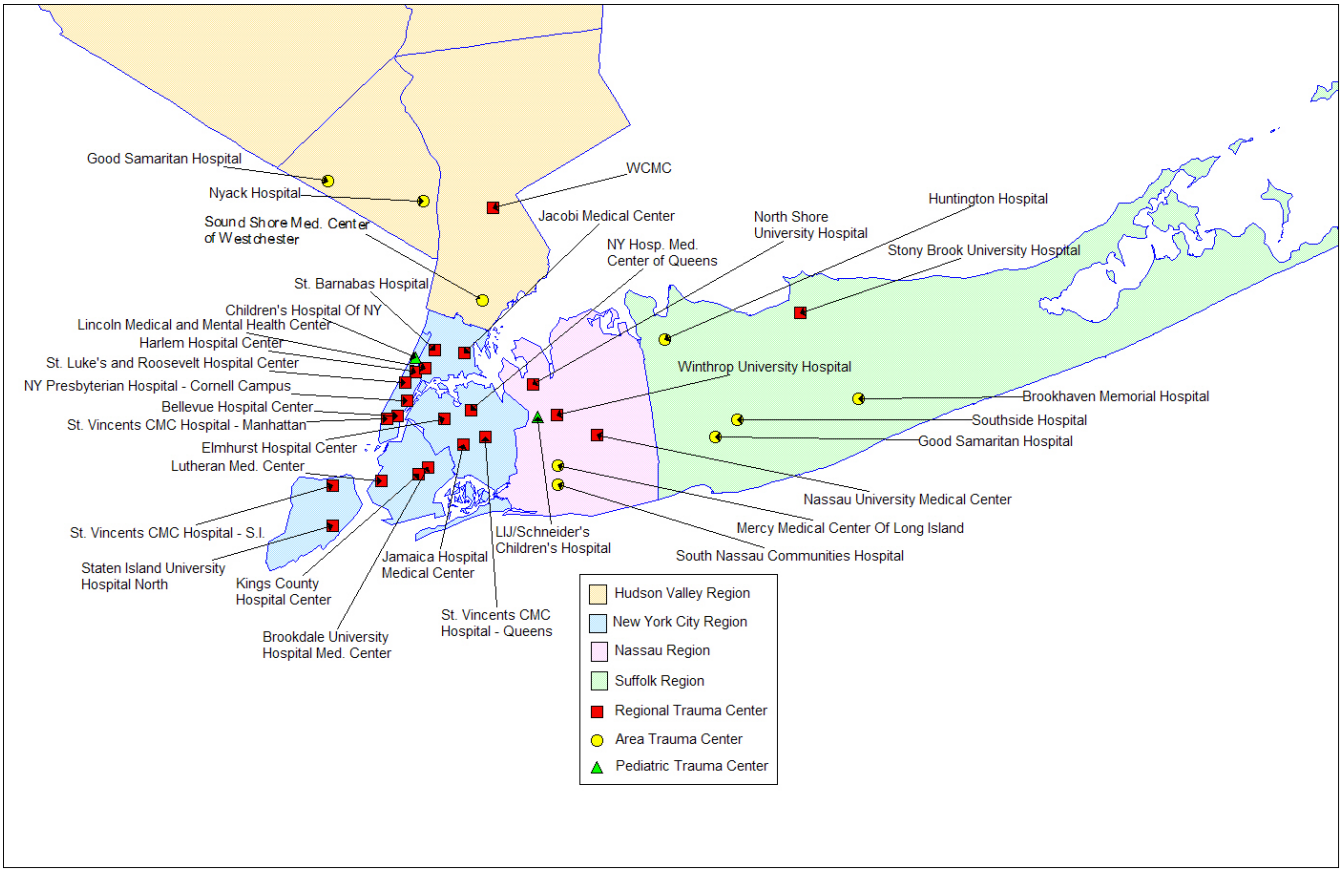


Figure 2
New York City and Long Island Trauma Centers



Data in the system is 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 contains information about the ambulance trip including the time of the call, the time of the ambulance arrived at the scene of the injury, the time spent by the Emergency Medical Service (EMS) team at the scene, the travel time to the hospital and a variety of 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.

The first year that Registry data were reported and analyzed was 1993. Data from trauma inpatients in 1993 were first 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 noncenter) 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 if 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 next 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 sex) 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. noncenters 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.

In addition, 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 noncenters). This was done by developing a statistical model for each mechanism of injury that was used to calculate risk-adjusted mortality rates for regions of the state and for levels of care, as well as to compare these risk-adjusted rates by region and level.

The last report, covering the time period 1996-1998, was similar to the 1994-1995 report in that it updated all of the information that was presented in the 1994-1995 report. This report is similar to the last two except for the fact that it is limited primarily to information on trauma centers since the Registry no longer contains information from noncenters.

The Department of Health and the Statewide Trauma Advisory Committee hope that these analyses and reports will ultimately serve hospitals and EMS agencies throughout the state in their efforts to improve the care of injured patients. The statewide Trauma 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

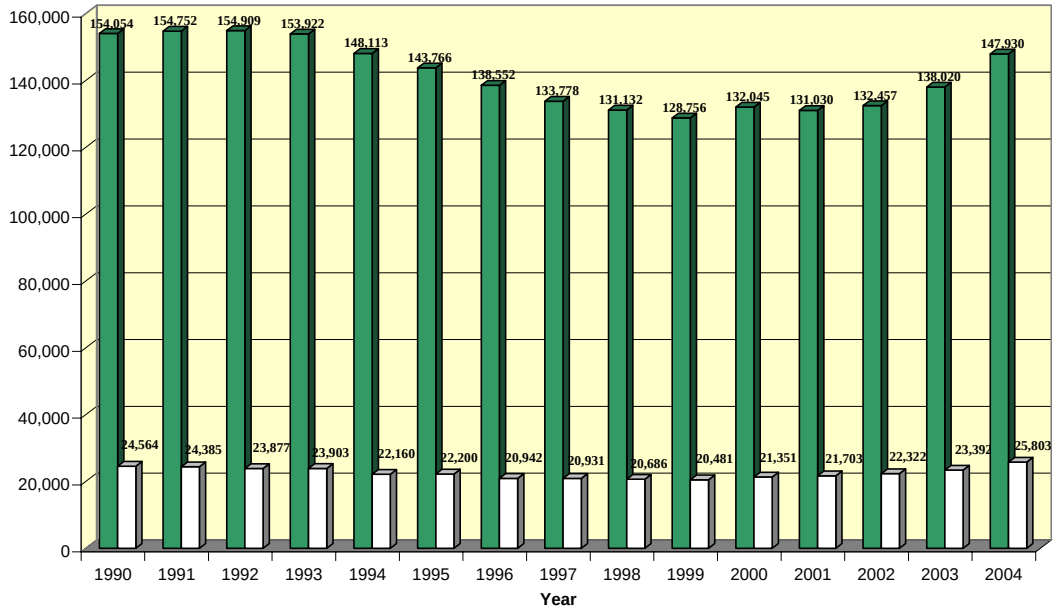
According to New York's Statewide Planning and Resource Cooperative System (SPARCS), the total number of trauma patients admitted to New York State hospitals declined between the years 1990 and 1999 and then increased between 1999 and 2004 (see Chart 1). A total of 147,930 trauma patients were admitted to New York State hospitals in 2004, a decrease of 4.0% from the 154,054 trauma inpatients admitted in 1990.

When it was initially established in 1993, the New York State Trauma Registry (NYSTR) was designed to include data on trauma inpatients that are identified by the Statewide Trauma Advisory Committee (STAC) to be at significant risk of dying in the hospital 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. Due to funding cuts, since 1999, the NYSTR contains complete data for trauma centers only.

As noted above, the list of the ICD-9-CM diagnostic codes that identify severe trauma patients, effective with January 1, 2004 discharges, is presented in Appendix 1. The number of patients qualifying for inclusion in the New York State Trauma Registry in 2004 was 25,803, approximately 1,300 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 1993-2004 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 that 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 2004 is approximately 2.14%.

Chart 1

1990-2004 Statewide
Number of Trauma Inpatients and Number of Severe Trauma Inpatients



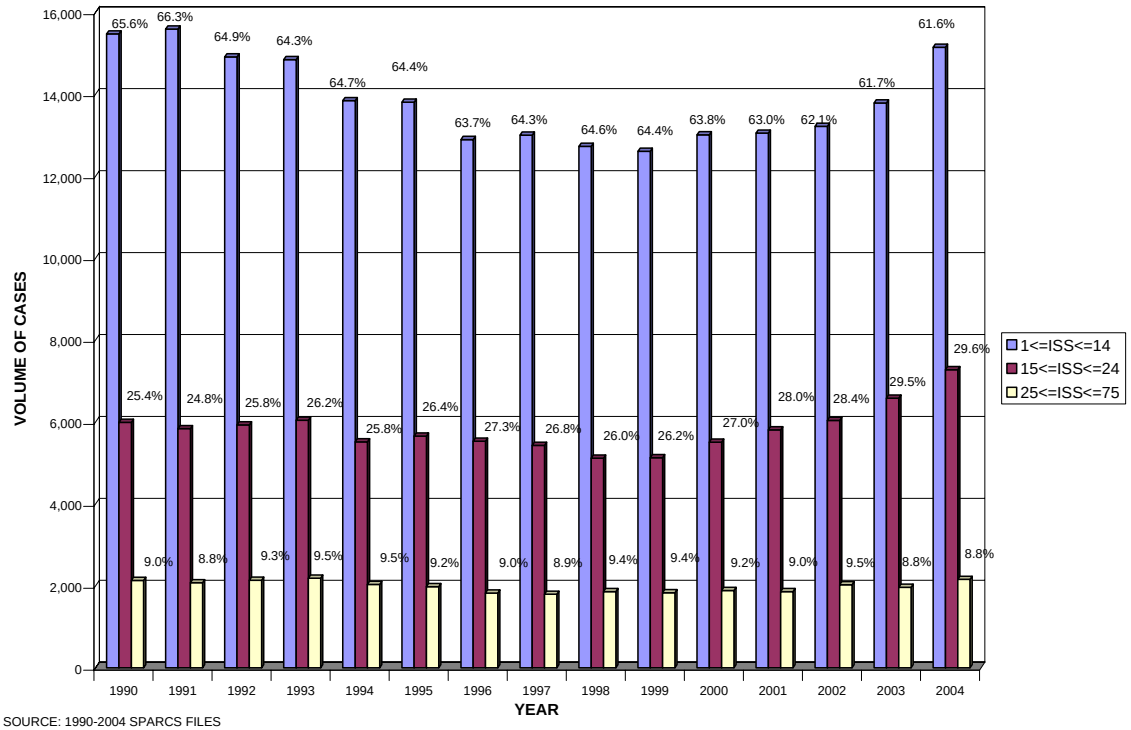
Source: 1990-2004 SPARCS

Chart 2 presents the number of severe trauma admissions, cases that qualify for the Registry, grouped by Injury Severity Score (ISS). Records with an ISS of 99 are excluded from this chart. The ISS, a measure of the severity of a patient's injury, has been found to be strongly related to patient outcome. 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 scoring 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.

As was shown in Chart 1, the number of severe trauma admissions increased slightly from 24,564 to 25,803 between 1990 and 2004.

Chart 2

Volume of Hospital Admissions for Severe Trauma by Injury Severity Score: 1990-2004



SOURCE: 1990-2004 SPARCS FILES

Changes in Mortality Rates by ISS Group for Severe Trauma Admissions: 1990-2004

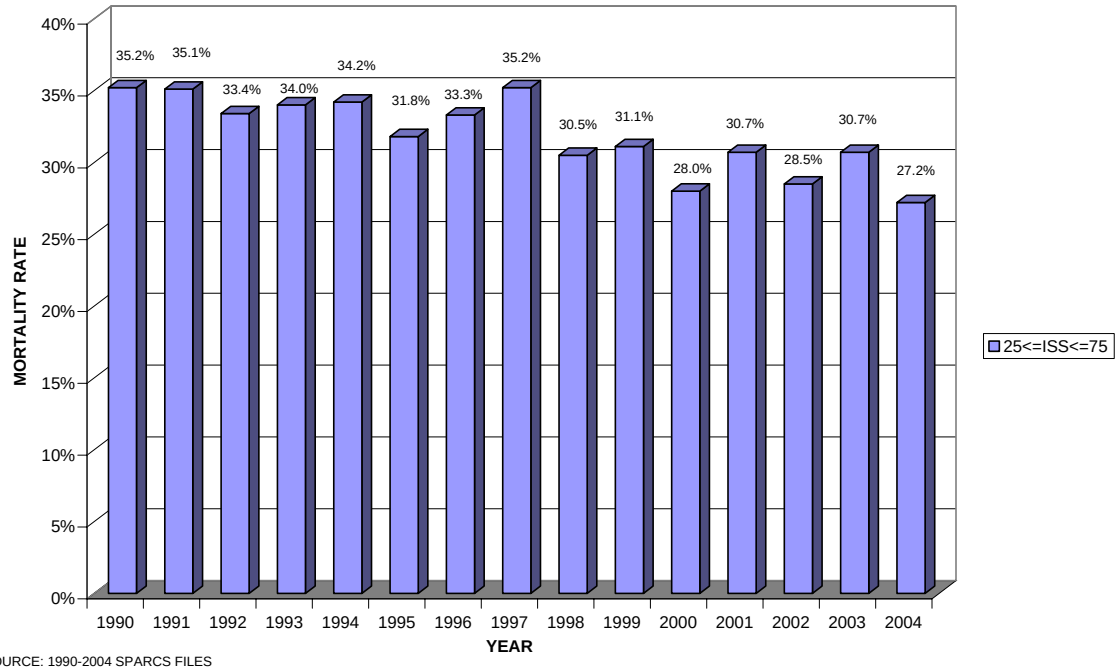
The data in Charts 3 and 4 demonstrate the changes in in-hospital mortality rates between 1990 and 2004 for the three ISS groups. Two charts are presented because, if these mortality rates were presented on one chart, the most seriously injured group would mask the decline in mortality in the other groups. 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 during the fifteen-year period 1990-2004. 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% to 6.6%, a

reduction of 9.2%. For patients with an ISS between 1 and 14, the inpatient mortality rate decreased slightly from 2.9% to 2.8%. 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 1990-2004 for ISS groups 1-14, 15-24 and 25-75.

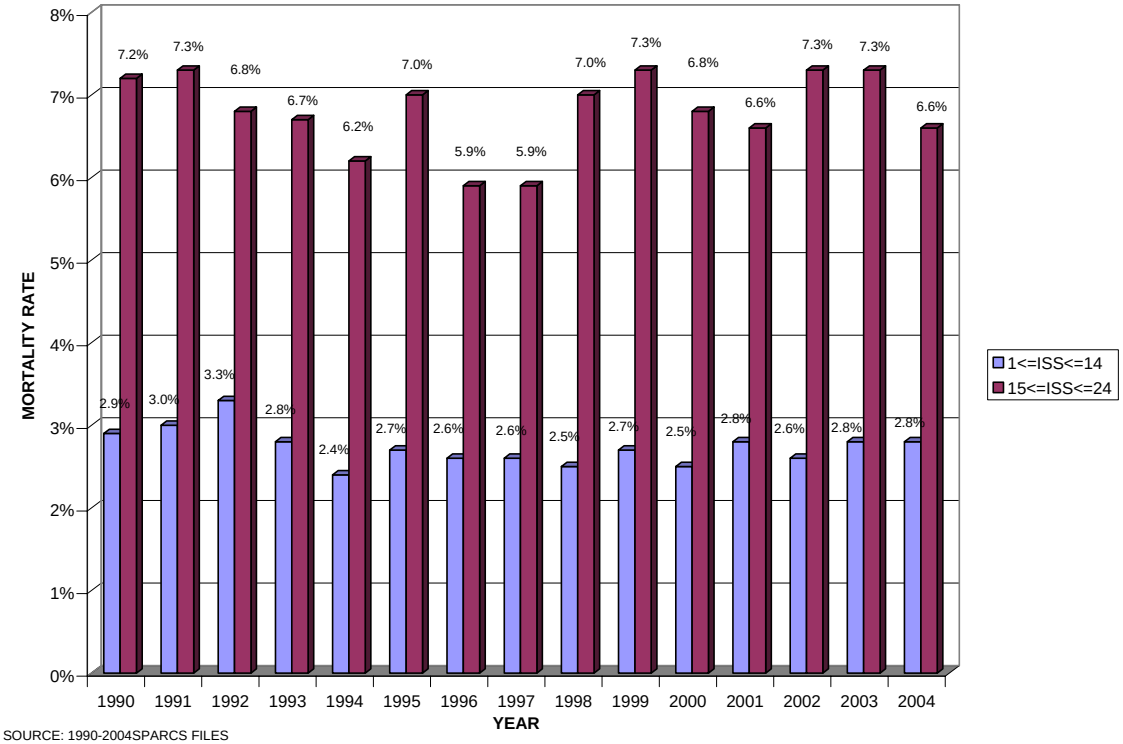
Chart 3

Changes in Mortality Rates by ISS Group for Severe Trauma Admissions: 1990-2004



SOURCE: 1990-2004 SPARCS FILES

Chart 4

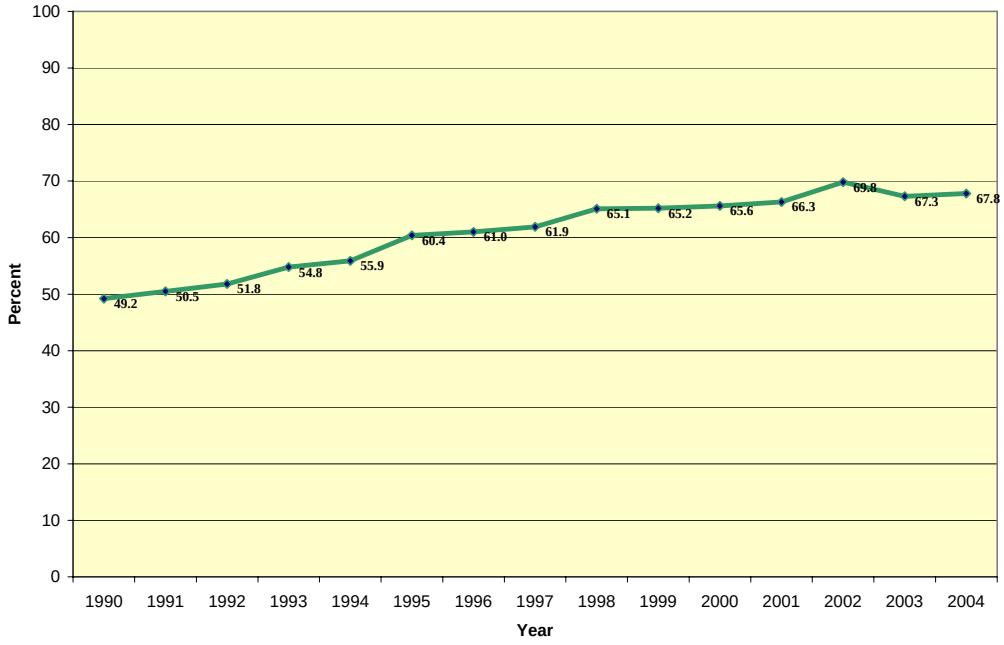


SOURCE: 1990-2004SPARCS FILES

The data in Chart 5 presents the percentage of New York State trauma patients admitted to trauma centers between 1990 and 2004. 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% in 1990 to 67.8% in 2004, an increase of 37.8%. 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 1990-2004.

Chart 5

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

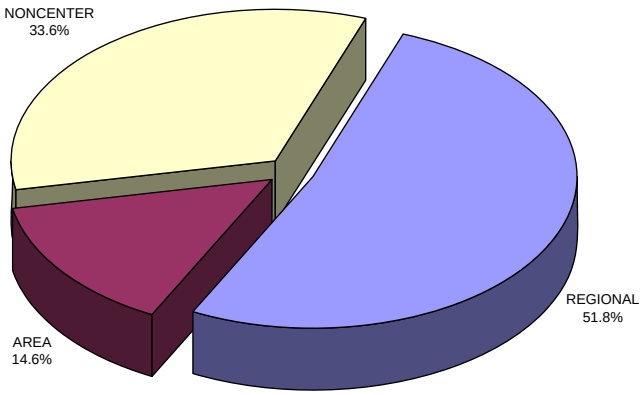


Source: 1990-2004 SPARCS

On page 5, Chart 1 entitled "1990-2004 Statewide Number of Trauma Inpatients and Number of Severe Trauma Inpatients" shows a total of 85,857 severe trauma inpatients for 1999-2002. As discussed earlier, some of these records were, after medical record review, deemed inappropriate for inclusion in the Registry. These exclusions reduced the total number of patients for 1999-2002 to 80,011. Among the inpatients qualifying for the 1999-2002 New York State Trauma Registry, 51.8% were admitted to regional trauma centers and 33.6% of these patients were admitted to noncenters (see Chart 6). Only 14.6% of these patients were hospitalized in area centers.

Chart 6

Distribution of Severe Trauma Inpatients by Hospital Level: 1999-2002

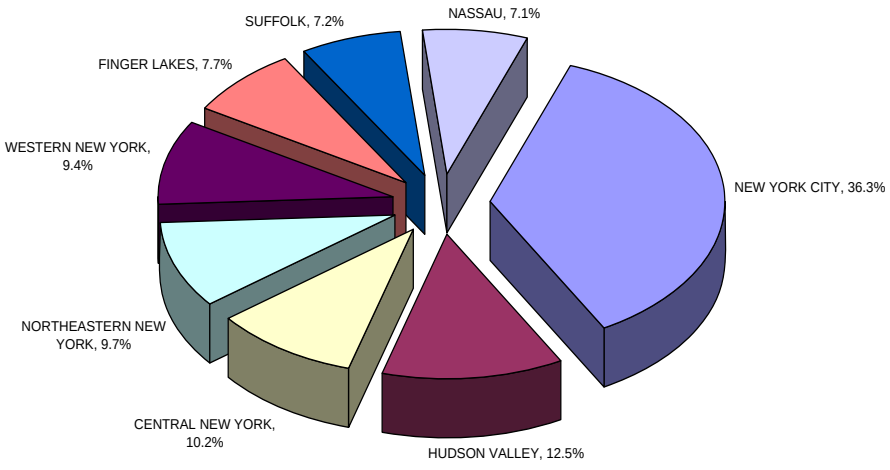


SOURCE: 1999-2002 SPARCS FILES

Chart 7 shows the distribution of inpatients qualifying for New York's 1999-2002 Registry by region of the state. Approximately 36% of the patients were in New York City. No other region had more than 13% of the total. The regions outside of New York City with the most patients were Hudson Valley (12.5%) and Central New York (10.2%). The regions with the fewest patients were Nassau (7.1%) and Suffolk (7.2%).

Chart 7

Regional Distribution of Severe Trauma Inpatients: 1999-2002

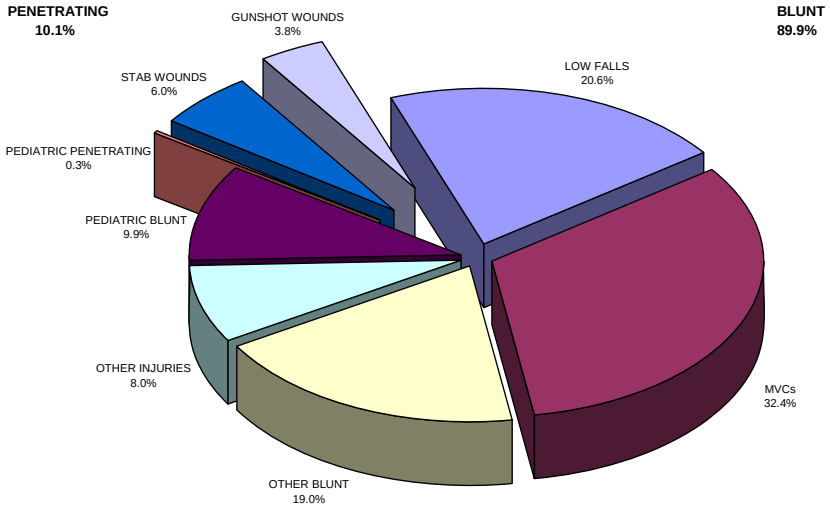


SOURCE: 1999-2002 SPARCS FILES

Of the inpatients qualifying for the 1999-2002 Registry, 89.9% were classified as having experienced blunt trauma (see Chart 8). The remaining 10.1% were classified as victims of penetrating trauma. The most common type of blunt trauma was motor vehicle crashes (32.4% of all trauma patients), followed by low falls (20.6% of all trauma patients). A total of 9.9% of the patients were pediatric patients (age less than 13 years) experiencing blunt injuries. A total of 6.0% of all adult inpatients qualifying for the Registry received stab wounds and 3.9% were treated for gunshot wounds. Only 0.3% of all 1999-2002 patients were pediatric patients with penetrating injuries (stab wounds or gunshot wounds).

Chart 8

Mechanism of Injury of Severe Trauma Inpatients: 1999-2002



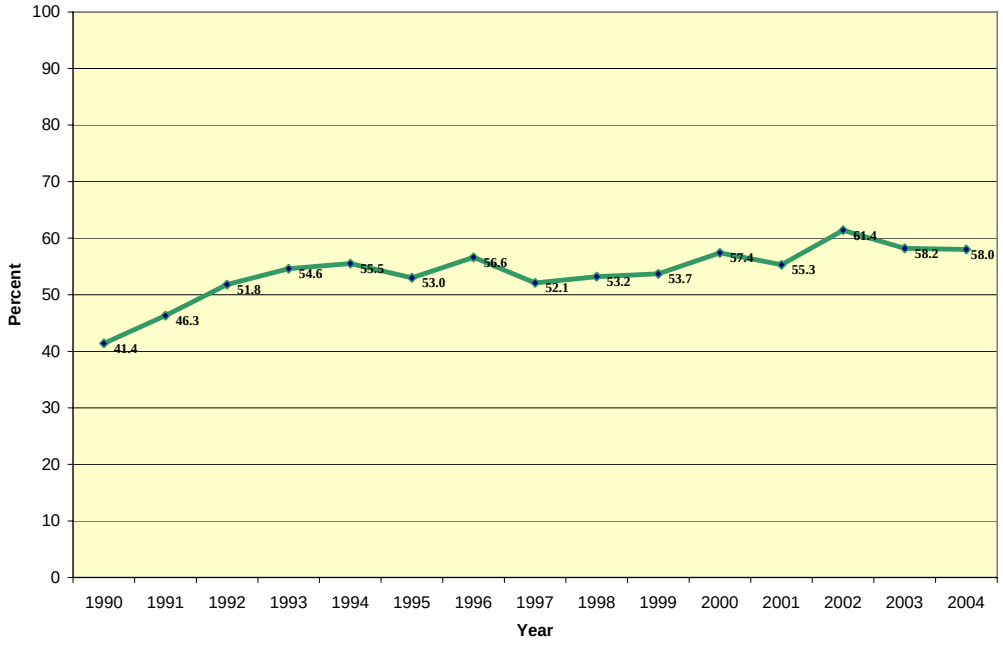
SOURCE: 1999-2002 SPARCS FILES

Percent of Inpatients Qualifying for the New York State Trauma Registry Admitted to Trauma Centers by Region: 1990-2004

Evident in the following eight charts are both the effect of the increase in the number of designated trauma centers and the influence of geography on the percent of patients in a particular region that is triaged to trauma centers. The geographically disperse regions of Western New York (Chart 9), Central New York (Chart 11) and Northeastern New York (Chart12) show moderate increases in the percent of patients triaged to centers. In these three regions 50-60% 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% to approximately 72%. 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 percent of Nassau's severe trauma patients that was triaged to a center has grown from 70% to around 85. In the Finger Lakes region, close to 80% of severe trauma patients are triaged to centers.

Chart 9

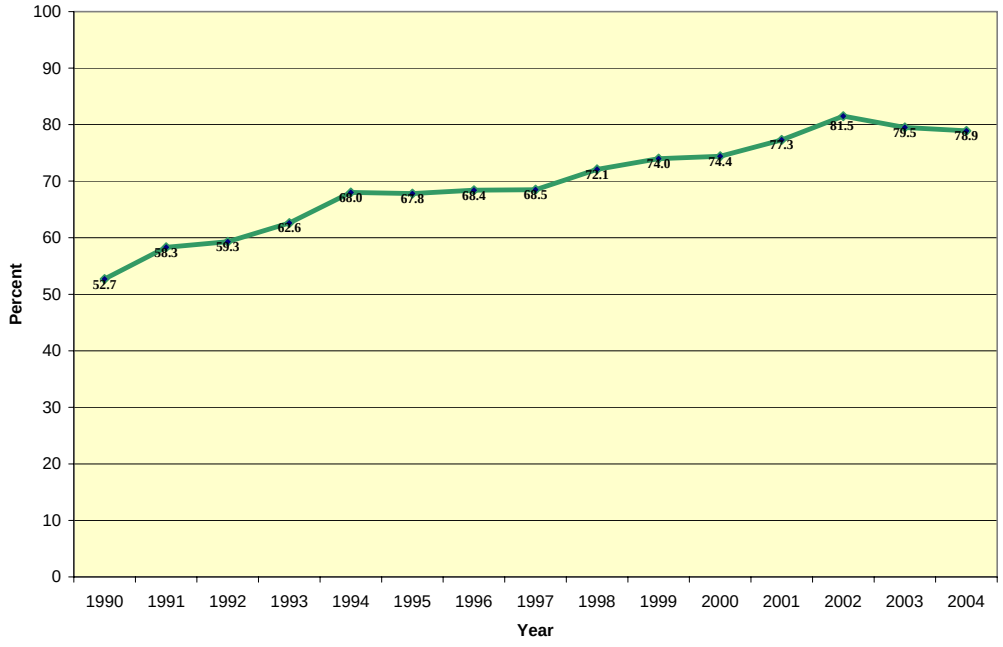
Western New York - Percent of Severe Trauma Inpatients Treated at Trauma Centers



Source: 1990-2004 SPARCS

Chart 10

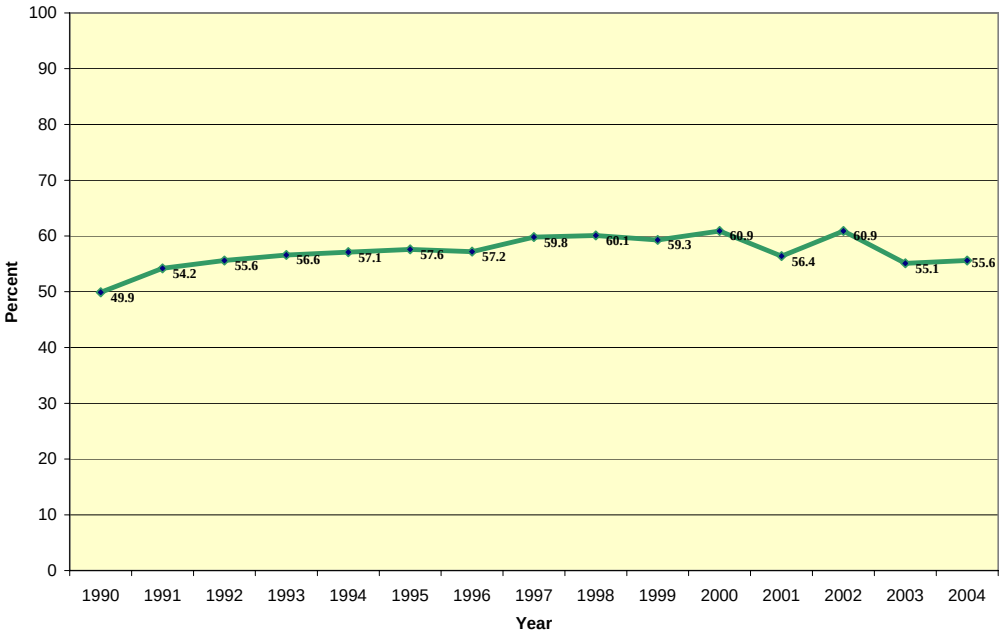
Finger Lakes - Percent of Severe Trauma Inpatients Treated at Trauma Centers



Source: 1990-2004 SPARCS

Chart 11

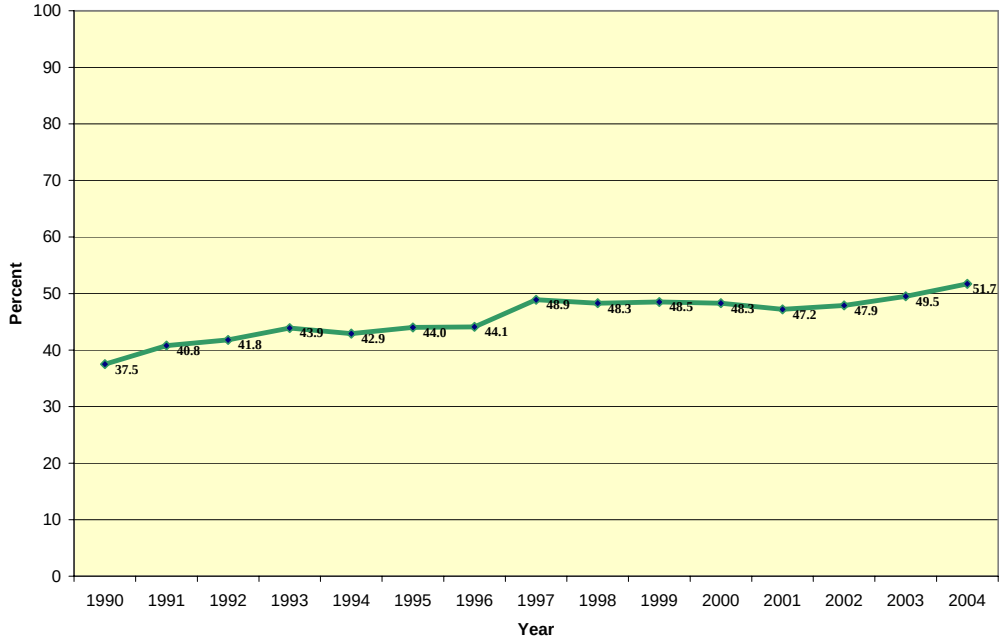
Central New York - Percent of Severe Trauma Inpatients Treated at Trauma Centers



Source: 1990-2004 SPARCS

Chart 12

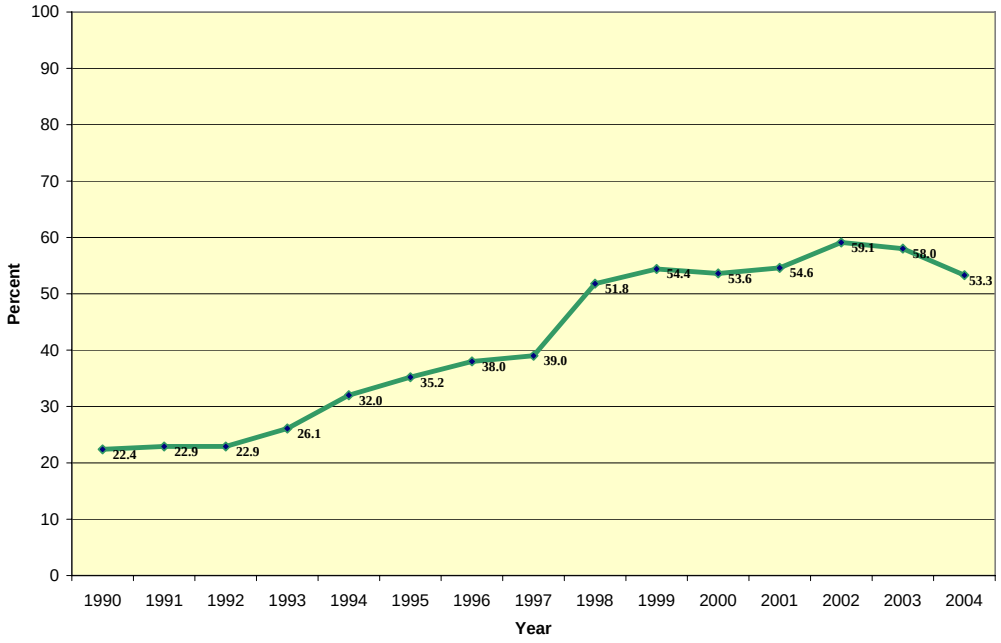
Northeastern New York - Percent of Severe Trauma Inpatients Treated at Trauma Centers



Source: 1990-2004 SPARCS

Chart 13

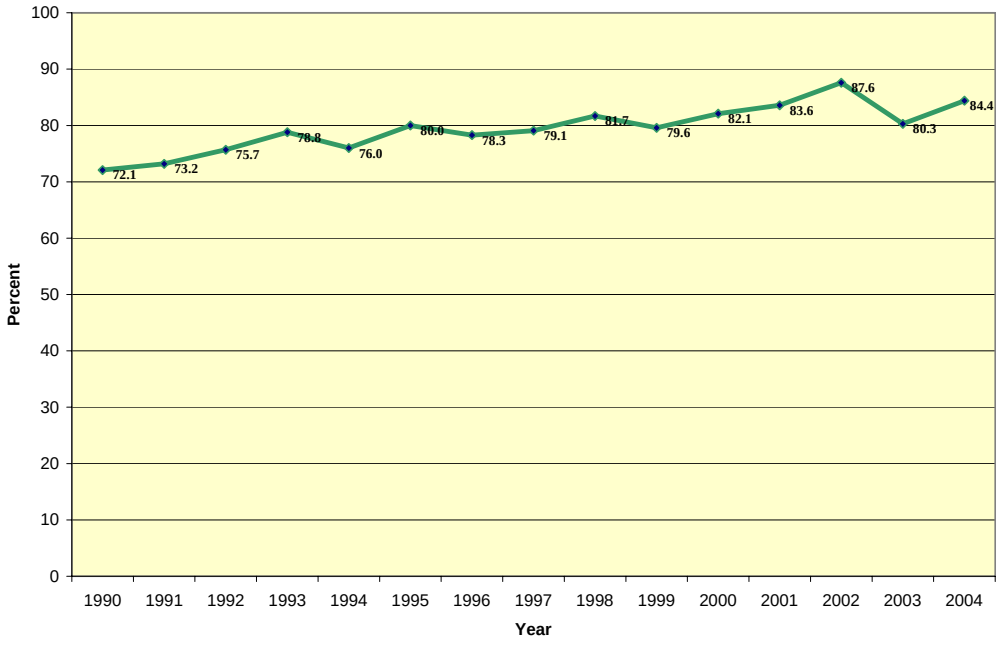
Hudson Valley - Percent of Severe Trauma Inpatients Treated at Trauma Centers



Source: 1990-2004 SPARCS

Chart 14

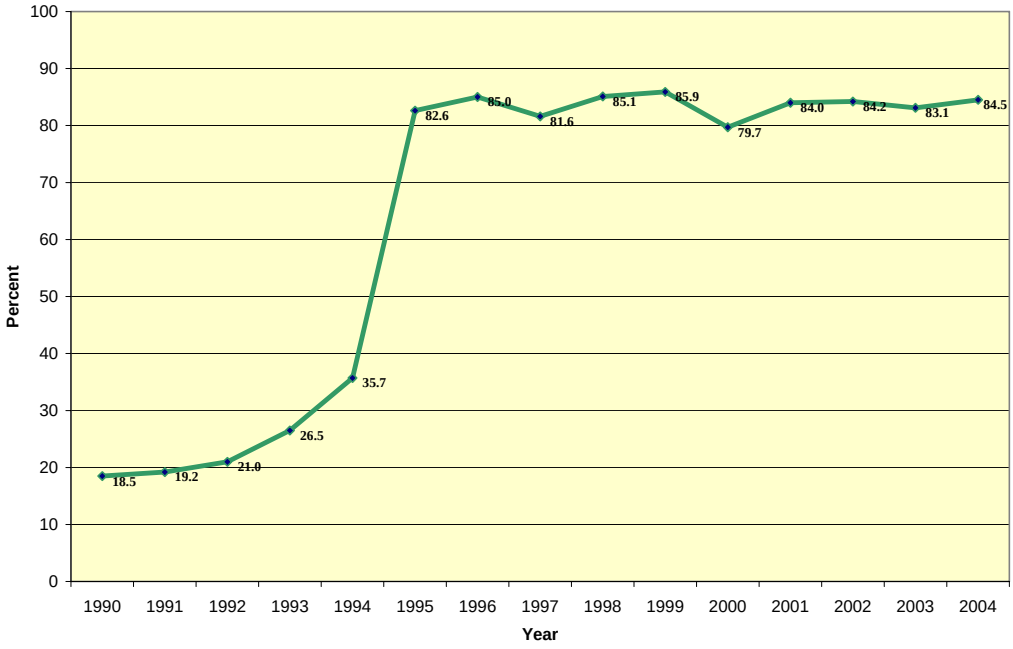
Nassau - Percent of Severe Trauma Inpatients Treated at Trauma Centers



Source: 1990-2004 SPARCS

Chart 15

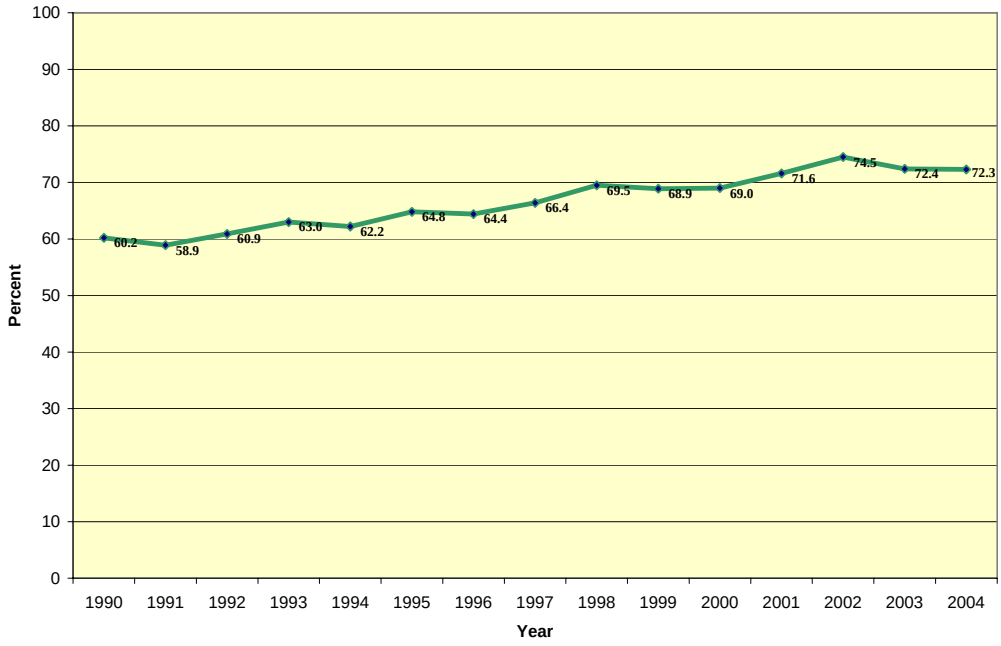
Suffolk - Percent of Severe Trauma Inpatients Treated at Trauma Centers



Source: 1990-2004 SPARCS

Chart 16

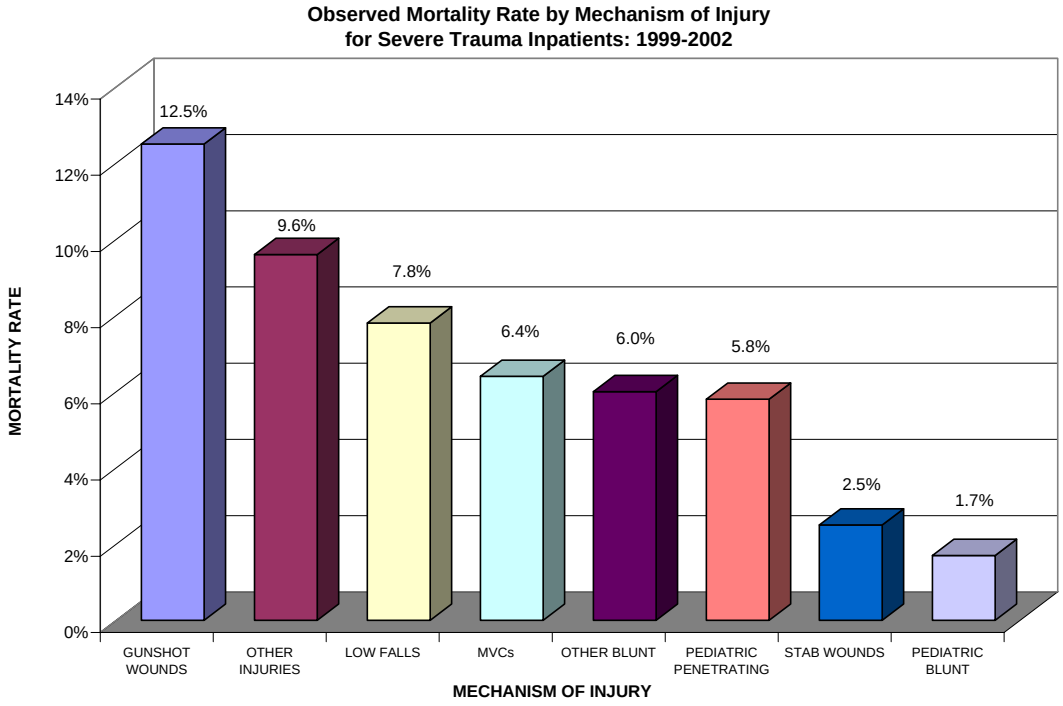
New York CIty - Percent of Severe Trauma Inpatients Treated at Trauma Centers



Source: 1990-2004 SPARCS

The overall statewide mortality rate for inpatients qualifying for inclusion in the 1999-2002 Registry was 6.40% (5,119 deaths among 80,011 patients). The mechanism of injury with the highest inpatient mortality rate among these patients was gunshot wounds, with a 12.5% mortality rate. The mechanisms of injury with the next highest mortality rates were "other injuries" (9.6%), low falls (7.8%), motor vehicle crashes (6.4%), and "other blunt" injuries (6.0%). The mechanism of injury with the lowest mortality rate among adult trauma inpatients qualifying for the Registry was stab wounds (2.5%). The mortality rates for pediatric patients were 5.8% for penetrating injuries and 1.7% for blunt injuries (see Chart 17).

Chart 17

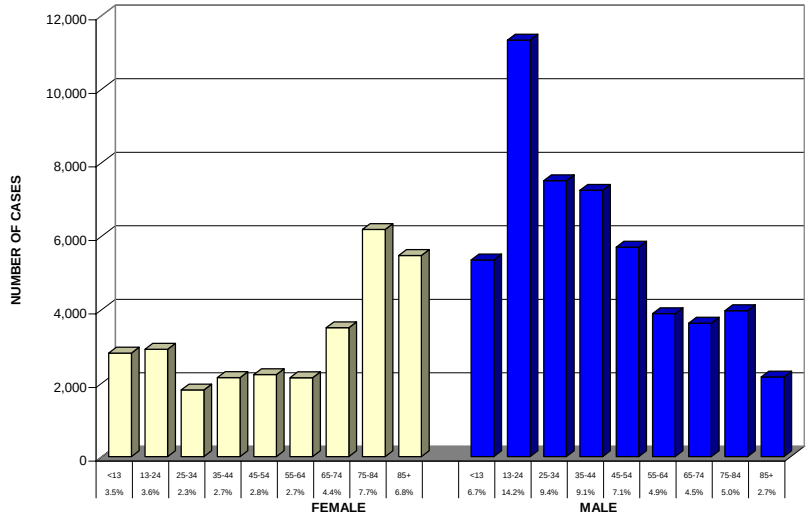


SOURCE: 1999-2002 SPARCS FILES

Among the inpatients qualifying for the 1999-2002 Registry, 63.5% were males. The age group among males with the highest percentage of trauma inpatients was 13-24 (14.2%), followed by males 25-34 (9.4% of all patients) and by males 35-44 (9.1% of all patients). Whereas, the most common age ranges for men in the Trauma Registry were the younger groups, the most populous groups among females were the more elderly, with ages 75-84 comprising 7.7% of all patients, and ages 85 and higher comprising 6.8% of all patients. Generally, men were less likely to be in the Registry with increasing age, whereas women after age 65 became more likely to be in the Registry (see Chart 18).

Chart 18

Age and Gender of Severe Trauma Inpatients: 1999-2002

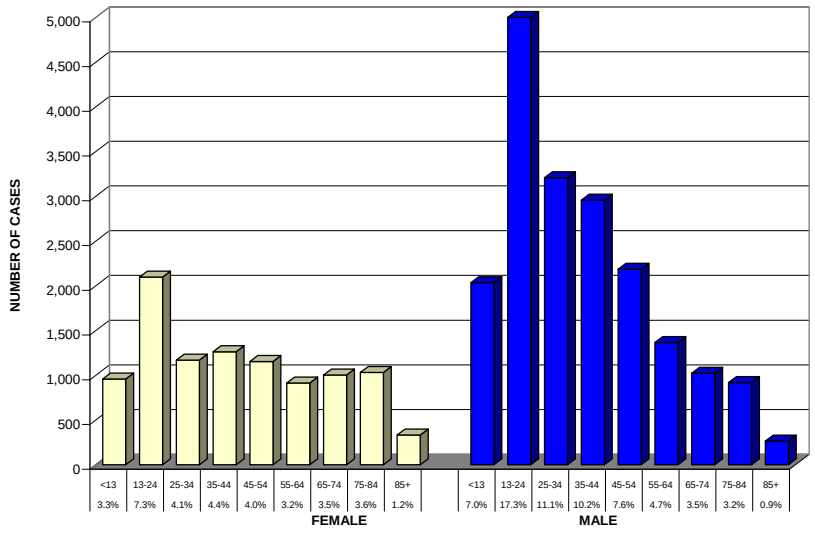


SOURCE: 1999-2002 SPARCS FILES

Of the 28,888 inpatients qualifying for the 1999-2002 Registry who were victims of motor vehicle crashes, 65.6% were males. The percentage of males in the Registry declined by age group from a high of 17.3% of all inpatients for ages 13-24 to 0.9% for ages 85 and older. Males 25-34 comprised 11.1% of all patients and males 35-44 comprised 10.2% 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 65 and older were hospitalized victims of motor vehicle crashes, whereas, for nearly every age group below 65, more men than women were hospitalized subsequent to motor vehicle crashes (see Chart 19).

Chart 19

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

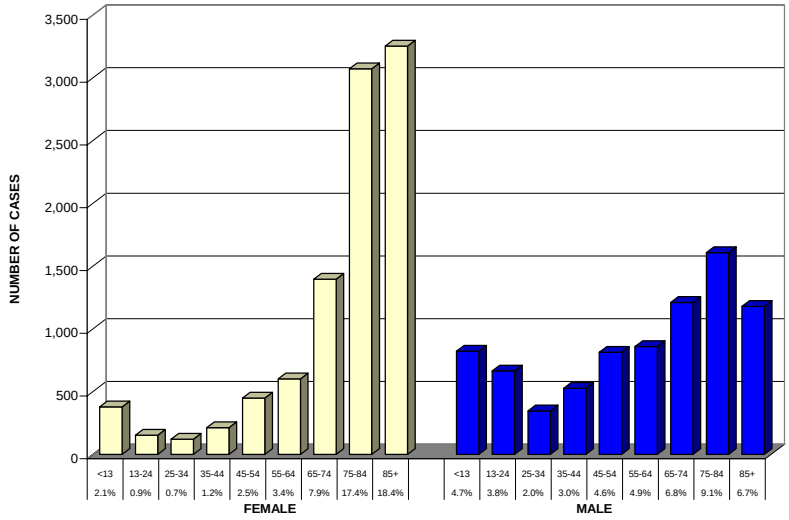


SOURCE: 1999-2002 SPARCS FILES

Of the 17,669 inpatients qualifying for the 1999-2002 Registry who were victims of low falls, 9,638 (54.6%) were women. By far the most populous age/sex groups hospitalized with low falls were women age 75-84 and 85 and above, which comprised 17.4% and 18.4% of all patients. These groups were followed by females between ages 65 and 74 years old (7.9% of all patients), and by males between 75 and 84 (9.1% of all patients). The number of females hospitalized with low falls rose with age, with the largest increases occurring at ages 65 and 75. The relationship with 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 obviously partly a result of greater longevity among women since more women are alive to experience low falls.

Chart 20

Age and Gender of Low Falls Severe Trauma Inpatients: 1999-2002

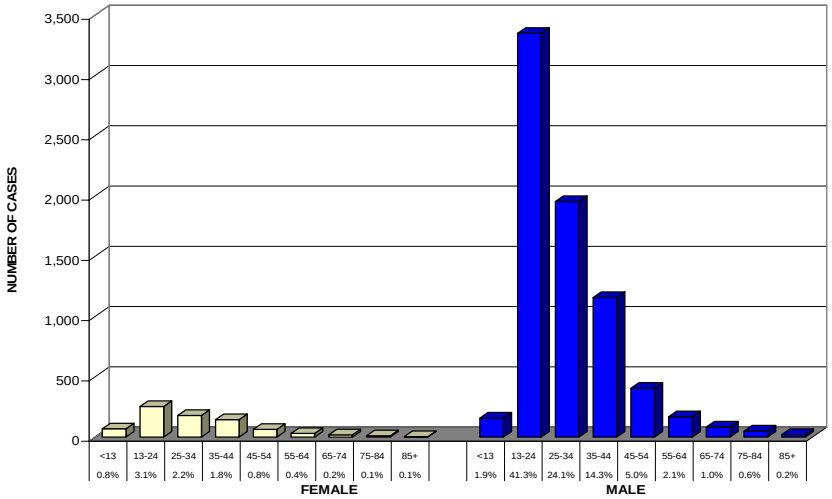


SOURCE: 1999-2002 SPARCS FILES

Of the 8,104 inpatients qualifying for the 1999-2002 Registry who were victims of penetrating injuries, 7,337 (90.5%) were males. The vast majority of these males were between ages 13 and 24 (41.3% of all patients), 25-34 (24.1% of all patients), and 35-44 (14.3% of all patients). The most common age group among women who were hospitalized victims of penetrating injuries was 13 to 24 (3.1% of all patients) (see Chart 21).

Chart 21

Age and Gender of Adult Inpatients with Severe Trauma Penetrating Injuries: 1999-2002



SOURCE: 1999-2002 SPARCS FILES

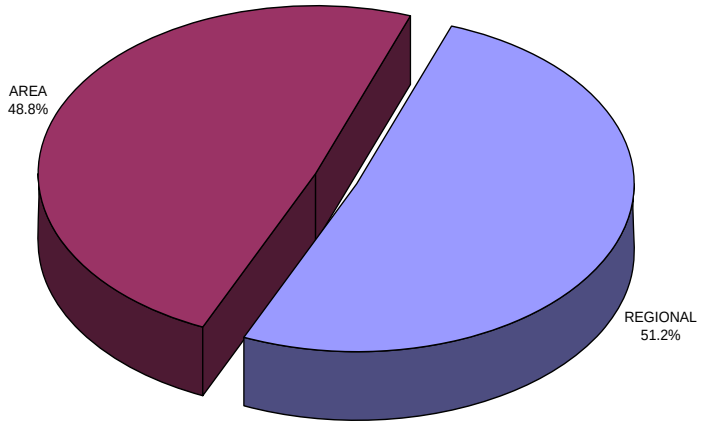
DESCRIPTIVE STATISTICS DEVELOPED FROM THE NEW YORK STATE TRAUMA REGISTRY

The following statistics were derived from the Trauma Registry and from New York Vital Statistics data. The population of patients who were DOA is described below by type of trauma center to which these patients were transported.

Chart 22 illustrates that the DOA population was transported to regional centers slightly more often than to area centers (51.2% vs. 48.8%).

Chart 22

Distribution of DOAs in the New York State Registry by Hospital Level: 1999-2002 (excluding New York City)

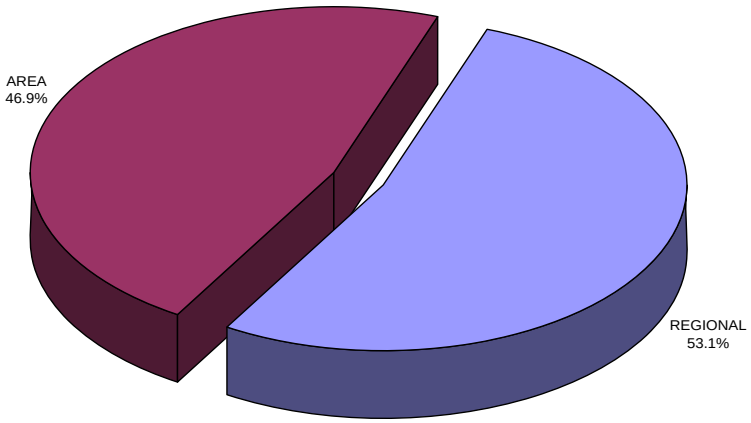


SOURCE: 1999-2002 NEW YORK STATE TRAUMA REGISTRY AND VITAL STATISTICS

Chart 23 illustrates that a total of 53.1% of DIE patients in trauma centers were treated at regional centers; the remaining 46.9% was treated at area centers.

Chart 23

Distribution of DIEs in the New York State Registry by Hospital Level: 1999-2002 (excluding New York City)

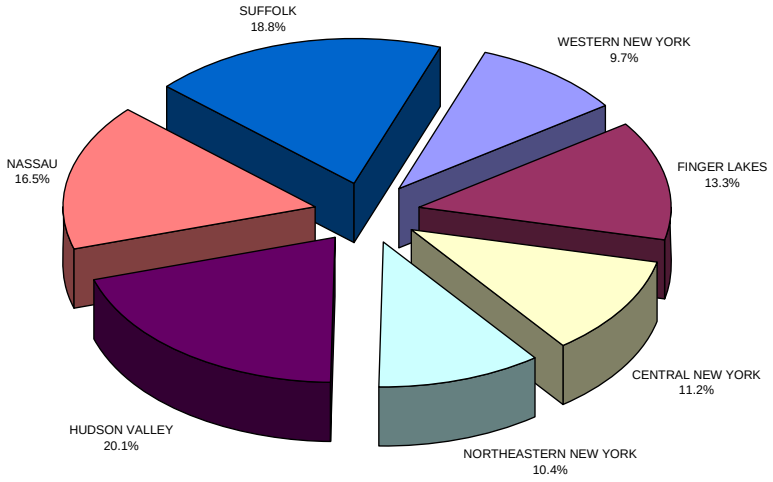


SOURCE: 1999-2002 NEW YORK STATE TRAUMA REGISTRY AND VITAL STATISTICS

The largest DOA populations were in Hudson Valley (20.1%), Suffolk (18.8%) and Nassau (16.5%). Western New York had the smallest population of DOAs (9.7%) (see Chart 24).

Chart 24

Distribution of DOAs in the New York State Trauma Registry by Region: 1999-2002 (excluding New York City)

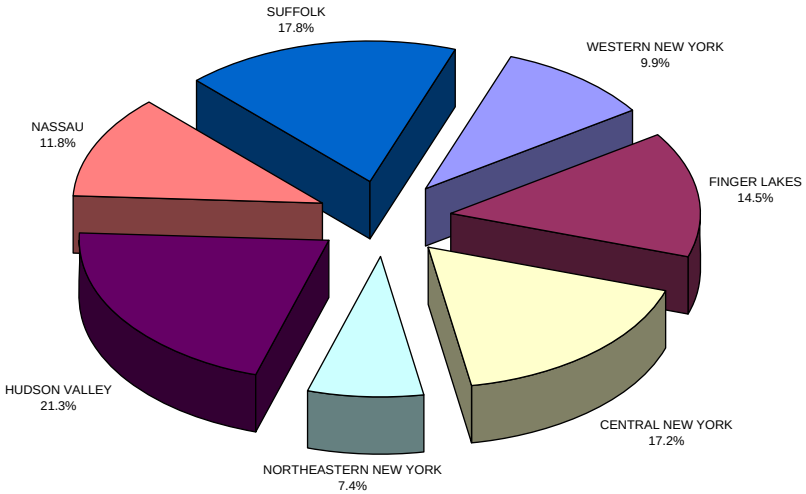


SOURCE: 1999-2002 NEW YORK STATE TRAUMA REGISTRY AND VITAL STATISTICS

The highest DIE populations were in Hudson Valley (21.3%), Suffolk (17.8%) and Central New York (17.2%). Western New York and Northeastern New York had the smallest DIE populations (9.9% and 7.4%, respectively) (see Chart 25).

Chart 25

Distribution of DIEs in the New York State Trauma Registry by Region: 1999-2002 (excluding New York City)

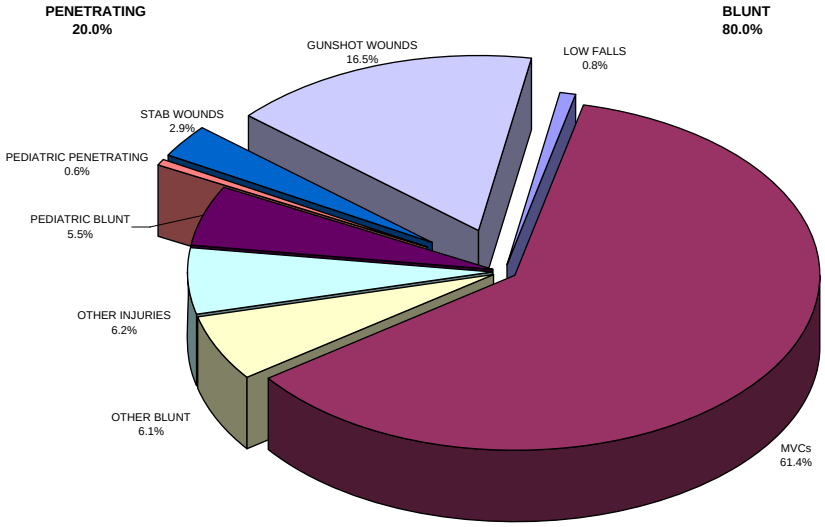


SOURCE: 1999-2002 NEW YORK STATE TRAUMA REGISTRY AND VITAL STATISTICS

Compared to the distribution for trauma inpatients, the distribution of DOAs is more heavily weighted toward penetrating injuries (20.0%). Only 3.9% of trauma inpatients qualifying for the Registry suffered gunshot wounds compared to 16.5% of the DOA population. Chart 26 shows 61.4% of the DOA population was motor vehicle crash patients, compared with 32.4% of trauma inpatients qualifying for the Registry. Very few low fall patients (0.8%) were DOAs.

Chart 26

Distribution of DOAs in the New York State Trauma Registry by Mechanism of Injury: 1999-2002 (excluding New York City)

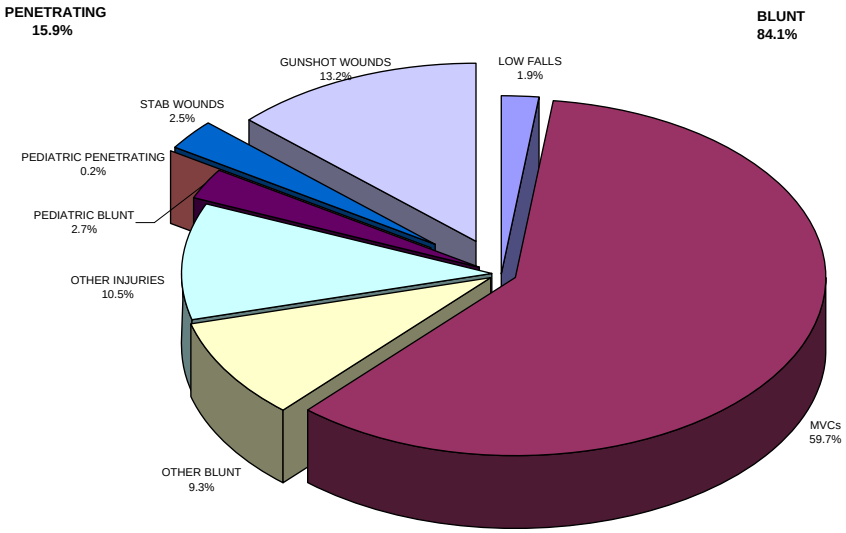


SOURCE: 1999-2002 NEW YORK STATE TRAUMA REGISTRY AND VITAL STATISTICS

The distribution of DIE patients also is more heavily weighted toward penetrating injuries (15.9%) than the distribution for trauma inpatients. Only 3.9% of trauma inpatients qualifying for the Registry suffered gunshot wounds compared to 13.2% of the DIE population. Chart 27 shows 59.7% of the DIE population was injured in a motor vehicle crash compared to 32.4% of inpatients qualifying for the Registry. Among adult injuries, the fewest DIEs were stab wounds (2.5%) and low falls (1.9%).

Chart 27

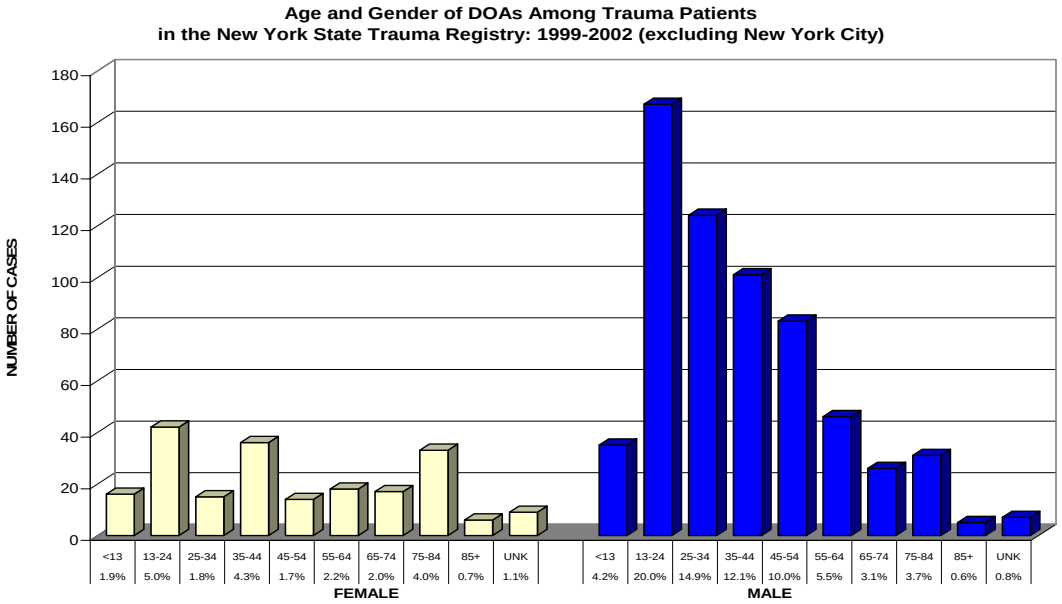
Distribution of DIEs in the New York State Trauma Registry by Mechanism of Injury: 1999-2002 (excluding New York City)



SOURCE: 1999-2002 NEW YORK STATE TRAUMA REGISTRY AND VITAL STATISTICS

Males comprised 74.9% of all DOAs. The male age groups with the most DOAs were 13-24 years old (20.0%) and 25-34 (14.9%). The male age groups with the fewest DOAs were 85+ (0.6%) and the 65-74 age group (3.1%). The female age groups with the most DOAs were the 13-24 age group (5.0%) and the 35-44 age group (4.3%). The least populous group among females was the 85+ age group, with only 0.7% of all DOAs (see Chart 28).

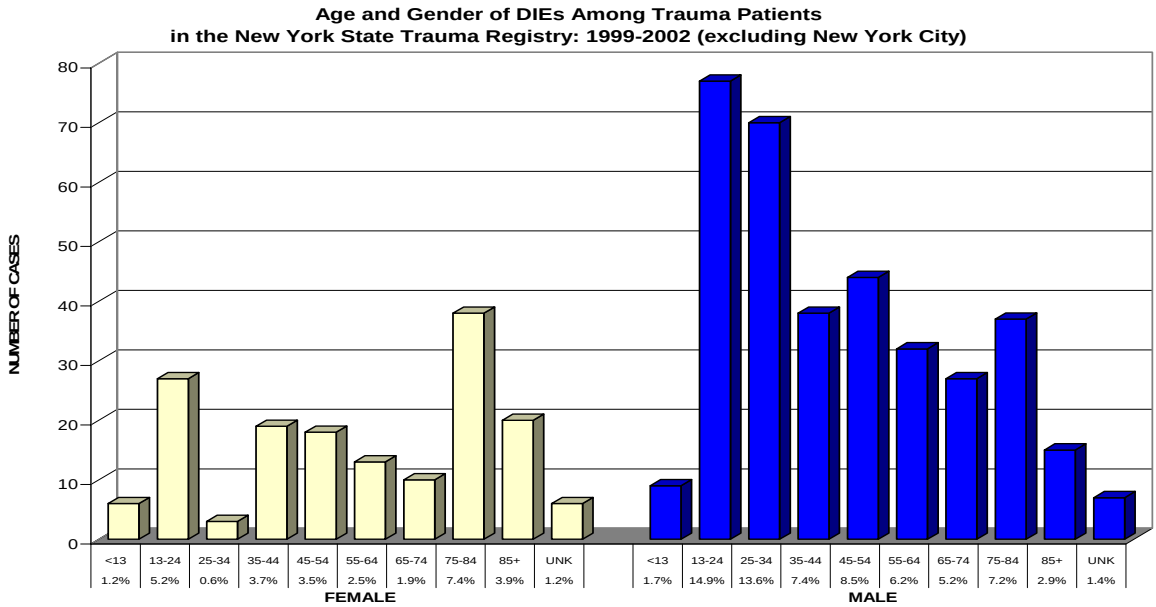
Chart 28



SOURCE: 1999-2002 NEW YORK STATE TRAUMA REGISTRY AND VITAL STATISTICS

Males comprised 69.0% of all DIEs. The male age groups with the most DIEs were 13-24 years old (14.9% of all DIEs) and 25-34 years old (13.6%). The least populous DIE age group among men was the <13 group (1.7%). Among women the most populous DIE groups were the older women (75-84 years old, with 7.4%), followed by women 13-24 years old (5.2%) (see Chart 29).

Chart 29



SOURCE: 1999-2002 NEW YORK STATE TRAUMA REGISTRY AND VITAL STATISTICS

Tables 1 and 2 present the distribution of patients in the NYSTR by region according to level of care (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, 78.3% were treated at regional centers while 21.7% were treated at area trauma centers. In New York City, 100% of the patients were treated at regional centers since there are no area centers in the region. After New York City, the region with the next largest percent of patients treated at regional centers was Western New York with 91.8%. The region with the smallest percent of patients treated at regional centers was Suffolk with 46.3%.

Among the inpatients in the models used to assess hospital performance, 47.1% 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 34.1% in New York City to a high of 58.1% in Hudson Valley. For most regions of the state, penetrating injuries (stab wounds and gunshot wounds) represent from 1.6% to 6.6% of the total patients. In New York City, these two mechanisms of injury represent 16.2% and 11.7% of the total patients.

Table 1
Distribution of New York State Inpatients by Region and Level
Five Adult Mechanisms of Injury: 1999 – 2002

Region	Regional Trauma Centers N (%)	Area Trauma Centers N (%)	Total
WNY	3,060 (91.8%)	272 (8.2%)	3,332 (100.0)
FIN	2,348 (59.0%)	1,631 (41.0%)	3,979 (100.0)
CNY	2,622 (58.0%)	1,898 (42.0%)	4,520 (100.0)
NNY	2,509 (80.5%)	608 (19.5%)	3,117 (100.0)
HUD	2,644 (57.2%)	1,979 (42.8%)	4,623 (100.0)
NAS	3,492 (78.3%)	968 (21.7%)	4,460 (100.0)
SUF	1,938 (46.3%)	2,251 (53.7%)	4,189 (100.0)
NYC	16,000 (100.0%)	0 (0.0%)	16,000 (100.0)
Total	34,613 (78.3%)	9,607 (21.7%)	44,220 (100.0)

WNY = Western New York
FIN = Finger Lakes
CNY = Central New York
NNY = Northeastern New York
HUD = Hudson Valley
NAS = Nassau
SUF = Suffolk
NYC = New York City

Table 2
Distribution of New York State Inpatients
by Region and Five Adult Mechanisms of Injury: 1999 – 2002

Region	Motor Vehicle Crash N (%)	Other Blunt N (%)	Low Falls N (%)	Stab Wounds N (%)	Gunshot Wounds N (%)	Total
WNY	1,836 (55.1%)	796 (23.9%)	332 (10.0%)	149 (4.5%)	219 (6.6%)	3,332 (100.0)
FIN	2,069 (52.0%)	880 (22.1%)	594 (14.9%)	207 (5.2%)	229 (5.8%)	3,979 (100.0)
CNY	2,428 (53.7%)	998 (22.1%)	700 (15.5%)	228 (5.0%)	166 (3.7%)	4,520 (100.0)
NNY	1,802 (57.8%)	682 (21.9%)	416 (13.3%)	128 (4.1%)	89 (2.9%)	3,117 (100.0)
HUD	2,686 (58.1%)	998 (21.6%)	640 (13.8%)	204 (4.4%)	95 (2.1%)	4,623 (100.0)
NAS	2,122 (47.6%)	990 (22.2%)	1,050 (23.5%)	186 (4.2%)	112 (2.5%)	4,460 (100.0)
SUF	2,423 (57.8%)	872 (20.8%)	669 (16.0%)	156 (3.7%)	69 (1.6%)	4,189 (100.0)
NYC	5,460 (34.1%)	3,815 (23.8%)	2,259 (14.1%)	2,587 (16.2%)	1,879 (11.7%)	16,000 (100.0)
Total	20,826 (47.1%)	10,031 (22.7%)	6,660 (15.1%)	3,845 (8.7%)	2,858 (6.5%)	44,220 (100.0)

WNY = Western New York
FIN = Finger Lakes
CNY = Central New York
NNY = Northeastern New York
HUD = Hudson Valley
NAS = Nassau
SUF = Suffolk
NYC = New York City

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 New York State Trauma Registry. These models have been used to assess the quality of care for different regions of the state and for different 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 and DOAs qualified based on whether the E-code assigned to the record indicated trauma. To ensure that all appropriate inpatient records were being submitted, the School of Public Health at the University at Albany, SUNY, which serves as the data coordinator and evaluator for the project, compared the inpatient records with data from the Department of Health's Statewide Planning and Research Cooperative System (SPARCS) acute care database. The submissions of DIEs and DOAs were matched against records in the Vital Statistics files to check for completeness. Any missing records that met the Registry definition and were not contained in the data 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≥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 each patient's chance of dying in the hospital during the admission for the traumatic injury as a function of various physiologic and anatomic risk factors for mortality in trauma patients. Most 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), possibly because of small sample sizes. However, these approaches did not accurately predict mortality for all of the five mechanisms of injury. Consequently, models were developed for each of the five mechanisms 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. In addition, since all of the New York City hospitals in the Registry were regional centers, the assessment of level of care for inpatients was done without New York City.

Stepwise logistic regression was used to develop the models. This statistical methodology has been employed in most other studies that predict survival or mortality for trauma patients. It consists of determining 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 misadventures were excluded as were patients with a principal diagnosis of burn. Patients who, on arrival at the hospital, had a GCS of three, no systolic blood pressure, no respirations, no pulse and who subsequently died were excluded. Also excluded were patients who, upon the ambulance's arrival at the scene, had a GCS of three, no systolic blood pressure, no respirations and no documented pulse.

Consistent with other trauma care studies, demographic and physiologic risk factors considered included the patient's age, Glasgow Coma Scale (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. The GCS is comprised of three components: eye opening, verbal response and motor response. Some statistical models, including those for this report, use these components separately rather than to combine them into the GCS. Verbal response cannot be accurately measured in intubated patients and, for this reason, was excluded from the models for this report. Respiratory rate, which has been used in some other studies, was not used because it, too, is not accurately measured in intubated patients. 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.

An additional risk factor that was investigated was intubation status, i.e., whether or not the patient was intubated, and where intubation first took place (in the ambulance or in the hospital). The final set of demographic and physiologic variables considered for each of the models was age, gender, eye opening, motor response, systolic blood pressure, and intubation status (intubated in the ambulance, first intubated in the hospital, receiving respiratory assistance in the ambulance but not intubated, first receiving respiratory assistance in the hospital without being intubated in the ambulance or hospital).

Also, the MVC model included a binary variable that denoted whether the injured patient was a pedestrian (instead of a driver or passenger of a motor vehicle), 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 treated as a candidate variable, and being admitted to one hospital and then being transferred to a second hospital was also treated as a candidate variable.

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. All of the proposed methods were examined and tested for their ability to predict mortality in conjunction with the demographic and physiologic risk factors mentioned above. The measure that worked the best was the International Classification of Diseases, Ninth Revisions-based Injury Severity Score (ICISS), developed by researchers in North Carolina[1]. 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

[1] 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.

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) 2001.

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, intubation status, 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.

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.

Cases not containing all of the significant variables were, by necessity, not included. Fortunately, the percentage of cases with missing variables was small, ranging from 2.6% for stab wound patients to 6.3% for patients who suffered low falls.

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. This was done by summing the predicted probabilities of death for each patient in the group and then dividing by the number of patients in the group. 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**. Two expected rates were calculated for each of the five mechanisms of injury: one that was based on all regions of the state for ultimately comparing performance across regions, and one that omitted New York City data that was used to compare performance of regional trauma centers and area trauma centers.

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, ironed out differences among groups in patient severity of illness. It arrives at a mortality rate for each provider on an identical group of patients.

To calculate the risk-adjusted mortality rate, the observed mortality rate is first divided by the group's expected morality rate. The **observed mortality rate** is merely 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 provider 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 provider's risk-adjusted rate.

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.

The **z statistic** or **z score** is an equivalent way of comparing observed and expected mortality rates. For a given group of patients, it is calculated as the difference between the observed and expected mortality rates, divided by a scaling factor that accounts for statistical variation. The z statistic has a shape that is approximately like a bell-shaped curve, and this enables the user to determine if the value obtained is unusually large or small.

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.

Equivalently, the z statistic can be used to yield identical conclusions to those obtained using risk-adjusted mortality rates. A z score larger than 1.96 or smaller than –1.96 should occur only 5% of the time if there is no true difference between the observed and expected mortality rates. Thus, if a value larger than 1.96 occurs, the mortality rate for the group is regarded as being significantly higher than that of the population of which it is a part (in this case, the statewide population). If a value less than –1.96 occurs, the mortality rate for the group is regarded as being significantly lower than that of the population of which it is a part.

The risk-adjusted mortality rate and the z score are used in this report as measures of quality of care provided by regions and levels of care. Although they are equivalent and provide redundant information, they are both used in the report because some readers may be more comfortable with one or the other of the two measures.

There are reasons that a group's risk-adjusted mortality rate or z score 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. If some hospitals have a tendency not to code some patient injuries in SPARCS, those hospitals are at a disadvantage relative to other hospitals 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 inhospital mortality are not contained in the statistical model for predicting mortality. This is a particular concern for regional trauma centers because noncenters, 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

Regional Comparisons

In the 1999-2002 Registry, there was a total of 20,826 motor vehicle crash (MVC) inpatients with data coded in all fields required by the MVC logistic regression model. A total of 1,491 of these patients (7.16%) 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 measures 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% confidence interval for each region. Figure 3 presents the risk adjusted mortality rate for each region along with its 95% confidence interval.

New York City had the largest number of MVC inpatients in the model (5,460 or 26.2% of all patients). The region with the fewest MVC inpatients was Northeastern New York with 1,802 patients (8.7%).

Observed mortality rates ranged from 4.98% to 8.30%, and expected mortality rates (a measure of relative injury severity) ranged from 6.32% to 8.15%. The risk-adjusted mortality rate, a measure of relative performance, ranged from 5.64% in Central New York to 8.63% in New York City. A comparison of the 95% confidence intervals for each region's risk-adjusted mortality rate with the overall statewide inhospital mortality rate for MVC patients demonstrates that New York City had a significantly higher mortality rate than expected (because the statewide rate of 7.16% is not contained in the confidence interval for New York City's' risk-adjusted mortality rate). Central New York had a significantly lower mortality rate than expected. As shown in Figure 3, the lower bound of the confidence interval on NYC's risk-adjusted mortality rate is above the statewide rate and the upper bound of the confidence interval for Central New York's mortality rate is below the statewide rate of 7.16%.

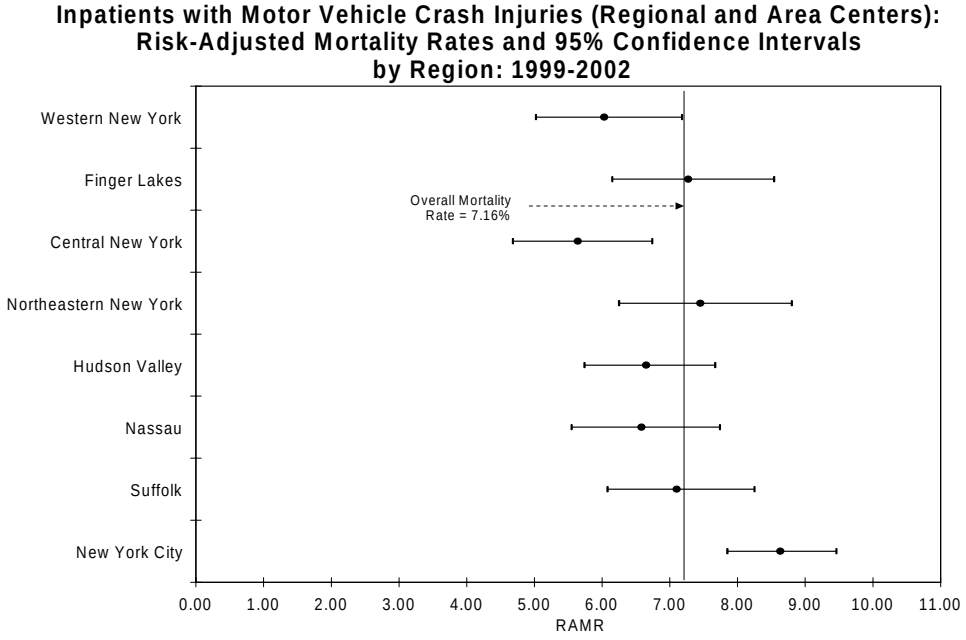
Table 3
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients with Motor Vehicle Crash Injuries
by Region: 1999 – 2002
Inpatients at Regional and Area Centers

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
WNY	1836	8.82	126	6.86	8.15	6.03	(5.02, 7.18)	-1.93
FIN	2069	9.93	148	7.15	7.04	7.27	(6.15, 8.54)	0.16
CNY	2428	11.66	121	4.98	6.32	5.64	(4.68, 6.74)	**-2.67**
NNY	1802	8.65	137	7.60	7.31	7.45	(6.25, 8.80)	0.43
HUD	2686	12.90	190	7.07	7.61	6.65	(5.74, 7.67)	-0.98
NAS	2122	10.19	144	6.79	7.39	6.58	(5.55, 7.74)	-0.98
SUF	2423	11.63	172	7.10	7.16	7.10	(6.08, 8.25)	-0.05
NYC	5460	26.22	453	8.30	6.88	8.63	(7.85, 9.46)	**3.84**
Total	20826	100.00	1491	7.16	------	------	----------	-----

WNY = Western New York
FIN = Finger Lakes
CNY = Central New York
NNY = Northeastern New York
HUD = Hudson Valley
NAS = Nassau
SUF = Suffolk
NYC = New York City

OMR = Observed Mortality Rate
EMR = Expected Mortality Rate
RAMR = Risk-Adjusted Mortality Rate

Figure 3



In the 1999-2002 Registry, there was a total of 21,096 motor vehicle crash (MVC) inpatients with data coded in all fields required by the MVC logistic regression model that included inpatients and deaths in the emergency department (DIEs). A total of 1,757 of these patients (8.33%) 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 measures 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% confidence interval for each region. Figure 4 presents the risk adjusted mortality rate for each region along with its 95% confidence interval.

New York City had the largest number of MVC inpatients in the model (5,493 or 26.0% of all patients). The region with the fewest MVC inpatients was Northeastern New York with 1,821 patients (8.6%).

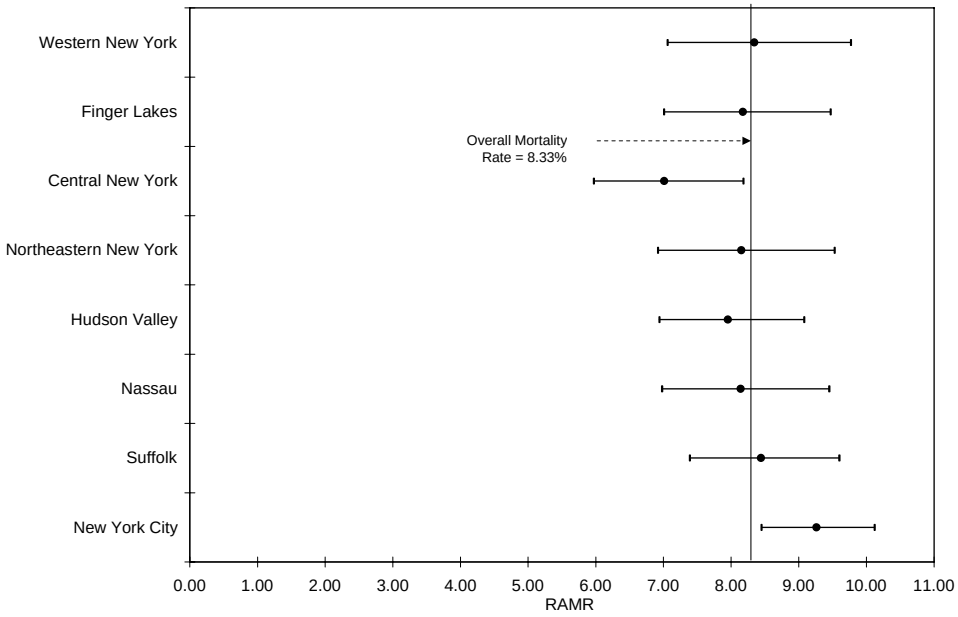
Observed mortality rates ranged from 6.56% to 9.38%, and expected mortality rates ranged from 7.79% to 9.26%. The risk-adjusted mortality rate, ranged from 7.01% in Central New York to 9.26% in New York City. A comparison of the 95% confidence intervals for each region's risk-adjusted mortality rate with the overall statewide inhospital and DIE mortality rate for MVC patients demonstrates that New York City had a significantly higher mortality rate than expected (because the statewide rate of 8.33% is not contained in the confidence interval for New York City's' risk-adjusted mortality rate). Central New York had a significantly lower mortality rate than expected. As shown in Figure 4, the lower bound of the confidence interval on NYC's risk-adjusted mortality rate is above the statewide rate and the upper bound for the confidence intervals on Central New York's mortality rate is below the statewide rate of 8.33%. It is notable that New York City had a significantly higher mortality rate than the state for MVCs with either definition of mortality and Central New York had a significantly lower mortality rate than the state using either definition of mortality.

Table 4
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients with Motor Vehicle Crash Injuries
by Region: 1999 – 2002
Deaths in the Emergency Department and Inpatients at Regional and Area Centers

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
WNY	1862	8.83	152	8.16	8.15	8.34	(7.06, 9.77)	-0.01
FIN	2098	9.95	177	8.44	8.60	8.17	(7.01, 9.47)	-0.21
CNY	2469	11.70	162	6.56	7.79	7.01	(5.97, 8.18)	**-2.20**
NNY	1821	8.63	156	8.57	8.76	8.15	(6.92, 9.53)	-0.22
HUD	2717	12.88	221	8.13	8.52	7.95	(6.94, 9.08)	-0.64
NAS	2152	10.20	174	8.09	8.27	8.14	(6.98, 9.45)	-0.25
SUF	2484	11.77	233	9.38	9.26	8.44	(7.39, 9.60)	0.18
NYC	5493	26.04	482	8.77	7.89	9.26	(8.45, 10.12)	**2.27**
Total	21096	100.00	1757	8.33	------	------	----------	-----

Figure 4

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: 1999-2002



Comparisons for Different Levels of Care

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% confidence interval for the two levels, regional and area, of trauma center care for MVC patients in 1999-2002. Figure 5 presents the risk-adjusted mortality rate and its 95% confidence intervals for each level of care.

Regional centers accommodated 78.1% of all MVC inpatients in the 1999-2002 data. The 1999-2002 observed morality rate for regional centers (7.63%) was considerably higher than the rate for area centers (5.46%); however, regional centers cared for the most severely injured patients as indicated by their expected mortality rate (7.58%), which was much higher than the expected rate for area centers (5.66%). 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, area centers had the lower risk-adjusted mortality rate (6.90%) compared to that of the regional centers (7.21%). Neither of these risk-adjusted mortality rates was significantly different from expected.

Table 5
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients with Motor Vehicle Crash Injuries
by Level: 1999 – 2002
Inpatients at Regional and Area Centers

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
Regional	16268	78.11	1242	7.63	7.58	7.21	(6.82, 7.63)	0.25
Area	4558	21.89	249	5.46	5.66	6.90	(6.07, 7.82)	-0.53
Total	20826	100.00	1491	7.16	------	------	----------	-----

Figure 5

Inpatients with Motor Vehicle Crash Injuries (Regional and Area Centers):
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Level: 1999-2002

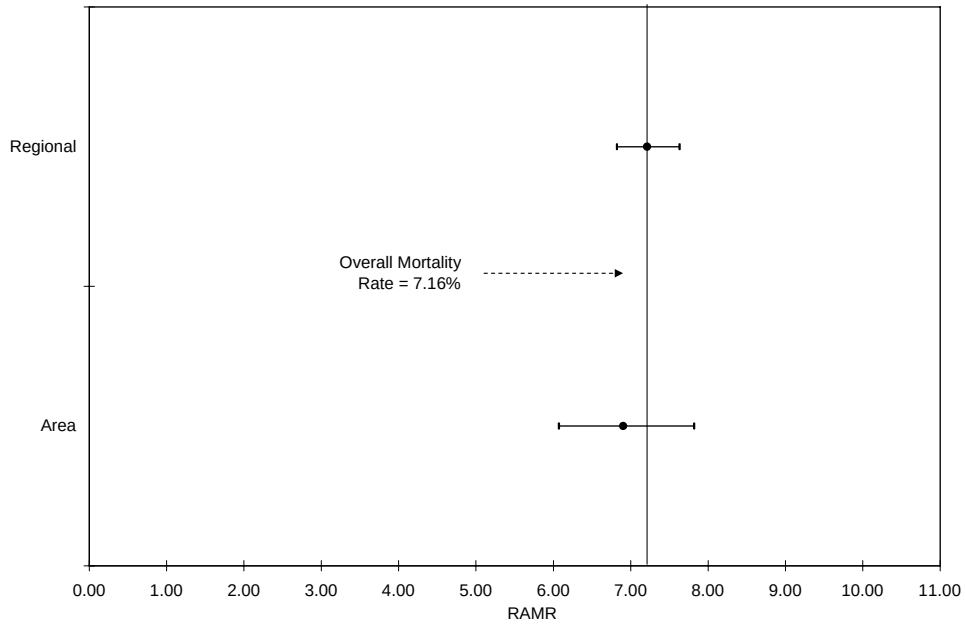


Table 6 presents the number of inpatients and DIEs, the percentage of all inpatients and DIEs, the number of deaths, the observed mortality rate, the expected mortality rate and the risk-adjusted mortality rate with its 95% confidence interval for the two levels, regional and area, of trauma center care for MVC patients in 1999-2002. Figure 6 presents the risk-adjusted mortality rate and its 95% confidence intervals for each level of care.

Regional centers accommodated 77.9% of all MVC inpatients in the 1999-2002 data. The 1999-2002 observed morality rate for regional centers (8.58%) was higher than the rate for area centers (7.45%); however, regional centers cared for the more severely injured patients as indicated by their expected mortality rate (8.58%), which was much higher than the expected rate for area centers (7.45%). These rates show there is a tendency to triage the more seriously injured MVC patients to regional trauma centers.

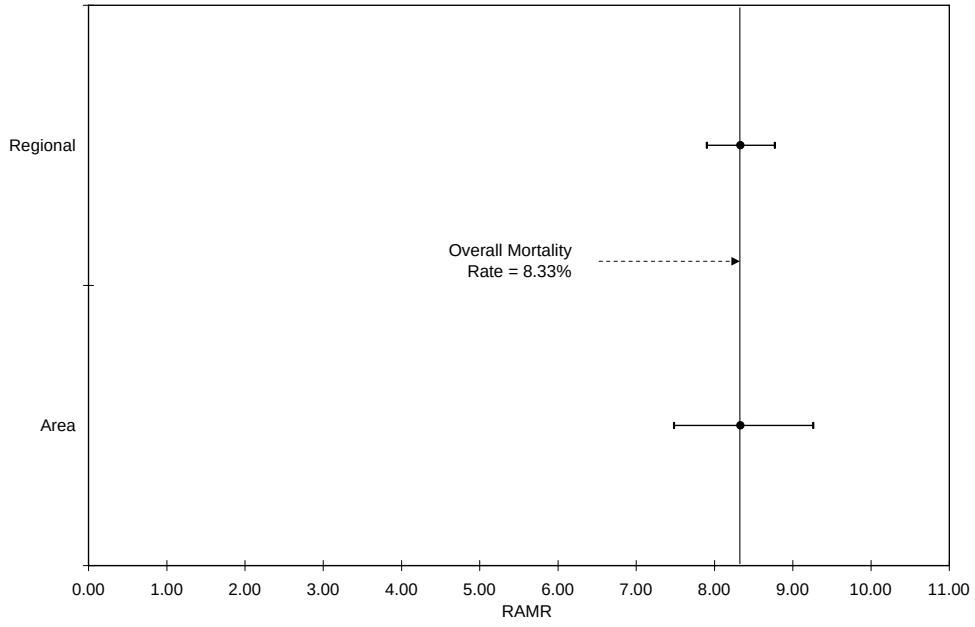
After adjusting for severity of injury, the regional and area centers had the same adjusted mortality rate (8.33%).

Table 6
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients with Motor Vehicle Crash Injuries
by Level: 1999 – 2002
Deaths in the Emergency Department and Inpatients at Regional and Area Centers

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
Regional	16440	77.93	1410	8.58	8.58	8.33	(7.90, 8.77)	0.02
Area	4656	22.07	347	7.45	7.45	8.33	(7.48, 9.26)	-0.01
Total	21096	100.00	1757	8.33	------	------	----------	-----

Figure 6

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: 1999-2002



Other Blunt Injuries

Regional Comparisons

"Other blunt injuries" are blunt injuries that are neither motor vehicle crash-related nor are low falls. Some examples of these injuries are higher falls (falls from a different level), being struck by an object or person, accidents caused by machinery or explosions and intentionally self-inflicted injuries. There were a total of 10,031 hospital inpatients in the Registry with completely coded data for other blunt injuries in New York State in 1999-2002. A total of 670 of these patients (6.68%) died in the hospital during the same admission. 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 measures of fit of the statistical model.

For inpatients with other blunt injuries by region, Table 7 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% confidence interval. Figure 7 presents the risk-adjusted mortality rate and 95% confidence interval for each region.

The region with the most patients with other blunt injuries was New York City, with 3,815 patients (38.0%). Central New York and Hudson Valley had the second highest total, with 998, 10.0% of all patients. Northeastern New York had the fewest (682 or 6.8% of the total), followed by Western New York with 796, or 7.9%, of the total.

Observed mortality rates for patients with other blunt injuries varied by region from 4.11% to 8.82%, and expected mortality rates ranged from 4.70% to 8.33%. Risk-adjusted mortality rates ranged from 4.39% in Western New York, significantly lower than expected, to 7.51% in New York City.

Table 7
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients with Other Blunt Injuries
by Region: 1999 – 2002
Inpatients at Regional and Area Centers

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
WNY	796	7.94	40	5.03	7.64	4.39	(3.14, 5.98)	**-2.75**
FIN	880	8.77	57	6.48	6.48	6.67	(5.05, 8.65)	0.08
CNY	998	9.95	48	4.81	5.78	5.55	(4.09, 7.36)	-1.23
NNY	682	6.80	28	4.11	4.70	5.83	(3.87, 8.43)	-0.61
HUD	998	9.95	88	8.82	7.98	7.38	(5.92, 9.09)	0.88
NAS	990	9.87	78	7.88	8.33	6.31	(4.99, 7.88)	-0.43
SUF	872	8.69	56	6.42	6.36	6.74	(5.09, 8.76)	0.03
NYC	3815	38.03	275	7.21	6.41	7.51	(6.65, 8.45)	1.88
Total	10031	100.00	670	6.68	------	------	----------	-----

Figure 7

**Inpatients with Other Blunt Injuries (Regional and Area Centers):
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Region: 1999-2002**

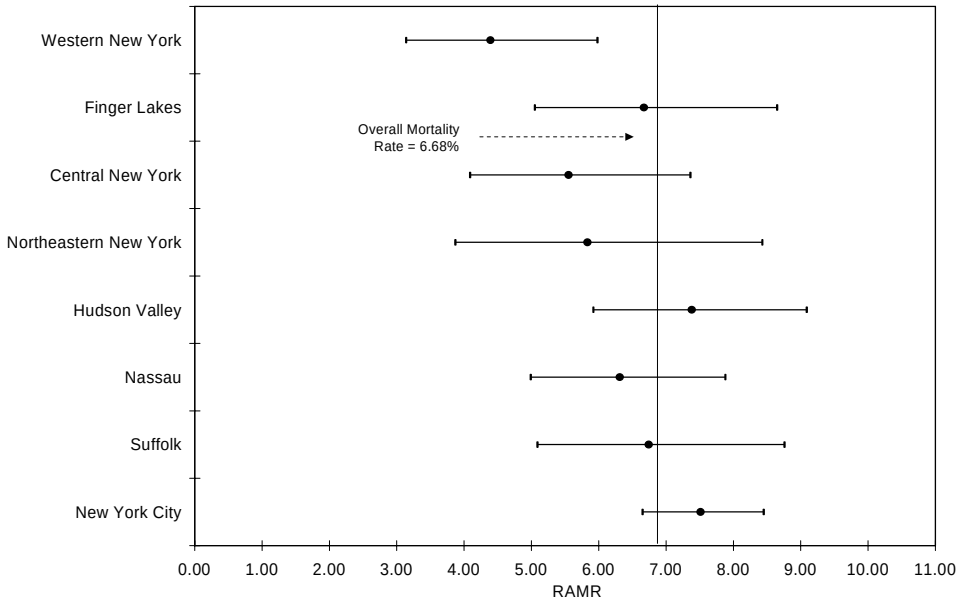
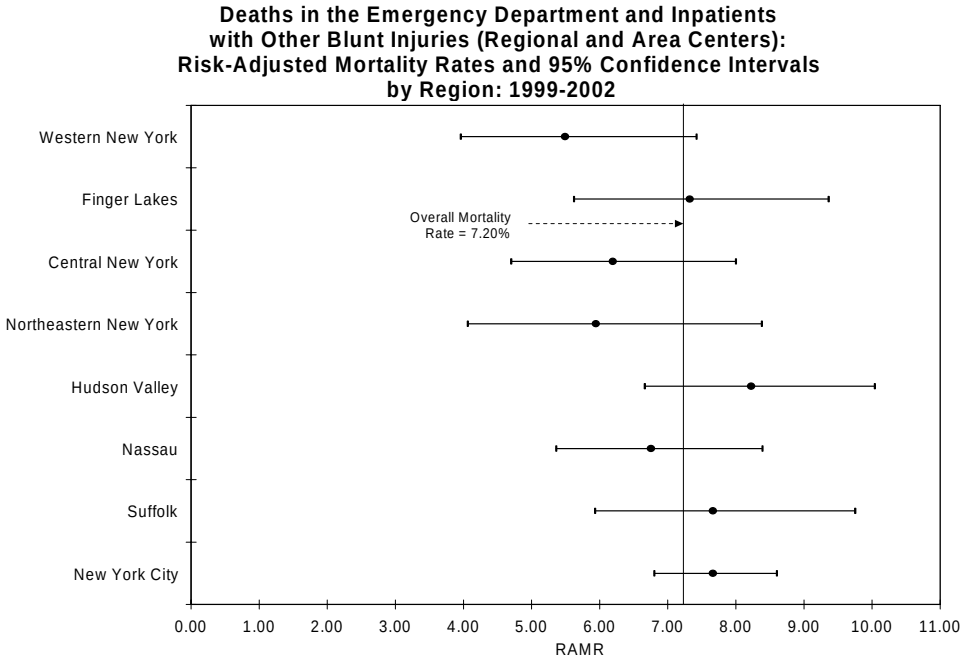


Table 8 and Figure 8 compare performance by region for other blunt injuries as was done in Table 7 and Figure 7, except that mortality is defined as death in the emergency department or as an inpatient. The most notable change between the tables is that with the expanded definition of death in Table 8, Western New York no longer has a significantly lower risk-adjusted mortality rate.

**Table 8
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients with Other Blunt Injuries
by Region: 1999 – 2002
Deaths in the Emergency Department and Inpatients at Regional and Area Centers**

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
WNY	796	7.90	42	5.28	6.92	5.49	(3.96, 7.42)	-1.74
FIN	885	8.78	63	7.12	7.00	7.32	(5.62, 9.36)	0.09
CNY	1006	9.98	58	5.77	6.70	6.19	(4.70, 8.00)	-1.09
NNY	686	6.81	32	4.66	5.66	5.94	(4.06, 8.38)	-1.01
HUD	1003	9.95	96	9.57	8.38	8.22	(6.66, 10.04)	1.24
NAS	992	9.85	81	8.17	8.70	6.75	(5.36, 8.39)	-0.51
SUF	882	8.75	66	7.48	7.03	7.66	(5.93, 9.75)	0.47
NYC	3826	37.97	287	7.50	7.04	7.66	(6.80, 8.60)	1.04
Total	10076	100.00	725	7.20	------	------	----------	-----

Figure 8



Comparison for Different Levels of Care

Table 9 contains the number of patients, percent of patients, number of deaths, observed mortality rate, expected mortality rate and risk-adjusted mortality rate along with its 95% confidence interval for the two levels of care (regional trauma centers and area trauma centers) for patients with other blunt injuries. Figure 9 presents the risk-adjusted mortality rate and its 95% confidence interval for each level of care.

Regional centers treated 7,895 inpatients with other blunt injuries (78.7% of the total). Area centers treated the remaining 21.3% of patients with other blunt injuries.

Regional centers had the higher observed mortality rate for patients with other blunt injuries (6.89%). The observed mortality rate at area centers was 5.90%. Regional centers also treated the most severely injured patients, with an expected mortality rate of 6.81% followed closely by area centers at 6.21%. 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 6.76% compared to that of the area centers (6.34%). Neither rate was statistically different from the statewide rate.

Table 9
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients with Other Blunt Injuries
by Level: 1999 – 2002
Inpatients at Regional and Area Centers

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
Regional	7895	78.71	544	6.89	6.81	6.76	(6.21, 7.36)	0.28
Area	2136	21.29	126	5.90	6.21	6.34	(5.28, 7.55)	-0.53
Total	10031	100.00	670	6.68	------	------	----------	-----

Figure 9

Inpatients with Other Blunt Injuries (Regional and Area Centers): Risk-Adjusted Mortality Rates and 95% Confidence Intervals by Level: 1999-2002

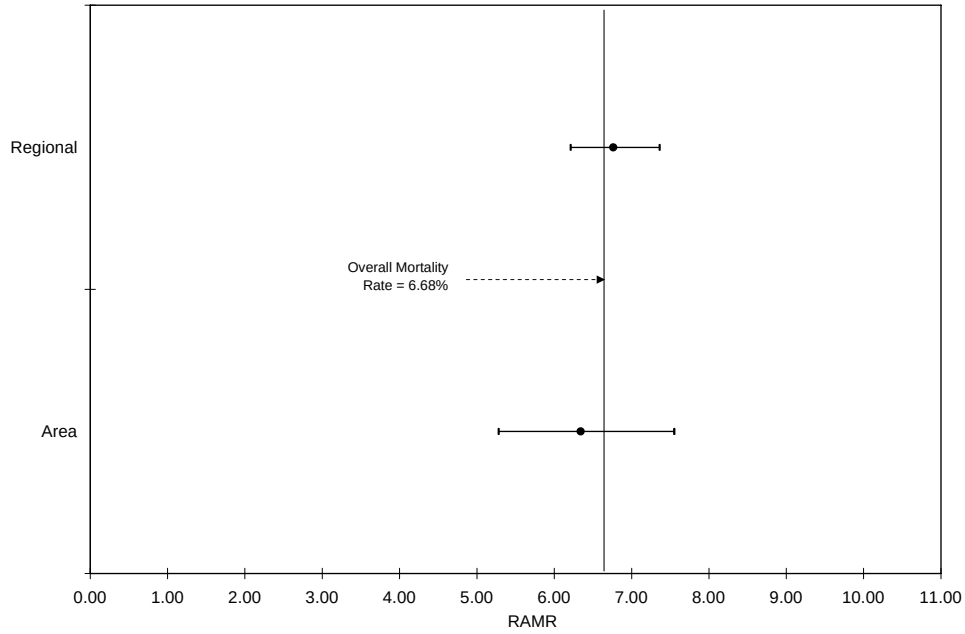


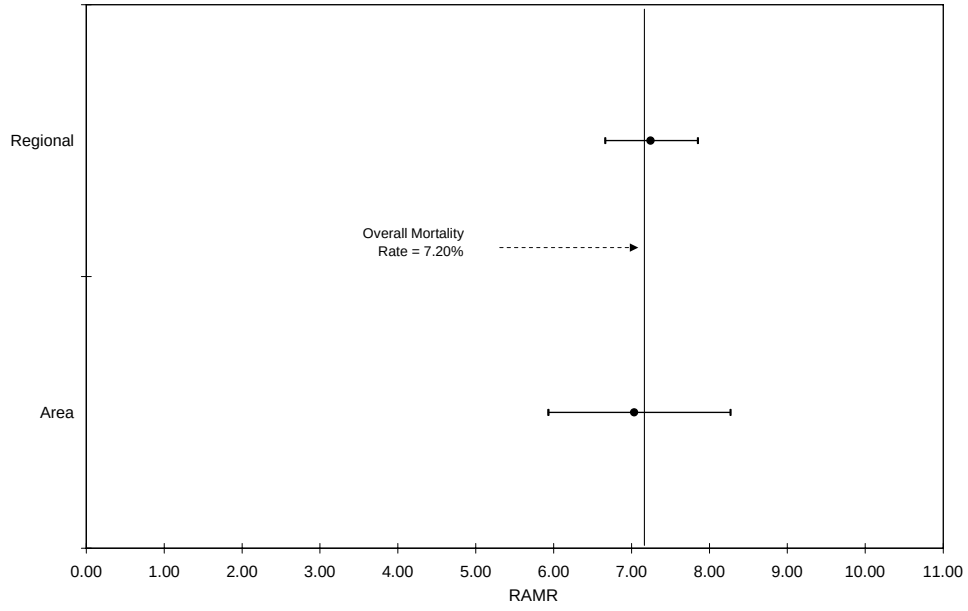
Table 10 and Figure 10 compare performance by region for other blunt injuries as was done in Table 9 and Figure 9, except that mortality is defined as death in the emergency department or as an inpatient. Again, there are no significant differences by level.

Table 10
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients with Other Blunt Injuries
by Level: 1999 – 2002
Deaths in the Emergency Department and Inpatients at Regional and Area Centers

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
Regional	7925	78.65	579	7.31	7.26	7.24	(6.66, 7.85)	0.13
Area	2151	21.35	146	6.79	6.95	7.03	(5.93, 8.27)	-0.23
Total	10076	100.00	725	7.20	------	------	----------	-----

Figure 10

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: 1999-2002



Low Falls

Regional Comparisons

A low fall is defined in terms of ICD-9-CM E-codes as a fall from the same level. In New York State during the years 1999-2002, there was a total of 6,660 hospital inpatients with low fall injuries for whom complete risk factor information was available in the New York State Trauma Registry (see Table 11). A total of 557 of these patients (8.36%) died in the hospital during the same admission. 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.

The observed inpatient mortality rates for patients suffering low falls ranged from 6.63% in WNY to 9.38% in Hudson Valley. Expected mortality rates ranged from 7.23% in Northeastern New York to 9.24% in Hudson Valley. Risk-adjusted mortality rates ranged from 6.72% in Western New York to 8.98% in New York City. 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.

Table 11
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients with Low Falls Injuries
by Region: 1999 - 2002
Inpatients at Regional and Area Centers

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
WNY	332	4.98	22	6.63	8.25	6.72	(4.21, 10.17)	-0.93
FIN	594	8.92	43	7.24	8.52	7.10	(5.14, 9.57)	-1.00
CNY	700	10.51	57	8.14	7.99	8.52	(6.45, 11.04)	0.10
NNY	416	6.25	30	7.21	7.23	8.34	(5.62, 11.90)	0.10
HUD	640	9.61	60	9.38	9.24	8.49	(6.48, 10.92)	0.07
NAS	1050	15.77	81	7.71	8.24	7.83	(6.22, 9.74)	-0.52
SUF	669	10.05	62	9.27	8.86	8.75	(6.71, 11.22)	0.31
NYC	2259	33.92	202	8.94	8.33	8.98	(7.79, 10.31)	0.98
Total	6660	100.00	557	8.36	------	------	----------	-----

Figure 11

**Inpatients with Low Fall Injuries (Regional and Area Centers):
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Region: 1999-2002**

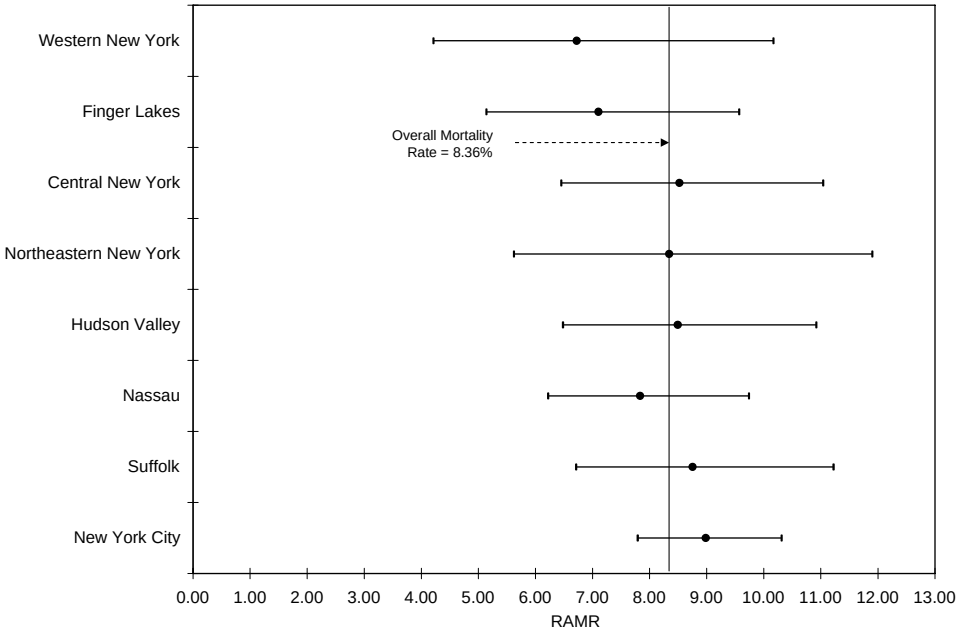


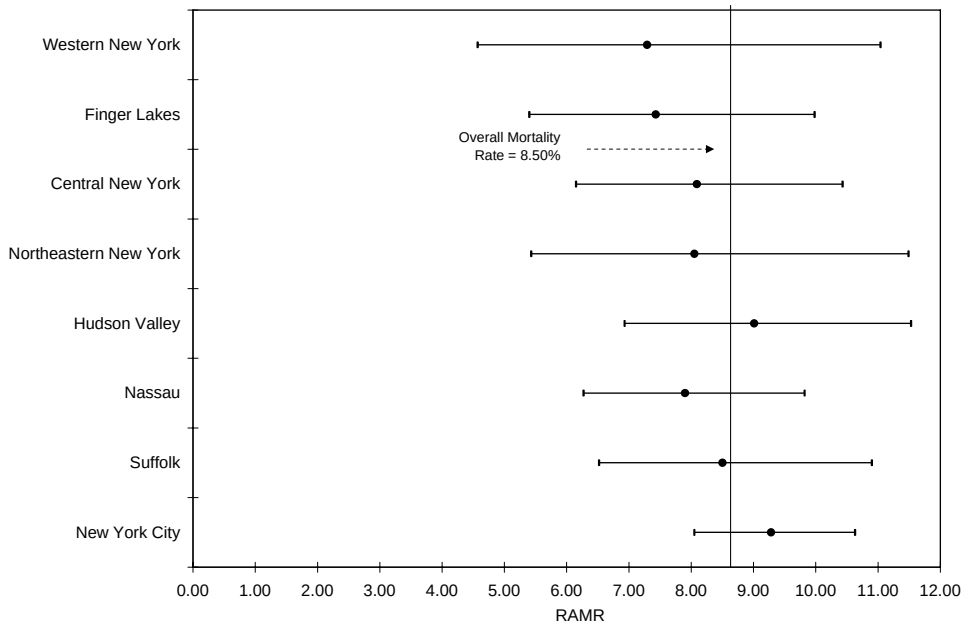
Table 12 and Figure 12 compare performance by region for low falls as was done in Table 11 and Figure 11, except that mortality is defined as death in the emergency department or as an inpatient. As with inpatient deaths for low falls, no region was found to have a significantly different mortality rate than the state.

**Table 12
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients with Low Falls Injuries
by Region: 1999 - 2002
Deaths in the Emergency Department and Inpatients at Regional and Area Centers**

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
WNY	332	4.98	22	6.63	7.73	7.29	(4.57, 11.04)	-0.60
FIN	595	8.92	44	7.39	8.46	7.43	(5.40, 9.98)	-0.81
CNY	702	10.52	59	8.40	8.84	8.09	(6.15, 10.43)	-0.30
NNY	416	6.24	30	7.21	7.61	8.05	(5.43, 11.49)	-0.18
HUD	643	9.64	63	9.80	9.24	9.01	(6.93, 11.53)	0.42
NAS	1050	15.74	81	7.71	8.30	7.90	(6.27, 9.82)	-0.60
SUF	670	10.04	62	9.25	9.25	8.50	(6.52, 10.90)	-0.04
NYC	2262	33.91	206	9.11	8.34	9.28	(8.05, 10.63)	1.21
Total	6670	100.00	567	8.50	------	------	----------	-----

Figure 12

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: 1999-2002



Comparison for Different Levels of Care

Table 13 contains the number of patients, number of deaths, observed mortality rate, expected mortality rate and risk-adjusted mortality rate along with its 95% confidence interval for the two levels of care (regional trauma centers and area trauma centers) for low falls patients. Figure 13 presents the risk-adjusted mortality rate and its 95% confidence interval for each level of care. Regional centers accommodated 4,498 low falls patients (67.5%) in contrast to the 78.1% of all MVC inpatients.

Regional centers had the higher observed mortality rate for low falls patients (8.56%, vs. 7.96% for area centers); however, the expected mortality rate for regional centers (8.52%) was also high. The expected rate for area centers was 8.04%. After factoring in the observed and the expected rates for each level, area centers had the slightly lower risk-adjusted mortality rate (8.28%) relative to that of the regional centers (8.40%). Neither rate was statistically different from the statewide rate.

Table 13
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients with Low Falls Injuries
by Level: 1999 - 2002
Inpatients at Regional and Area Centers

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
Regional	4498	67.54	385	8.56	8.52	8.40	(7.58, 9.28)	0.07
Area	2162	32.46	172	7.96	8.04	8.28	(7.09, 9.61)	-0.08
Total	6660	100.00	557	8.36	------	------	----------	-----

Figure 13

**Inpatients with Low Fall Injuries (Regional and Area Centers):
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Level: 1999-2002**

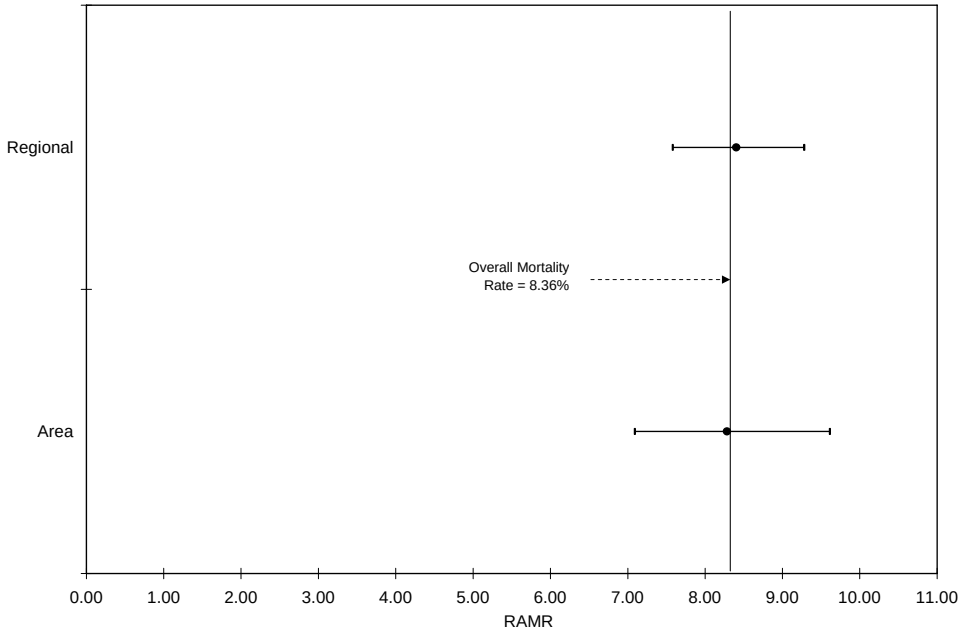


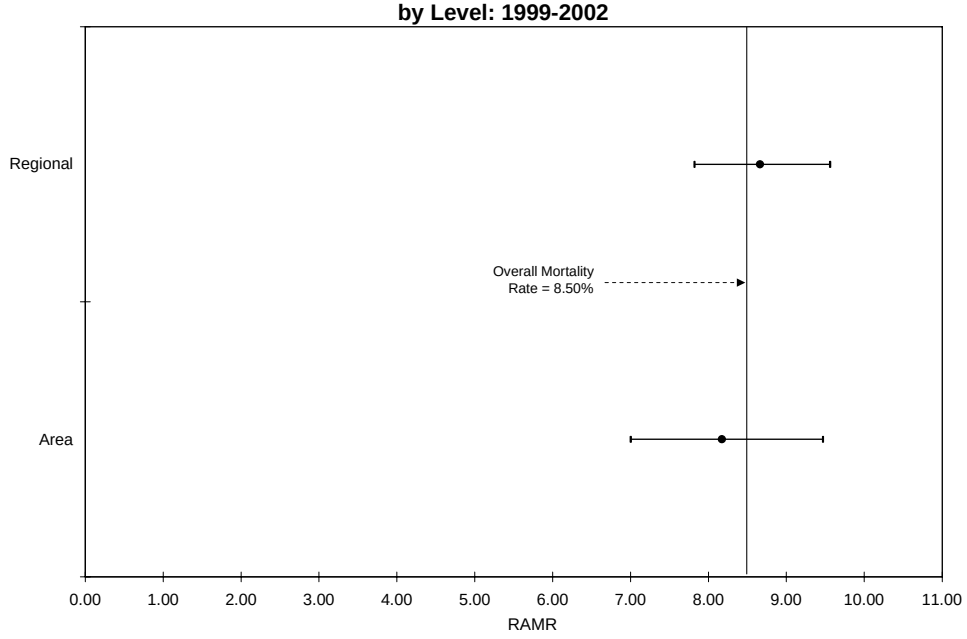
Table 14 and Figure 14 compare performance by level for low falls as was done in Table 13 and Figure 13, except that mortality is defined as death in the emergency department or as an inpatient. As with inpatient deaths for low falls, the two levels did not have significantly different mortality rates.

**Table 14
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients with Low Falls Injuries
by Level: 1999 - 2002
Deaths in the Emergency Department and Inpatients at Regional and Area Centers**

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
Regional	4504	67.53	392	8.70	8.55	8.66	(7.82, 9.56)	0.34
Area	2166	32.47	175	8.08	8.41	8.17	(7.00, 9.47)	-0.48
Total	6670	100.00	567	8.50	------	------	----------	-----

Figure 14

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: 1999-2002



Stab Wounds

Regional Comparisons

There were a total of 3,845 stab wound inpatients in the 1999-2002 Registry with values coded in all fields required by the logistic regression model. A total of 93 of these patients (2.42%) 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 measures of fit of the statistical model.

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

The region with the most patients with stab wounds was New York City with 2,587 patients (67.3%). This percentage is much higher than the New York City share of the three mechanisms of injury corresponding to blunt injuries. Central New York had the second highest percentage with 5.9%, and Northeastern New York had the lowest percentage of stab wound patients in the Registry (3.3%).

Observed mortality rates ranged from 0.98% (204 patients with two deaths in Hudson Valley) to 4.03% in Western New York. Expected mortality rates ranged from 1.24% to 4.88%. Risk-adjusted mortality rates ranged from 1.44% in Finger Lakes to 3.39% in Suffolk. No regions had a risk-adjusted mortality rate that was statistically significantly lower or higher than expected.

Table 15
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients with Stab Wound Injuries
by Region: 1999 – 2002
Inpatients at Regional and Area Centers

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
WNY	149	3.88	6	4.03	3.57	2.73	(1.00, 5.94)	0.15
FIN	207	5.38	6	2.90	4.88	1.44	(0.52, 3.13)	-1.16
CNY	228	5.93	5	2.19	2.60	2.04	(0.66, 4.76)	-0.11
NNY	128	3.33	2	1.56	1.24	3.04	(0.34, 10.96)	0.07
HUD	204	5.31	2	0.98	1.47	1.61	(0.18, 5.83)	-0.19
NAS	186	4.84	5	2.69	2.99	2.18	(0.70, 5.08)	0.05
SUF	156	4.06	4	2.56	1.83	3.39	(0.91, 8.68)	0.47
NYC	2587	67.28	63	2.44	2.27	2.60	(2.00, 3.32)	0.52
Total	3845	100.00	93	2.42	------	------	----------	-----

Figure 15

**Inpatients with Stab Wound Injuries (Regional and Area Centers):
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Region: 1999-2002**

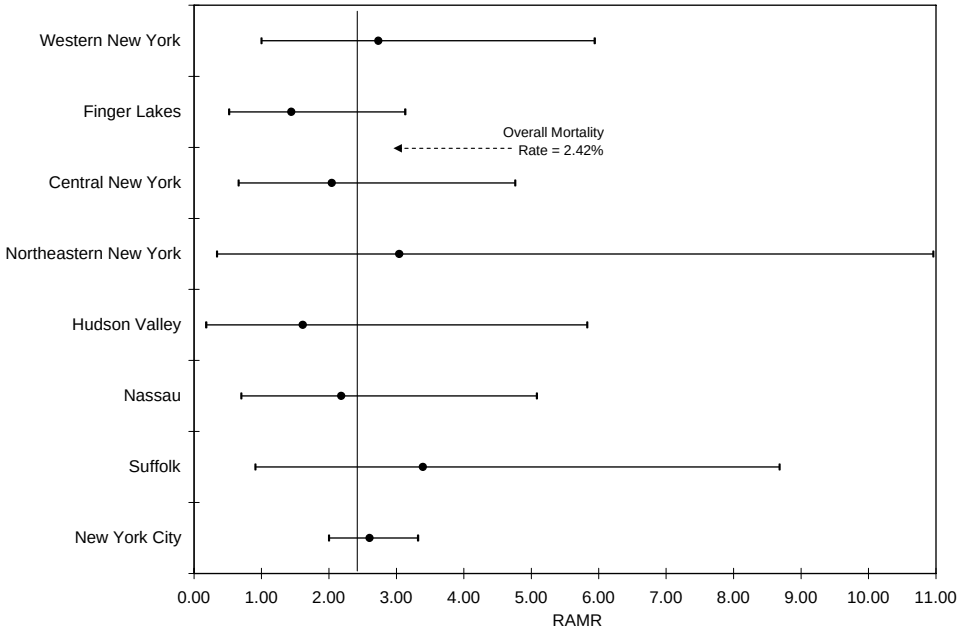


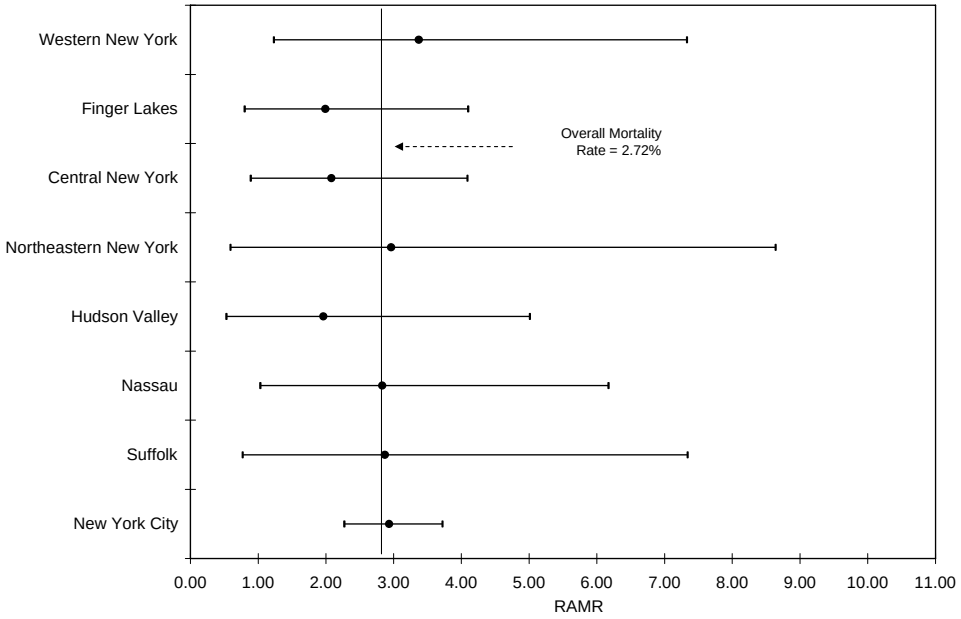
Table 16 and Figure 16 compare performance by region for stab wounds as was done in Table 15 and Figure 15, except that mortality is defined as death in the emergency department or as an inpatient. As with inpatient deaths for stab wounds, no region was found to have a significantly different mortality rate than the state.

**Table 16
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients with Stab Wounds Injuries
by Region: 1999 – 2002
Deaths in the Emergency Department and Inpatients at Regional and Area Centers**

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
WNY	149	3.86	6	4.03	3.25	3.37	(1.23, 7.33)	0.37
FIN	208	5.39	7	3.37	4.60	1.99	(0.80, 4.10)	-0.64
CNY	231	5.99	8	3.46	4.54	2.08	(0.89, 4.09)	-0.58
NNY	129	3.34	3	2.33	2.14	2.96	(0.59, 8.64)	-0.05
HUD	206	5.34	4	1.94	2.70	1.96	(0.53, 5.01)	-0.39
NAS	187	4.85	6	3.21	3.08	2.83	(1.03, 6.17)	-0.04
SUF	156	4.04	4	2.56	2.44	2.87	(0.77, 7.34)	-0.06
NYC	2592	67.19	67	2.58	2.40	2.93	(2.27, 3.72)	0.56
Total	3858	100.00	105	2.72	------	------	----------	-----

Figure 16

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: 1999-2002



Comparison for Different Levels of Care

Table 17 contains the number of patients, number of deaths, observed mortality rate, expected mortality rate and risk-adjusted mortality rate along with its 95% confidence interval for the two levels of trauma center care (regional and area) for patients with stab wounds. Figure 17 presents the risk-adjusted mortality rate and its 95% confidence interval for each level of care. Regional centers treated 3,398 inpatients with stab wounds (88.4% of the total), while area centers treated the other 447 inpatients.

The observed mortality rate was slightly higher for regional centers (2.47%) than the observed rate for area centers (2.01%). Regional centers had the higher expected mortality rate of 2.46% while the area expected rate was 2.11%.

The lower risk-adjusted mortality rate occurred among area centers (2.31%). The regional centers' risk-adjusted mortality rate was 2.43%. Neither of these rates was significantly different from the overall statewide rate of 2.42%.

Table 17
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients with Stab Wounds Injuries
by Level: 1999 – 2002
Inpatients at Regional and Area Centers

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
Regional	3398	88.37	84	2.47	2.46	2.43	(1.94, 3.01)	0.01
Area	447	11.63	9	2.01	2.11	2.31	(1.05, 4.39)	0.08
Total	3845	100.00	93	2.42	------	------	----------	-----

Figure 17

**Inpatients with Stab Wound Injuries (Regional and Area Centers):
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Level: 1999-2002**

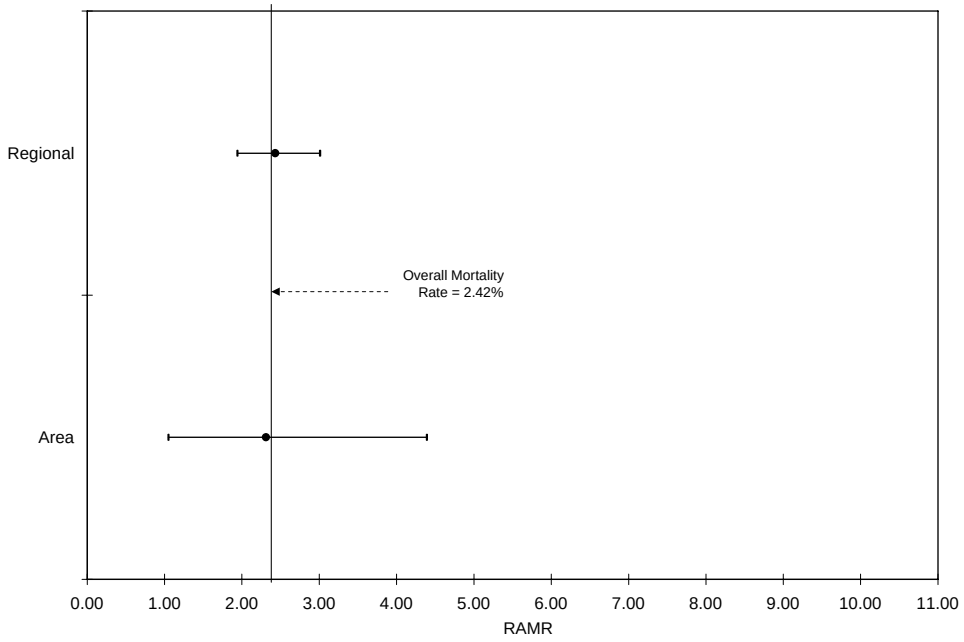


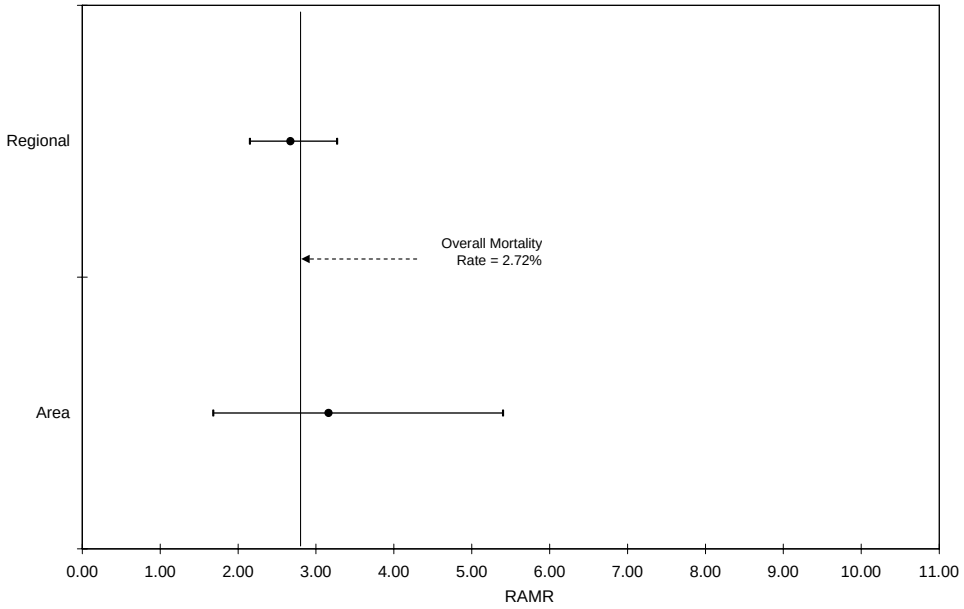
Table 18 and Figure 18 compare performance by level for stab wounds as was done in Table 17 and Figure 17 except that mortality is defined as death in the emergency department or as an inpatient. As with inpatient deaths for stab wounds, the two levels of care did not have significantly different risk-adjusted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

**Table 18
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients with Stab Wounds Injuries
by Level: 1999 – 2002
Deaths in the Emergency Department and Inpatients at Regional and Area Centers**

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
Regional	3407	88.31	92	2.70	2.75	2.67	(2.15, 3.27)	-0.12
Area	451	11.69	13	2.88	2.49	3.16	(1.68, 5.40)	0.43
Total	3858	100.00	105	2.72	------	------	----------	-----

Figure 18

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: 1999-2002



Gunshot Wounds

Regional Comparisons

There was a total of 2,858 gunshot wound inpatients with completely coded data in the fields required by the logistic regression model. A total of 382 of these patients (13.37%) 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 measures of fit of the statistical model.

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

New York City accounted for an overwhelming majority of the patients (1,879 or 65.8%) of this mechanism of injury. Finger Lakes had the second highest percentage with 8.0%, and Suffolk accounted for only 2.4% of inpatients suffering from gunshot wounds.

Observed mortality rates varied across regions from 9.04% to 22.11%, and expected mortality rates ranged from 11.66% to 23.86%. The region with the lowest risk-adjusted mortality rate was Central New York with 8.57%. New York City had the highest risk-adjusted mortality rate (14.64%). No region had a risk-adjusted mortality rate that was significantly different from the statewide average.

Table 19
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients with Gunshot Wound Injuries
by Region: 1999 – 2002
Inpatients at Regional and Area Centers

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
WNY	219	7.66	23	10.50	13.67	10.27	(6.51, 15.41)	-1.19
FIN	229	8.01	39	17.03	17.95	12.68	(9.02, 17.34)	-0.23
CNY	166	5.81	15	9.04	14.10	8.57	(4.79, 14.13)	-1.70
NNY	89	3.11	14	15.73	15.88	13.24	(7.23, 22.22)	0.14
HUD	95	3.32	21	22.11	23.86	12.38	(7.66, 18.93)	-0.21
NAS	112	3.92	18	16.07	17.33	12.39	(7.34, 19.59)	-0.17
SUF	69	2.41	12	17.39	17.73	13.11	(6.77, 22.90)	0.12
NYC	1879	65.75	240	12.77	11.66	14.64	(12.85, 16.61)	1.37
Total	2858	100.00	382	13.37	------	------	----------	-----

Figure 19

**Inpatients with Gunshot Wound Injuries (Regional and Area Centers):
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Region: 1999-2002**

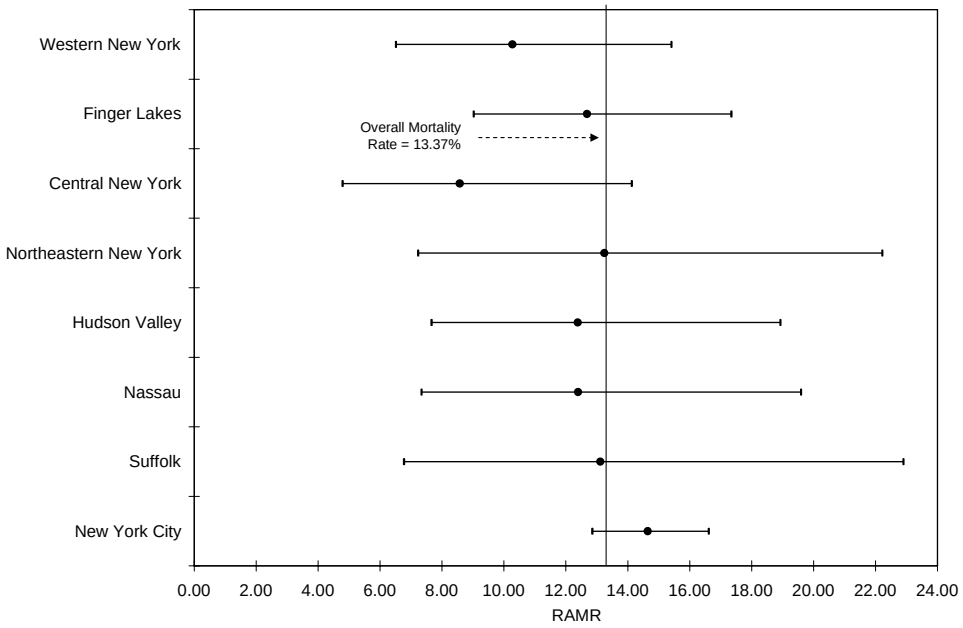


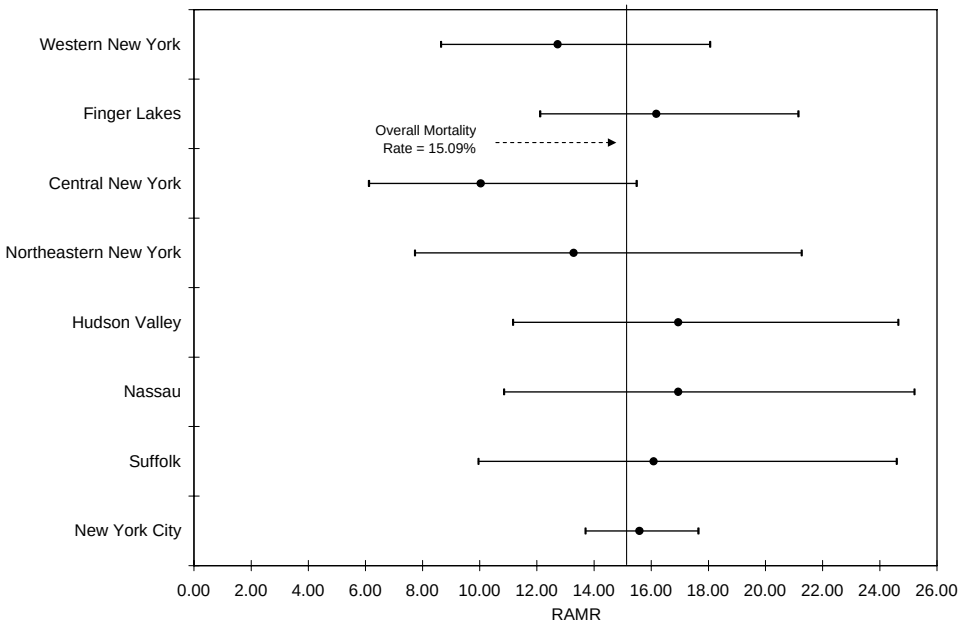
Table 20 and Figure 20 compare performance by region for gunshot wounds as was done in Table 19 and Figure 19, except that mortality is defined as death in the emergency department or as an inpatient. As with inpatient deaths for gunshot wounds, no region was found to have a mortality rate significantly different from that of the state.

**Table 20
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients with Gunshot Wounds Injuries
by Region: 1999 – 2002
Deaths in the Emergency Department and Inpatients at Regional and Area Centers**

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
WNY	227	7.78	31	13.66	16.20	12.72	(8.64, 18.05)	-0.86
FIN	243	8.33	53	21.81	20.35	16.17	(12.11, 21.15)	0.45
CNY	171	5.86	20	11.70	17.60	10.03	(6.12, 15.49)	-1.82
NNY	92	3.16	17	18.48	21.00	13.28	(7.73, 21.26)	-0.38
HUD	101	3.46	27	26.73	23.82	16.94	(11.16, 24.64)	0.52
NAS	118	4.05	24	20.34	18.12	16.94	(10.85, 25.21)	0.49
SUF	78	2.67	21	26.92	25.26	16.08	(9.95, 24.59)	0.22
NYC	1886	64.68	247	13.10	12.68	15.58	(13.70, 17.65)	0.48
Total	2916	100.00	440	15.09	------	------	----------	-----

Figure 20

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: 1999-2002



Comparison of Different Levels of Care

Table 21 contains the number of patients, number of deaths, observed mortality rate, expected mortality rate and risk-adjusted mortality rate along with its 95% confidence interval for the different levels of care for gunshot wound patients. Figure 21 presents the risk-adjusted mortality rate and its 95% confidence interval for each level of care. Regional centers treated 2,554 inpatients with gunshot wounds (89.4% of the total). Area centers treated 304 inpatients.

The observed mortality rate was higher for regional centers (13.43%) than for area centers (12.83%). The risk-adjusted mortality rates were 11.90% for area centers and 13.56% for regional trauma centers. Neither rate was significantly different from the overall statewide rate.

Table 21
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients with Gunshot Wounds Injuries
by Level: 1999 – 2002
Inpatients at Regional and Area Centers

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
Regional	2554	89.36	343	13.43	13.24	13.56	(12.16, 15.07)	0.24
Area	304	10.64	39	12.83	14.40	11.90	(8.46, 16.27)	-0.63
Total	2858	100.00	382	13.37	------	------	----------	-----

Figure 21

**Inpatients with Gunshot Wound Injuries (Regional and Area Centers):
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Level: 1999-2002**

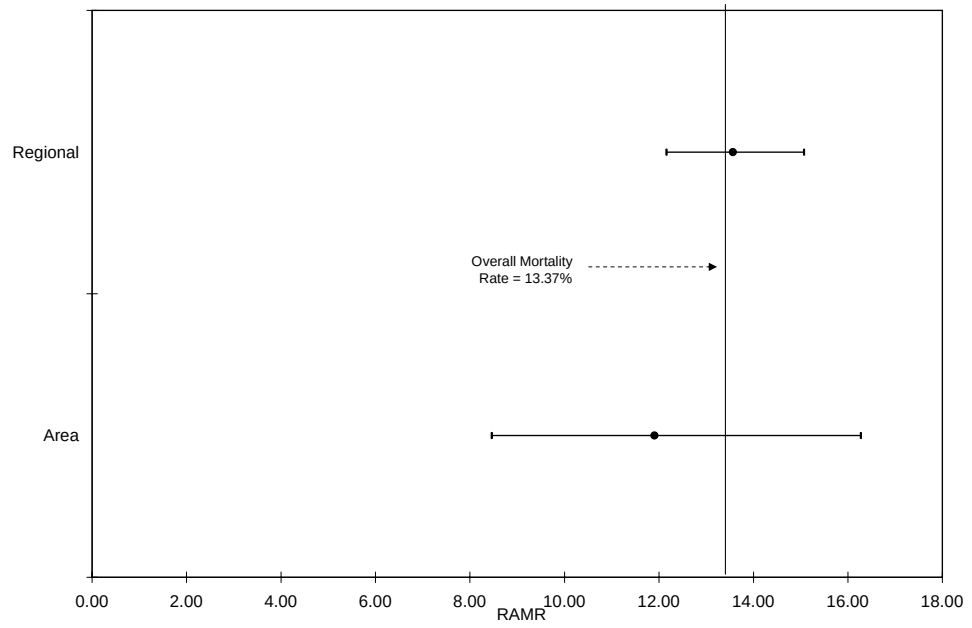


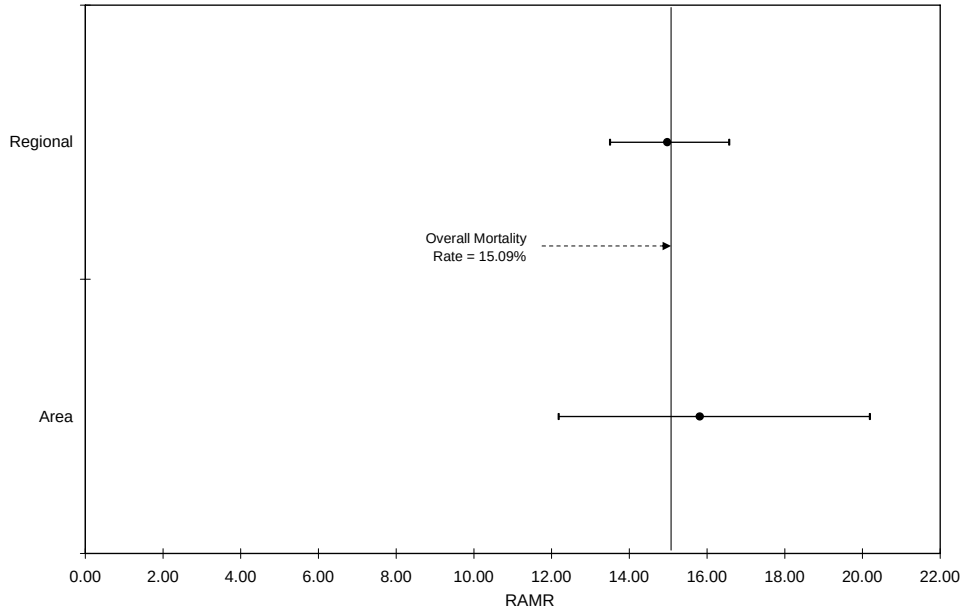
Table 22 and Figure 22 compare performance by region for gunshot wounds as was done in Table 21 and Figure 21, except that mortality is defined as death in the emergency department or as an inpatient. As with inpatient deaths for gunshot wounds, the risk-adjusted mortality rates for the two levels of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

**Table 22
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients with Gunshot Wounds Injuries
by Level: 1999 – 2002
Deaths in the Emergency Department and Inpatients at Regional and Area Centers**

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
Regional	2587	88.72	376	14.53	14.55	14.97	(13.50, 16.57)	-0.12
Area	329	11.28	64	19.45	18.56	15.81	(12.18, 20.19)	0.33
Total	2916	100.00	440	15.09	------	------	----------	-----

Figure 22

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: 1999-2002



All Patients

Regional Comparisons

Table 23 and Figure 23 compare regions across all mechanisms of injury by summing expected and observed deaths across MOIs and then testing for statistical differences between each region and the entire state. As indicated, Western New York (RAMR= 5.74%) and Central New York (RAMR = 5.99%) both had significantly lower mortality than the statewide value of 7.22%. Also, New York City (RAMR = 8.20%) had a significantly higher mortality than the statewide mortality rate.

Table 23
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients (Five Adult Mechanisms of Injury)
by Region: 1999 – 2002
Inpatients at Regional and Area Centers

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
WNY	3332	7.54	217	6.51	8.20	5.74	(5.00, 6.55)	**-3.48**
FIN	3979	9.00	293	7.36	7.65	6.95	(6.17, 7.79)	-0.63
CNY	4520	10.22	246	5.44	6.56	5.99	(5.27, 6.79)	**-2.98**
NNY	3117	7.05	211	6.77	6.72	7.27	(6.32, 8.32)	0.07
HUD	4623	10.45	361	7.81	7.98	7.06	(6.35, 7.83)	-0.38
NAS	4460	10.09	326	7.31	7.86	6.71	(6.00, 7.48)	-1.30
SUF	4189	9.47	306	7.30	7.24	7.29	(6.49, 8.15)	0.14
NYC	16000	36.18	1233	7.71	6.79	8.20	(7.74, 8.67)	**4.34**
Total	44220	100.00	3193	7.22	------	------	----------	-----

Figure 23

Inpatients Five Adult Mechanisms of Injury - Regional and Area Centers:
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Region: 1999-2002

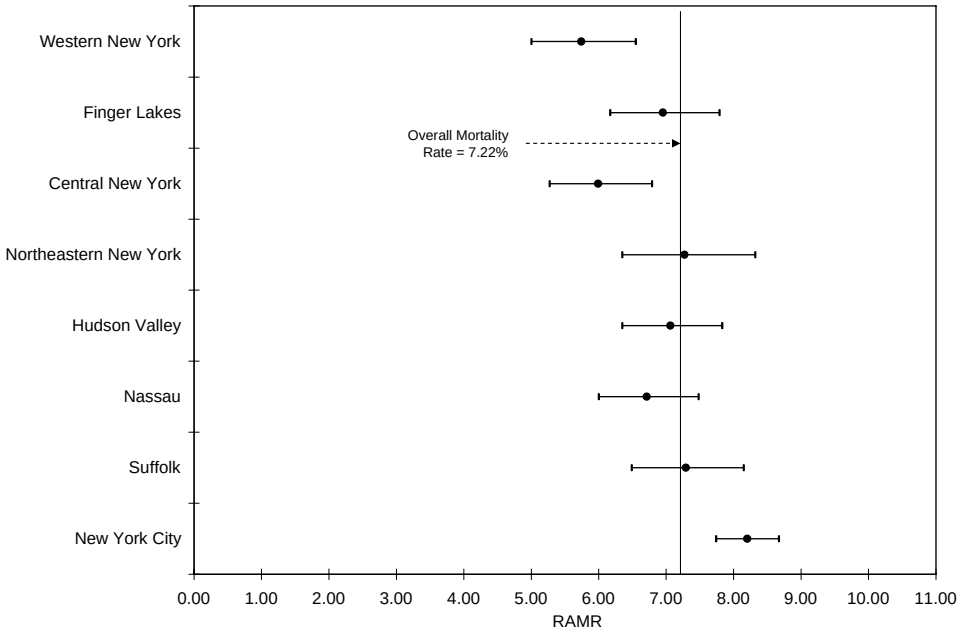


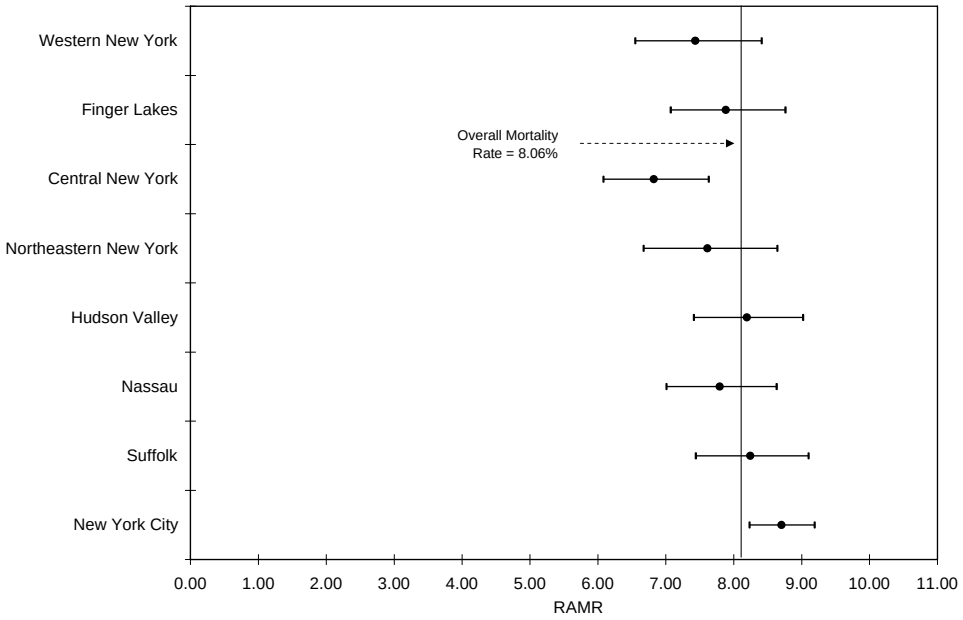
Table 24 and Figure 24 compare performance by region across all MOIs as was done in Table 23 and Figure 23, except that mortality is defined as death in the emergency department or as an inpatient. For this measure of mortality, Central New York (RAMR = 6.82%) had a significantly lower risk-adjusted mortality rate than the statewide mortality rate of 8.06%, and New York City (RAMR = 8.70%) had a significantly higher risk-adjusted mortality than the statewide value. It is also notable that although Western New York had a significantly lower risk-adjusted inpatient mortality than the state (see Table 23), it did not have a significantly different risk-adjusted emergency department/inpatient mortality rate (7.43% vs. 8.06%).

Table 24
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients - Five Adult Mechanisms of Injury
by Region: 1999 – 2002
Deaths in the Emergency Department and Inpatients at Regional and Area Centers

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
WNY	3366	7.54	253	7.52	8.15	7.43	(6.55, 8.41)	-1.25
FIN	4029	9.03	344	8.54	8.73	7.88	(7.07, 8.76)	-0.38
CNY	4579	10.26	307	6.70	7.91	6.82	(6.08, 7.63)	**-2.95**
NNY	3144	7.05	238	7.57	8.02	7.61	(6.67, 8.64)	-0.85
HUD	4670	10.47	411	8.80	8.66	8.19	(7.41, 9.02)	0.31
NAS	4499	10.08	366	8.14	8.42	7.79	(7.01, 8.63)	-0.62
SUF	4270	9.57	386	9.04	8.84	8.24	(7.44, 9.10)	0.42
NYC	16059	35.99	1289	8.03	7.43	8.70	(8.23, 9.19)	**2.73**
Total	44616	100.00	3594	8.06	------	------	----------	-----

Figure 24

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: 1999-2002



Comparison of Levels of Care for All Patients

The following table compares 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
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients (Five Adult Mechanisms of Injury)
by Level: 1999 – 2002
Inpatients at Regional and Area Centers

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
Regional	34613	78.27	2598	7.51	7.44	7.28	(7.01, 7.57)	0.44
Area	9607	21.73	595	6.19	6.43	6.95	(6.41, 7.54)	-0.90
Total	44220	100.00	3193	7.22	--------	--------	----------	-----

Figure 25

Inpatients Five Adult Mechanisms of Injury - Regional and Area Centers:
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
by Level: 1999-2002

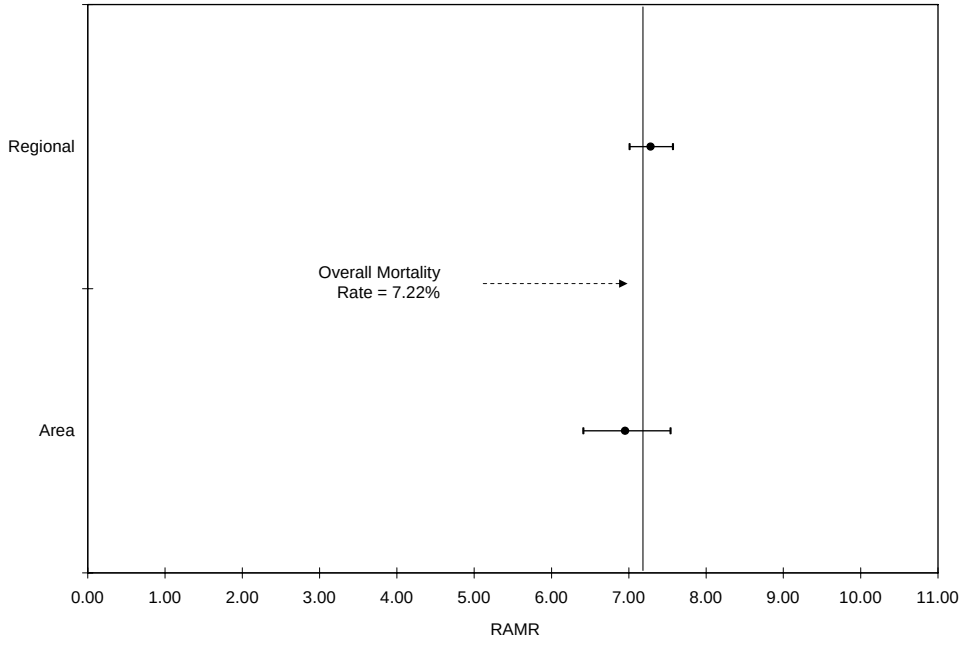


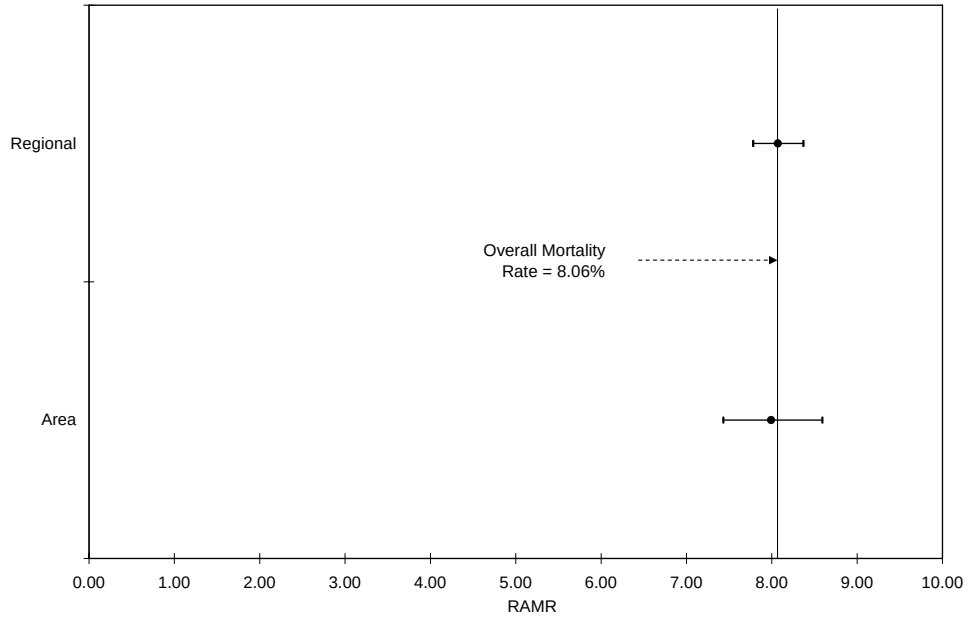
Table 26 and Figure 26 present risk-adjusted mortality rates for level of care when ED deaths have been included in addition to inpatient deaths. As indicated, the respective rates for regional trauma centers and area trauma centers were 8.07% and 7.99%. Neither level's rate was statistically significantly different from the statewide rate.

Table 26
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients - Five Adult Mechanisms of Injury
by Level: 1999 – 2002
Deaths in the Emergency Department and Inpatients at Regional and Area Centers

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
Regional	34863	78.14	2849	8.17	8.16	8.07	(7.78, 8.37)	0.10
Area	9753	21.86	745	7.64	7.70	7.99	(7.43, 8.59)	-0.19
Total	44616	100.00	3594	8.06	8.06	8.06	----------	-----

Figure 26

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: 1999-2002



ANALYSES EXCLUDING NEW YORK CITY

The following analyses compare levels of care when the New York City data were excluded. This was done because New York City has no area centers. Two sets of models were developed - those that excluded deaths in the emergency department and those that included these cases. Although neither level of care was different from the statewide average, the z-statistic for the regional centers was negative whether DIEs were excluded or included.

Table 27
Models Developed Excluding New York City
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients (Five Adult Mechanisms of Injury)
by Level: 1999 – 2002
Inpatients at Regional and Area Centers

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
Regional	18612	65.96	1365	7.33	7.47	6.81	(6.46,7.19)	-0.66
Area	9606	34.04	593	6.17	5.91	7.24	(6.67,7.85)	1.03
Total	28218	100.00	1958	6.94	--------	--------	----------	-----

Table 28
Models Developed Excluding New York City
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients (Five Adult Mechanisms of Injury)
by Level: 1999 – 2002
Deaths in the Emergency Department and Inpatients at Regional and Area Centers

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
Regional	18803	65.85	1558	8.29	8.44	7.91	(7.53,8.32)	-0.73
Area	9752	34.15	745	7.64	7.34	8.40	(7.81,9.02)	1.09
Total	28555	100.00	2303	8.07	--------	--------	----------	-----

OMR = Observed Mortality Rate
EMR = Expected Mortality Rate
RAMR = Risk-Adjusted Mortality Rate

TRENDS IN TRAUMA MORTALITY RATES FOR 1996-2002

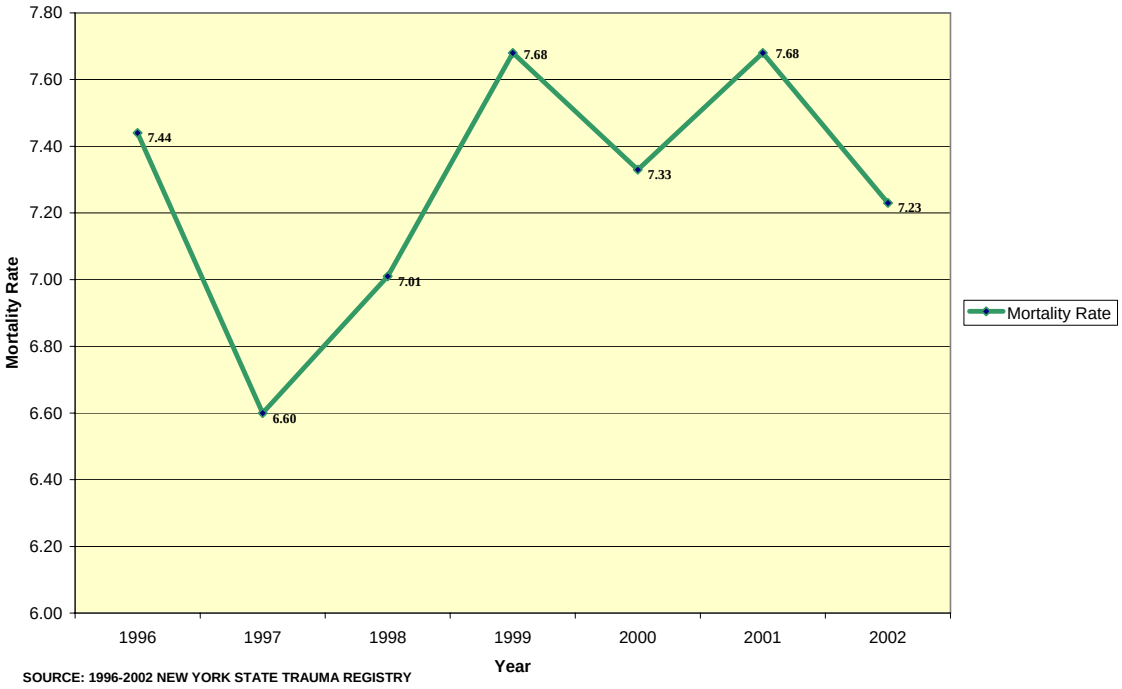
Charts 30 and 31 present, respectively, trends in the risk-adjusted inpatient mortality rate and the risk-adjusted inpatient/emergency department mortality rate for 1996-2002 for patients in trauma centers in the Trauma Registry. Since the Registry contains only trauma center patients in the time period 1999-2002, all patients in the Registry are included in those years. In order to be able to accurately compare performance in those years with earlier years, the only patients included for the time period 1996-1998 are trauma center patients.

As indicated in Chart 30, the risk-adjusted mortality rate for inpatients in the Registry decreased from 7.44% in 1996 to 6.60% in 1997, then increased to 7.01% in 1998, and then went up and down from 7.68% in 1999 to 7.33% in 2000 to 7.68% in 2001 to 7.23% in 2002.

Chart 31 indicates that the risk-adjusted mortality rate for inpatient/emergency department mortality in the Registry rose and fell frequently between 1996 and 2002, but in general was lower in the later years. All rates were above 8% in the first four years, and below 8% for the last three years of the time period, with the lowest rate (7.63%) occurring in the most recent year (2002).

Chart 30

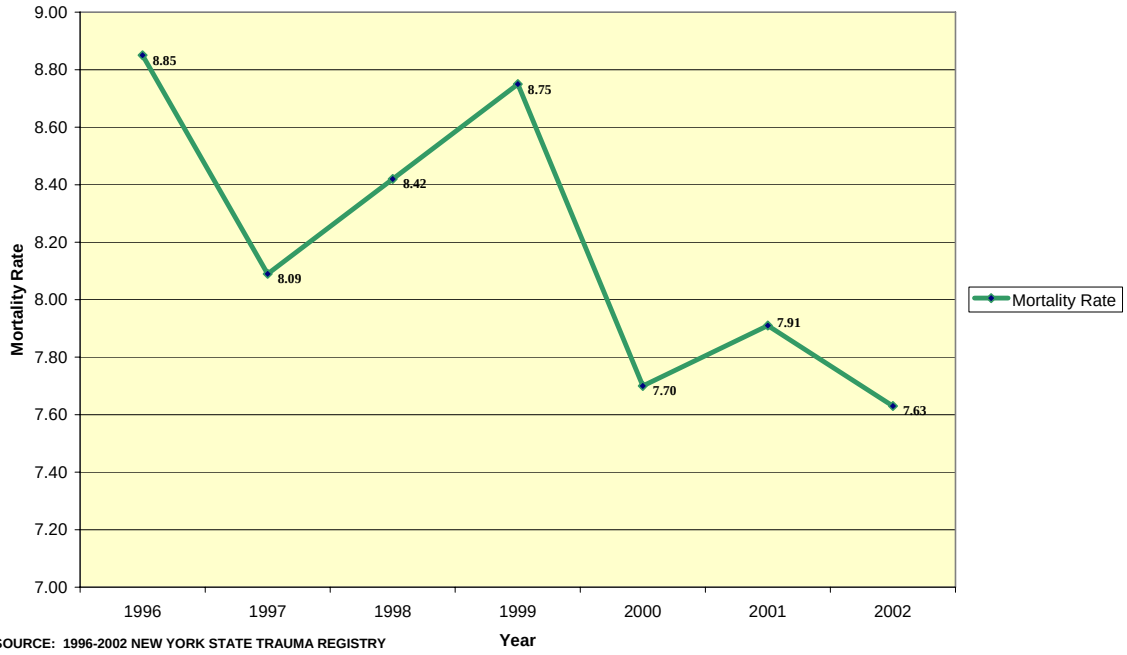
Risk-Adjusted Mortality Rate for Inpatients in the New York State Trauma Registry: 1996-2002



SOURCE: 1996-2002 NEW YORK STATE TRAUMA REGISTRY

Chart 31

Risk-Adjusted Mortality Rate for Deaths in the Emergency Department and Inpatients in the New York State Trauma Registry: 1996-2002



SOURCE: 1996-2002 NEW YORK STATE TRAUMA REGISTRY

COMPARISON OF TRAUMA SYSTEM PERFORMANCE
1996-1998 vs. 1999-2002

Tables 29 and 30 present a comparison of the time period 1996-1998 and the time period 1999-2002. Although tables for each individual MOI are not shown here, the table was obtained by combining the results for each individual MOI into a single expected and observed mortality rate for each time period.

Table 29 indicates that there was a lower risk-adjusted inpatient mortality rate for the earlier time period (7.01% vs. 7.49%), but that the difference was not significant in that neither time period differed significantly from the overall mortality rate of 7.28%.

Table 29
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients (Five Adult Mechanisms of Injury)
by Time Period
Inpatients at Regional and Area Centers

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
1996-1998	31462	41.58	2314	7.35	7.64	7.01	(6.72, 7.30)	-1.82
1999-2002	44196	58.42	3191	7.22	7.02	7.49	(7.23, 7.75)	1.59
Total	75658	100.00	5505	7.28	--------	--------	----------	-----

Table 30 demonstrates that after including emergency department deaths along with inpatient deaths, the 1999-2002 time period had a lower, but not significantly lower risk-adjusted mortality rate (7.99% vs. 8.44%).

Table 30
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Patients (Five Adult Mechanisms of Injury)
by Time Period
Deaths in the Emergency Department and Inpatients at Regional and Area Centers

Region	Number of Patients	Percent of Patients	Number of Deaths	OMR	EMR	RAMR	Confidence Interval For RAMR	Z Score
1996-1998	31818	41.63	2661	8.36	8.10	8.44	(8.12, 8.77)	1.62
1999-2002	44607	58.37	3590	8.05	8.23	7.99	(7.74, 8.26)	-1.36
Total	76425	100.00	6251	8.18	--------	--------	----------	-----

In conclusion, although there were no significant differences with either mortality definition, it appears that there was more of a tendency for a patient to die in an emergency department in the earlier time period. Also, the first model contains both physiologic measures and anatomic injuries and the earlier time period has higher expected rates for this model. In contrast, the second model contains only physiologic measures and the latter time period has higher expected rates using that model. Consequently, it appears that the anatomic injuries were more severe in the earlier time period but that the physiologic measures were more severe in the latter time period.

1999-2002 HOSPITAL OUTCOMES FOR PATIENTS IN THE NEW YORK STATE TRAUMA REGISTRY

Table 31 presents the 1999-2002 results for hospitals treating trauma inpatients that qualified for the New York State Trauma Registry. For each hospital, 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, a 95 percent confidence interval for the risk-adjusted mortality rate and the z-score.

Table 32 presents the same information, except that the measure of mortality is death in the hospital's emergency department or as an inpatient.

As noted earlier in this report, 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 emergency department/inpatient deaths. In order to assess hospital-level performance for all adult trauma patients, the predicted or expected probability of death from the model appropriate for each individual patient was used. 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.

Definitions of key terms are as follows:

The **observed mortality rate (OMR)** is the number of observed deaths divided by the number of patients.

The **expected mortality rate (EMR)** is the sum of the predicted probabilities of death for all patients divided by the total number of patients.

The **risk-adjusted mortality rate (RAMR)** is 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 after adjusting for risk 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 44,220 adults treated at all fifty trauma centers in the statistical models used to assess performance for inpatients only was 7.22 percent. Observed mortality rates ranged from 0.00 percent to 13.73 percent. The risk-adjusted mortality rate used to measure performance for all hospitals ranged from 0.00 percent to 16.34 percent.

The overall mortality rate for the 44,616 adults treated at all fifty trauma centers in the statistical models used to assess performance for deaths in the emergency department and inpatients was 8.06 percent. Observed mortality rates ranged from 0.00 percent to 21.43 percent. The risk-adjusted mortality rate used to measure performance for all hospitals ranged from 0.00 percent to 11.52 percent.

Five hospitals (Erie County Medical Center, Winthrop University Hospital, North Shore University Hospital, University Hospital SUNY Health Science Center, and New York Hospital at Medical Center of Queens) had inpatient mortality rates that were significantly lower than the statewide mean. Four hospitals (Southside Hospital, Kings County Hospital Center, St. Luke's Roosevelt Hospital, and City Hospital Center at Elmhurst) had inpatient mortality rates that were significantly higher than the statewide mean.

Two hospitals (United Health Services Hospitals-Wilson Hospital Division, University Hospital SUNY Health Science Center) had in-hospital (inpatient or emergency department) mortality rates that were significantly lower than the statewide mean, and two hospitals (Southside Hospital, Kings County Hospital Center) had rates that were significantly higher.

Table 31
Number of Patients; Number of Deaths;
Observed, Expected and Risk-Adjusted Mortality Rates;
Significance of Risk-Adjusted Mortality Rates for
New York State Inpatients (Five Adult Mechanisms of Injury): 1999 – 2002

Hospital (PFI:name)	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	z-Score
Western New York							
Regional centers							
0208:Women and Children's Hospital of Buffalo	226	4	1.77	1.75	7.31	(1.97,18.71)	-0.14
0210:Erie County Medical Center	2834	203	7.16	9.08	5.70	(4.94,6.54)	**-3.47**
Area center							
0103:Woman's Christian Association	272	10	3.68	4.38	6.06	(2.90,11.14)	-0.37
Finger Lakes							
Regional center							
0413:Strong Memorial Hospital	2348	174	7.41	7.65	6.99	(5.99,8.11)	-0.38
Area centers							
0116:Arnot Ogden Medical Center	589	52	8.83	7.86	8.11	(6.05,10.63)	0.77
0411:Rochester General Hospital	1042	67	6.43	7.54	6.15	(4.77,7.82)	-1.26
Central New York							
Regional center							
0635:University Hospital SUNY Health Science Center	2622	128	4.88	6.42	5.49	(4.58,6.52)	**-3.20**
Area centers							
0058:United Health Services Hospitals Inc-Wilson Hospital	886	56	6.32	7.54	6.05	(4.57,7.86)	-1.28
0598:St. Elizabeth Medical Center	503	41	8.15	7.63	7.72	(5.54,10.47)	0.37
0630:St. Joseph's Hospital Health Center	260	13	5.00	4.24	8.52	(4.53,14.58)	0.49
0636:Crouse Hospital	249	8	3.21	4.76	4.87	(2.10,9.60)	-0.98
Northeastern New York							
Regional center							
0001:Albany Medical Center Hospital	2509	194	7.73	7.32	7.62	(6.59,8.77)	0.72
Area centers							
0135:Champlain Valley Physicians' Hospital Medical Center	268	8	2.99	4.16	5.19	(2.23,10.22)	-0.77
0746:Mary Imogene Bassett Hospital	340	9	2.65	4.32	4.42	(2.02,8.40)	-1.40
Hudson Valley							
Regional center							
1139:Westchester Medical Center	2644	239	9.04	9.19	7.10	(6.23,8.06)	-0.22

Area centers							
0180:St. Francis Hospital	889	61	6.86	6.53	7.59	(5.80,9.74)	0.34
0776:Nyack Hospital	463	20	4.32	5.37	5.81	(3.55,8.98)	-0.87
0779:Good Samaritan Hospital of Suffern	341	21	6.16	7.04	6.32	(3.91,9.66)	-0.48
1039:Hudson Valley Hospital Center	65	4	6.15	4.65	9.55	(2.57,24.46)	0.37
1072:Sound Shore Medical Center of Westchester	221	16	7.24	7.24	7.22	(4.12,11.73)	0.17
Nassau							
Regional centers							
0511:Winthrop University Hospital	813	47	5.78	8.52	4.90	(3.60,6.52)	**-2.75**
0528:Nassau University Medical Center	1479	146	9.87	8.77	8.13	(6.87,9.56)	1.38
0541:North Shore University Hospital	1200	65	5.42	6.94	5.64	(4.35,7.19)	**-2.00**
Area centers							
0513:Mercy Medical Center	499	32	6.41	7.66	6.04	(4.13,8.53)	-0.93
0527:South Nassau Communities Hospital	469	36	7.68	6.46	8.57	(6.00,11.87)	0.95
Suffolk							
Regional center							
0245:University Hospital	1938	165	8.51	8.80	6.99	(5.96,8.14)	-0.38
Area centers							
0885:Brookhaven Memorial Hospital Medical Center Inc	441	28	6.35	6.20	7.39	(4.91,10.69)	0.06
0913:Huntington Hospital	484	18	3.72	4.96	5.42	(3.21,8.56)	-1.13
0924:Southside Hospital	514	49	9.53	6.59	10.44	(7.72,13.80)	**2.38**
0925:Good Samaritan Hospital Medical Center	761	39	5.12	5.83	6.35	(4.52,8.68)	-0.71
0943:St. Catherine of Siena Hospital	51	7	13.73	6.07	16.34	(6.54,33.66)	1.77
New York City							
Regional centers							
1165:Jacobi Medical Center	1781	116	6.51	6.59	7.14	(5.90,8.56)	-0.06
1172:Lincoln Medical & Mental Health Center	1061	80	7.54	7.07	7.71	(6.11,9.59)	0.54
1176:St. Barnabas Hospital	445	47	10.56	8.41	9.07	(6.67,12.06)	1.46
1286:Brookdale Hospital Medical Center	1030	63	6.12	5.32	8.31	(6.38,10.63)	1.05
1301:Kings County Hospital Center	1596	179	11.22	8.32	9.74	(8.36,11.27)	**3.78**
1304:Lutheran Medical Center	1079	94	8.71	7.45	8.44	(6.82,10.33)	1.44
1438:Bellevue Hospital Center	1440	93	6.46	5.55	8.40	(6.78,10.29)	1.38
1445:Harlem Hospital Center	674	41	6.08	5.22	8.41	(6.03,11.41)	0.90
1458:New York Presbyterian Hospital at New York Weill Cornell Center	807	65	8.05	7.78	7.47	(5.77,9.52)	0.23
1464:New York Presbyterian Hospital at Columbia Presbyterian Center	33	0	0.00	0.68	0.00	(0.00,100.00)	0.84

1469:St. Luke's Roosevelt Hospital at St. Luke's Hospital Division	599	58	9.68	7.06	9.91	(7.52,12.81)	**2.24**
1471:SVCMC-St. Vincent's Manhattan	657	37	5.63	5.14	7.91	(5.57,10.91)	0.49
1626:City Hospital Center at Elmhurst	1502	120	7.99	5.94	9.72	(8.06,11.62)	**3.07**
1629:Jamaica Hospital Medical Center	815	52	6.38	6.84	6.73	(5.03,8.83)	-0.42
1630:Long Island Jewish Medical Center	35	1	2.86	1.84	11.19	(0.15,62.24)	0.07
1637:New York Hospital at Medical Center of Queens	917	61	6.65	8.64	5.56	(4.25,7.14)	**-2.05**
1738:SVCMC-St. Vincent's Staten Island	393	27	6.87	6.50	7.63	(5.03,11.10)	0.22
1740:Staten Island University Hospital-North	497	42	8.45	7.93	7.69	(5.55,10.40)	0.36
3013:SVCMC-Mary Immaculate	639	57	8.92	7.00	9.21	(6.97,11.93)	1.72

Table 32
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): 1999 – 2002

Hospital (PFI:name)	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	z-Score
Western New York							
Regional centers							
0208:Women and Children's Hospital of Buffalo	226	4	1.77	1.55	9.21	(2.48, 23.57)	0.09
0210:Erie County Medical Center	2864	235	8.21	8.93	7.40	(6.48, 8.41)	-1.28
Area center							
0103:Woman's Christian Association	276	14	5.07	5.37	7.61	(4.15,12.76)	-0.04
Finger Lakes							
Regional center							
0413:Strong Memorial Hospital	2376	202	8.50	8.95	7.65	(6.63,8.78)	-0.70
Area centers							
0116:Arnot Ogden Medical Center	590	54	9.15	8.17	9.02	(6.78,11.77)	0.77
0411:Rochester General Hospital	1063	88	8.28	8.54	7.81	(6.26,9.62)	-0.22
Central New York							
Regional center							
0635:University Hospital SUNY Health Science Center	2658	165	6.21	7.75	6.46	(5.51,7.52)	**-2.90**
Area centers							
0058:United Health Services Hospitals Inc-Wilson Hospital	900	71	7.89	10.24	6.20	(4.84,7.82)	**-2.23**
0598:St. Elizabeth Medical Center	511	49	9.59	7.30	10.58	(7.82,13.98)	1.78
0630:St. Joseph's Hospital Health Center	261	14	5.36	5.32	8.13	(4.44,13.64)	-0.06
0636:Crouse Hospital	249	8	3.21	5.27	4.91	(2.11,9.67)	-1.32
Northeastern New York							
Regional center							
0001:Albany Medical Center Hospital	2532	217	8.57	8.64	7.99	(6.96,9.13)	-0.07
Area centers							
0135:Champlain Valley Physicians' Hospital Medical Center	271	11	4.06	5.90	5.55	(2.76,9.92)	-1.14
0746:Mary Imogene Bassett Hospital	341	10	2.93	5.08	4.65	(2.23,8.55)	-1.73
Hudson Valley							

Regional center							
1139:Westchester Medical Center	2662	257	9.65	9.60	8.10	(7.14,9.16)	0.07
Area centers							
0180:St. Francis Hospital	914	86	9.41	7.97	9.51	(7.60,11.74)	1.46
0776:Nyack Hospital	460	20	4.35	6.10	5.74	(3.50,8.87)	-1.47
0779:Good Samaritan Hospital of Suffern	345	25	7.25	7.32	7.97	(5.16,11.77)	0.08
1039:Hudson Valley Hospital Center	65	4	6.15	5.44	9.11	(2.45,23.34)	0.08
1072:Sound Shore Medical Center of Westchester	224	19	8.48	8.57	7.97	(4.80,12.45)	0.11
Nassau							
Regional centers							
0511:Winthrop University Hospital	826	60	7.26	9.35	6.26	(4.78,8.06)	-1.96
0528:Nassau University Medical Center	1489	156	10.48	9.24	9.14	(7.76,10.69)	1.51
0541:North Shore University Hospital	1205	71	5.89	7.06	6.72	(5.25,8.48)	-1.50
Area centers							
0513:Mercy Medical Center	506	39	7.71	8.54	7.27	(5.17,9.94)	-0.54
0527:South Nassau Communities Hospital	473	40	8.46	7.53	9.05	(6.47,12.32)	0.67
Suffolk							
Regional center							
0245:University Hospital	1966	193	9.82	10.07	7.85	(6.78,9.04)	-0.31
Area centers							
0885:Brookhaven Memorial Hospital Medical Center Inc	448	35	7.81	6.67	9.43	(6.57,13.11)	0.85
0913:Huntington Hospital	490	24	4.90	5.58	7.07	(4.53,10.52)	-0.52
0924:Southside Hospital	520	55	10.58	7.40	11.52	(8.68,14.99)	**2.46**
0925:Good Samaritan Hospital Medical Center	790	67	8.48	9.48	7.21	(5.58,9.15)	-0.85
0943:St. Catherine of Siena Hospital	56	12	21.43	15.61	11.05	(5.71,19.31)	0.94
New York City							
Regional centers							
1165:Jacobi Medical Center	1783	118	6.62	6.86	7.77	(6.43,9.30)	-0.33
1172:Lincoln Medical & Mental Health Center	1064	83	7.80	8.37	7.51	(5.98,9.31)	-0.57
1176:St. Barnabas Hospital	455	57	12.53	10.56	9.56	(7.24,12.38)	1.21
1286:Brookdale Hospital Medical Center	1036	67	6.47	6.08	8.57	(6.64,10.89)	0.46
1301:Kings County Hospital Center	1597	180	11.27	9.01	10.08	(8.66,11.66)	**2.87**
1304:Lutheran Medical Center	1087	102	9.38	7.66	9.87	(8.05,11.98)	1.95
1438:Bellevue Hospital Center	1445	97	6.71	5.72	9.45	(7.67,11.53)	1.50
1445:Harlem Hospital Center	674	41	6.08	4.91	9.99	(7.17,13.55)	1.28
1458:New York Presbyterian Hospital at New York Weill Cornell	810	68	8.40	7.79	8.68	(6.74,11.00)	0.56

1464:New York Presbyterian Hospital at Columbia Presbyter	33	0	0.00	1.18	0.00	(0.00,76.02)	0.48
1469:St. Luke's Roosevelt Hospital at St. Luke's Hospital	599	58	9.68	7.53	10.36	(7.87,13.39)	1.79
1471:SVCMC-St. Vincent's Manhattan	656	37	5.64	6.64	6.84	(4.81,9.43)	-0.92
1626:City Hospital Center at Elmhurst	1514	132	8.72	7.78	9.03	(7.55,10.71)	1.26
1629:Jamaica Hospital Medical Center	817	52	6.36	7.09	7.23	(5.40,9.49)	-0.70
1630:Long Island Jewish Medical Center	35	1	2.86	6.96	3.31	(0.04,18.40)	-0.52
1637:New York Hospital at Medical Center of Queens	924	68	7.36	8.74	6.78	(5.27,8.60)	-1.38
1738:SVCMC-St. Vincent's Staten Island	395	29	7.34	6.99	8.47	(5.67,12.16)	0.20
1740:Staten Island University Hospital-North	497	42	8.45	8.05	8.45	(6.09,11.42)	0.26
3013:SVCMC-Mary Immaculate	638	57	8.93	7.72	9.32	(7.06,12.08)	1.03

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. The following data are taken from the Center for Disease Control (CDC), National Center for Injury Prevention and Control, Web-Based Injury Statistics Query and Reporting System (WISQARS), www.cdc.gov/ncipc/wisqars. 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 firearm injuries) that comprise approximately three-quarters of all traumatic injuries contained in New York's Registry.

Table 33 presents, for motor vehicle crashes (ICD-10 Codes: V02-04,V09.0,V09.2,V12-V14,V19.0-V19.2,V19.4-V19.6,V20-V79, V80.3-V80.5,V81.0-V81.1,V82.0-V82.1,V83-V86,V87.0-V87.8, V88.0-V88.8,V89.0,V89.2) in New York State and the United States in 2002, the mortality rate per 100,000 population, the age-adjusted mortality rate per 100,000 population (based on 1940 data), and the level of significance (p-value) of the difference in age-adjusted rates between New York and the United States. It should be noted that, although it would have been preferable 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, this was impossible because these data were not available for the United States as a whole.

As indicated, the rate of MVCs deaths per 100,000 population in the United States in 2002 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 15.42%, whereas it was only 8.44% in New York State. The difference between these two rates was 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. However, the relative population density of New York and the United States were not substantially different in 1999 and 2002. Consequently, a valid measure of the recent impact of New York's trauma system on MVC mortality is to compare the percent change in age-adjusted mortality per 100,000 population in New York with the percent change in the United States. The appropriate time period to ascertain the recent impact of the trauma system is 1999 to 2002, the latest available year of data. This is done in Table 34.

Chart 32 presents the mortality rates per 100,000 population for New York and the United States from 1999 through 2002. As demonstrated in Table 34, the mortality rate in the United States changed from 14.81 per 100,000 in 1999 to 15.42 per 100,000 in 2002, an increase of 4.1%. During the same time period in New York, the mortality rate per 100,000 changed from 8.80 to 8.44, a decrease of 4.0%. The change in mortality rate per 100,000 in New York was found to be significantly different than the change in the United States ($p<0.0001$), indicating that recent quality assurance and quality improvement efforts related to New York's trauma system and Trauma Registry appear to have resulted in mortality reductions for MVCs that are higher than those experienced in the United States. In fact, if New York had experienced the same increase as was experienced in the U.S., New York's age-adjusted mortality rate per 100,000 in 2002 would have been 9.16 per 100,000, which would have resulted in an additional 58 deaths in 2002.

Table 33
Mortality Rate per 100,000 Population for MVCs (ICD-10 Codes: V02-V04,V09.0,V09.2,V12-V14,V19.0-V19.2,V19.4-V19.6,V20-V79, V80.3-V80.5,V81.0-V81.1,V82.0-V82.1,V83-V86,V87.0-V87.8, V88.0-V88.8,V89.0,V89.2)
United States vs. New York State: 2002

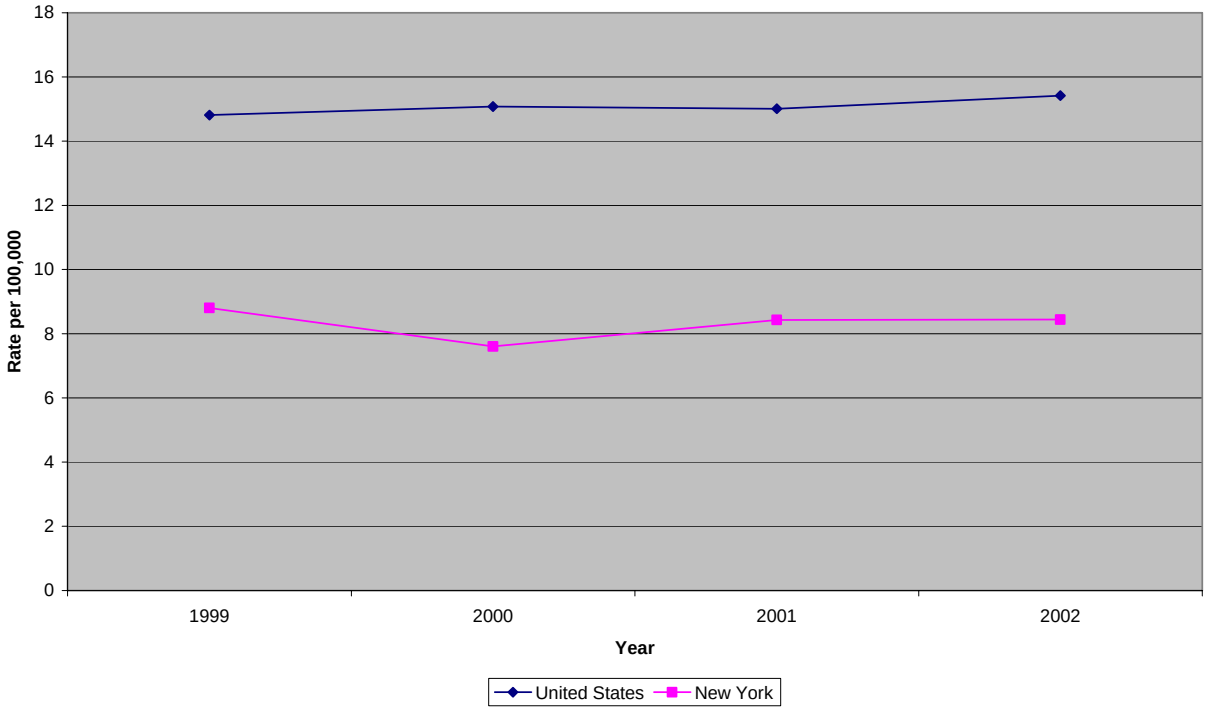
	Population	Deaths	Mortality Rate /100,000 Population	Age-Adjusted* Mortality Rate/ 100,000 Population	p-value for Difference in Age-Adjusted* Mortality Rates
United States	287,974,001	45,380	15.76	15.42	<0.0001
New York State	19,134,293	1,695	8.86	8.44	

Table 34
Change in Deaths per 100,000 Population for MVCs (ICD-10 Codes: V02-V04,V09.0,V09.2,V12-V14,V19.0-V19.2,V19.4-V19.6,V20-V79, V80.3-V80.5,V81.0-V81.1,V82.0-V82.1,V83-V86,V87.0-V87.8, V88.0-V88.8,V89.0,V89.2)
United States vs. New York State: 1999 to 2002

	Age- Adjusted* Mortality Rate: 1999	Age-Adjusted* Mortality Rate: 2002	Percent Change	P Value for Difference in Percent Change
United States	14.81	15.42	4.1	<0.0001
New York State	8.80	8.44	-4.0	

Chart 32

Unintentional Motor Vehicle, Traffic-Related Age-Adjusted Death Rates: United States vs. New York State: 1999-2002



* Adjusted using population of the United States in 1940

Table 35 presents, for falls (ICD-10 Codes: W00-W19) in New York State and the United States in 2002, the mortality rate per 100,000 population, the age-adjusted mortality rate per 100,000 population (based on 1940 data), and the level of significance (p-value) of the difference in age-adjusted rates between New York and the United States. (Note: these data were also taken from the Center for Disease Control (CDC), National Center for Injury Prevention and Control, Web-Based Injury Statistics Query and Reporting System (WISQARS), www.cdc.gov/ncipc/wisqars).

As indicated in Table 35, the mortality rate for falls per 100,000 population in the United States in 2002 was slightly higher than the rate in New York (2.59 vs. 2.28, respectively). This difference was statistically significant ($p = 0.0039$). It is notable that the age-adjusted rates for New York and the United States were much lower than the unadjusted rates, no doubt because the population has aged considerably since 1940, the year CDC used as the base for the age adjustments.

Table 36 presents the age-adjusted mortality rates per 100,000 population for falls in New York and for the United States in 1999 and 2002, as well as the percent changes over these time periods, and the level of significance of the difference in rates of change between the United States and New York. Chart 33 presents the mortality rates per 100,000 population for New York and the United States for all years between 1999 and 2002.

Table 36 demonstrates that the mortality rate per 100,000 population in the United States rose from 2.31 in 1999 to 2.59 in 2002, an increase of 12.1%. During the same time period, the rate fell in New York from 2.35 to 2.28, an decrease of 2.9%. New York's rate decreased while the rate in the United States increased, and the difference was statistically significant ($p < 0.0001$). It should be noted that the increase in the United States during the 1999-2002 time period is likely to be related to the aging of our nation's population.

Table 35
Deaths per 100,000 Population for Falls (ICD-10 Codes: W00-W19)
United States vs. New York State: 2002

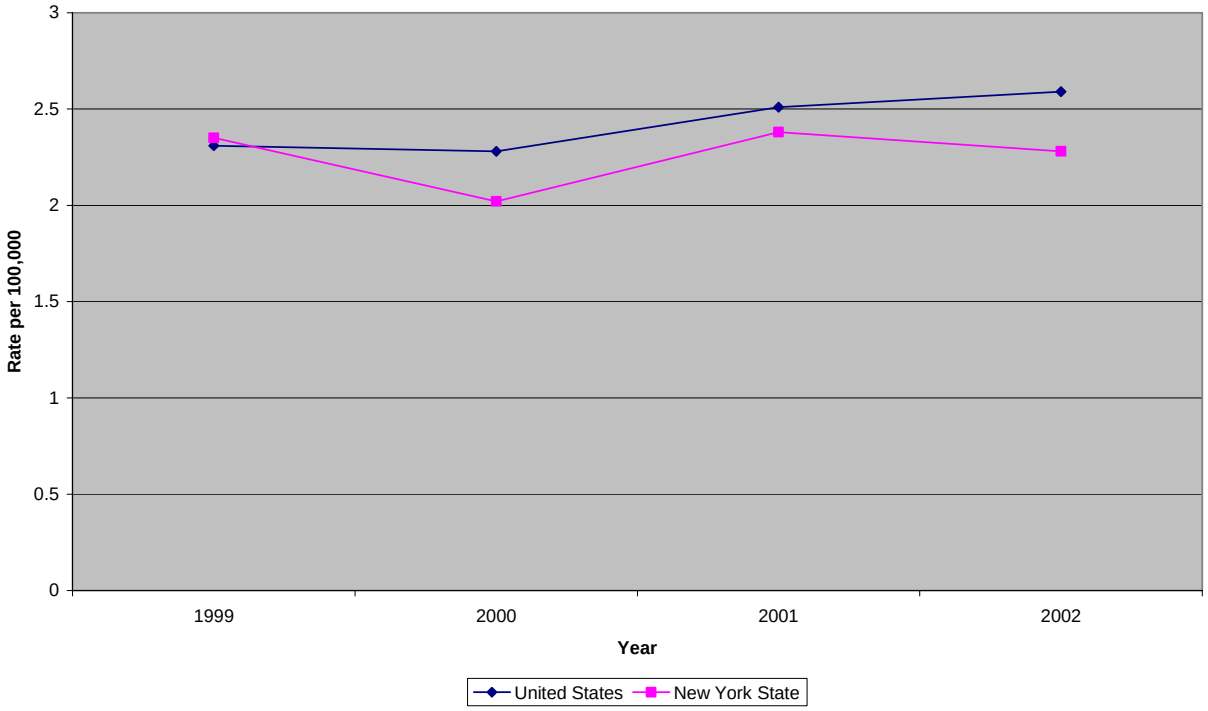
	Population	Deaths	Mortality Rate /100,000 Population	Age-Adjusted* Mortality Rate /100,000	p Value for Difference in Age-Adjusted* Mortality Rates
United States	287,974,001	16,257	5.65	2.59	0.0039
New York State	19,134,293	948	4.95	2.28	

Table 36
Change in Deaths per 100,000 Population for Falls (ICD-10 Codes: W00-W19)
United States vs. New York State: 1999 to 2002

	Age-Adjusted* Mortality Rate: 1999	Age-Adjusted* Mortality Rate: 2002	Percent Change	p Value for Difference in Percent Change
United States	2.31	2.59	+12.1	<0.0001
New York State	2.35	2.28	-2.9	

Chart 33

Unintentional Fall Age-Adjusted Death Rates:
United States vs. New York State: 1999-2002



* Adjusted using population of the United States in 1940

Table 37 presents, for firearms (ICD-10 Codes: W32-W34,X72-X74,X93-X95,Y22-Y24, Y35.0, U01.4) in New York State and the United States in 2002, the mortality rate per 100,000 population, the age-adjusted mortality rate per 100,000 population (based on 1940 data), and the level of significance (p-value) of the difference in age-adjusted rates between New York and the United States. (Note: these data were also taken from the Center for Disease Control (CDC), National Center for Injury Prevention and Control, Web-Based Injury Statistics Query and Reporting System (WISQARS), www.cdc.gov/ncipc/wisqars.)

As indicated in Table 37, the age-adjusted mortality rate of firearms per 100,000 population in the United States in 2002 was 10.31, substantially higher than the comparable rate in New York (5.37), and this difference was statistically significant ($p < 0.0001$).

Table 38 presents the age-adjusted mortality rates per 100,000 population for firearms in New York and for the United States in 1999 and 2002, as well as the percent changes over these time periods, and the level of significance of the difference in rates of change between the United States and New York. Also, Chart 34 presents the mortality rates per 100,000 population for New York and the United States for all years between 1999 and 2002.

Table 38 demonstrates that the mortality rate for firearms per 100,000 population in the United States increased from 10.24 in 1999 to 10.31 in 2002, an increase of 1.0%. During the same time period, the rate decreased in New York from 5.66 to 5.37, a decrease of 5.0%. New York's rate decreased while the rate in the United States increased and the difference was statistically significant ($p < 0.0001$). Again, as with motor vehicle crashes, 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. Obviously, another factor may be the enhanced law enforcement efforts that have occurred during this time frame, particularly in New York City.

Table 37
Deaths per 100,000 Population for Firearms
(ICD-10 Codes: W32-W34,X72-X74,X93-X95,Y22-Y24, Y35.0, U01.4)
United States vs. New York State: 2002

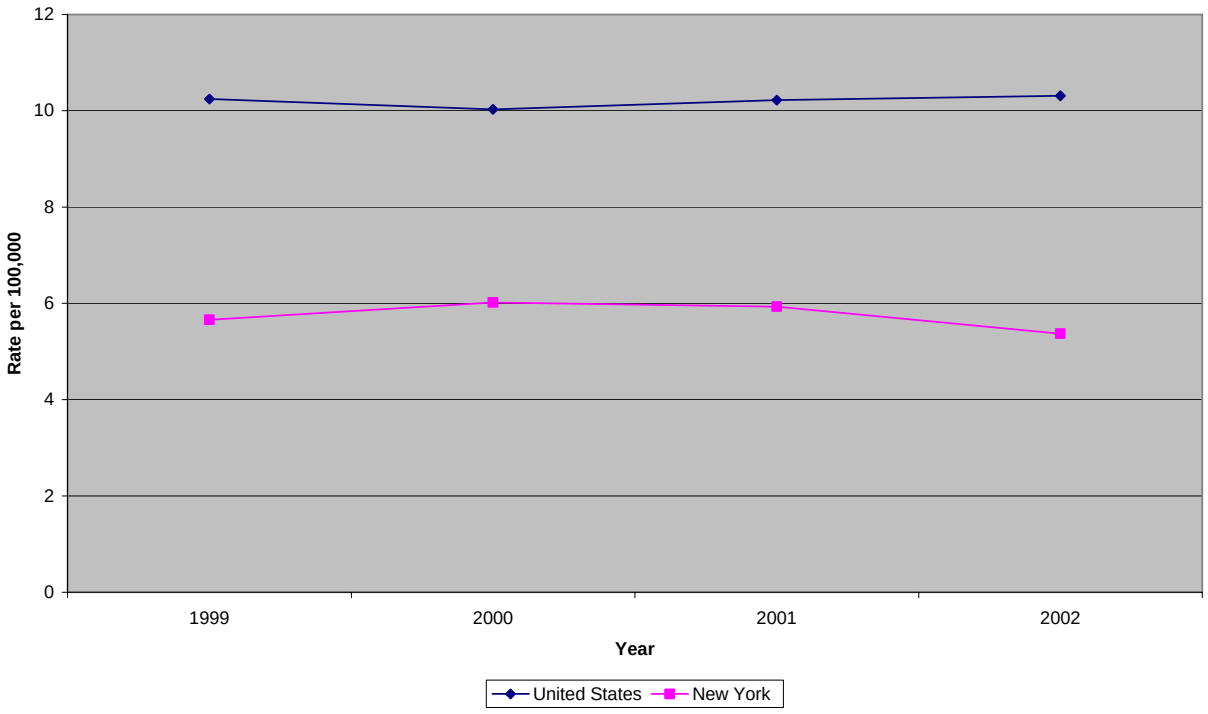
	Population	Deaths	Mortality Rate /100,000 Population	Age-Adjusted* Mortality Rate/100,000	p-value for Difference in Age-Adjusted* Mortality Rates
United States	287,974,001	30,242	10.50	10.31	<0.0001
New York State	19,134,293	994	5.19	5.37	

Table 38
Change in Deaths per 100,000 Population for Firearms
(ICD-10 Codes: W32-W34,X72-X74,X93-X95,Y22-Y24, Y35.0, U01.4)
United States vs. New York State: 1999 to 2002

	Age- Adjusted* Mortality Rate: 1999	Age-Adjusted* Mortality Rate: 2002	Percent Change	p-value for Difference in Percent Change
United States	10.24	10.31	+1.0	<0.0001
New York State	5.66	5.37	-5.0	

Chart 34

Firearm-Related Age-Adjusted Death Rates:
United States vs. New York State: 1999-2002



* Adjusted using population of the United States in 1940

Appendix 1

ICD-9-CM Codes for Inclusion in the New York State Trauma Registry (effective January 1, 2004)

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	.9
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				

Appendix 2

Hospitals Participating in the New York State Trauma Registry in 1999-2002

Region: Western New York

Level	Hospital Name
Regional	Children's Hospital of Buffalo
	Erie County Medical Center
Area	Woman's Christian Association

Region: Finger Lakes

Level	Hospital Name
Regional	Strong Memorial Hospital
Area	Arnot Ogden Medical Center
	Rochester General Hospital

Region: Central New York

Level	Hospital Name
Regional	University Hospital SUNY Health Science Center
Area	Crouse Hospital
	St. Elizabeth Medical Center
	St. Joseph's Hospital Health 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
	Hudson Valley Hospital Center
	Nyack Hospital
	Sound Shore Medical Center of Westchester
	St. Francis Hospital

Region: Nassau

Level	Hospital Name
Regional	Nassau University Medical Center
	North Shore University Hospital
	Winthrop University Hospital
Area	Mercy Medical Center
	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
	St. Catherine of Siena 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
	Lutheran Medical Center

New York Hospital at Medical Center of Queens
New York Presbyterian Hospital at Columbia Presbyterian Center
New York Presbyterian Hospital at New York Weill Cornell Center
SVCMC-Mary Immaculate
SVCMC-St. Vincent's Manhattan
SVCMC-St. Vincent's Staten Island
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: 1999 – 2002

Risk Factor	Parameter Estimate	p-value	Odds Ratio
Male gender	0.3620	<0.0001	1.436
Age	-0.0244	0.0033	0.976
Age squared	0.000689	<0.0001	1.001
Motor response on arrival at final hospital	-0.1898	<0.0001	0.827
Systolic blood pressure on arrival at the final hospital	-0.0300	<0.0001	0.970
Systolic blood pressure squared	0.000076	<0.0001	1.000
Intubation in the field or referring hospital	1.3592	<0.0001	3.893*
Respiratory assistance in the field or referring hospital	0.7414	0.0098	2.099*
Intubation for the first time in the final hospital	1.7336	<0.0001	5.661*
Respiratory assistance for the first time in the final hospital	0.3691	0.0035	1.446*
ICISS	-4.5788	<0.0001	0.010
Pedestrian	0.3982	<0.0001	1.489**

Intercept = 2.4662
C = 0.934
H-L = 22.35 (p=0.0043)
***Odds relative to patients who had no intubation or respiratory assistance at any time**
****Odds relative to non-pedestrians**

Appendix 4

Independent Risk Factors for Inpatient Mortality for Motor Vehicle Crash Deaths in the Emergency Department and Inpatients in New York State: 1999 – 2002

Risk Factor	Parameter Estimate	p-value	Odds Ratio
Male gender	0.2469	0.0003	1.280
Age	-0.0325	<0.0001	0.968
Age squared	0.000741	<0.0001	1.001
Motor response on arrival at final hospital	-0.3643	<0.0001	0.695
Systolic blood pressure on arrival at the final hospital	-0.0347	<0.0001	0.966
Systolic blood pressure squared	0.000089	<0.0001	1.000
Intubation in the field or referring hospital	2.1794	<0.0001	8.841*
Respiratory assistance in the field or referring hospital	1.2260	<0.0001	3.408*
Intubation for the first time in the final hospital	2.3596	<0.0001	10.587*
Respiratory assistance for the first time in the final hospital	0.5344	<0.0001	1.706*
Pedestrian	0.4186	<0.0001	1.520**
Transfer after admission to the referring hospital	-1.2683	0.0001	0.281***

Intercept = 0.2469
C = 0.915
H-L = 21.46 (p=0.0060)
***Odds relative to patients who had no intubation or respiratory assistance at any time**
****Odds relative to non-pedestrians**
*****Odds relative to patients who were 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: 1999 – 2002

Risk Factor	Parameter Estimate	p-value	Odds Ratio
Age	0.00430	0.7705	1.004
Age squared	0.000422	0.0008	1.000
Eye response on arrival at final hospital	-0.4135	<0.0001	0.661
Systolic blood pressure on arrival at the final hospital	-0.0279	<0.0001	0.973
Systolic blood pressure squared	0.000075	<0.0001	1.000
Intubation in the field or referring hospital	1.3089	<0.0001	3.702*
Intubation for the first time in the final hospital	1.3919	<0.0001	4.022*
ICISS	-5.2482	<0.0001	0.005
Transfer from the emergency department of the referring hospital	-0.6583	0.0005	0.518**

Intercept = 3.1614
C = 0.942
H-L = 16.22 (p=0.0394)
***Odds relative to patients who were not intubated at any time**
****Odds relative to patients who were not transported from the emergency department of another hospital**

Appendix 6

Independent Risk Factors for Inpatient Mortality for Other Blunt Deaths in the Emergency Department and Inpatients in New York State: 1999 - 2002

Risk Factor	Parameter Estimate	p-value	Odds Ratio
Age	0.00592	0.6313	1.006
Age squared	0.000412	0.0001	1.000
Eye response on arrival at final hospital	-0.3494	<0.0001	0.705
Motor response on arrival at final hospital	-0.3138	<0.0001	0.731
Systolic blood pressure on arrival at the final hospital	-0.0290	<0.0001	0.971
Systolic blood pressure squared	0.000083	<0.0001	1.000
Intubation in the field or referring hospital	1.8942	<0.0001	6.647*
Respiratory assistance in the field or referring hospital	1.0314	0.0067	2.805*
Intubation for the first time in the final hospital	1.8685	<0.0001	6.479*
Transfer from the emergency department of the referring hospital	-0.6332	<0.0001	0.531**

Intercept = 0.0482
C = 0.920
H-L =17.64 (p=0.0241)
***Odds relative to the group composed of patients who had no intubation or respiratory assistance at any time and patients who had respiratory assistance in the final hospital**
****Odds relative to patients who were 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: 1999 – 2002

Risk Factor	Parameter Estimate	p-value	Odds Ratio
Male gender	0.7264	<0.0001	2.068
Age	0.0504	<0.0001	1.052
Eye response on arrival at final hospital	-0.3763	<0.0001	0.686
Intubation in the field or referring hospital	1.0170	0.0032	2.765*
Intubation for the first time in the final hospital	1.4615	<0.0001	4.313*
ICISS	-5.3590	<0.0001	0.005

Intercept = -0.5720
C = 0.845
H-L =10.89 (p=0.2081)
***Odds relative to patients who were not intubated at any time**

Appendix 8

Independent Risk Factors for Inpatient Mortality for Low Fall Deaths in the Emergency Department and Inpatients in New York State: 1999 – 2002

Risk Factor	Parameter Estimate	p-value	Odds Ratio
Male gender	0.7469	<0.0001	2.110
Age	0.0514	<0.0001	1.053
Motor response on arrival at final hospital	-0.4261	<0.0001	0.653
Intubation in the field or referring hospital	1.6653	<0.0001	5.287*
Respiratory assistance in the field or referring hospital	1.0209	0.0288	2.776*
Intubation for the first time in the final hospital	2.1038	<0.0001	8.197*

Intercept = -4.4896
C = 0.816
H-L = 8.07 (p=0.4263)
***Odds relative to the group composed of patients who had no intubation or respiratory assistance at any time and patients who had respiratory assistance in the final hospital**

Appendix 9

Independent Risk Factors for Inpatient Mortality for Stab Wound Inpatients in New York State: 1999 – 2002

Risk Factor	Parameter Estimate	p-value	Odds Ratio
Age	-0.0299	0.3958	0.971
Age squared	0.000753	0.0408	1.001
Motor response on arrival at final hospital	-0.4925	<0.0001	0.611
Systolic blood pressure on arrival at the final hospital	-0.0116	0.0010	0.989
Intubation in the field or referring hospital	1.6533	0.0035	5.224*
Intubation for the first time in the final hospital	1.3615	<0.0001	3.902*
ICISS	-6.1530	<0.0001	0.002

Intercept = 4.4128
C = 0.968
H-L = 9.97 (p=0.2674)
***Odds relative to patients who were not intubated at any time**

Appendix 10

Independent Risk Factors for Inpatient Mortality for Stab Wound Deaths in the Emergency Department and Inpatients in New York State: 1999 – 2002

Risk Factor	Parameter Estimate	p-value	Odds Ratio
Age	-0.0326	0.3067	0.968
Age squared	0.000729	0.0294	1.001
Motor response on arrival at final hospital	-0.5410	<0.0001	0.582
Systolic blood pressure on arrival at the final hospital	-0.0128	<0.0001	0.987
Intubation in the field or referring hospital	2.5432	<0.0001	12.720*
Intubation for the first time in the final hospital	2.1163	<0.0001	8.300*

Intercept = -0.2325
C = 0.932
H-L = 10.44 (p=0.2352)
***Odds relative to patients who were not intubated at any time**

Appendix 11

Independent Risk Factors for Inpatient Mortality for Gunshot Wound Inpatients in New York State: 1999 – 2002

Risk Factor	Parameter Estimate	p-value	Odds Ratio
Motor response on arrival at final hospital	-0.3983	<0.0001	0.671
Systolic blood pressure on arrival at the final hospital	-0.0376	<0.0001	0.963
Systolic blood pressure squared	0.000123	0.0003	1.000
Intubation in the field or referring hospital	1.4421	<0.0001	4.230*
Intubation for the first time in the final hospital	1.1573	<0.0001	3.181*
ICISS	-5.4255	<0.0001	0.004

Intercept = 5.7709
C = 0.950
H-L =12.59 (p=0.1269)
***Odds relative to patients who were not intubated at any time**

Appendix 12

Independent Risk Factors for Inpatient Mortality for Gunshot Wound Deaths in the Emergency Department and Inpatients in New York State: 1999 – 2002

Risk Factor	Parameter Estimate	p-value	Odds Ratio
Eye response on arrival at final hospital	-0.3653	0.0015	0.694
Motor response on arrival at final hospital	-0.3360	<0.0001	0.715
Systolic blood pressure on arrival at the final hospital	-0.0338	<0.0001	0.967
Systolic blood pressure squared	0.000104	0.0006	1.000
Intubation in the field or referring hospital	2.0170	<0.0001	7.516*
Respiratory assistance in the field or referring hospital	1.7229	<0.0001	5.601*
Intubation for the first time in the final hospital	1.9185	<0.0001	6.811*
Respiratory assistance for the first time in the final hospital	0.6557	0.0124	1.927*

Intercept = 2.2708
C = 0.920
H-L = 27.81 (p=0.0005)
***Odds relative to patients who had no intubation or respiratory assistance at any time**