



New York State Trauma Registry

Statistical Report 1/1/2016-12/31/2020

Bureau of Emergency Medical Services and Trauma Systems
& Data Management, Analysis and Research Group

Office of Primary Care and Health System Management
New York State Department of Health

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Executive Summary

Introduction

This report is to present summary statistics of trauma-related injuries and outcomes of the care provided in trauma centers designated in New York State (NYS) for the calendar years 2016-2020. January 2020 marked the beginning of the Covid pandemic which significantly affected trauma incidents and is reflected in this report. Some of the statistical reporting in this multi-year analysis could have been affected by the covid pandemic. Trauma clinicians, administrators and policy makers may use this report to identify important areas and issues for enhancing systems development and clinical quality improvement; the public may use this report to learn more about the trauma system in NYS. As trauma centers in NYS transition to the standards of the American College of Surgeons Committee on Trauma and additional levels of trauma center are added to the State system, this report will serve as a baseline for measuring improvements in outcome and injury prevention.

Key Findings:

For the discharge years 2016-2020, the NYS Trauma Registry received a total of 279,782 trauma cases submitted by the 46 trauma centers across the state.

- Annually, there were an average of 55,956 trauma incidents with a 2.6% case fatality rate.
 - Trauma incidence and fatality rate increased with patient's age.
 - Males had a higher trauma incidence rate than females, particularly for males under age 75. Males had a higher case fatality rate than females, a difference which widens after age 50.
 - Blacks had a higher trauma incidence rate compared to other races aged 13-58; whites had a higher rate for patients aged 59+.
 - Long Island Region (Nassau and Suffolk) had a higher trauma incidence rate compared to other Regions; Finger Lakes Region had the highest case fatality rate.
 - Trauma was most likely to happen on the weekends, in summer months, and in the afternoon (peaking at 4 p.m.).
- The leading causes of trauma were falls (64.8%) and motor vehicle traffic accidents (16.2%). Firearms had the highest case fatality rate (7.0%).
 - EMS handled/transported 69.0% of all trauma cases and 89.8% for the most severe trauma cases (ISS 35-75). The median EMS response time was 6.80 minutes and median EMS transport time was 17.20 minutes.
 - The median time at a referring hospital inversely correlated with injury severity; 3.8 - 4.0 hours for low severity trauma and 2.6 hours for most severe trauma. New York City Region had the longest time (4.8 hours).
 - Similarly, median time in a trauma center emergency department decreased with increasing injury severity; 6.0 hours for low severity trauma and 2.0 hours for most severe trauma.
 - About 45.9% of trauma patients were discharged to home with no services, 17.3% to inpatient rehabilitation, 9.6% to home with home health services, and 8.5% to skilled nursing facilities.
 - Trauma centers in Central New York Region had significantly higher adjusted mortality ratio (1.28; CI, 1.19-1.38). Northeastern Region had the lowest adjusted mortality ratio (0.81; CI, 0.74-0.88).

Materials and Methods

1. Data Sources

Trauma Registry - Established in 1993, the NYS Trauma Registry (NYSTR) receives reports from designated trauma centers on patients identified and treated for traumatic injury (Inclusion Criteria in Appendix). The reports contain variables specified by the NYSTR including patients' demographic information, diagnoses and treatments. A very small portion of the trauma reports in the NYSTR were submitted from several non-trauma centers/hospitals.

Statewide Planning and Research Cooperative System (SPARCS) - Implemented by the NYS Department of Health (NYSDOH) in 1979, SPARCS is a comprehensive, integrated information system available to assist hospitals and organizations in the health care industry with healthcare resource planning, financial analysis, decision making, and surveillance of NYS. SPARCS receives, processes, stores, and analyzes the inpatient and emergency department data from all hospitals in New York. Each health care provider submits its SPARCS data, as mandated, in the uniform, computer-readable format described in the Universal Data Set.

Surveillance, Epidemiology, and End Results Program (SEER) - The population estimates used to calculate trauma incidence and mortality were from Surveillance, Epidemiology, and End Results Program (SEER) of the National Cancer Institute. This data was produced by the US Census Bureau's Population Estimates Program, in collaboration with the National Center for Health Statistics and with support from the National Cancer Institute. [1]

2. The Cohort

A cohort used for generating the NYSTR Summary Report was constructed with trauma data submitted from the certified trauma centers. Trauma records submitted by non-trauma centers were excluded in the data analyses.

3. Data Matching

A dataset containing all patients diagnosed with traumatic injuries and who were treated in NYS trauma centers was created from SPARCS hospital inpatient and emergency department (ED) discharge files. This data file was matched to Trauma Registry records for the same discharge year period by using identifying variables such as hospital's Permanent Facility Identifier, admission dates, discharge dates, hospital's medical record numbers, patients' date of birth, etc. The matches were conducted without using patient name and address, because SPARCS does not contain patient name and SPARCS ED data does not have patient address information. The records found in the SPARCS hospital data files or ED data files (but not in the Trauma Registry database), were defined as unmatched/missed reports and were sent to hospitals for audits. After checking their own unmatched/missed reports, hospitals resubmitted the missing trauma cases and corrected trauma cases to the Trauma Registry.

Materials and Methods (continued...)

4. Statistical Analysis

Descriptive Analysis. Descriptive statistics were used to perform quantitative analysis, describe the basic features of the data, and provide summaries stratified by selected factors.

Predictive Analysis. Predictive analysis of risk of mortality was performed to develop a risk-adjusted model that provides unbiased estimates of trauma case fatality rates. The detailed description of the risk adjustment methodology is provided in the Risk Adjustment Methodology section in Appendix A.

5. Specific Notes

EMS Time Variables. Many omissions were present in the EMS time variables; additionally, negative time values and excessively long-time values were excluded. Therefore, when time variables were quoted, a subset excluding the records with missing values was used.

E-codes. In the cohort, some patients have more than one E code for cause of injury. In this analysis, only the primary E code cause was used, in the Injury Statistics section.

6. Software

All figures, tables, maps, and calculations were created with SAS (Statistical Analysis System) statistical software [2].

7. Definitions

Pediatric patients. In this report, pediatric patients are defined as those who are aged 14 years or younger.

Verification Levels of Trauma Centers. Trauma centers are evaluated and verified by the American College of Surgeons to improve trauma care. The trauma center level (I - V) refers to the resources available to care for a trauma patient. A Level I trauma center can provide the highest level of care for a patient presenting after a traumatic injury. A Level IV or V trauma center will stabilize an injured patient and arrange for transfer to a higher level of care. [3]

Injury Severity Score. An established medical score to assess trauma severity. It correlates with mortality, morbidity and hospitalization time after trauma. It ranges from 1 to 75, where 75 is considered nonsurvivable. [4]

Case Fatality Rate. Number of deaths divided by total cases.

Race. Patient self-identified race as White, Black, Asian/Pacific Islander, American Indian/Alaska Native, multi-race or others.

Ethnicity. Patient self-identified as Spanish/Hispanic origin or non-Spanish/non-Hispanic origin.

Materials and Methods (continued...)

8. References

[1] Surveillance, Epidemiology, and End Results (SEER) Program Populations (1969-2020) (www.seer.cancer.gov/popdata). National Cancer Institute, DCCPS, Surveillance Research Program, released February 2022.

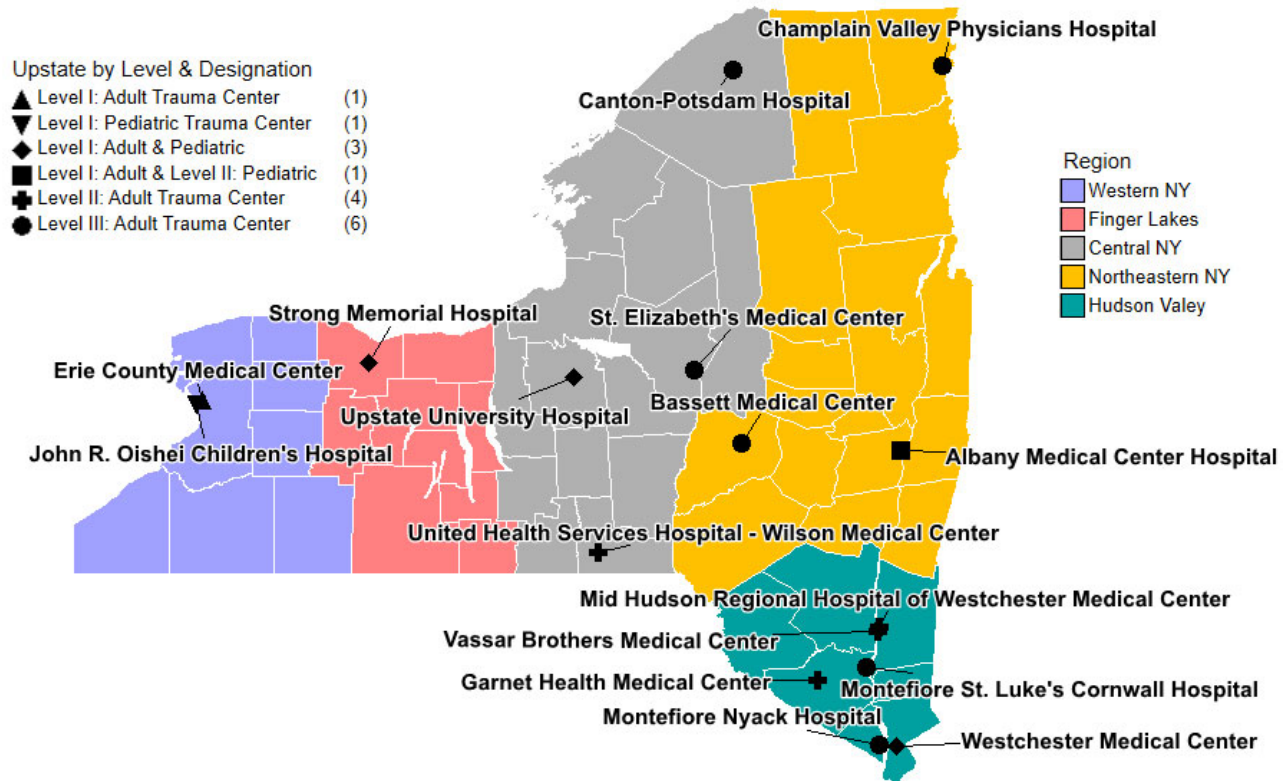
[3] SAS Institute Inc. 2016, 9.4 Interface. Cary, NC: SAS Institute Inc.

[3] Southern, AP; Celik, DH. EMS, Trauma Center Designation. NCBI Bookshelf. A service of the National Library of Medicine, National Institutes of Health. StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. <https://www.ncbi.nlm.nih.gov/books/NBK560553/#article-33962.s6>.

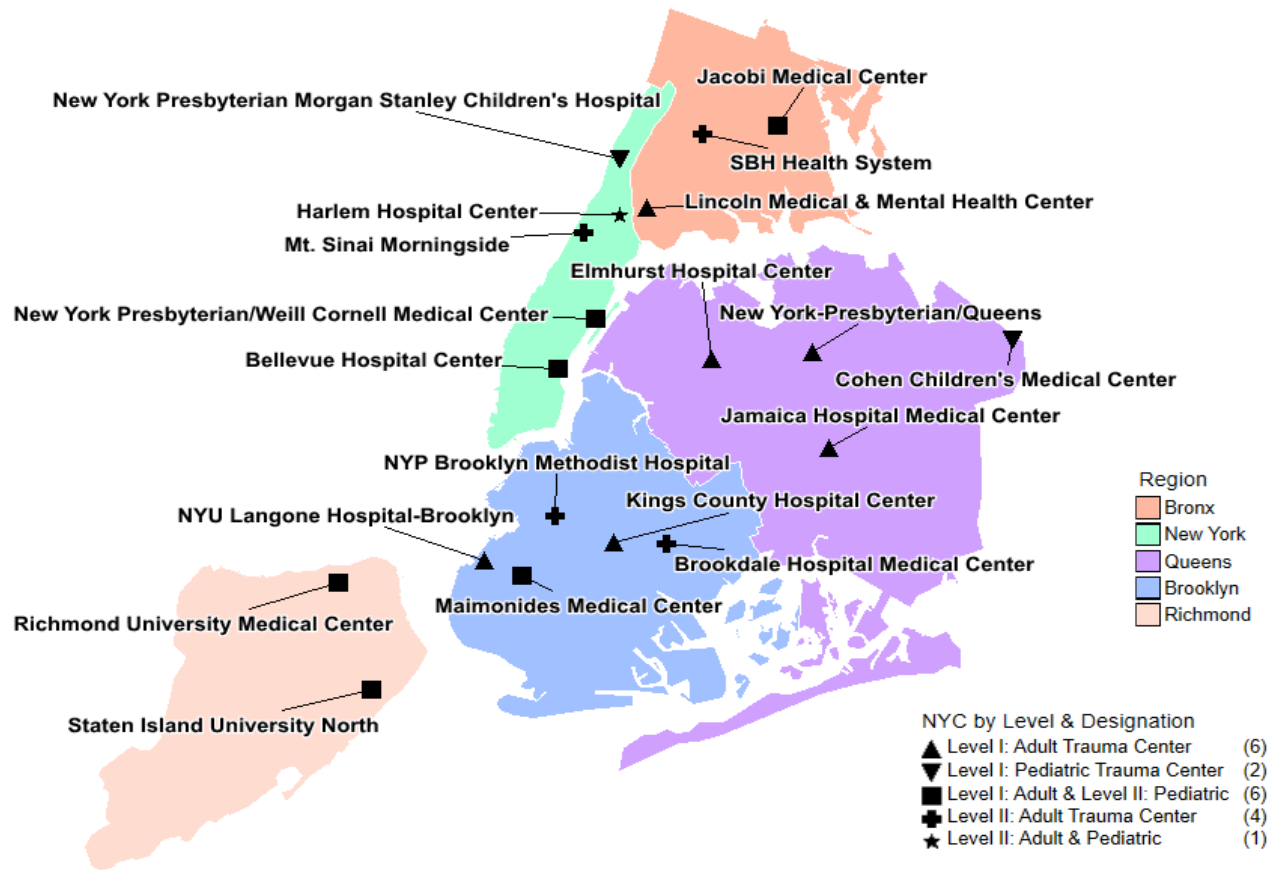
[4] Baker, O'Neill, Haddon, and Long. The Injury Severity Score: A Method for Describing Patients with Multiple Injuries and Evaluating Emergency Care. *Journal of Trauma*, Volume 14, No. 3, March 1974.

Facility Information

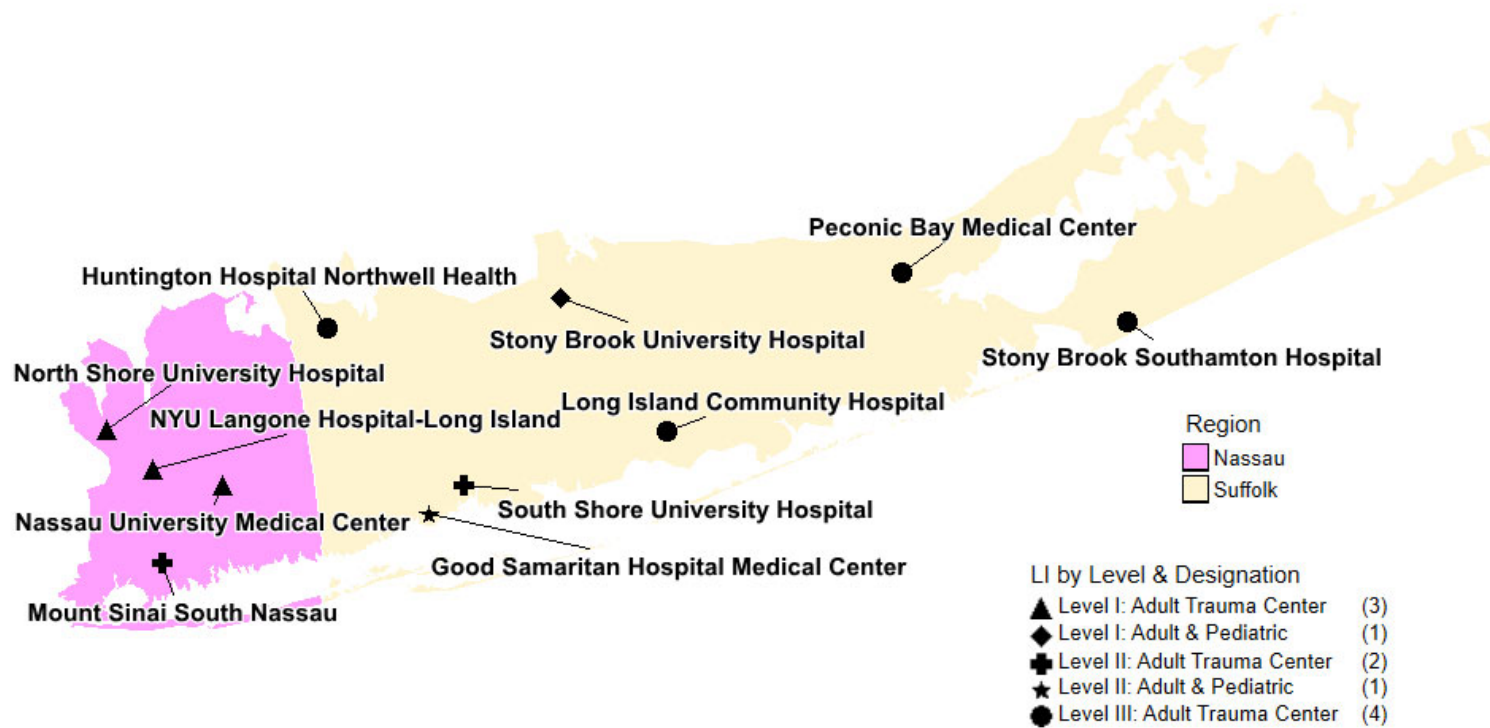
Facility Information: Trauma Centers in Upstate Region



Facility Information: Trauma Centers in New York City Region



Facility Information: Trauma Centers in Long Island Region



Upstate Trauma Center Average Annual Case Loads (2016-2020)

Region	Facility	Total Cases ^a	Adult Cases	Pediatric Cases	Facility	
					Verification	Designation
Central NY	Canton-Potsdam Hospital	191	179	11	Level III	Adult Trauma Center
	St. Elizabeth's Medical Center	563	558	5	Level III	Adult Trauma Center
	United Health Services Hospital - Wilson Medical Center	980	961	19	Level II	Adult Trauma Center
	Upstate University Hospital	2,970	2,530	440	Level I	Dual Designation
	Total	4,704	4,228	475		
Finger Lakes	Strong Memorial Hospital	2,355	2,112	243	Level I	Dual Designation
	Total	2,355	2,112	243		
Hudson Valley	Garnet Health Medical Center	1,207	1,153	54	Level II	Adult Trauma Center
	Mid Hudson Regional Hospital of Westchester Medical center	526	520	5	Level II	Adult Trauma Center
	Montefiore Nyack Hospital	582	570	12	Level III	Adult Trauma Center
	Montefiore St. Luke's Cornwall Hospital	621	596	25	Level III	Adult Trauma Center
	Vassar Brothers Medical Center	665	655	10	Level II	Adult Trauma Center
	Westchester Medical Center	2,100	1,726	375	Level I	Dual Designation
Total	5,701	5,220	480			
Northeastern NY	Albany Medical Center Hospital	3,528	3,207	321	Level I	Dual Designation
	Bassett Medical Center	594	569	25	Level III	Adult Trauma Center
	Champlain Valley Physicians Hospital	407	395	6	Level III	Adult Trauma Center
	Total	4,530	4,171	352		
Western NY	Erie County Medical Center	2,484	2,482	2	Level I	Adult Trauma Center
	John R. Oishei Children's Hospital	355	68	287	Level I	Pediatric Trauma Center
	Total	2,839	2,550	289		

^a Total Cases include unknowns (adult or pediatric).

New York City Trauma Center Average Annual Case Loads (2016-2020)

Region	Facility	Total Cases ^a	Adult Cases	Pediatric Cases	Facility	
					Verification	Designation
Bronx	Jacobi Medical Center	1,637	1,517	120	Level I	Dual Designation
	Lincoln Medical & Mental Health Center	1,077	1,032	45	Level I	Adult Trauma Center
	SBH Health System	871	863	9	Level II	Adult Trauma Center
	Total	3,586	3,411	174		
Kings	Brookdale Hospital Medical Center	829	801	28	Level II	Adult Trauma Center
	Kings County Hospital Center	1,155	1,083	73	Level I	Adult Trauma Center
	Maimonides Medical Center	1,192	1,060	132	Level I	Dual Designation
	NYP Brooklyn Methodist Hospital	818	773	43	Level II	Adult Trauma Center
	NYU Langone Hospital-Brooklyn	1,317	1,286	31	Level I	Adult Trauma Center
	Total	5,312	5,003	307		
New York	Bellevue Hospital Center	1,378	1,303	74	Level I	Adult Trauma Center
	Harlem Hospital Center	528	493	35	Level II	Adult Trauma Center
	Mt. Sinai Morningside	1,059	1,055	4	Level II	Adult Trauma Center
	New York Presbyterian Morgan Stanley Children's Hospital	207	35	172	Level I	Pediatric Trauma Center
	New York Presbyterian/Weill Cornell Medical Center	1,635	1,459	175	Level I	Dual Designation
	Total	4,806	4,346	460		
Queens	Cohen Children's Medical Center	708	149	559	Level I	Pediatric Trauma Center
	Elmhurst Hospital Center	1,330	1,288	42	Level I	Adult Trauma Center
	Jamaica Hospital Medical Center	1,730	1,691	40	Level I	Adult Trauma Center
	New York-Presbyterian/Queens	1,500	1,461	37	Level I	Adult Trauma Center
	Total	5,269	4,589	678		
Richmond	Richmond University Medical Center	1,486	1,379	107	Level I	Dual Designation
	Staten Island University North	2,319	2,081	238	Level I	Dual Designation
	Total	3,805	3,460	345		

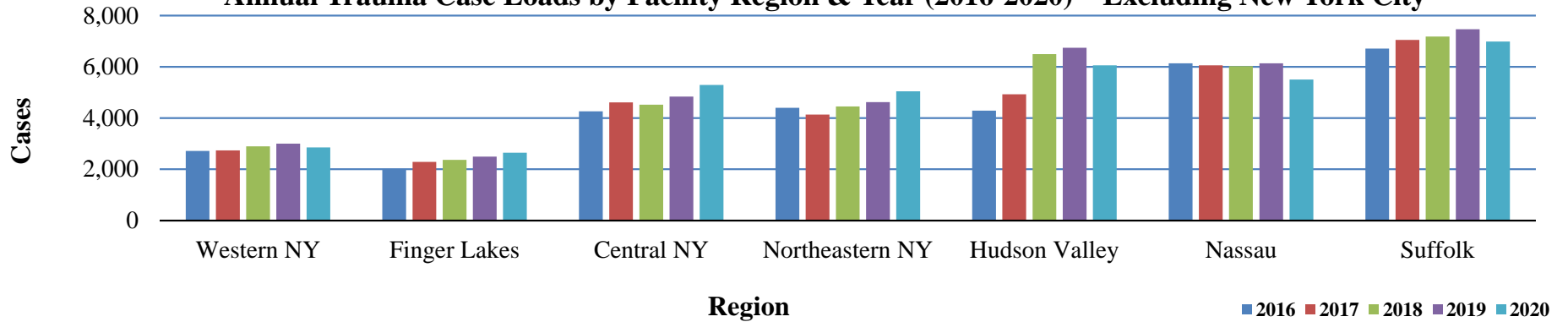
^a Total Cases include unknowns (adult or pediatric).

Long Island Trauma Center Average Annual Case Loads (2016-2020)

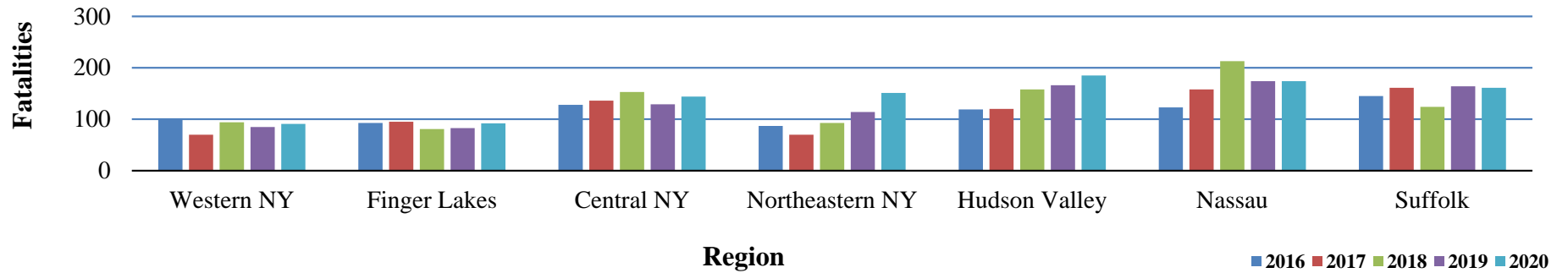
Region	Facility	Total Cases	Adult Cases	Pediatric Cases	Facility	
					Verification	Designation
Nassau	Mount Sinai South Nassau	1,052	1,044	8	Level II	Adult Trauma Center
	Nassau University Medical Center	1,407	1,370	37	Level I	Adult Trauma Center
	North Shore University Hospital	2,183	2,175	8	Level I	Adult Trauma Center
	NYU Langone Hospital-Long Island	1,329	1,241	88	Level I	Adult Trauma Center
	Total	5,971	5,830	141		
Suffolk	Good Samaritan Hospital Medical Center	1,677	1,541	136	Level II	Dual Designation
	Huntington Hospital Northwell Health	938	916	22	Level III	Adult Trauma Center
	Long Island Community Hospital	667	664	2	Level III	Adult Trauma Center
	Peconic Bay Medical Center	390	388	2	Level III	Adult Trauma Center
	South Shore University Hospital	1,147	1,134	13	Level II	Adult Trauma Center
	Stony Brook Southampton Hospital	299	294	4	Level III	Adult Trauma Center
	Stony Brook University Hospital	1,962	1,792	169	Level I	Dual Designation
	Total	7,079	6,730	347		
Statewide Total		55,956	51,651	4,291		

^a Total Cases include unknowns (adult or pediatric).

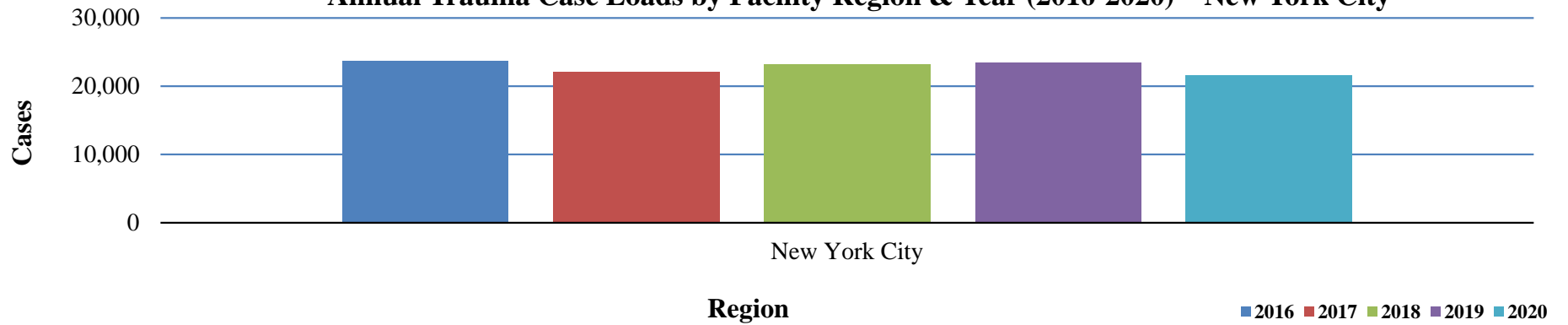
Annual Trauma Case Loads by Facility Region & Year (2016-2020) – Excluding New York City



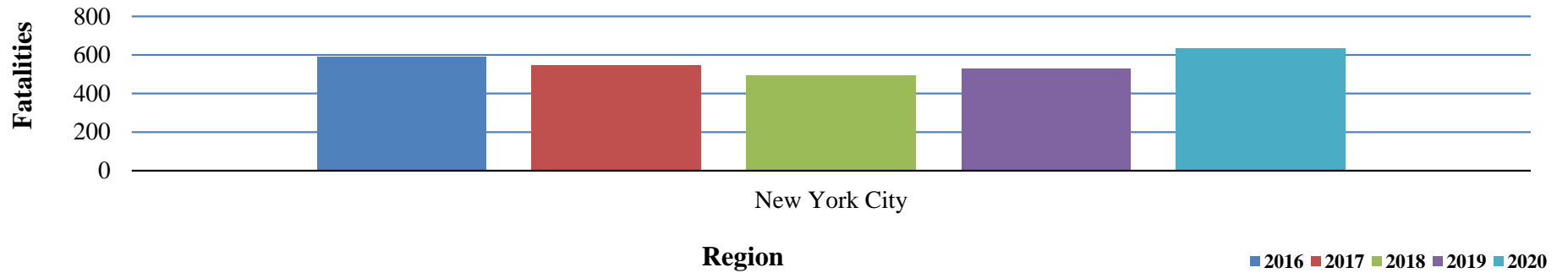
Annual Trauma Fatalities by Facility Region & Year (2016-2020) – Excluding New York City



Annual Trauma Case Loads by Facility Region & Year (2016-2020) – New York City



Annual Trauma Fatalities by Facility Region & Year (2016-2020) – New York City



Patient Characteristics

Summary of Patient Characteristics - Annual Average (2016-2020)

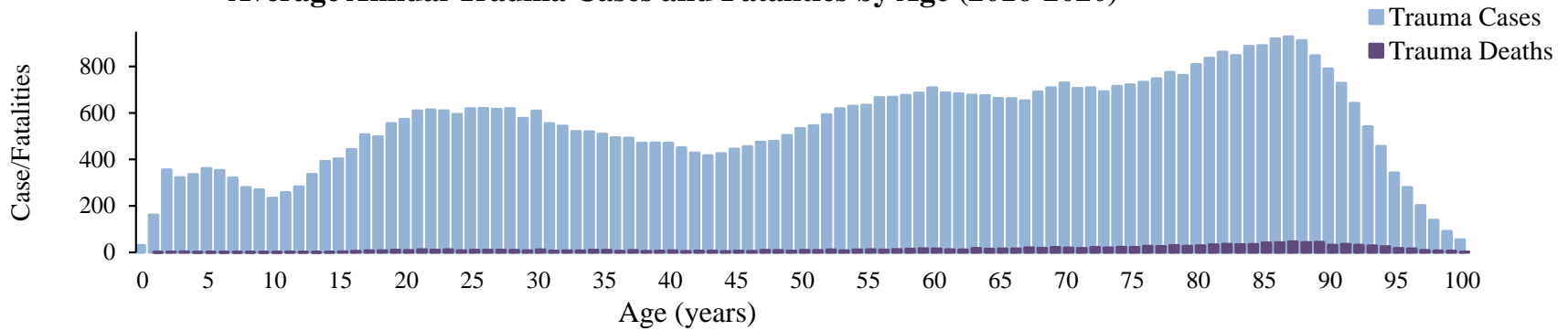
	Demographics	Cases	%	Incidence ^a	Deaths	Fatality Rate ^a	Mortality ^a
Age	0-14	4,291	7.68	1.27	20	0.46	0.01
	15-29	8,456	15.15	2.13	137	1.62	0.03
	30-44	7,374	13.18	1.93	113	1.53	0.03
	45-59	8,607	15.39	2.21	157	1.82	0.04
	60-74	10,358	18.49	3.39	271	2.62	0.09
	75-84	7,980	14.24	8.41	304	3.81	0.32
	85+	8,876	15.84	19.42	442	4.98	0.97
Sex	Female	23,735	42.41	2.36	528	2.22	0.05
	Male	31,759	56.79	3.35	917	2.89	0.10
Race	American Indian or Alaska Native	89	0.16	0.39	2	2.25	0.01
	Asian or Pacific Islander	2,050	3.67	1.11	60	2.93	0.03
	Black	8,237	14.74	2.27	186	2.26	0.05
	White	34,650	61.94	2.51	946	2.73	0.07
Ethnicity	Hispanic or Latino	7,184	12.84	1.93	144	2.01	0.04
	Not Hispanic or Latino	45,539	81.38	2.88	1,200	2.63	0.08
Region	Central NY	4,939	8.17	2.69	134	2.93	0.08
	Finger Lakes	2,193	3.92	1.74	81	3.69	0.06
	Hudson Valley	5,676	10.11	2.44	155	2.74	0.07
	Nassau	4,939	8.83	3.64	142	2.87	0.10
	New York City	22,823	40.82	2.72	561	2.46	0.07
	Northeastern NY	4,131	7.38	2.77	96	2.32	0.06
	Suffolk	6,903	12.34	4.66	143	2.08	0.10
	Western NY	3,070	5.49	2.02	96	3.11	0.06
	Total^b	55,956	100.00	2.87	1,444	2.58	0.07

^a Incidence/1000 = Cases × 1,000 / Population; Fatality rate(%) = Deaths × 100 / Cases; Mortality/1000 = Deaths × 1,000 / Population.

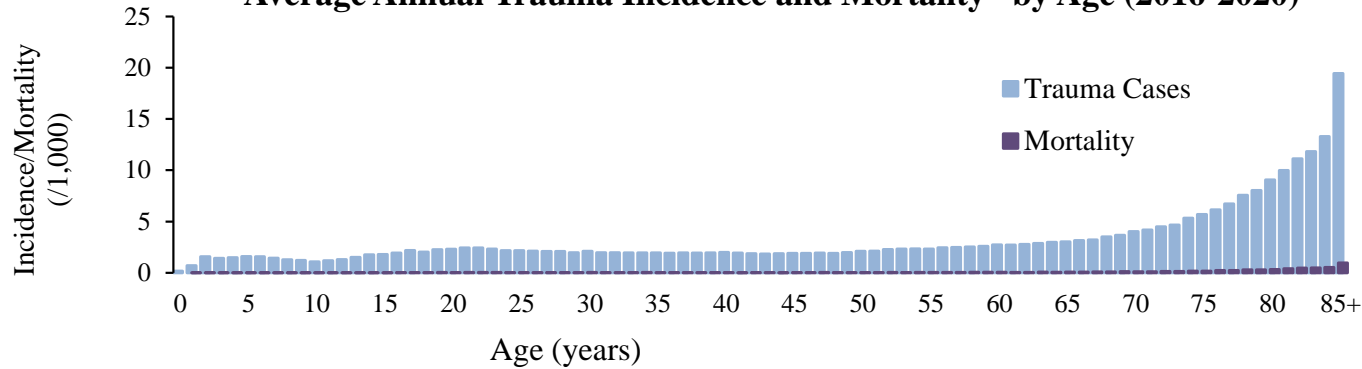
^b Null value counts are omitted from the subcategories but contained in the total.

Population source: National Cancer Institute (<https://seer.cancer.gov/popdata/download.html>).

Average Annual Trauma Cases and Fatalities by Age (2016-2020)

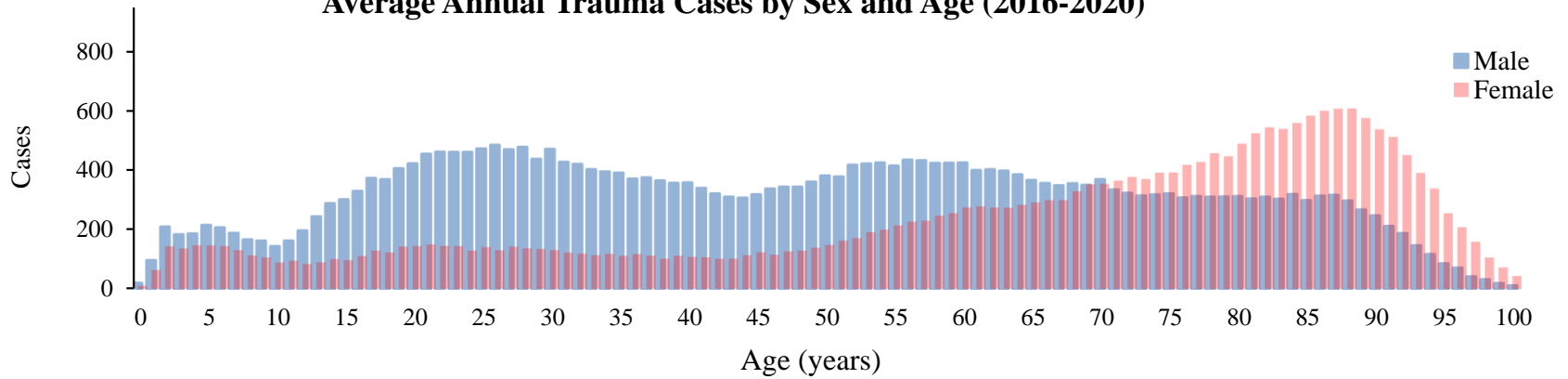


Average Annual Trauma Incidence and Mortality^a by Age (2016-2020)

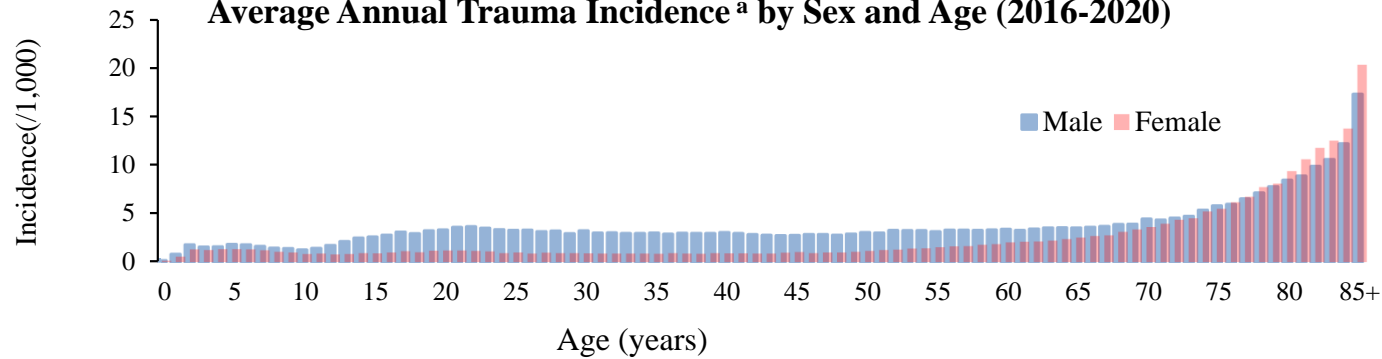


^a Incidence/1000 = Incidents x 1,000 / Population; Mortality/1000 = Deaths x 1,000 / Population.

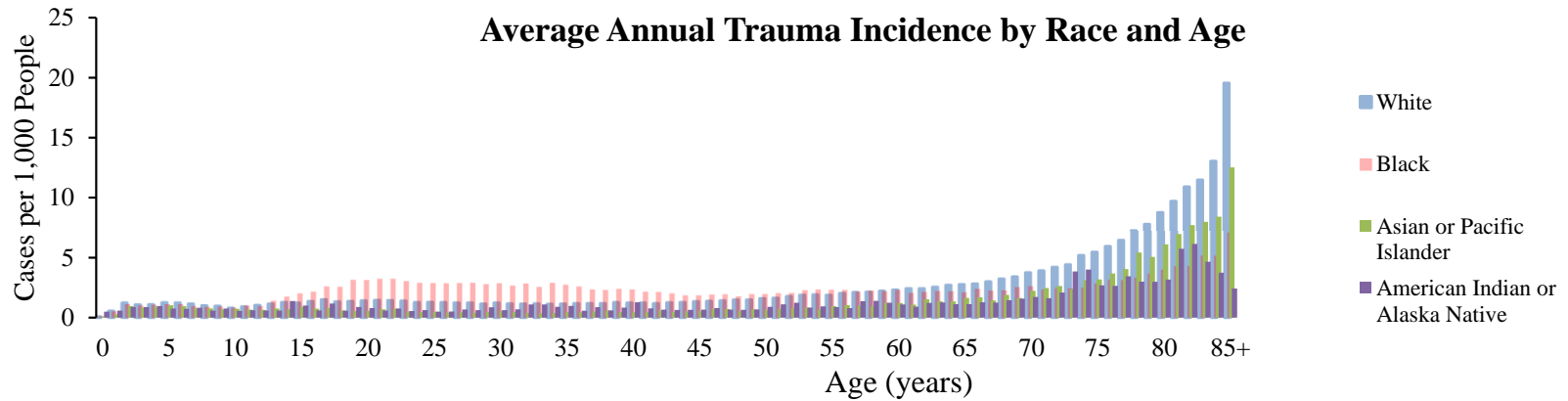
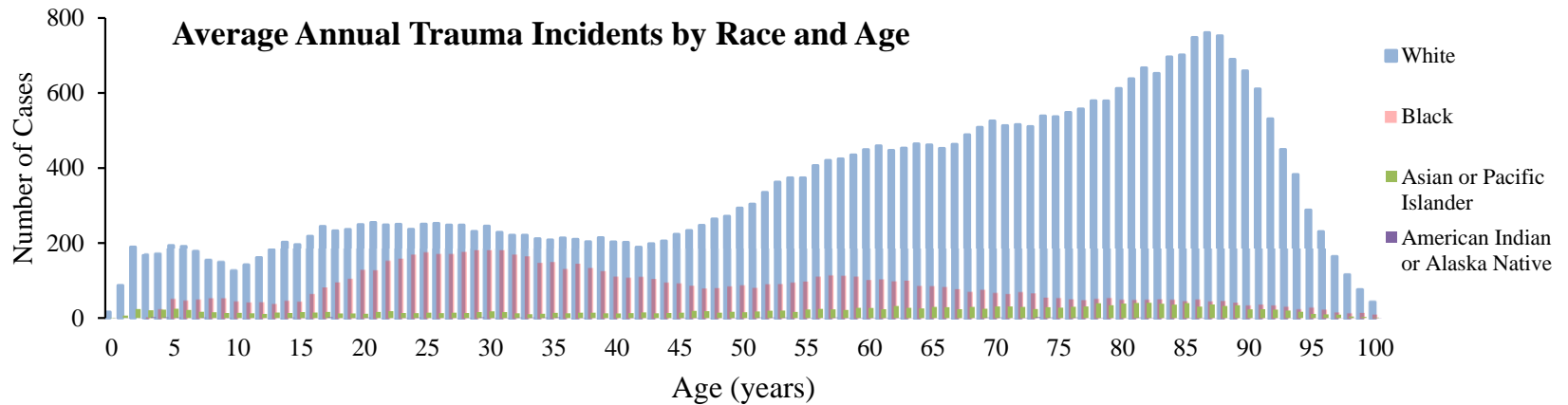
Average Annual Trauma Cases by Sex and Age (2016-2020)



Average Annual Trauma Incidence^a by Sex and Age (2016-2020)

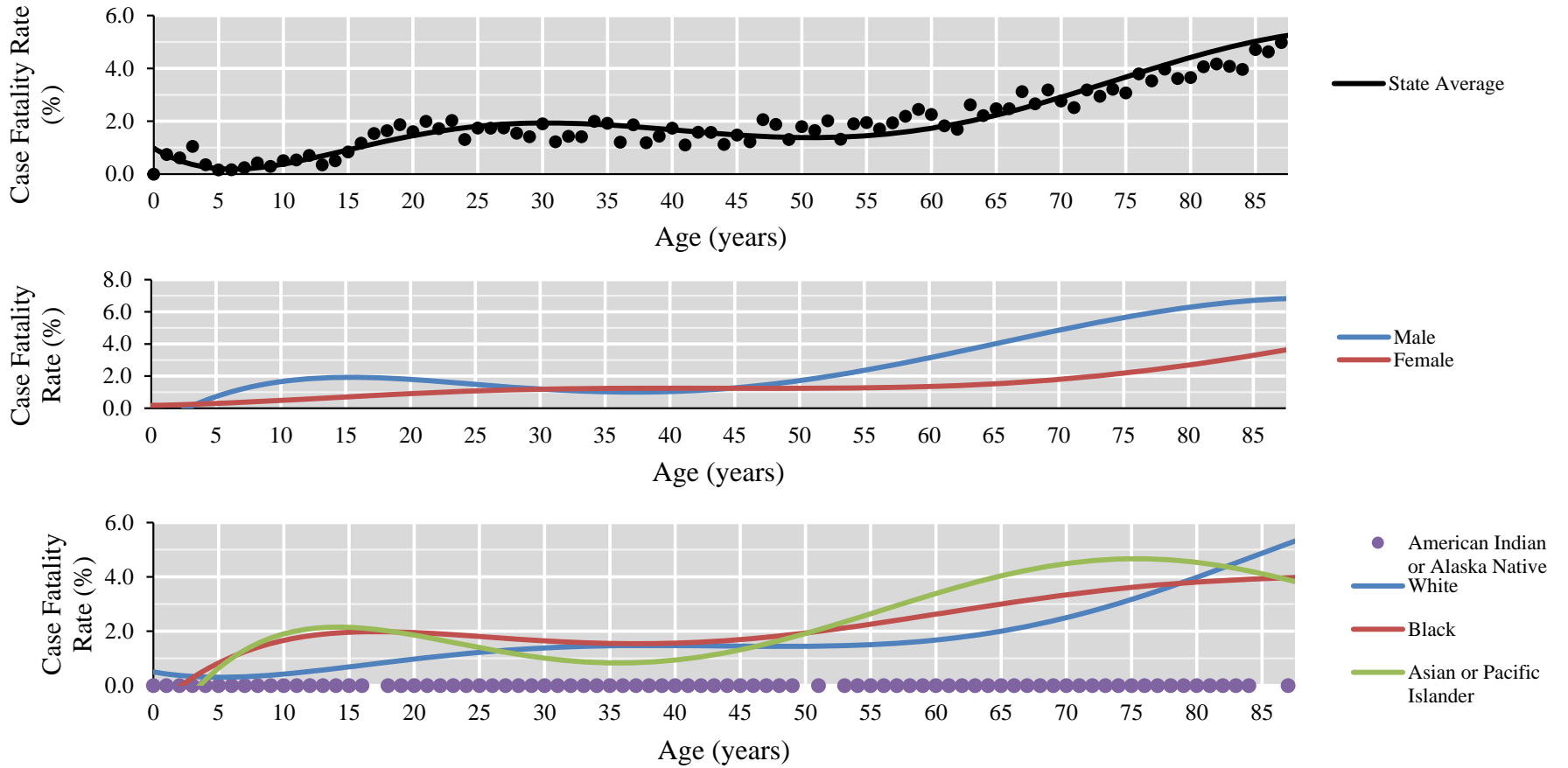


^a Incidence/1000 = Cases × 1, 000 / Population

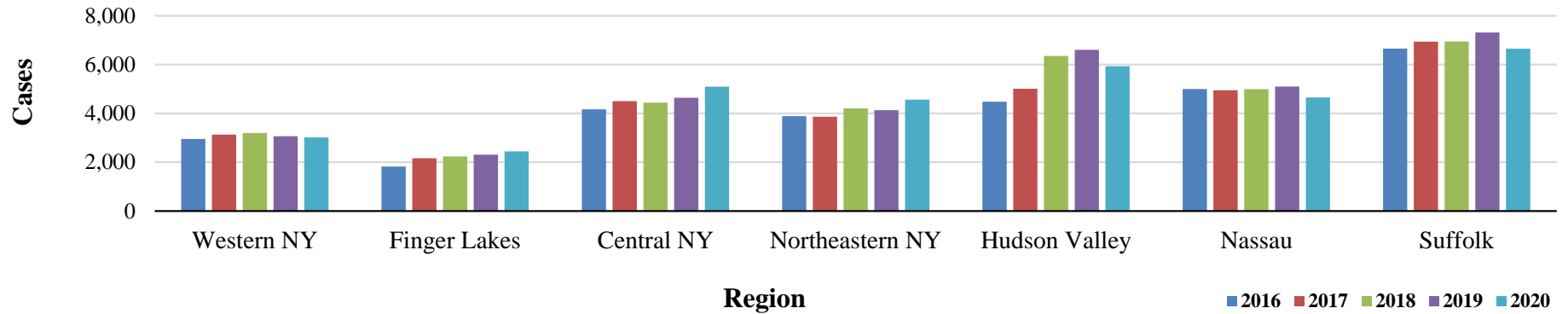


^a Incidence/1000 = Cases × 1,000 / Population

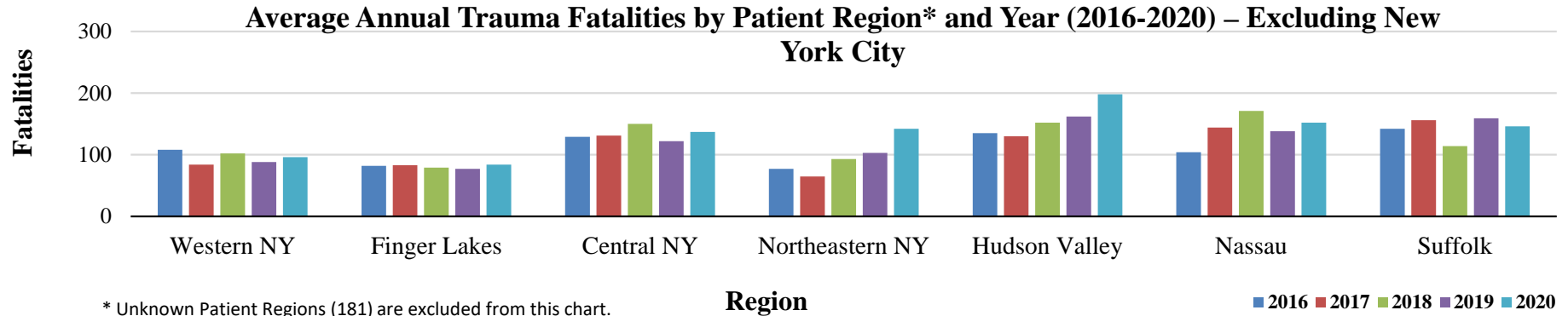
Average Annual Trauma Fatality Rate (%) by Age, Sex and Race (2016-2020)



Annual Trauma Cases by Patient Region and Year (2016-2020) – Excluding New York City

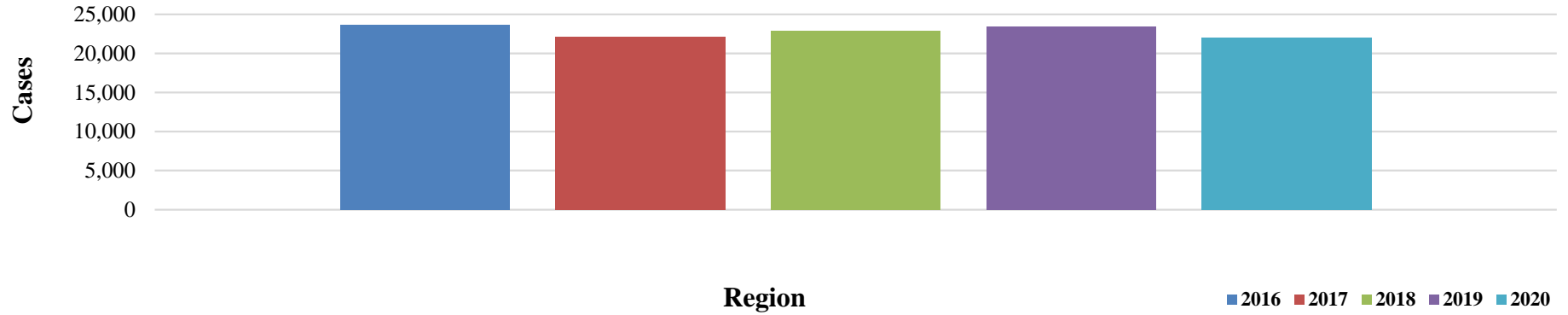


Average Annual Trauma Fatalities by Patient Region* and Year (2016-2020) – Excluding New York City

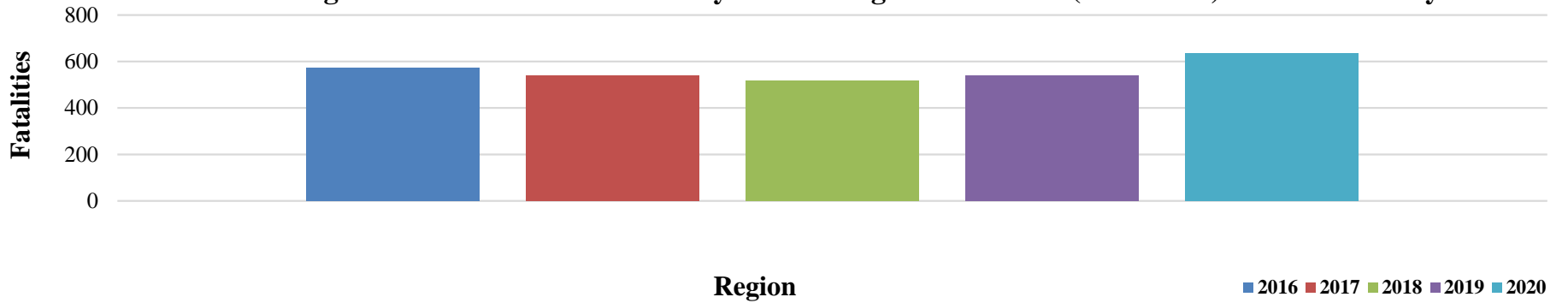


* Unknown Patient Regions (181) are excluded from this chart.

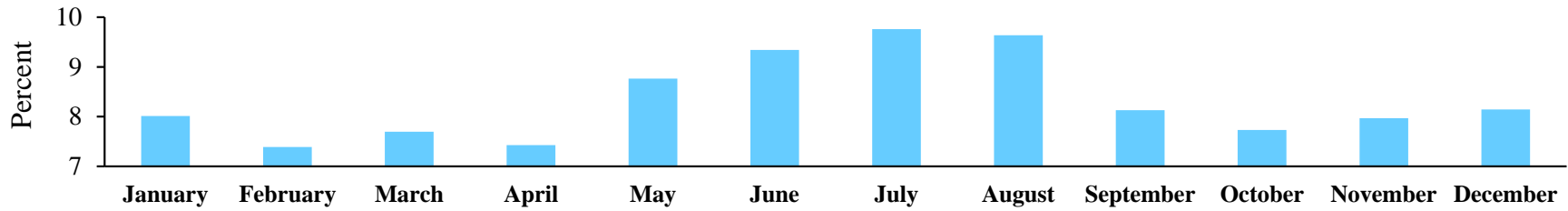
Annual Trauma Cases by Patient Region and Year (2016-2020) – New York City



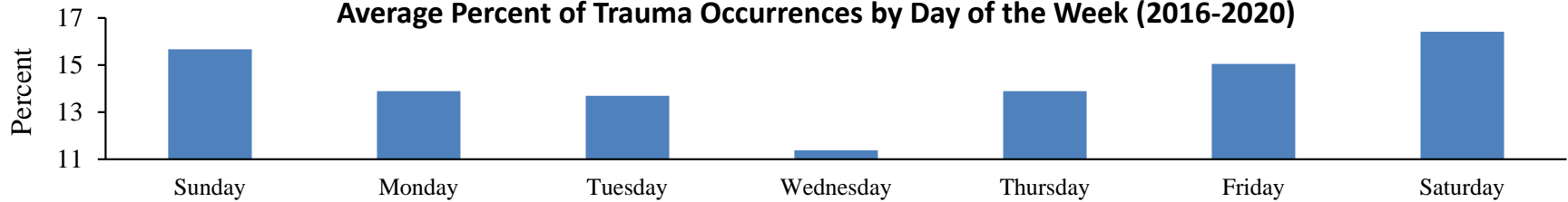
Average Annual Trauma Fatalities by Patient Region* and Year (2016-2020) – New York City



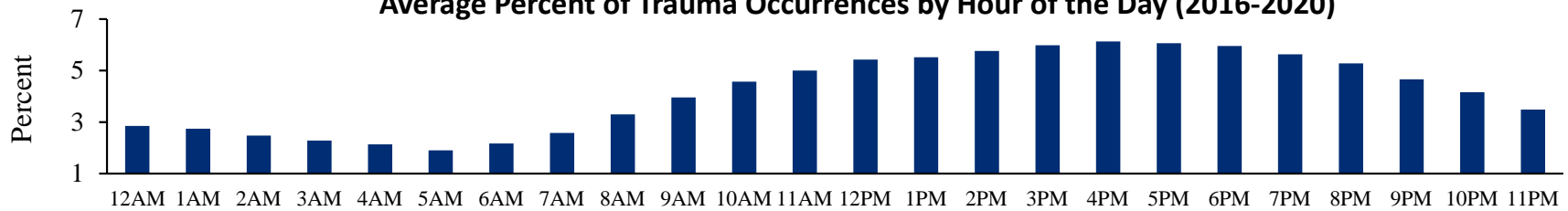
Average Percent of Trauma Occurrences by Month of the year (2016-2020)



Average Percent of Trauma Occurrences by Day of the Week (2016-2020)



Average Percent of Trauma Occurrences by Hour of the Day (2016-2020)



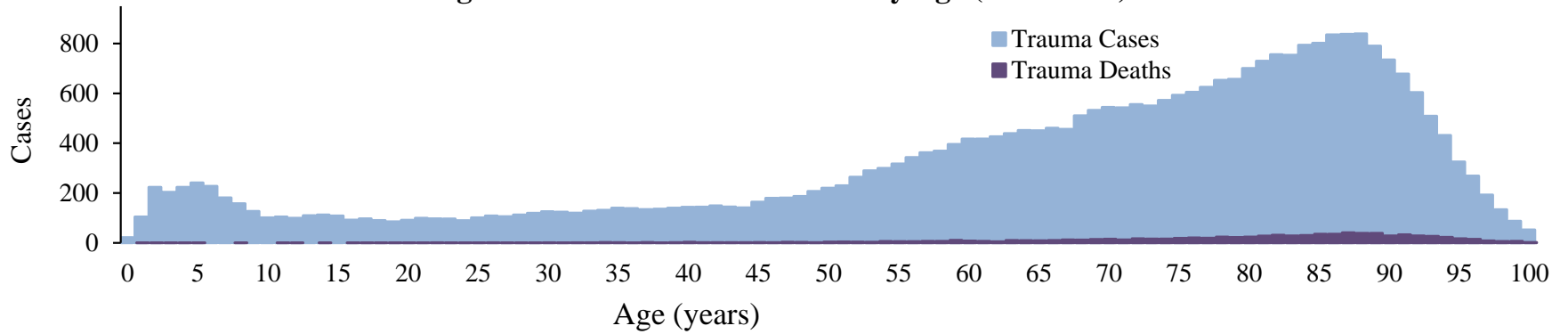
Injury Statistics

Average Annual Trauma Cases by Category, Intention and Place (2016-2020)

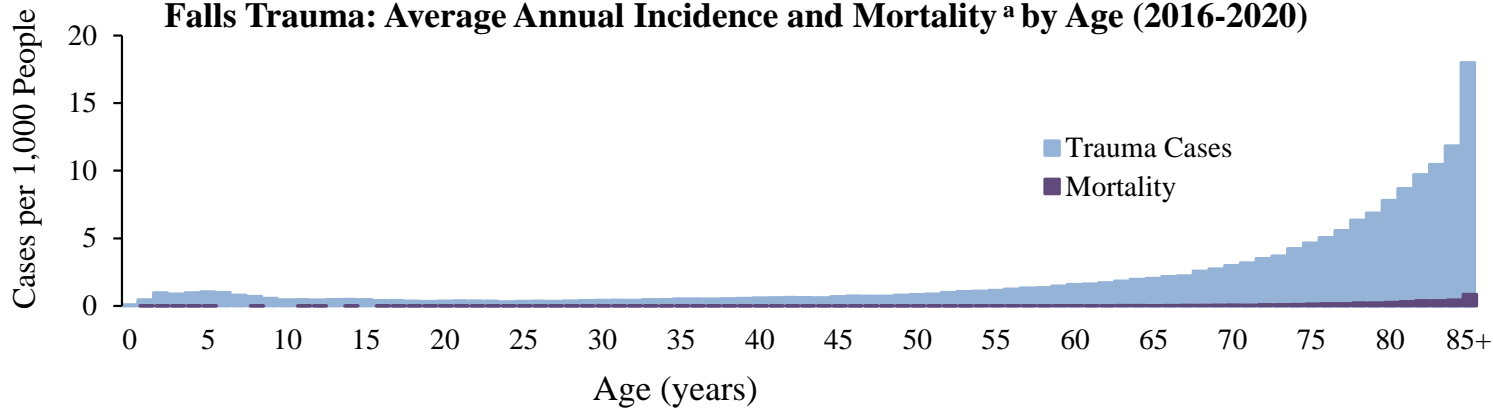
	Category	Annual Cases		Annual Deaths		Fatality Rate
		N	pct*	N	pct*	pct^
Intention	Unintentional	48,370	86.44	1,251	86.58	2.59
	Assault	5,334	9.53	112	7.75	2.10
	Self-Inflicted	573	1.02	42	2.88	7.26
	Other/unknown	1,679	3.00	40	2.78	2.39
Category	Falls	32,202	57.55	936	64.77	2.91
	Motor vehicle traffic	8,998	16.08	235	16.27	2.61
	Cut/pierce/struck	6,144	10.98	51	3.54	0.83
	Firearm	1,349	2.41	94	6.51	6.97
	Pedestrian, non traffic	1,129	2.02	25	1.72	2.20
	Pedal cyclist, non traffic	963	1.72	6	0.43	0.64
	Fire, burn	393	0.70	8	0.57	2.09
	Other/unknown	4,779	8.54	89	6.19	1.87
Place	Home	21,315	38.09	690	47.80	3.24
	Street and highway	15,280	27.31	378	26.16	2.47
	Residential Institution	2,933	5.24	127	8.79	4.33
	Public Building	2,647	4.73	52	3.57	1.95
	Recreation and sport	2,206	3.94	14	0.96	0.63
	Industrial	671	1.20	7	0.51	1.10
	Farm	178	0.32	3	0.18	1.46
	Other specified	3,262	5.83	59	4.10	1.81
	Other unspecified/unknown	7,464	13.34	115	7.93	1.54
Total		55,956	100.0	1,444	100.0	2.58

* Cases x 100/Total; ^ Deaths x 100 Cases.

Falls Trauma: Average Annual Cases and Fatalities by Age (2016-2020)

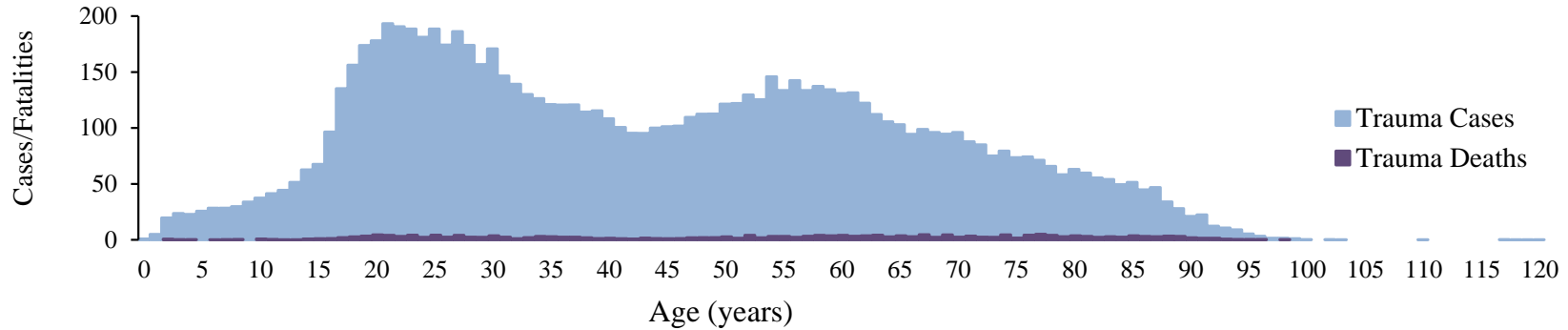


Falls Trauma: Average Annual Incidence and Mortality^a by Age (2016-2020)

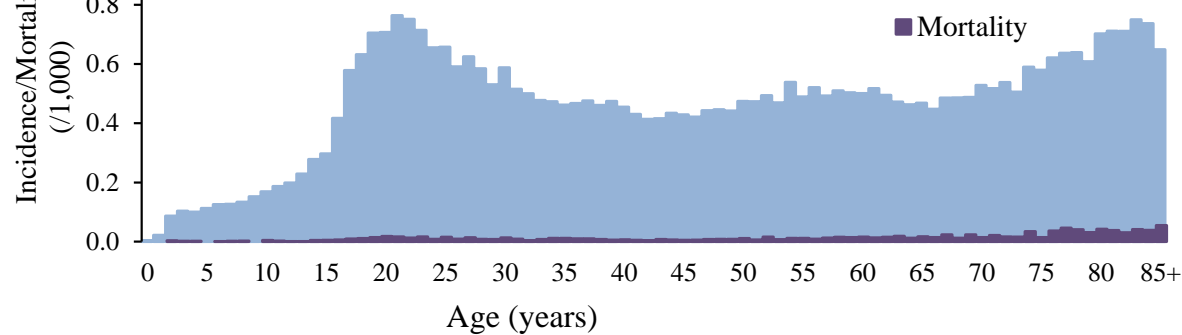


^a Incidence/1000 = Cases × 1,000 / Population; Mortality/1000 = Deaths × 1,000 / Population.

Motor Vehicle Traffic Trauma: Average Annual Cases and Fatalities by Age (2016-2020)

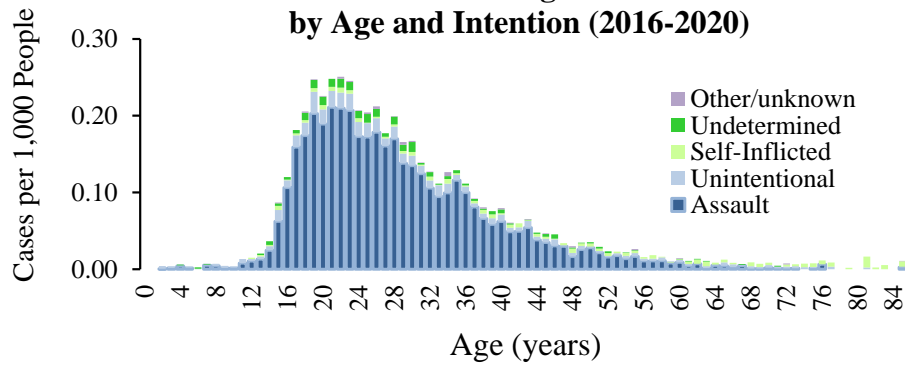


Motor Vehicle Traffic Trauma: Average Annual Incidence and Mortality^a by Age (2016-2020)

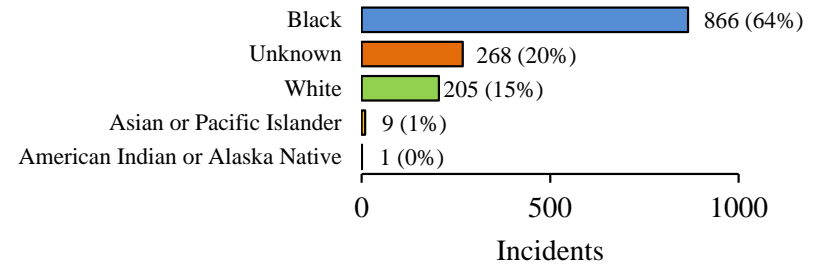


^a Incidence/1000 = Cases × 1,000 / Population; Mortality/1000 = Deaths × 1,000 / Population.

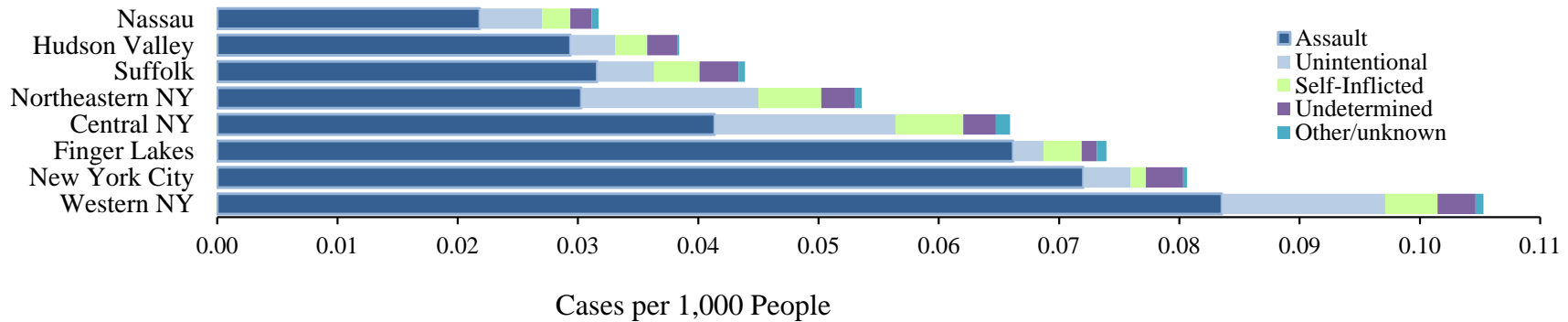
Firearm Trauma: Average Annual Incidence^a by Age and Intention (2016-2020)



Average Annual Firearm Trauma Incidents by Race

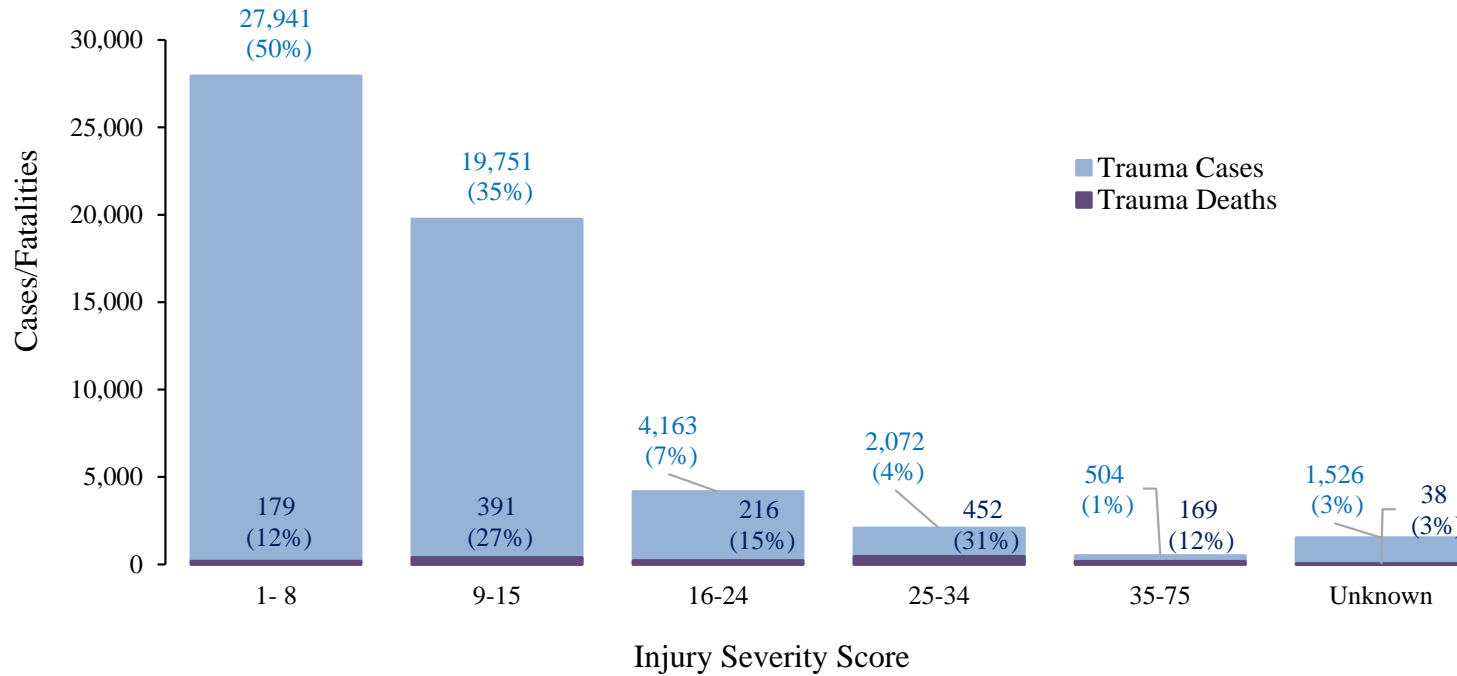


Firearm Trauma: Average Annual Incidence^a by Region and Intention (2016-2020)

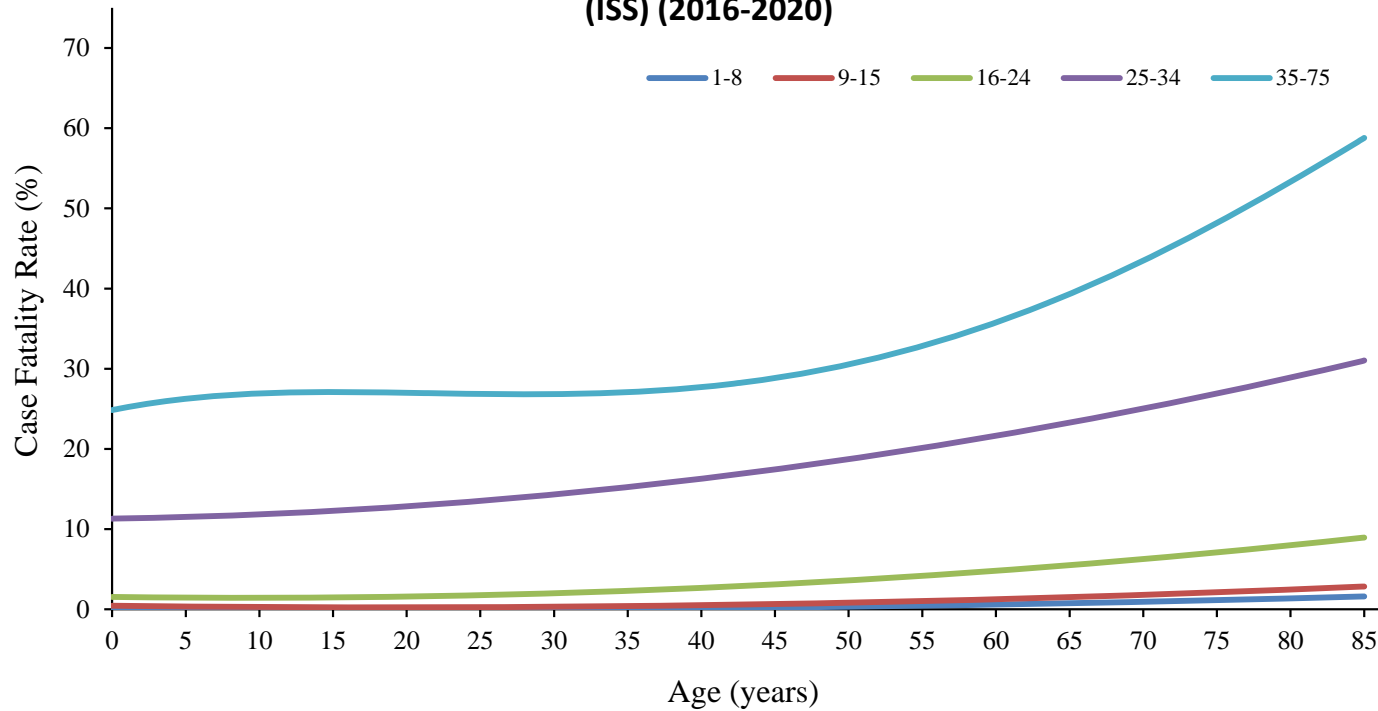


^a Incidence/1000 = Cases × 1,000 / Population

Average Annual Trauma Cases and Fatalities by Injury Severity Score (ISS) (2016-2020)

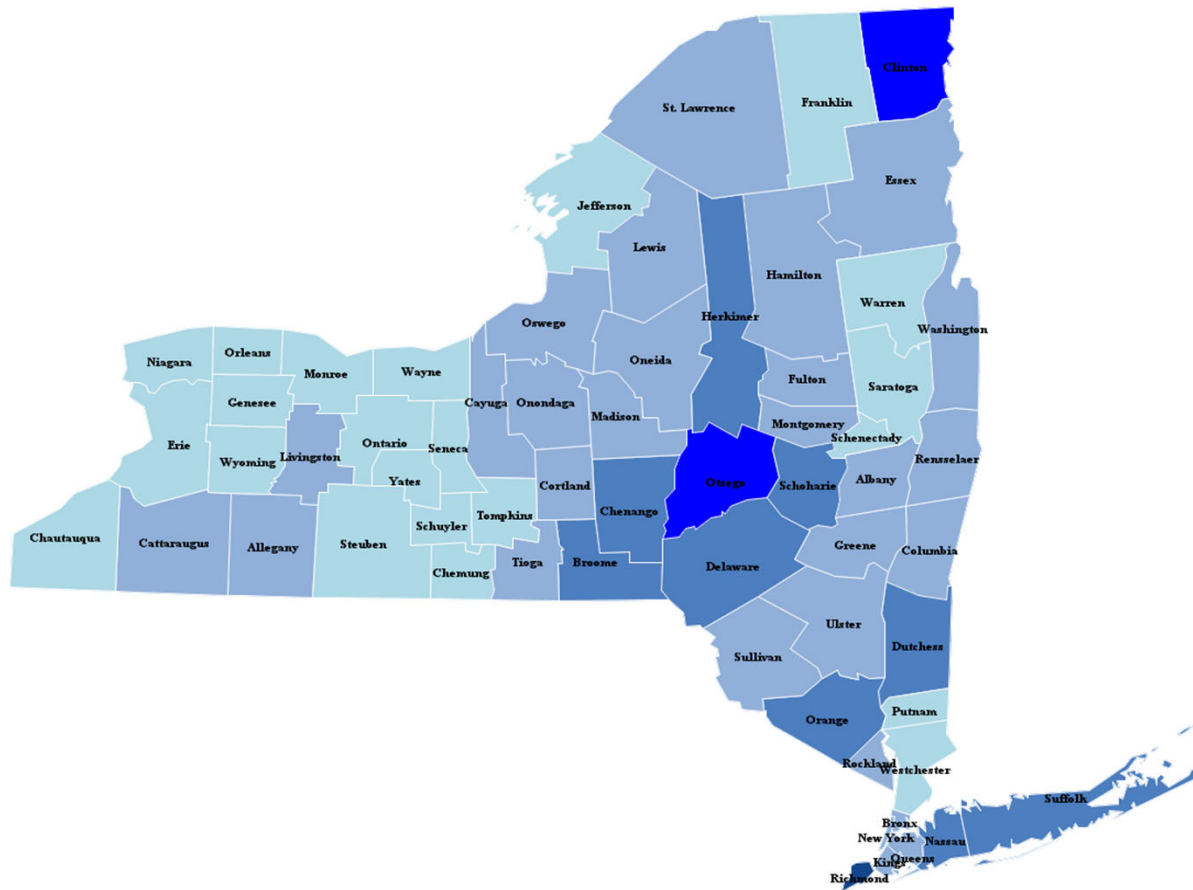


Average Annual Trauma Case Fatality Rate by Age and Injury Severity Score (ISS) (2016-2020)

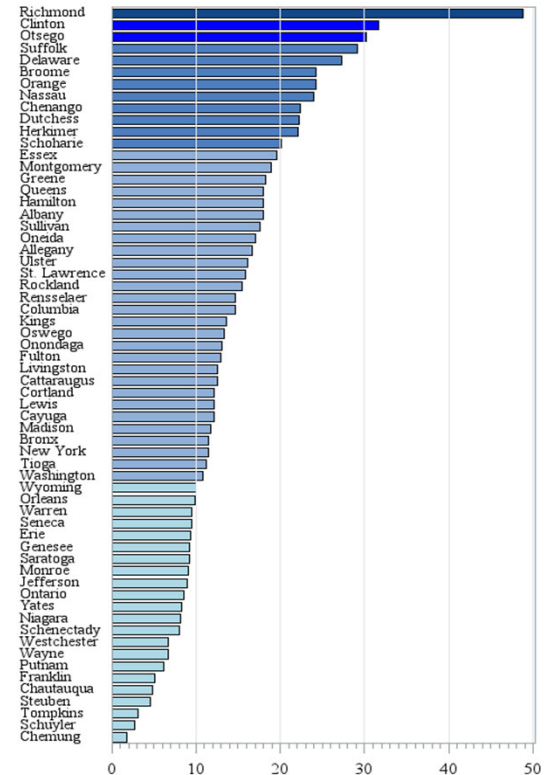


Incidence by Trauma Mechanism and County

Falls Trauma: Average Annual Incidence by County (2016-2020)



Average_Annual_Incidence low- 10 10 - 20 20 - 30 30 - 40 40 -high

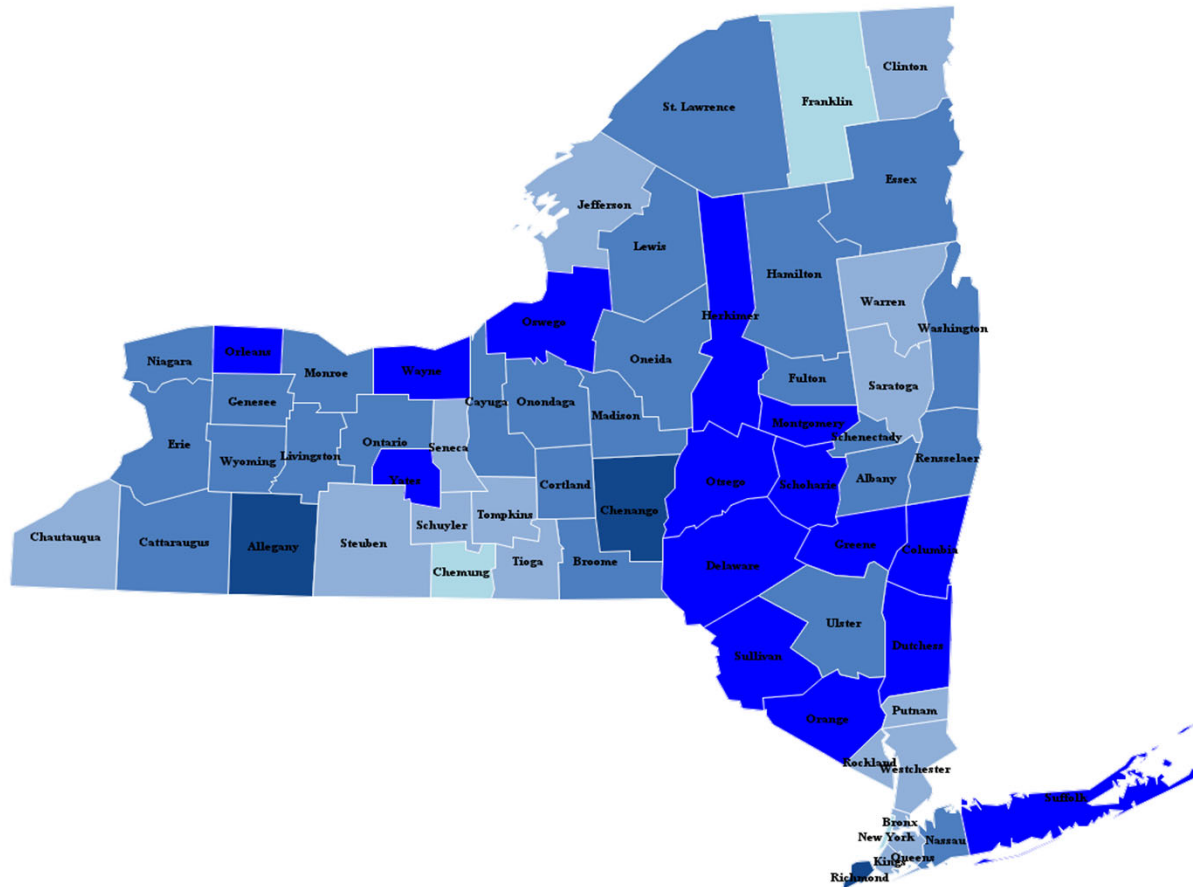


Cases per 10,000 people

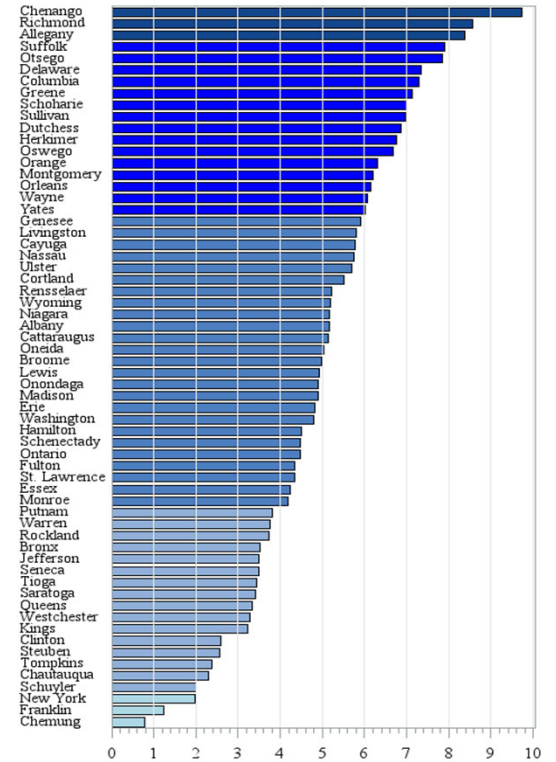
color 1 2 3 4 5



Motor Vehicle Trauma: Average Annual Incidence by County (2016-2020)



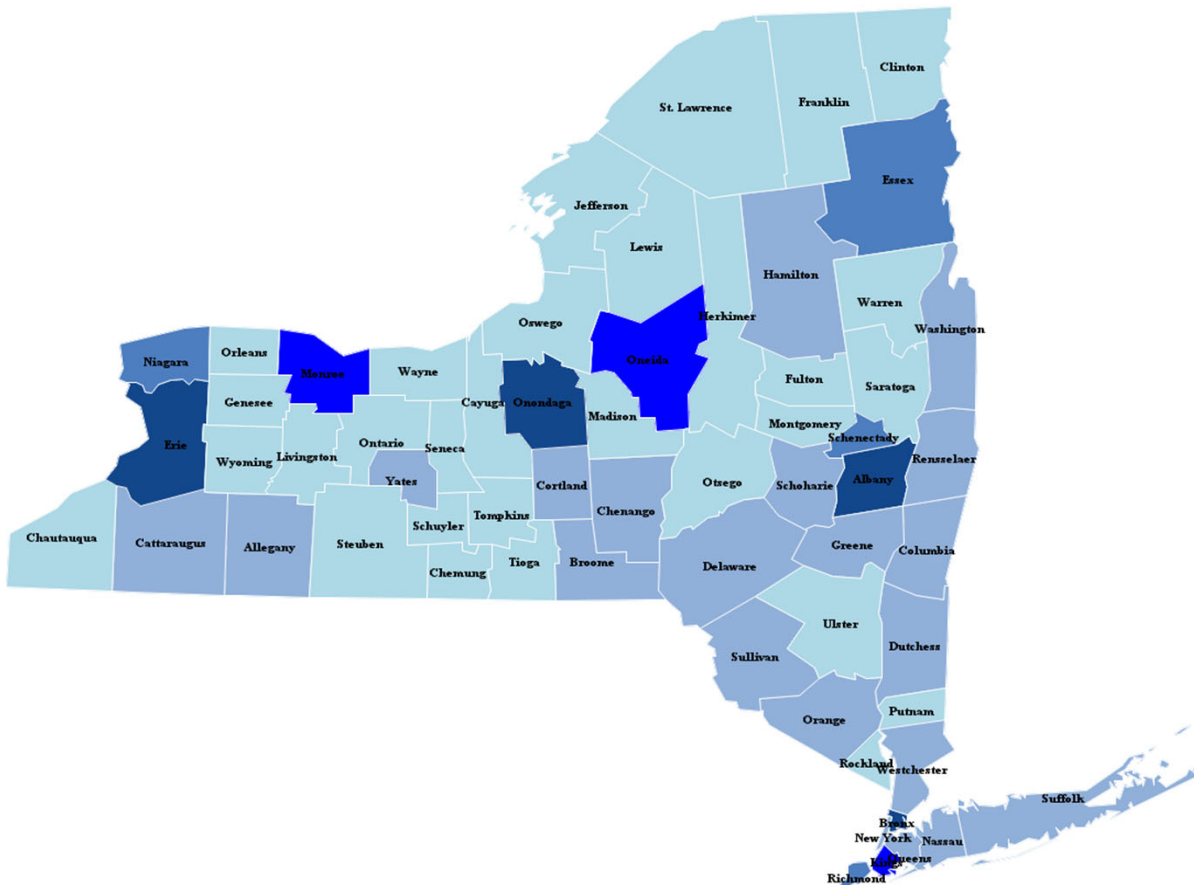
Average_Annual_Incidence low- 2 2 - 4 4 - 6 6 - 8 8 - high



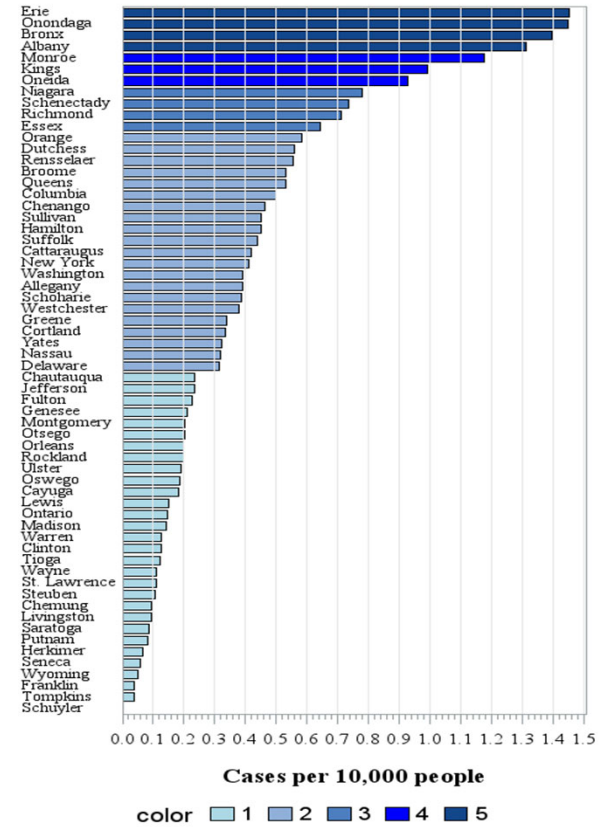
Cases per 10,000 people
color 1 2 3 4 5



Firearm Trauma: Average Annual Incidence by County (2016-2020)



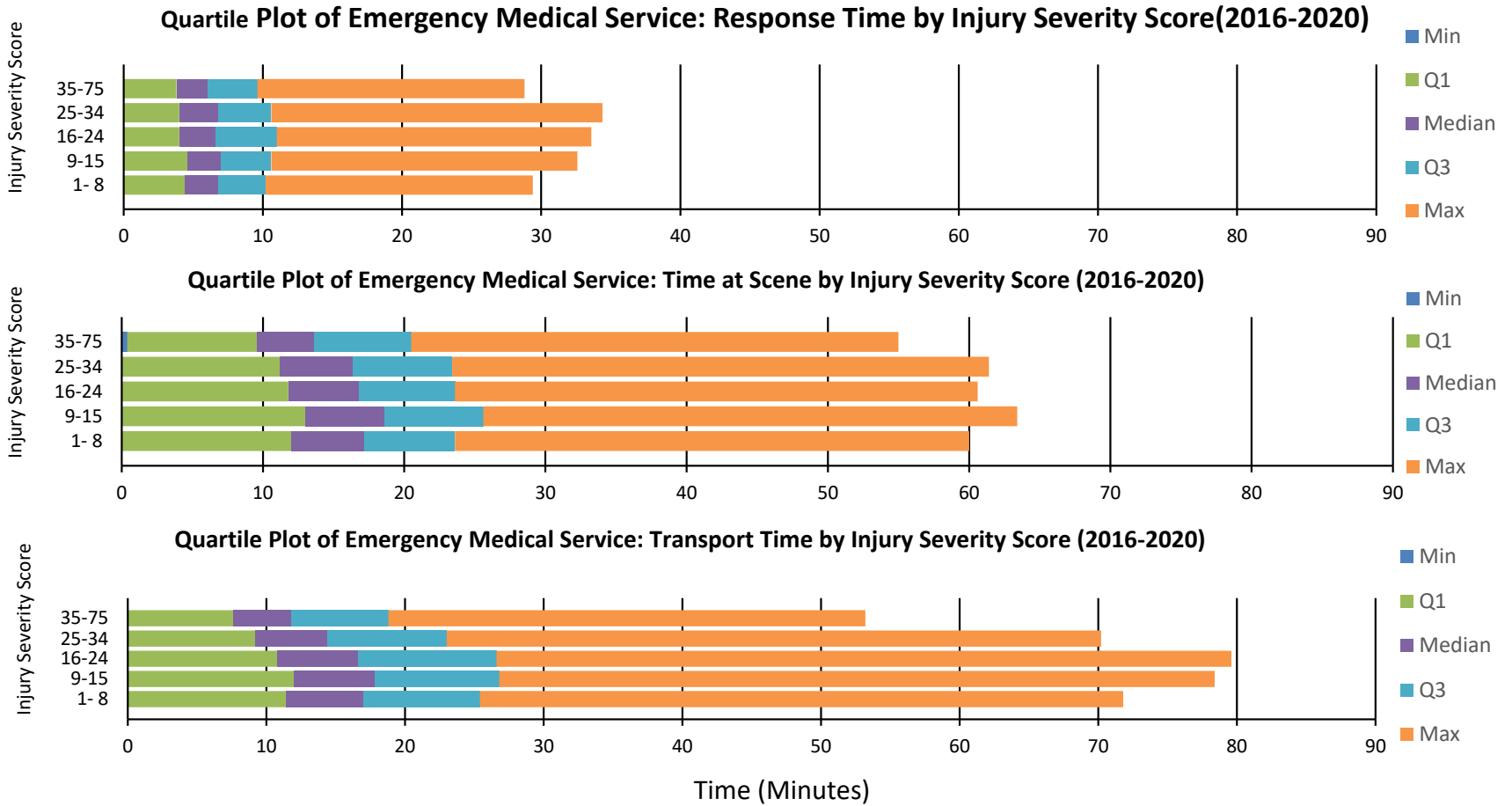
Average_Annual_Incidence low- 0.3 0.3- 0.6 0.6- 0.9 0.9- 1.2 1.2-high



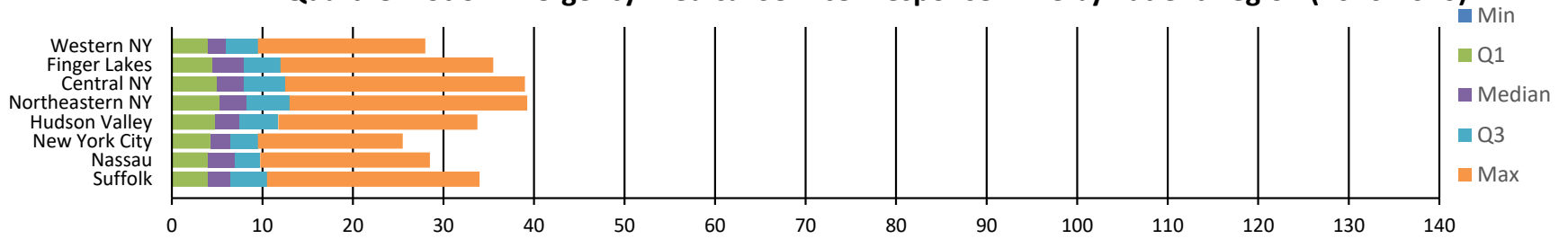
Emergency Medical Services

Average Annual Summary of EMS Statistics (2016-2020)

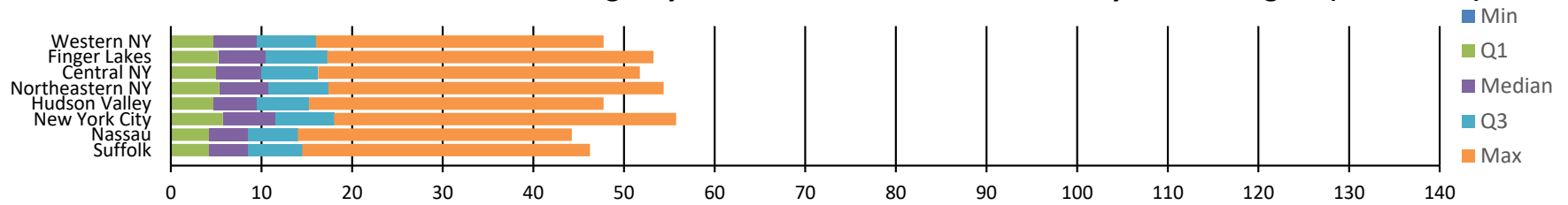
	Average Annual Trauma Cases	Incidents handled by EMS		Median Time (in minutes)		
		EMS Responses	Percent	Response At Scene	Transport	
ISS						
1-8	27,941	17,538	62.46	6.80	17.20	17.00
9-15	19,751	13,936	71.23	7.00	18.60	17.80
16-24	4,163	3,143	77.12	6.60	16.80	16.60
25-34	2,072	1,595	78.52	6.80	16.40	14.40
35-75	504	445	89.77	6.00	13.60	11.80
Unknown	1,526	1,150	66.93	6.80	16.80	17.20
Incident Region						
New York City	22,823	15,502	67.92	5.20	15.40	12.00
Suffolk	6,903	4,996	72.37	5.20	12.20	13.20
Hudson Valley	5,676	3,231	56.92	6.00	12.60	15.80
Nassau	4,939	3,581	72.50	5.60	12.60	12.60
Central NY	4,570	3,364	73.62	6.40	14.20	18.40
Northeastern NY	4,131	2,895	70.08	6.60	14.10	23.60
Western NY	3,070	2,277	74.17	4.80	12.60	15.40
Finger Lakes	2,193	1,714	78.14	6.40	14.00	18.10
Unknown	1,651	1,074	65.06	6.20	14.00	15.40
Total	55,956	38,635	69.04	6.80	17.60	17.20



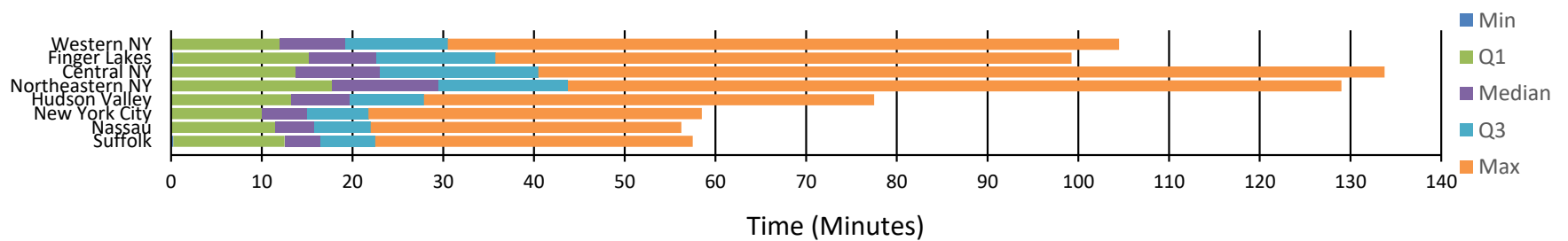
Quartile Plot of Emergency Medical Service: Response Time by Patient Region (2016-2020)



Quartile Plot of Emergency Medical Service: Time at Scene by Patient Region (2016-2020)



Quartile Plot of Emergency Medical Service: Transport Time by Patient Region (2016-2020)



Time (Minutes)

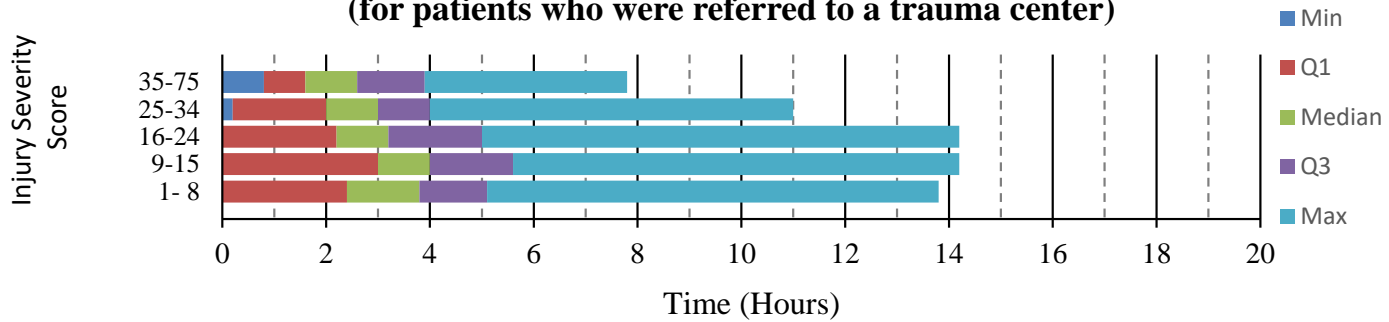
Referring Hospitals

Summary of Referring Hospitals Statistics (2016-2020)

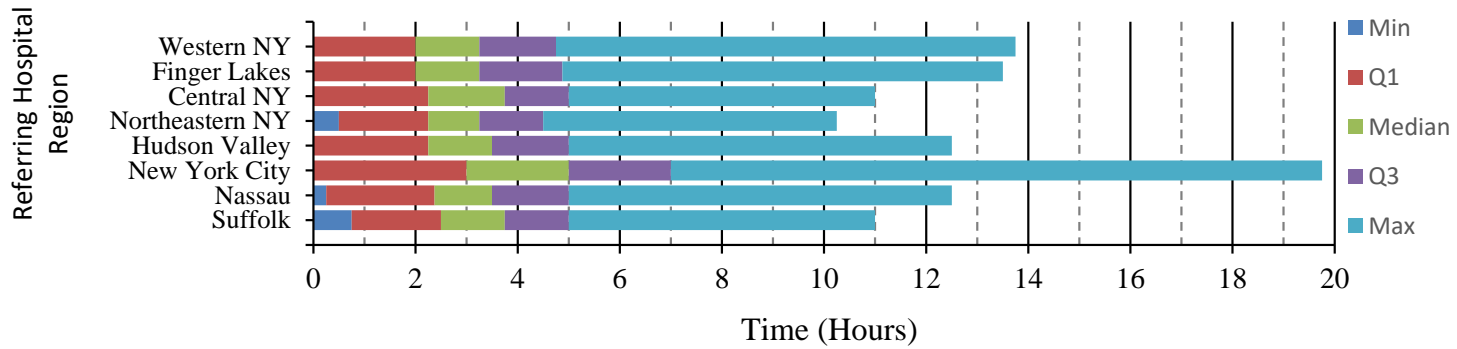
	Average Annual Trauma Cases ^a	Patients Referred from Initial Destination	Percent of Patients Referred	Median Time at Referring Hospital (hours)
ISS				
1-8	27,941	5,336	19.10	3.80
9-15	19,751	4,329	21.92	4.00
16-24	4,163	1,047	25.15	3.20
25-34	2,072	532	25.67	3.00
35-75	504	94	18.62	2.60
Incident Region				
New York City	22,823	2,124	9.31	4.80
Suffolk	6,903	1,046	15.16	3.80
Hudson Valley	5,676	819	14.43	3.40
Nassau	4,939	375	7.59	3.40
Central NY	4,570	1,289	28.20	3.60
Northeastern NY	4,131	1,636	39.61	3.20
Western NY	3,070	931	30.31	3.20
Finger Lakes	2,193	420	19.14	3.20
Total	55,956	11,628	20.78	4.00

^a Unknown counts are omitted from the subcategories but contained in the total.

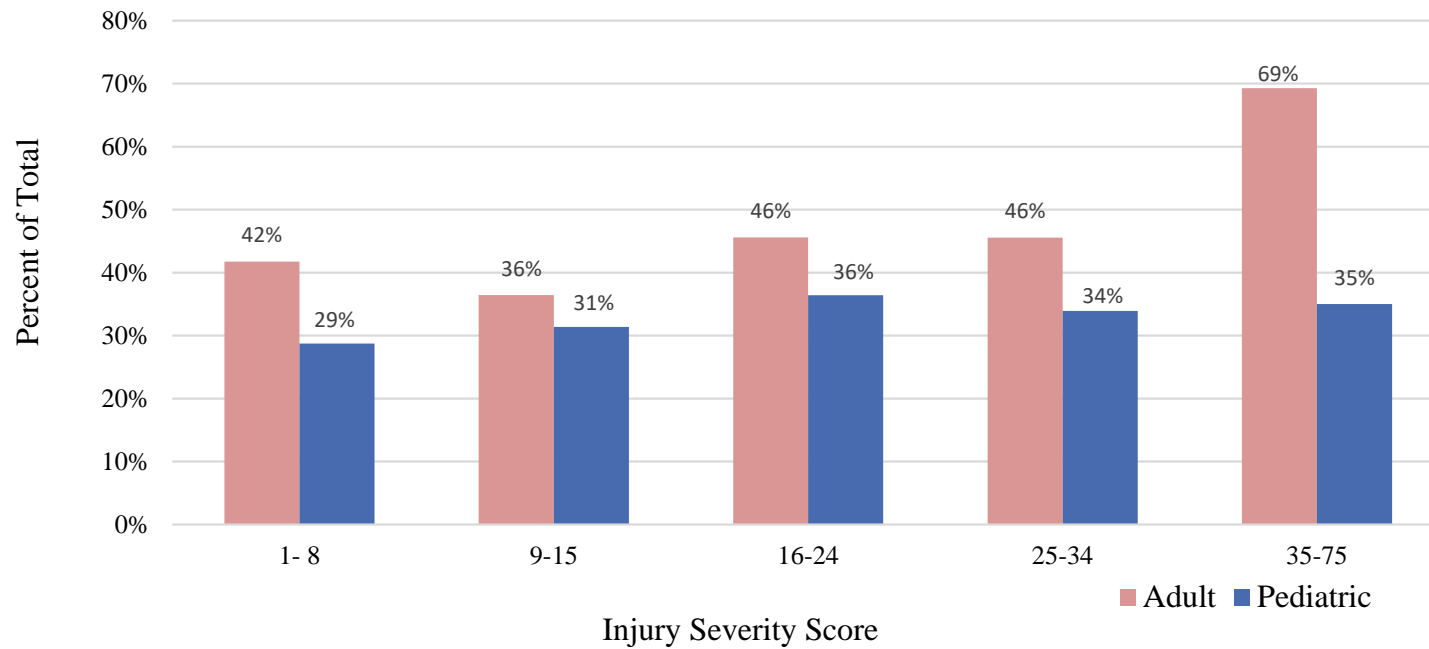
Time at Referring Hospital by Injury Severity Score (2016-2020)
 (for patients who were referred to a trauma center)



Time at Referring Hospital by Referring Hospital Region (2016-2020)
 (for patients who were referred to a trauma center)



Transport to Appropriate Trauma Center by Injury Severity Score and Age (Adult/Pediatrics) (2016-2020)



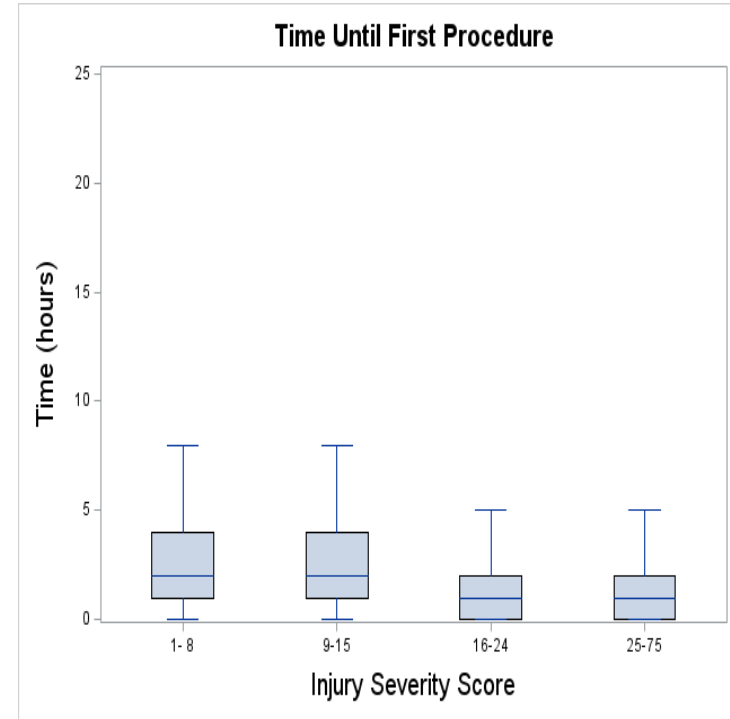
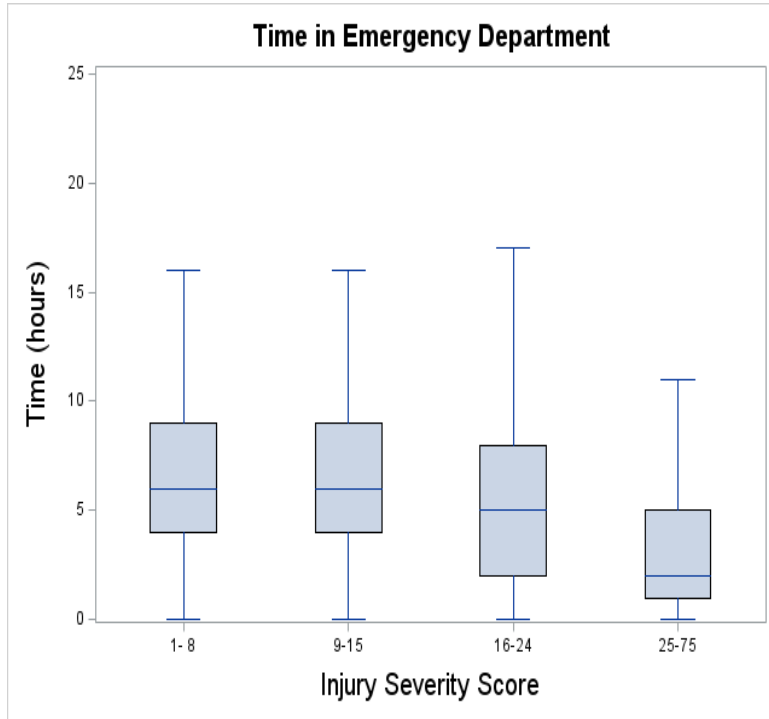
Final Hospital Statistics

Summary of Final Hospitals Statistics (2016-2020)

	Average Annual Trauma Cases ^a	Admitted to Intensive Care Unit				Requiring a Ventilator			
		Cases		Deaths		Cases		Deaths	
		N	%	N	Fatality Rate (%)	N	%	N	Fatality Rate (%)
Age									
0-14	4,291	854	19.90	16	1.87	419	9.76	18	4.30
15-29	8,456	2,257	26.69	96	4.25	1,423	16.83	115	8.08
30-44	7,374	1,911	25.92	82	4.29	1,282	17.39	97	7.57
45-59	8,607	2,333	27.11	131	5.62	1,389	16.14	134	9.65
60-74	10,358	2,619	25.28	226	8.63	1,629	15.73	220	13.51
75+	16,856	4,018	23.84	530	13.19	2,278	13.51	441	19.36
ISS									
1-8	27,941	3,937	14.09	109	2.77	2,864	10.25	93	3.25
9-15	19,751	5,022	25.43	261	5.20	2,649	13.41	209	7.89
16-24	4,163	2,581	62.00	176	6.82	1,185	28.47	161	13.59
25-34	2,072	1,631	78.72	373	22.87	1,129	54.49	386	34.19
35-75	504	381	75.60	134	35.17	371	73.61	149	40.16
Unknown	1,526	340	22.28	29	8.53	223	14.61	27	12.11
Total	55,956	13,893	24.83	1,082	7.79	8,421	15.05	1,025	12.17

^a Null value counts are omitted from the subcategories but contained in the total.

Emergency Department Timing, by Injury Severity Score (ISS) (2016-2020)

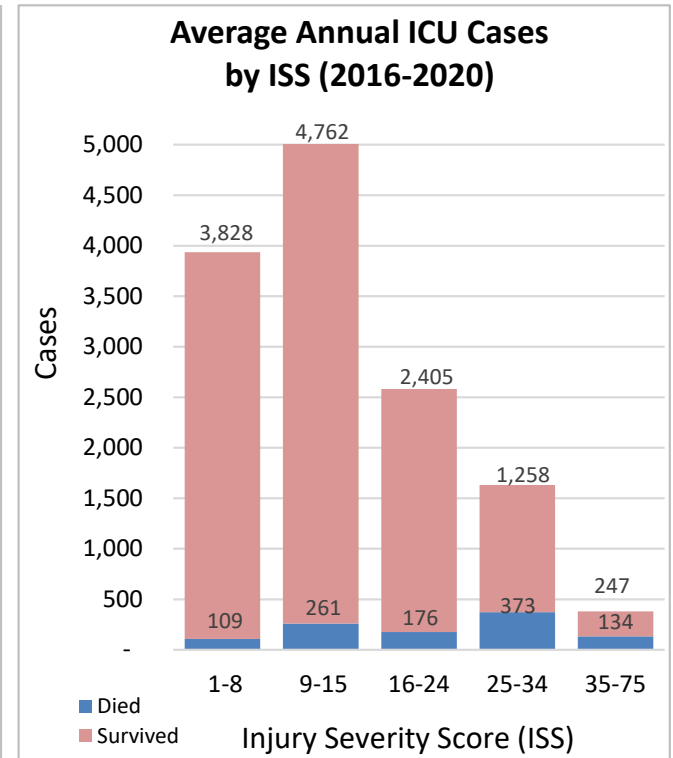
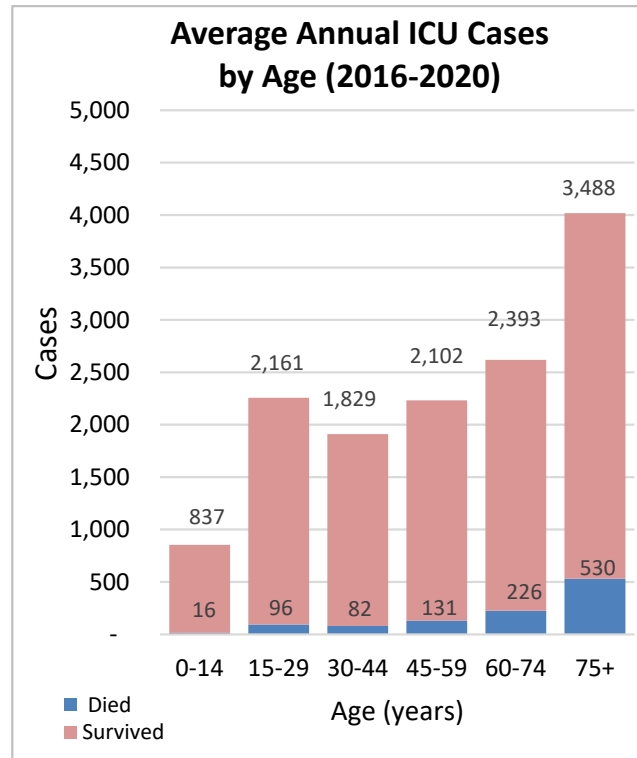
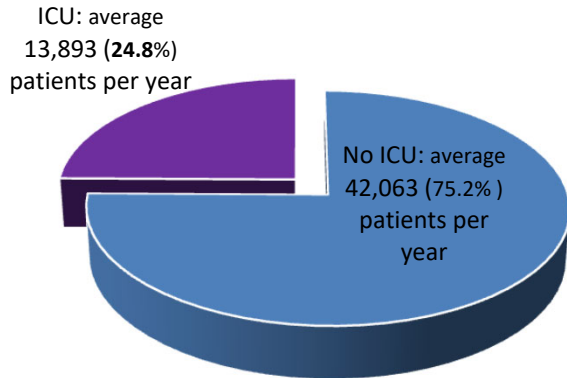


The blue line inside of each box plot is the median.

Note: Outliers (negative time and time > 24 days) were excluded from these statistics.

Average Annual Trauma Cases in Intensive Care Unit (ICU) (2016-2020)

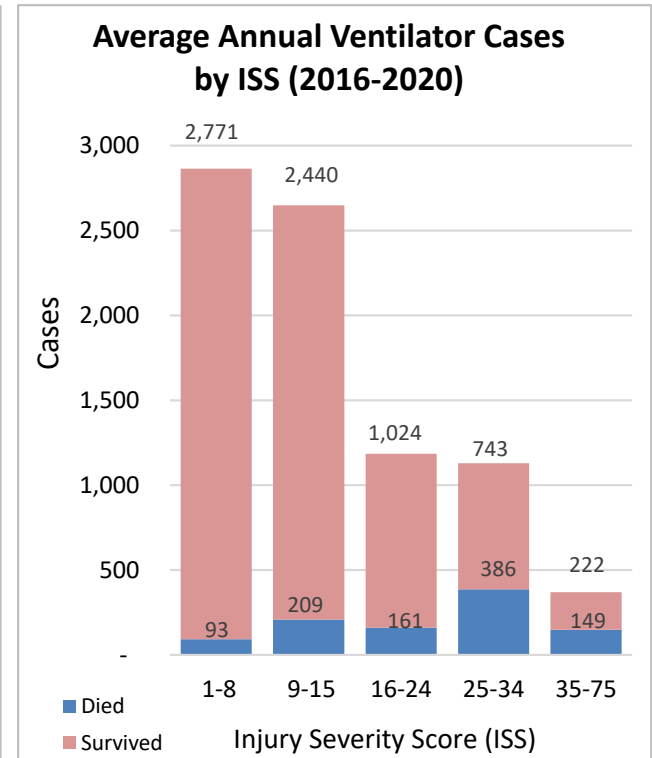
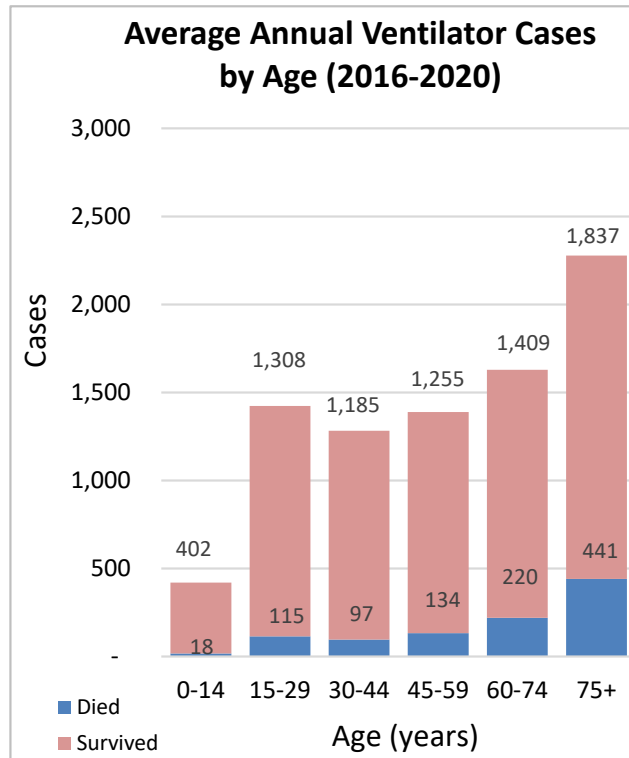
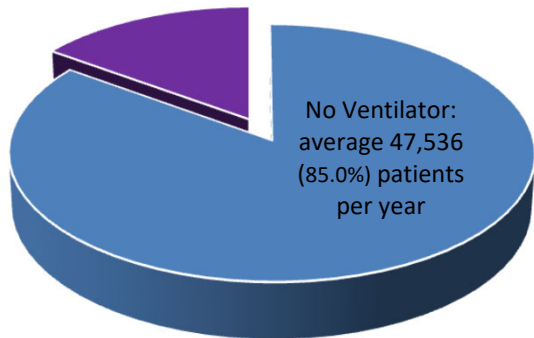
Trauma Patients admitted to the Intensive Care Unit (ICU) (2016-2020)



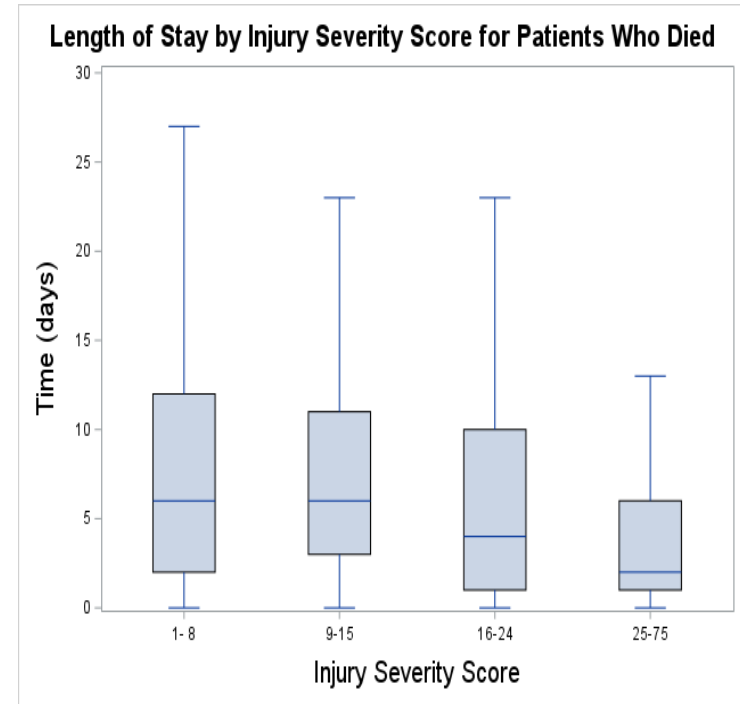
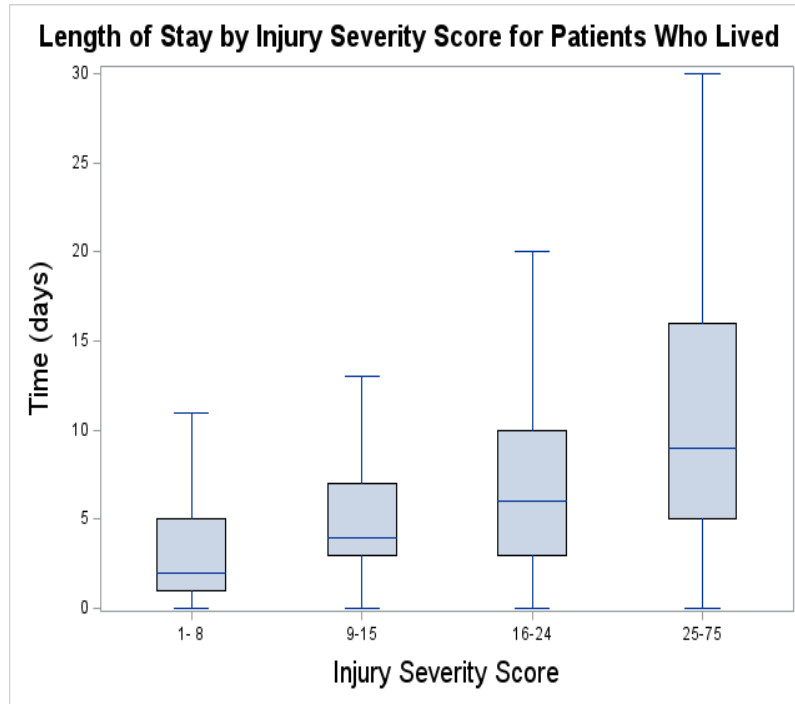
Average Annual Trauma Cases Utilized Ventilator (2016-2020)

Trauma Patients Requiring a Ventilator (2016-2020)

Ventilator: average 8,421 (15.0%) patients per year



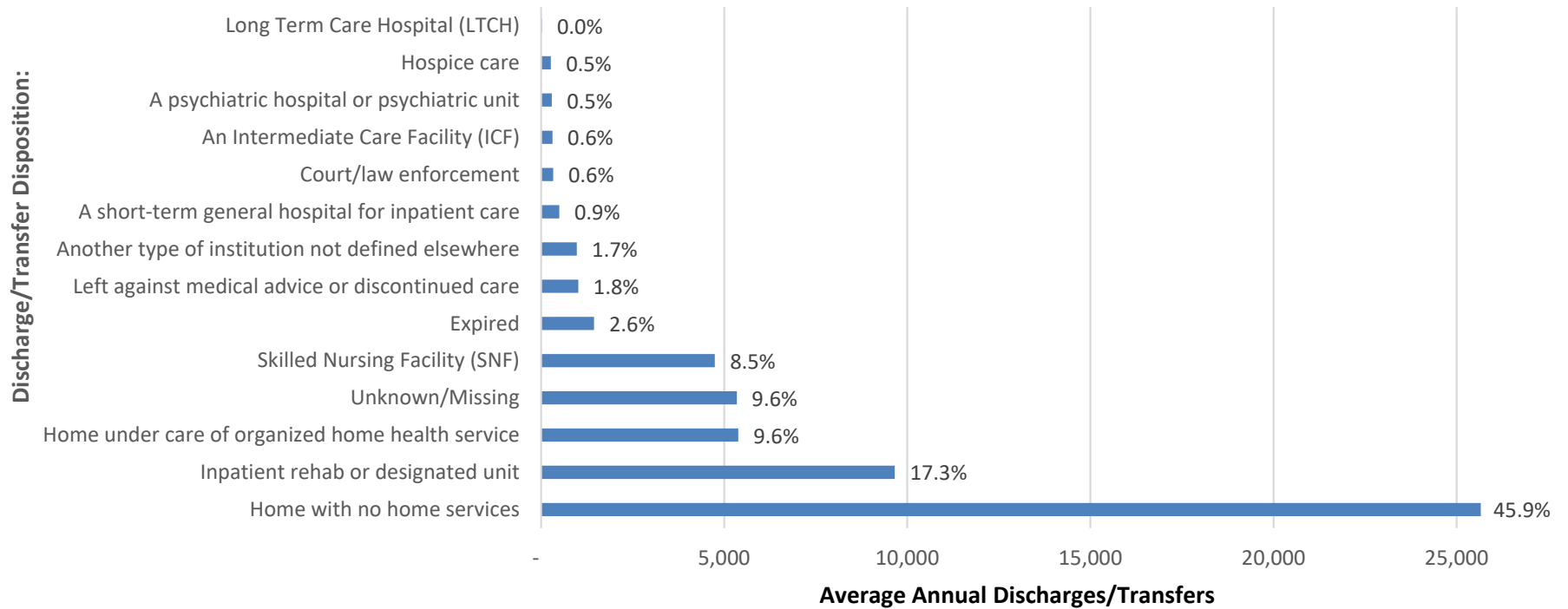
Length of Stay for Patients Who Lived or Died, by Injury Severity Score (ISS) (2016-2020)



The blue line inside of each box plot is the median.

Note: Outliers (negative time and time > 30 days) were excluded from these statistics.

Average Annual Discharges/Transfers by Disposition (2016-2020)



Risk-Adjusted Comparisons

Risk-Adjusted Mortality Ratios^a (2016-2020)

	Facilities	Total Trauma Cases ^b	Total Trauma Deaths	Observed Fatality Rate (%)	Expected Fatality Rate (%)	Mortality Ratio	Confidence Interval
Designation							
Adult Trauma Center	32	158,667	4,163	2.62	2.63	1.00	(.97 - 1.03)
Dual Designation	11	114,310	3,027	2.65	2.57	1.03	(.99 - 1.07)
Pediatric Trauma Center	3	6,348	32	0.50	0.99	0.51	(.33 - .69)
Facility Type							
Level I	24	196,729	5,230	2.66	2.60	1.02	(.99 - 1.05)
Level II	12	56,337	1,473	2.61	2.70	0.97	(.92 - 1.02)
Level III	10	26,259	519	1.98	2.06	0.96	(.88 - 1.04)
Region							
Central NY	4	23,520	690	2.93	2.29	1.28	(1.19 - 1.38)
Hudson Valley	6	28,504	748	2.62	2.91	0.90	(.84 - .96)
Nassau	4	29,857	842	2.82	2.92	0.96	(.90 - 1.03)
New York City	19	113,888	2,787	2.45	2.30	1.06	(1.02 - 1.10)
Northeastern NY	3	22,648	515	2.27	2.80	0.81	(.74 - .88)
Suffolk	7	35,395	755	2.13	2.53	0.84	(.78 - .90)
Western NY/Finger Lakes	3	25,970	885	3.41	3.04	1.12	(1.05 - 1.19)
Total	46	279,782	7,222	2.58	2.57	1.01	(.98 - 1.03)

^a The Risk-adjustment Methodology is described in Appendix A.

^b Null value counts are omitted from the subcategories but contained in the total.

Risk-Adjusted Mortality Ratios ^a (2016-2020): Pediatrics (<=14 years)

	Facilities	Total Trauma Cases ^b	Total Trauma Deaths	Observed Fatality Rate (%)	Expected Fatality Rate (%)	Mortality Ratio	Confidence Interval
Designation							
Adult Trauma Center	32	4,061	11	0.27	0.45	0.60	(.25 - .96)
Dual Designation	11	1,227	62	5.05	6.35	0.80	(.60 - .99)
Pediatric Trauma Center	3	5,087	26	0.51	1.03	0.49	(.30 - .68)
Facility Type							
Level I	24	19,064	95	0.50	0.74	0.68	(.54 - .81)
Level II/III	22	2,361	4	0.17	0.36	0.47	(.01 - .92)
Region							
Central NY	4	2,377	14	0.59	0.69	0.85	(.41 - 1.30)
Hudson Valley	6	2,401	17	0.71	0.69	1.03	(.54 - 1.52)
Nassau/Suffolk	11	2,444	8	0.33	0.55	0.59	(.18 - 1.00)
New York City	19	9,818	34	0.35	0.56	0.62	(.41 - .82)
Northeastern NY	3	1,759	4	0.23	0.53	0.43	(.01 - .85)
Western NY/ Finger Lakes	3	2,656	22	0.83	1.43	0.58	(.34 - .82)
Total	46	21,455	99	0.46	0.69	0.67	(.53 - .80)

^a The Risk-adjustment Methodology is described in Appendix A.

^b Null value counts are omitted from the subcategories but contained in the total.

Risk-Adjusted Mortality Ratios^a (2016-2020): High Severity Injury (ISS≥25)

	Facilities	Total Trauma Cases ^b	Total Trauma Deaths	Observed Fatality Rate (%)	Expected Fatality Rate (%)	Mortality Ratio	Confidence Interval
Designation							
Adult Trauma Center	32	5,080	1,412	27.80	26.43	1.05	(1.00 - 1.11)
Dual Designation	11	4,371	967	22.12	23.57	0.94	(.88 - 1.00)
Pediatric Trauma Center	3	144	22	15.28	19.52	0.78	(.46 - 1.11)
Facility Type							
Level I	24	7,403	1,862	25.15	24.94	1.01	(.96 - 1.05)
Level II	12	1,801	451	25.04	25.36	0.99	(.90 - 1.08)
Level III	10	391	88	22.51	24.99	0.90	(.71 - 1.09)
Region							
Central NY	4	900	208	23.11	20.57	1.12	(.97 - 1.28)
Hudson Valley	6	1,026	243	23.68	24.03	0.99	(.86 - 1.11)
Nassau	4	899	271	30.14	29.51	1.02	(.90 - 1.14)
New York City	19	3,647	965	26.46	24.69	1.07	(1.00 - 1.14)
Northeastern NY	3	852	137	16.08	22.32	0.72	(.60 - .84)
Suffolk	7	1,129	242	21.43	25.75	0.83	(.73 - .94)
Western NY/Finger Lakes	3	1,142	335	29.33	28.26	1.04	(.93 - 1.15)
Total	46	9,595	2,401	25.02	25.02	1.00	(.96 - 1.04)

^a The Risk-adjustment Methodology is described in Appendix A.

Risk-Adjusted Mortality Ratios ^a (2016-2020): Firearm Injury

	Facilities	Total Trauma Cases ^b	Total Trauma Deaths	Observed Fatality Rate (%)	Expected Fatality Rate (%)	Mortality Ratio	Confidence Interval
Designation							
Adult Trauma Center	32	4,235	299	7.06	7.15	0.99	(.88 - 1.10)
Pediatric/Dual Designation	14	2,395	162	6.76	6.61	1.02	(.87 - 1.18)
Facility Type							
Level I	24	4,998	351	7.02	7.10	0.99	(.89 - 1.09)
Level II	12	1,381	99	7.17	6.87	1.04	(.84 - 1.25)
Level III	10	251	11	4.38	4.40	1.00	(.41 - 1.58)
Region							
Central NY	4	577	49	8.49	6.07	1.40	(1.01 - 1.79)
Hudson Valley	6	329	22	6.69	8.13	0.82	(.48 - 1.17)
Nassau	4	242	17	7.02	6.34	1.11	(.58 - 1.63)
New York City	19	3,531	220	6.23	6.18	1.01	(.87 - 1.14)
Northeastern NY	3	397	24	6.05	6.37	0.95	(.57 - 1.33)
Suffolk	7	303	22	7.26	8.43	0.86	(.50 - 1.22)
Western NY/ Finger Lakes	3	1,268	107	8.44	9.05	0.93	(.76 - 1.11)
Total	46	6,647	461	6.94	6.94	1.00	(.91 - 1.09)

^a The Risk-adjustment Methodology is described in Appendix A.

^b Null value counts are omitted from the subcategories but contained in the total.

Risk-Adjusted Mortality Ratios^a (2016-2020): Motor Vehicle Accidents

	Facilities	Total Trauma Cases ^b	Total Trauma Deaths	Observed Fatality Rate (%)	Expected Fatality Rate (%)	Mortality Ratio	Confidence Interval
Designation							
Adult Trauma Center	32	20,485	337	1.65	1.83	0.90	(.80 - .99)
Pediatric/Dual Designation	14	19,604	471	2.40	2.19	1.10	(1.00 - 1.20)
Facility Type							
Level I	24	28,796	664	2.31	2.13	1.08	(1.00 - 1.16)
Level II	12	7,498	114	1.52	1.93	0.79	(.64 - .93)
Level III	10	3,795	30	0.79	1.22	0.65	(.42 - .88)
Region							
Central NY	4	5,125	123	2.40	1.94	1.24	(1.02 - 1.45)
Hudson Valley	6	5,857	119	2.03	2.32	0.88	(.72 - 1.03)
Nassau	4	3,870	59	1.52	1.59	0.96	(.72 - 1.21)
New York City	19	8,668	131	1.51	1.46	1.04	(.86 - 1.22)
Northeastern NY	3	4,809	81	1.68	2.06	0.82	(.64 - .99)
Suffolk	7	5,431	98	1.80	2.06	0.88	(.70 - 1.05)
Western NY/Finger Lakes	3	6,345	197	3.10	2.69	1.15	(.99 - 1.31)
Total	46	40,105	808	2.01	2.01	1.00	(.93 - 1.07)

^a The Risk-adjustment Methodology is described in Appendix A.

^b Null value counts are omitted from the subcategories but contained in the total.

Risk-Adjusted Mortality Ratios^a (2016-2020): Head Injury

	Facilities	Total Trauma Cases	Total Trauma Deaths	Observed Fatality Rate (%)	Expected Fatality Rate (%)	Mortality Ratio	Confidence Interval
Designation							
Adult Trauma Center	32	19,452	1,910	9.82	9.54	1.03	(.98 - 1.08)
Dual Designation	11	15,398	1,401	9.10	9.34	0.97	(.92 - 1.03)
Pediatric Trauma Center	3	865	18	2.08	4.11	0.51	(.27 - .74)
Facility Type							
Level I	24	26,667	2,538	9.52	9.41	1.01	(.97 - 1.05)
Level II	12	7,342	649	8.84	9.27	0.95	(.88 - 1.03)
Level III	10	1,706	142	8.32	8.18	1.02	(.85 - 1.19)
Region							
Central NY	4	3,279	340	10.37	7.94	1.31	(1.17 - 1.44)
Hudson Valley	6	3,425	320	9.34	9.82	0.95	(.85 - 1.06)
Nassau	4	3,867	416	10.76	10.93	0.98	(.89 - 1.08)
New York City	19	14,047	1,258	8.96	8.72	1.03	(.97 - 1.08)
Northeastern NY	3	3,258	221	6.78	8.70	0.78	(.68 - .88)
Suffolk	7	4,461	364	8.16	9.82	0.83	(.75 - .92)
Western NY/Finger Lakes	3	3,378	410	12.14	10.73	1.13	(1.02 - 1.24)
Total	46	35,715	3,329	9.32	9.32	1.00	(.97 - 1.03)

^a The Risk-adjustment Methodology is described in Appendix A.

Appendix

Appendix A: Risk-Adjustment Methodology

1. Introduction. The goal of the risk adjustment was to provide unbiased estimates of trauma fatality rates after controlling for contributing risk factors. The risk adjustment model was developed using the New York Trauma Registry data submitted by the trauma centers across the state.

2. Trauma data. Trauma records submitted by the New York State certified trauma centers for patients.

3. Selection of the risk factors. The contributing fatality risk factors included the following categories:

- Patient demographic variables: age, gender, and comorbidities;
- Patient condition upon arrival: Glasgow coma score, systolic blood pressure, and prehospital conditions;
- Required pre-hospital and emergency room treatments: CPR, intubation, and ventilation;
- Severity of injury, Mechanism of injury, and post trauma complications.

4. Risk adjustment model. Logistic regression was used to model trauma patient fatality risk with trauma death as the dependent variable and the potential risks factors (listed in 3) as the independent variables. The final risk adjustment model variables are statistically significant with $\geq 95\%$ confidence (next page).

5. Calculation of the risk-adjusted mortality ratios and confidence intervals

- Observed fatality rate: calculated using the number of patient deaths observed in the group divided by the number of patients in the group.
- Expected fatality rate: calculated using the developed risk-adjusted model adjusting for the differences among groups.
- Risk-adjusted (standardized) mortality ratios: calculated using the observed fatality rate divided by the expected fatality rate. If the ratio is larger than one, the group has a higher observed fatality rate than expected based on its patient mix.
- Confidence interval: The 95% confidence intervals for the mortality ratios were calculated using the standard error of the observed fatality rate [1]. A confidence interval does not include one indicating statistical significance.

6. Reference:

[1] Hosmer D. and Lemeshow S. Confidence Interval Estimates of an Index of Quality Performance Based on Logistic Regression Models. *Statistics in Medicine*, Volume 14, 2161-2172 (1995).

Summary Statistics of the Risk-adjustment Model Variables

Independent variable	Estimate	Std. Error	z value	Pr (> z)
(Intercept)	-7.32	0.10	4928.31	<.0001
Demographics				
Age 30-65 years	0.33	0.05	42.45	<.0001
Age > 65 years	1.56	0.06	726.62	<.0001
Male	0.16	0.03	28.34	<.0001
Payor [Medicare]	0.26	0.04	33.53	<.0001
Patient condition on arrival				
Prehospital SBP < 90 mmHg	0.77	0.08	83.01	<.0001
Comorbidity				
Congestive heart failure within 30 days	0.42	0.06	43.94	<.0001
Advanced directive	1.46	0.06	572.43	<.0001
Cirrhosis or end stage liver disease	1.06	0.13	68.86	<.0001
Disseminated cancer	1.05	0.13	63.92	<.0001
Prior renal failure	0.58	0.08	52.86	<.0001
Required treatment				
CPR administered in field or ED	1.48	0.06	554.28	<.0001
Ventilator required	2.80	0.04	5370.68	<.0001
ICU stay (yes)	0.55	0.04	197.19	<.0001
Injury Severity				
Injury Severity Score >=25	1.29	0.04	1109.63	<.0001
Mechanism of injury				
Fall	0.47	0.07	40.60	<.0001
Firearm	1.40	0.09	233.87	<.0001
Pedestrian/cyclist	0.43	0.09	21.94	<.0001
Complications				
New myocardial infarction	1.01	0.18	30.34	<.0001
Severe sepsis	1.13	0.11	100.93	<.0001

Appendix B: Inclusion & Exclusion Criteria

A trauma patient is defined as a patient of any age who has sustained a traumatic injury who is either admitted to the hospital (including a 23-hour admission for observation) or expires in the emergency department with at least one injury diagnosis code of:

- **ICD-9 code** of 800-959.9. **Isolated injuries and burns are excluded:** 905-909.9 (late effects of injury), 910-924.9 (superficial injuries including blisters, contusions, abrasions, and insect bites), 930-939.9 (foreign bodies) and 940-949 (burns).
- **ICD-10 code** of: S00-S99 with 7th character modifiers of A,B, or C ONLY (injuries to specific body parts-initial encounter); T07, T14, T79.A1-T79.A9 with 7th character modifier of A ONLY (Traumatic Compartment Syndrome-initial encounter). **Superficial injuries are excluded:** S00, S10, S20, S30, S40, S50, S60, S70, S80 and S90. Late effect codes, which are represented using the same range of injury diagnosis codes but with the 7th digit modifier code of D through S, are also excluded. ICD-10 was required beginning 1/1/16.

The following **External Cause of Injury codes (E-codes)** are unlikely to generate an injury with ICD-9/ICD-10 codes on the NYSTR inclusion list. Should a case present with one of these E-codes the registrar should give the case careful review. It is possible that such a record would qualify for exclusion, and in such case the registrar should complete an exclusion form; or it is possible that a more accurate E-code could be assigned, and in such case the registrar should change the E-code prior to submission to the state registry.

- **ICD-9:** E837.3, E850-869.9, E870-879.9, E890-899, E900-904.9, E906.0, E906.3, E910-915, E923.0 .1 .2 .8 .9, E924.0 .1 .2 .8 .9, E925.1 .8 .9, E926.1, E929.0-.9, E930-949, E950.0-.7, E954, E958.1, E959, E968.3, E968.7, E969, E977, E980.0-.9, E981-982, E983.0-.9, E984, E989, and E999.0-.1
- **ICD-10:** V90, V92, W42, W46, W65-W69, W73-W74, X10-X19, X30-X32, X38, X52, X58, X71, X75, X77, Y21, Y25, Y27, Y35-Y38, Y62-Y69, Y70-Y84, and Y90-Y99

Records with a principal diagnosis of V57 are excluded (unless the records reflect trauma deaths in the Emergency Department).