# State Trauma Data, Trauma Patient Matching

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# CEMSIS Trauma Data

- Two sources of data
  - Prehospital Electronic Patient Care Reports (ePCR)
  - Trauma Hospital Patient Registry data (NTDB complaint)
- Trauma Reports
  - Quarterly/Annual Overall Trauma Patient Characteristics report
    - Summary of ePCR and Hospital Registry Data since 2024
  - Core Measures
    - 4 current & 5 ‘test’ measures. Two are for Trauma:
      - TRA-2: Transport of Trauma Patients to a Trauma Center
      - TRA-3: Documentation of GCS, SBP, and RR for Trauma Patients [test]
  - CEMSIS – Trauma Patient Data Matching
    - “Integrating Prehospital and Trauma Registry Data: A California EMS Data Linkage Initiative”

# CALIFORNIA EMERGENCY MEDICAL SERVICES AUTHORITY
# Statewide Trauma Data Report
# Quarter 4 - 2024

Updated 8/29/25

# CEMSIS Introduction

- The California EMS Information System (CEMSIS) database is a large convenience sample — it consists solely of data submitted by participating EMS agencies, and it is not a population-based data set. In addition, the CEMSIS database inherits the individual deficiencies originating from its contributing entities.

- EMSA is continually cleaning and standardizing the data to improve data quality. Despite these efforts, errors remain for several reasons.

- The CEMSIS database is subject to the limitations of any "convenience sample". As a "convenience sample", the CEMSIS database is subject to various forms of bias. The most obvious problems are selection bias, the inconsistency with which clinical variables can be measured or documented, and inter-agency differences in treatment and transport practices.

- CEMSIS trauma data is indicated by the blue ambulance icon in this report.

# CEMSIS Trauma Data

Q4 2024

## EMS Trauma Related Incidents

**Traumatic Injury**
n = 177,841

**Traumatic Arrest**
n = 778

**Trauma Patients meeting Trauma Triage Criteria and Transported to a Trauma Center**
12,630/14,657 = 86%

**Tranexamic Acid Administration**
n = 401

**Needle Thoracostomy Procedure**
n = 264

**Transfusion of a Blood Product Procedure**
**(by EMS Ground Transport)**
n = 2

*By analyzing statewide EMS trauma data, providers can spot trends, optimize interventions, and improve survival rates during critical moments, leading to enhanced medical services and patient outcomes.*

# TRAUMATIC INJURY (T14.90)

# Traumatic Injury (T14.90)

Q4 2024

**177,841**
Total Records (n)

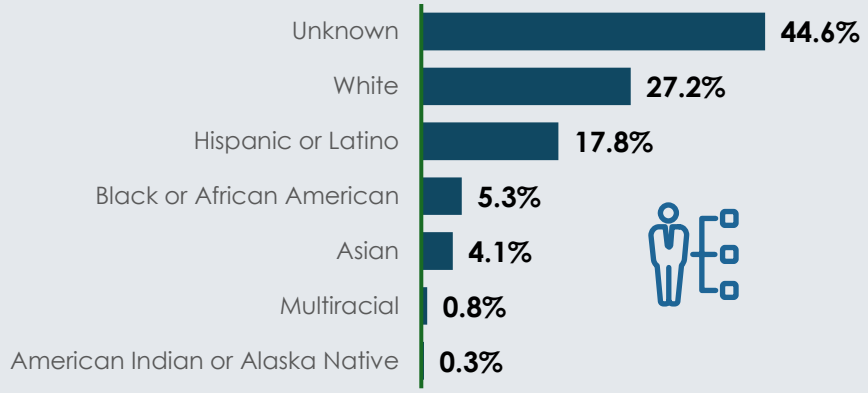
- 185,056 records before data cleaning
- 5,932 duplicate records removed (3%)
- 1,283 records removed due to age documentation error (<1%)
- 13,220 approximate duplicate records remain in final data set 7%+)

| Age | Gender | | | | |
|---|---|---|---|---|---|
| | Male | Female | Unknown | Other | **Total** |
| 1-14 Years | 6,179 | 4,119 | 226 | 12 | **10,536** |
| 15-24 Years | 11,565 | 8,153 | 408 | 45 | **20,171** |
| 25-34 Years | 13,233 | 9,057 | 435 | 54 | **22,779** |
| 35-44 Years | 11,501 | 7,991 | 317 | 29 | **19,838** |
| 45-54 Years | 8,912 | 7,129 | 233 | 18 | **16,292** |
| 55-64 Years | 10,101 | 8,804 | 204 | 18 | **19,127** |
| 65-74 Years | 9,836 | 11,475 | 179 | 30 | **21,520** |
| 75+ Years | 17,230 | 30,016 | 288 | 44 | **47,578** |
| **Total** | **88,557** | **86,744** | **2,290** | **250** | **177,841** |

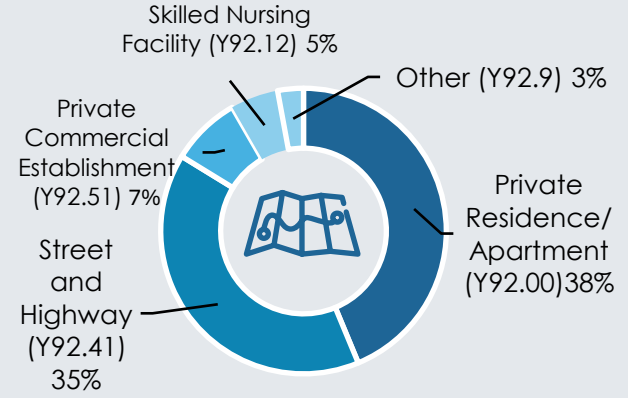
## Report Criteria

- Incident Dates = 10/1/24 – 12/31/24
- eResponse.05 Type of Service Requested = Emergency Response (Primary Response Area)
- eDisposition.27 Unit Disposition = Patient Contact Made
- eSituation.11 Provider's Primary Impression = Traumatic Injury (T14.90)

## Race



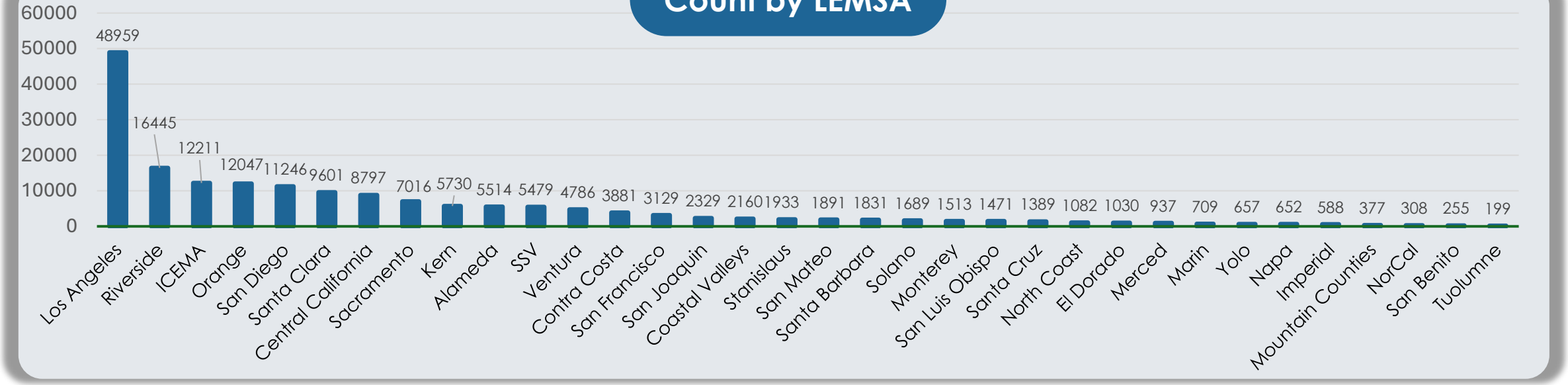

## Top 5 Incident Locations



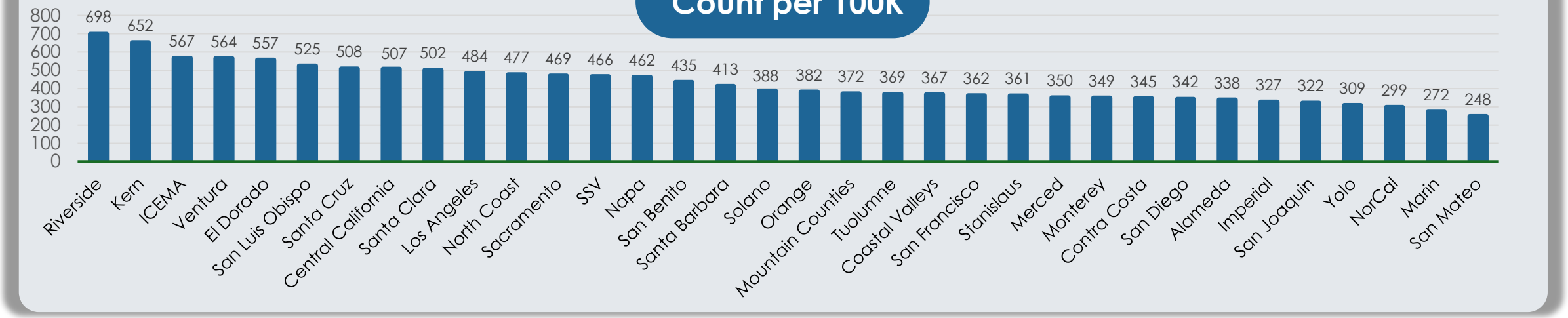
# Traumatic Injury (T14.90)

Q3 2024

## Count by LEMSA




## Count per 100K



# TRAUMATIC ARREST (I46.8)

# Traumatic Arrest (I46.8)

Q4 2024

**778**
Total Records (n)

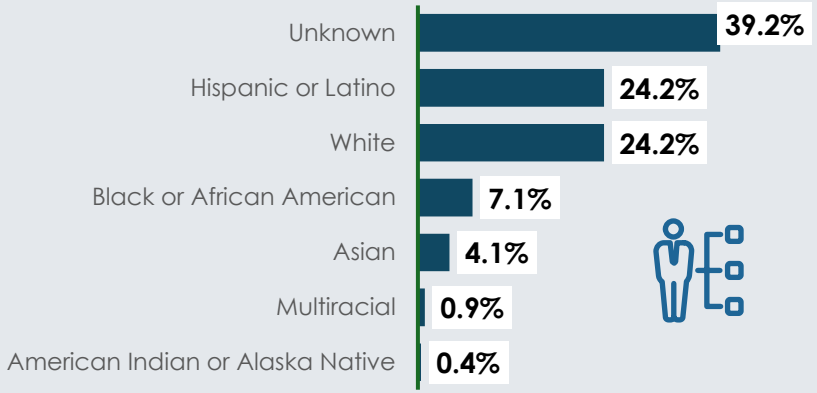
- 850 records before data cleaning
- 34 duplicate records removed (4%)
- 38 records removed due to age documentation error (4%)
- 65 approximate duplicate records remain in final data set (8%+)

| Age | Gender | | | |
|---|---|---|---|---|
| | Male | Female | Unknown | **Total** |
| 1-14 Years | 19 | 15 | 1 | **35** |
| 15-24 Years | 58 | 23 | | **81** |
| 25-34 Years | 133 | 30 | 2 | **165** |
| 35-44 Years | 143 | 39 | 2 | **184** |
| 45-54 Years | 90 | 29 | | **119** |
| 55-64 Years | 67 | 13 | | **80** |
| 65-74 Years | 44 | 17 | | **61** |
| 75+ Years | 29 | 24 | | **53** |
| **Total** | **583** | **190** | **5** | **778** |

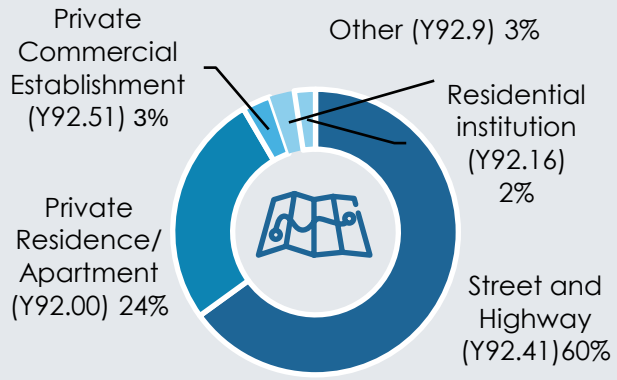
## Report Criteria

- Incident Dates = 10/1/24 – 12/31/24
- eResponse.05 Type of Service Requested = Emergency Response (Primary Response Area)
- eDisposition.27 Unit Disposition = Patient Contact Made
- eSituation.11 Provider's Primary Impression = Traumatic Arrest (I46.8)

## Race



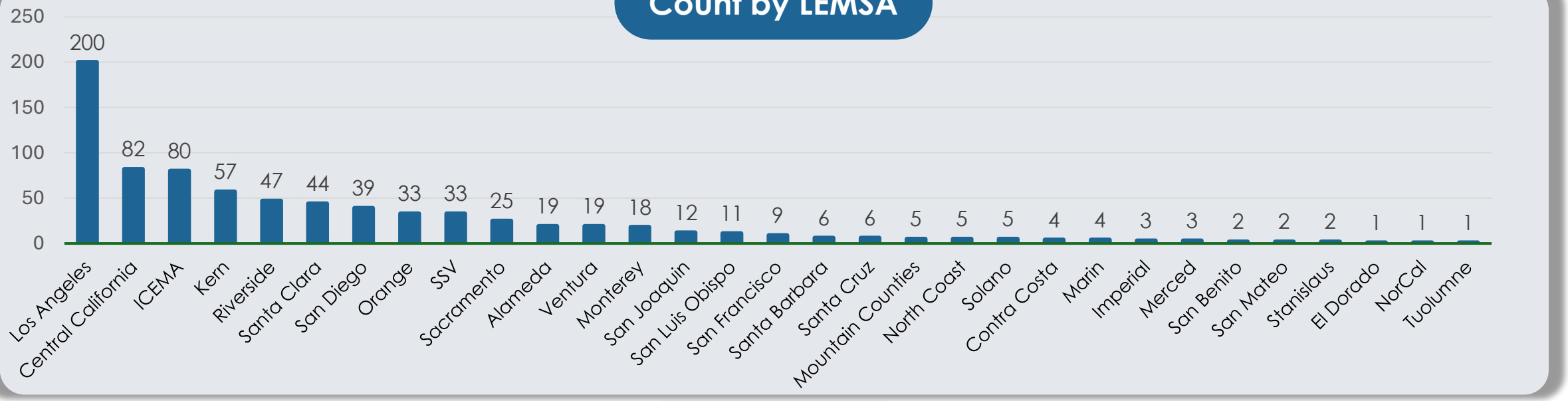

## Top 5 Incident Locations



# Traumatic Arrest (I46.8)

Q4 2024

## Count by LEMSA




## Count per 100K

# Trauma Patients Meeting Trauma Triage Criteria and Transported to a Trauma Center

# Trauma Patients Meeting Trauma Triage Criteria and Transported to a Trauma Center

## National Guideline for the Field Triage of Injured Patients

### RED CRITERIA
***High Risk for Serious Injury***

**Injury Patterns**

- Penetrating injuries to head, neck, torso, and proximal extremities
- Skull deformity, suspected skull fracture
- Suspected spinal injury with new motor or sensory loss
- Chest wall instability, deformity, or suspected flail chest
- Suspected pelvic fracture
- Suspected fracture of two or more proximal long bones
- Crushed, degloved, mangled, or pulseless extremity
- Amputation proximal to wrist or ankle
- Active bleeding requiring a tourniquet or wound packing with continuous pressure

**Mental Status & Vital Signs**

**All Patients**
- Unable to follow commands (motor GCS < 6)
- RR < 10 or > 29 breaths/min
- Respiratory distress or need for respiratory support
- Room-air pulse oximetry < 90%

**Age 0–9 years**
- SBP < 70mm Hg + (2 x age in years)

**Age 10–64 years**
- SBP < 90 mmHg or
- HR > SBP

**Age ≥ 65 years**
- SBP < 110 mmHg or
- HR > SBP

***Patients meeting any one of the above RED criteria should be transported to the highest-level trauma center available within the geographic constraints of the regional trauma system***

### YELLOW CRITERIA
***Moderate Risk for Serious Injury***

**Mechanism of Injury**

- High-Risk Auto Crash
  - Partial or complete ejection
  - Significant intrusion (including roof)
    - >12 inches occupant site OR
    - >18 inches any site OR
    - Need for extrication for entrapped patient
  - Death in passenger compartment
  - Child (age 0–9 years) unrestrained or in unsecured child safety seat
  - Vehicle telemetry data consistent with severe injury
- Rider separated from transport vehicle with significant impact (eg, motorcycle, ATV, horse, etc.)
- Pedestrian/bicycle rider thrown, run over, or with significant impact
- Fall from height > 10 feet (all ages)

**EMS Judgment**

**Consider risk factors, including:**
- Low-level falls in young children (age ≤ 5 years) or older adults (age ≥ 65 years) with significant head impact
- Anticoagulant use
- Suspicion of child abuse
- Special, high-resource healthcare needs
- Pregnancy > 20 weeks
- Burns in conjunction with trauma
- Children should be triaged preferentially to pediatric capable centers

**If concerned, take to a trauma center**

***Patients meeting any one of the YELLOW CRITERIA WHO DO NOT MEET RED CRITERIA should be preferentially transported to a trauma center, as available within the geographic constraints of the regional trauma system (need not be the highest-level trauma center)***

Source: ACS National Guideline for the Field Triage of Injured Patients: Recommendations of the National Expert Panel on Field Triage, 2021

# Trauma Patients Meeting Trauma Triage Criteria and Transported to a Trauma Center

Q4 2024

**12,630**
Total Numerator Records (n)

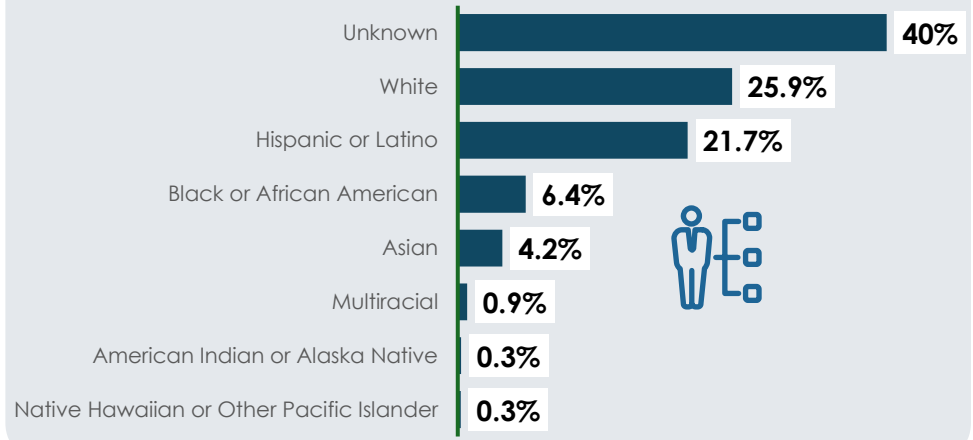
- 12,801 numerator records before data cleaning
- 66 duplicate records removed (<1%)
- 105 records removed due to age documentation error (<1%)
- 65 approximate duplicate records remain in final data set (<1%)

| Age | Gender | | | | |
|---|---|---|---|---|---|
| | Male | Female | Other | Unknown | **Total** |
| 1-14 Years | 403 | 238 | 1 | | **642** |
| 15-24 Years | 1,524 | 585 | 7 | 5 | **2,121** |
| 25-34 Years | 1,747 | 550 | 4 | 1 | **2,302** |
| 35-44 Years | 1,511 | 441 | 2 | 1 | **1,955** |
| 45-54 Years | 1,117 | 349 | | 1 | **1,467** |
| 55-64 Years | 1,044 | 397 | | 1 | **1,442** |
| 65-74 Years | 714 | 423 | 2 | | **1,139** |
| 75+ Years | 793 | 766 | 1 | 2 | **1,562** |
| **Total** | **8,853** | **3,749** | **17** | **11** | **12,630** |

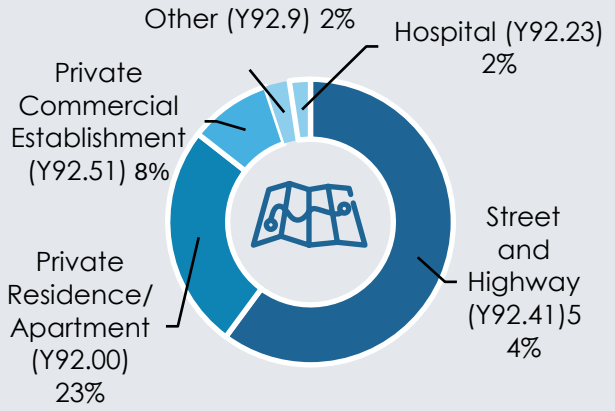
## Report Criteria

- Incident Dates = 10/1/24 – 12/31/24
- eResponse.05 Type of Service Requested = Emergency Response (Primary Response Area)
- eDisposition.30 Transport Disposition = Transport by this EMS Unit or Transport by Another EMS Unit
- eResponse.07 Unit Transport and Equipment Capability = Ground and Air Transport
- eInjury.03 Trauma Triage Criteria (High Risk for Serious Injury) = Red Box 1 and 2 of ACS Field Triage of Injured Patients Criteria
- eInjury.04 Trauma Triage Criteria (Moderate Risk for Serious Injury) = Yellow Box 1 of ACS Field Triage of Injured Patients Criteria
- eDisposition.23 Hospital Capability = Trauma Center Level 1, 2, 3, 4
- eDisposition.02 Destination/Transferred To, Code = Trauma Center Code List

## Race



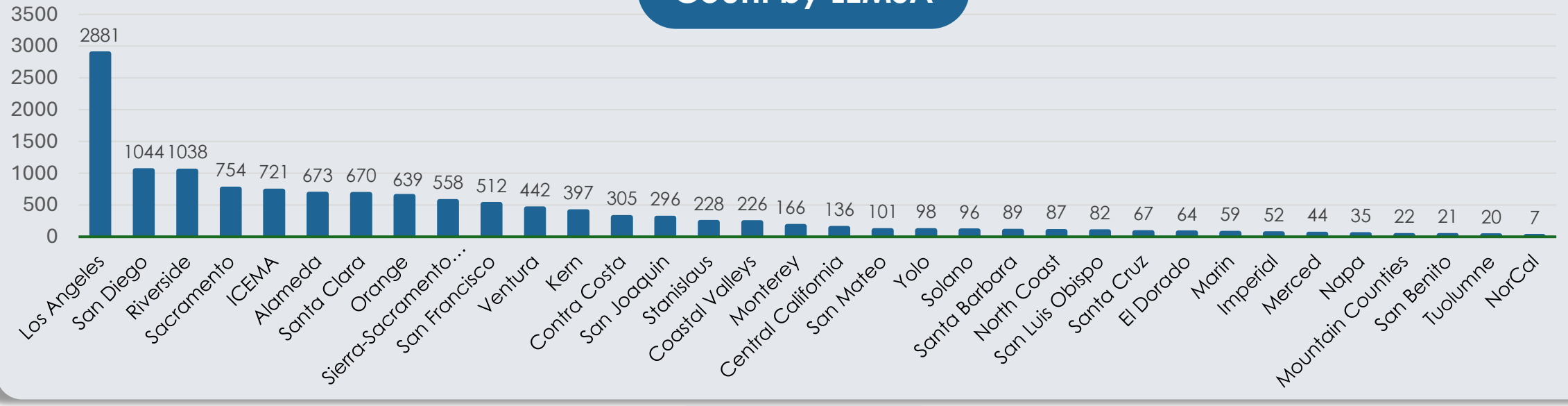

## Top 5 Incident Locations



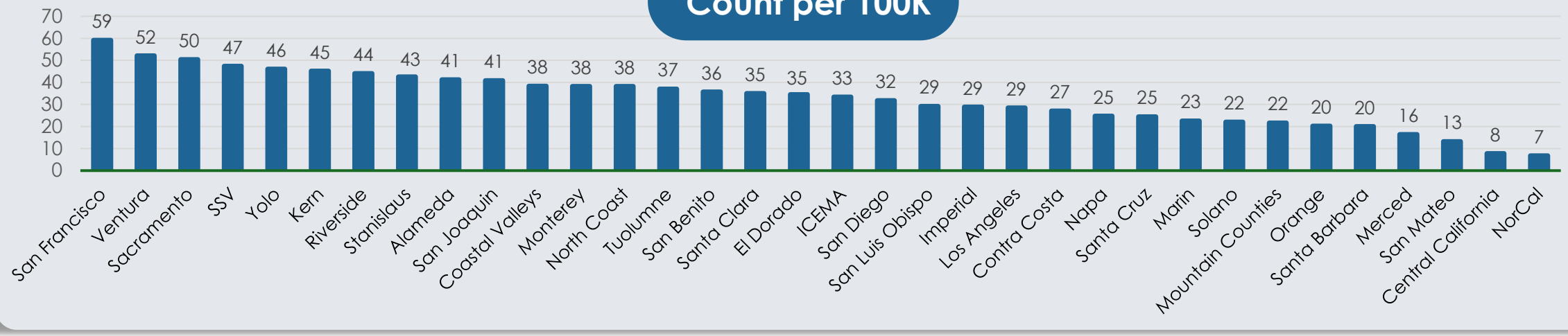
# Trauma Patients Meeting Trauma Triage Criteria and Transported to a Trauma Center

Q4 2024

## Count by LEMSA




## Count per 100K



# TRANEXAMIC ACID (10691)

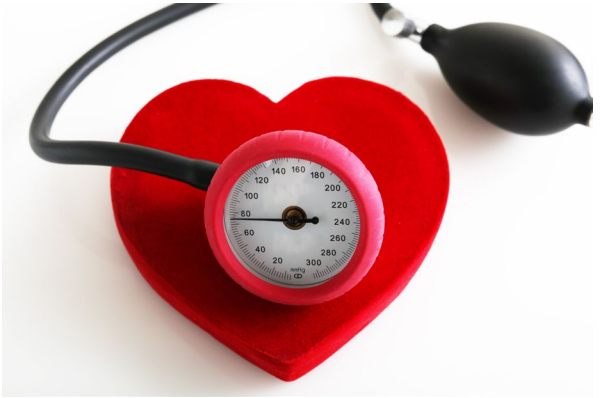
# Tranexamic Acid (10691)

Q4 2024

**401**
Total Records (n)

- 429 records before data cleaning
- 22 duplicate records removed (1%)
- 6 records removed due to age documentation error (2%)
- 18 approximate duplicate records remain in final data set (<1%)

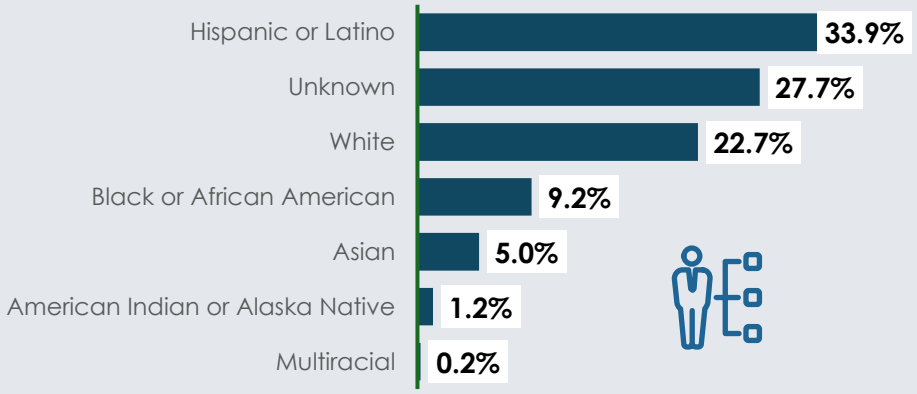
| Age | Gender | | |
|---|---|---|---|
| | Male | Female | Total |
| 1-14 Years | 2 | 2 | **4** |
| 15-24 Years | 54 | 10 | **64** |
| 25-34 Years | 78 | 28 | **106** |
| 35-44 Years | 52 | 19 | **71** |
| 45-54 Years | 43 | 8 | **51** |
| 55-64 Years | 26 | 15 | **41** |
| 65-74 Years | 20 | 18 | **38** |
| 75+ Years | 17 | 9 | **26** |
| **Total** | **292** | **109** | **401** |



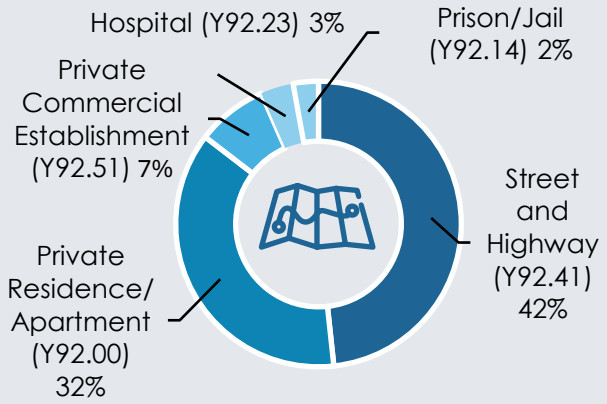
## Report Criteria

- Incident Dates = 10/1/24 – 12/31/24
- eResponse.05 Type of Service Requested = Emergency Response (Primary Response Area)
- eMedications.03 Medication Administered = Tranexamic Acid (10691)

## Race



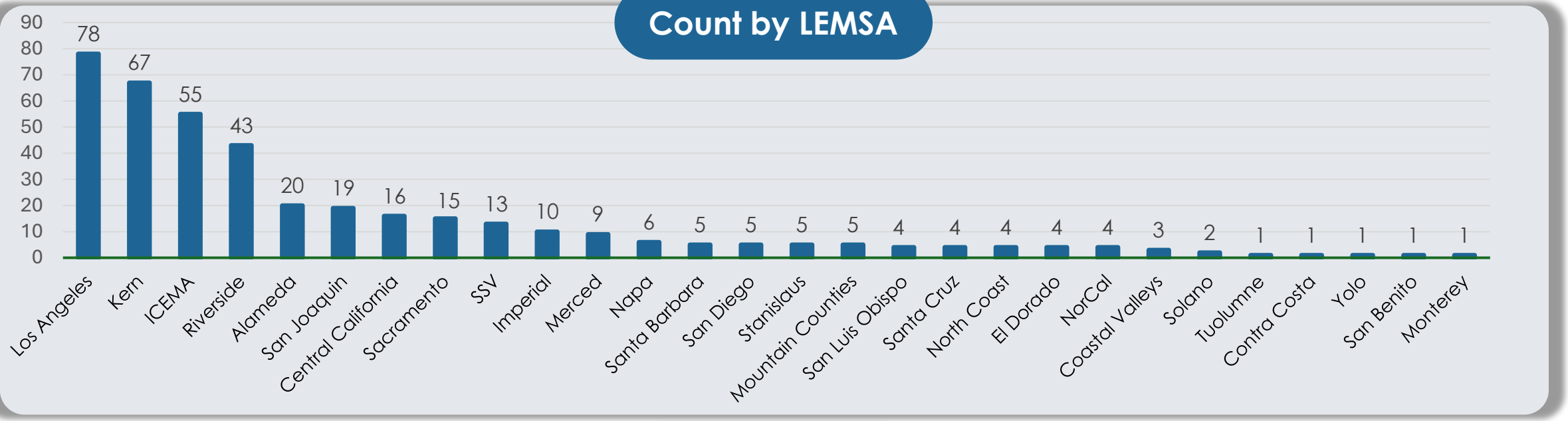

## Top 5 Incident Locations



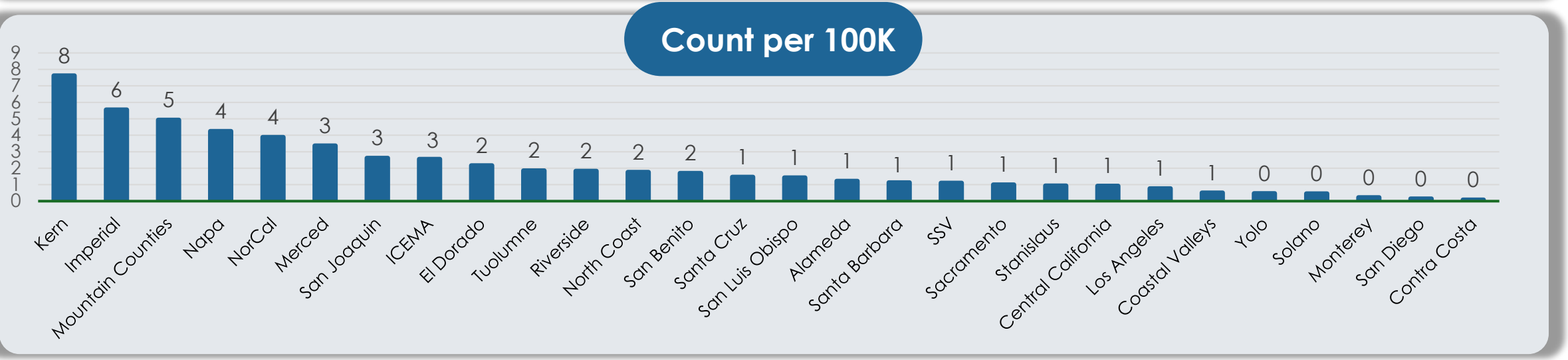
# Tranexamic Acid (10691)

Q4 2024

## Count by LEMSA




## Count per 100K



# NEEDLE THORACOSTOMY (182705007)

# Needle Thoracostomy (182705007)

Q4 2024

**264**
Total Records (n)

- 413 records before data cleaning
- 137 duplicate records removed (33%)
- 12 records removed due to age documentation error (3%)

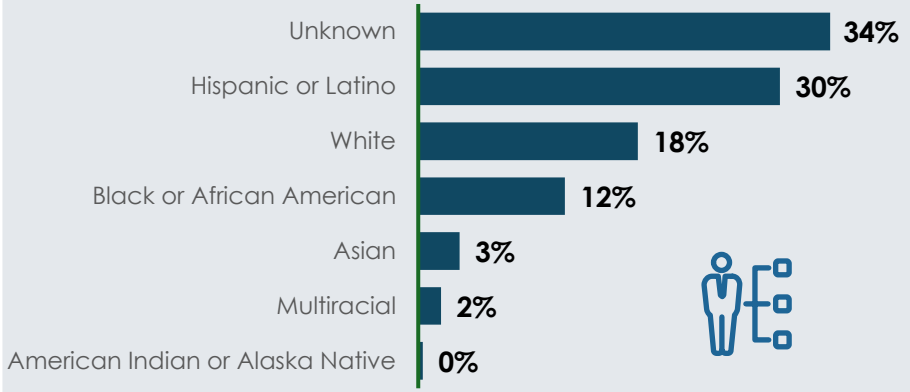
- **Deduplication process is being revised to ensure multiple procedures or attempts are not being removed as duplicate record*

| Age | Gender | | |
|---|---|---|---|
| | Male | Female | **Total** |
| 1-14 Years | 1 | 2 | **3** |
| 15-24 Years | 33 | 5 | **38** |
| 25-34 Years | 57 | 8 | **65** |
| 35-44 Years | 52 | 10 | **62** |
| 45-54 Years | 33 | 3 | **36** |
| 55-64 Years | 24 | 4 | **28** |
| 65-74 Years | 18 | 5 | **23** |
| 75+ Years | 5 | 4 | **9** |
| **Total** | **223** | **41** | **264** |

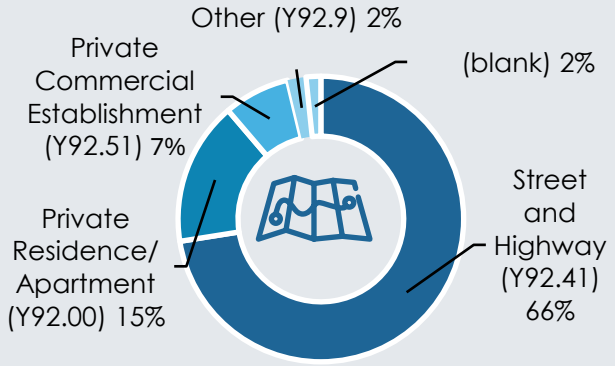
## Report Criteria

- Incident Dates = 10/1/24 – 12/31/24
- eResponse.05 Type of Service Requested = Emergency Response (Primary Response Area)
- eProcedures.03 Procedure = Needle Thoracostomy (182705007)

## Race



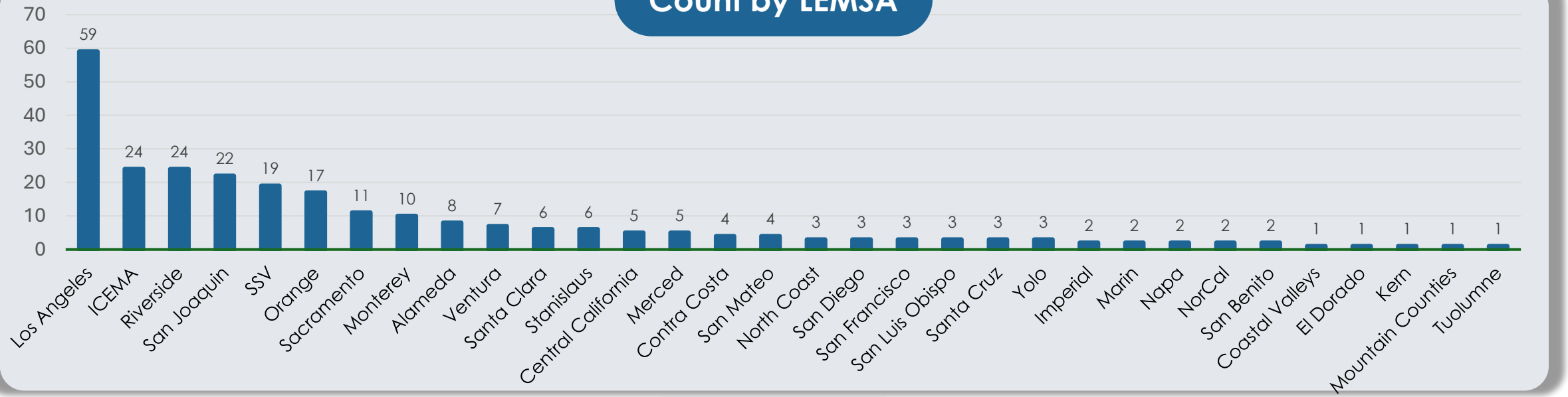

## Top 5 Incident Locations



# Needle Thoracostomy (182705007)

Q4 2024

## Count by LEMSA

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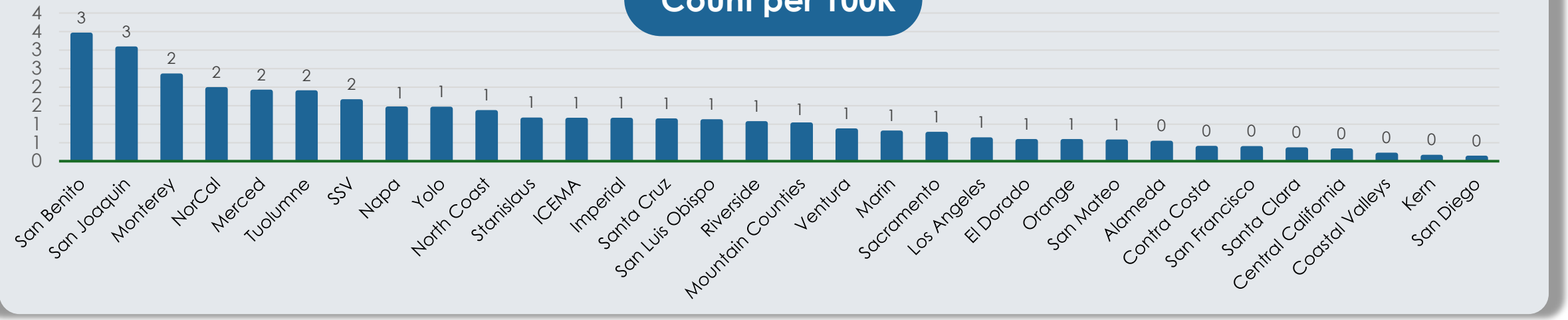


# Patient Registry Introduction

- Patient Registry integrates information across the medical community, allowing data to flow from the ambulance to the hospital to state and national registries. Hospitals have secure access to their own patient registry.
- Patient Registry currently collects trauma data from California designated trauma facilities based on the most recent National Trauma Data Bank Standard.
- EMSA is continually cleaning and standardizing the data to improve data quality. Despite these efforts, errors remain for several reasons.
- Patient Registry trauma data is indicated by the gold hospital icon in this report.

# Patient Registry Trauma Data

Q4 2024

## Hospital Trauma Related Incidents

**Hospital Documentation**
80/83 trauma facilities provided data for Q4 = 96%

**Trauma Records Total**
n = 30,509

**Top Injury Severity Score (ISS) Range**
ISS Range 0-14
n = 25,857

**Top Emergency Department Disposition**
Floor bed (general admission, non specialty unit bed)
n = 10,450

**Top Facility Discharge Disposition**
Discharged to home or self-care (routine discharge)
n = 12,576

*By analyzing statewide hospital trauma center data, providers can spot trends, optimize interventions, and improve survival rates during critical moments, leading to enhanced medical services and patient outcomes.*

# PATIENT REGISTRY TRAUMA DATA DEMOGRAPHICS

# Trauma Data Demographics

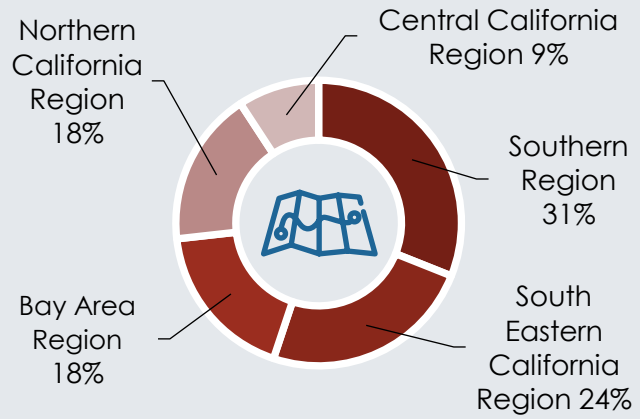
Q4 2024

**30,509**
Total Records (n)

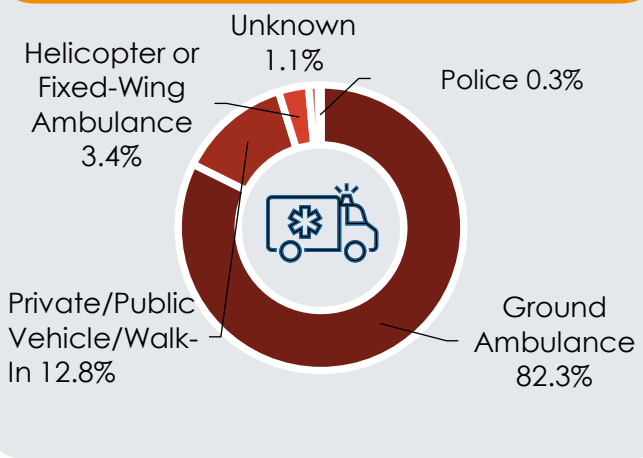
- 30,678 records before data cleaning
- 165 duplicate records removed (<1%)
- 4 records removed due to missing patient age and date of birth
- 166 approximate duplicate records remain in final data set (<1%)

| Age | Gender | | | | |
|---|---|---|---|---|---|
| | Male | Female | Unknown | Other | Total |
| 1-14 Years | 1,111 | 658 | 178 | 2 | **1,949** |
| 15-24 Years | 2,385 | 787 | 180 | 3 | **3,355** |
| 25-34 Years | 2,704 | 855 | 185 | 4 | **3,748** |
| 35-44 Years | 2,427 | 780 | 186 | | **3,393** |
| 45-54 Years | 1,900 | 695 | 162 | 3 | **2,760** |
| 55-64 Years | 2,126 | 1,021 | 183 | 2 | **3,332** |
| 65-74 Years | 2,037 | 1,641 | 190 | 2 | **3,870** |
| 75+ Years | 3,347 | 4,379 | 376 | | **8,102** |
| **Total** | **18,037** | **10,816** | **1,640** | **16** | **30,509** |

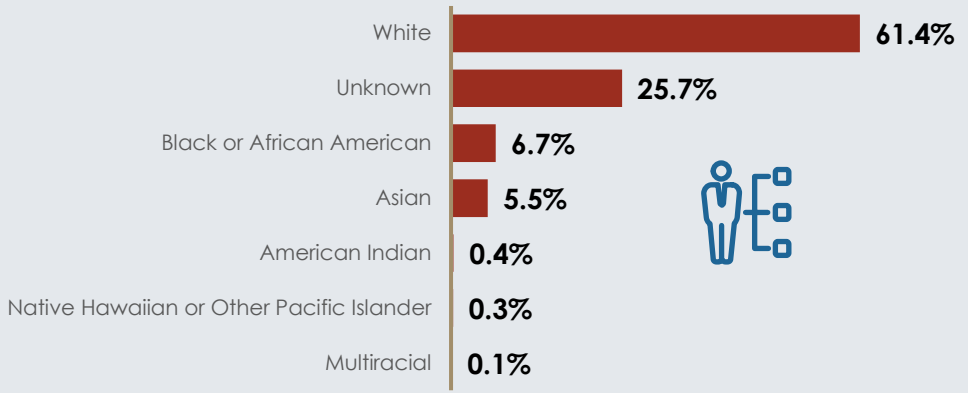
## Trauma Region by Destination




## Transport Mode Hospital Arrival




## Race



# PATIENT REGISTRY TRAUMA DATA CHARACTERISTICS

# Trauma Data Characteristics

Q4 2024

**30,509**
Total Records (n)

| ISS Range | Count |
|---|---|
| 0-14 | 25,857 |
| 15-24 | 2,760 |
| 25-34 | 1445 |
| 35-44 | 306 |
| 45-54 | 68 |
| 55-64 | 21 |
| 65-74 | 5 |
| 75+ | 47 |

| Emergency Department Disposition | Count |
|---|---|
| Floor bed (general admission, non specialty unit bed) | 10,450 |
| Intensive Care Unit | 5,492 |
| Home without services | 4,449 |
| Telemetry/step-down unit (less acuity than ICU) | 4,124 |
| Operating Room (Hybrid OR) | 2,858 |
| Transferred to another hospital | 1,138 |
| Observation unit (unit that provides < 24 hour stays) | 990 |
| Deceased/Expired | 338 |
| Not Applicable | 316 |
| Other (jail, institution, etc) | 184 |
| AMA | 143 |
| Home with services | 27 |

| Facility Discharge Disposition | Count |
|---|---|
| Discharged to home or self-care (routine discharge) | 12,576 |
| Not Applicable | 6,395 |
| Skilled Nursing Facility (SNF) | 4,086 |
| Home with Home Health Services | 2,871 |
| Inpatient Rehabilitation Facility (IRF) | 1,521 |
| Acute care hospital | 766 |
| Deceased/Expired | 751 |
| AMA | 628 |
| Hospice care | 233 |
| Correctional Facility or in Law Enforcement Custody | 215 |
| Another type of institution not defined elsewhere | 159 |
| Psych Visit | 148 |
| Long Term Care Hospital (LTCH) | 123 |
| Intermediate Care Facility (ICF) | 30 |
| Not Known/Not Recorded | 7 |

# Trauma Data Reconciliation: CEMSIS vs. Patient Registry

Q4 2024

The following outlines discrepancies between the number of CEMSIS records for patients meeting trauma triage criteria who were transported to a trauma center and the number of corresponding Patient Registry records for trauma patients in Q4 2024.

## CEMSIS

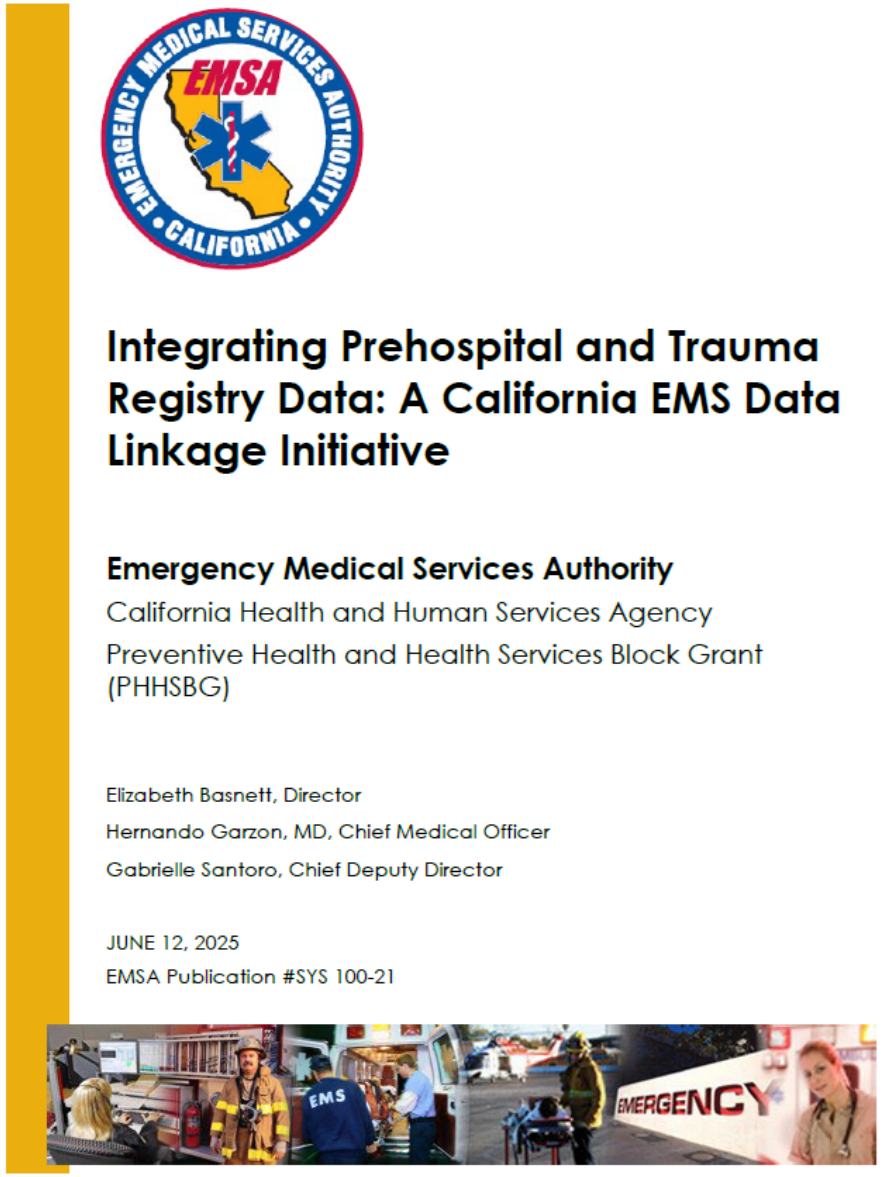
- Total traumatic injury patients (T14.90): 185,056
- Transported to trauma center: 73,138 (37%)
- Missing / incomplete triage fields:
  - 11% (20,100) – eInjury.03 & eInjury.04 = Not Applicable / Not Recorded / Blank
  - 3% (5,102) – Blank eInjury.03, only Step 4 in eInjury.04 (excluded from TRA-2)
- TRA-2 Numerator (met criteria + transported): 12,801

**percentages are estimates based on raw data*

## PATIENT REGISTRY

- 82% arrived by EMS
- 18% arrived by other means

# Integrating Prehospital and Trauma Registry Data

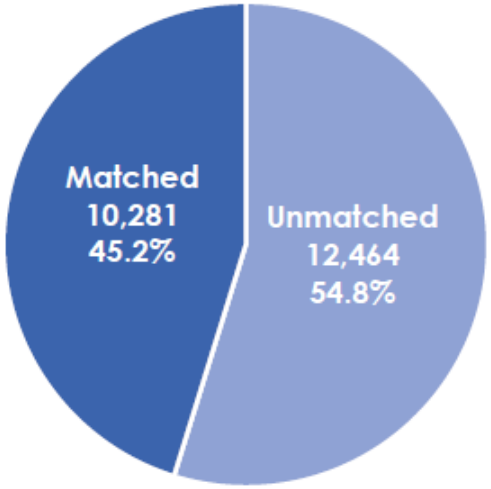



- CEMSIS and Trauma Data Linkage Initiative Report is a deliverable for the Preventive Health and Health Services Block Grant (PHHSBG)
- Utilizes probabilistic matching to link patient records between two independent data sources: CEMSIS and Patient Registry
- Structured three-step matching process:
  - 1. Exact matching (records with identical key details),
  - 2. Refined criteria-based matching (using additional patient and incident details), and
  - 3. Fuzzy matching (allowing minor discrepancies, such as dates differing by up to one day).

# Patient Matching – Data from Jan 1 – Jun 30, 2024

GENERAL CHARACTERISTICS AND DEMOGRAPHICS

**FIGURE 1: MATCHED AND UNMATCHED CEMSIS RECORDS**




Of the 22,745 CEMSIS records for trauma patients who met ACS Trauma Triage Criteria Steps 1, 2, and 3 for Q1-Q2 2024, 10,281 records (45.2%) were successfully matched to corresponding records in the Patient Registry. Approximately 6% of the matched records may have duplication (same patient, same incident) and could not be removed from the dataset due to variations in documentation by providers. 10% of unmatched records did not have a date of birth recorded, possibly preventing linkage.

# Patient Matching – Data from Jan 1 – Jun 30, 2024

FIGURE 2: MATCHED RECORDS BY DATA LINKAGE HIERARCHY

| Linkage Phase | Linkage Name | Patient Demographics | | | Patient Characteristics | Date | Location | | Records Matched |
|---|---|---|---|---|---|---|---|---|---|
| | | Date of Birth | Age and Age Units | Gender | Patient Postal Code | Incident Date | Scene Incident County | Facility Destination Code | |
| 1 | Initial | Exact | | | | Exact | | | 8,038 |
| 2 | Refined Criteria | Drop | Exact | Exact | Exact | Exact | Exact | Exact | 2,243 |
| 3A | Fuzzy 1 | Exact | | | | +/- 1 Day | | | 0 |
| 3B | Fuzzy 2 | Drop | Exact | Exact | Exact | +/- 1 Day | Exact | Exact | 0 |
| | | | | | | | | | Total: 10,281 |

**Implications for Trauma System Optimization**

These findings underscore the regional variations in trauma triage documentation and injury severity, emphasizing the need for ongoing evaluation of EMS triage protocols across LEMSAs. The variability in TTC documentation and severe trauma proportions suggests opportunities for enhanced EMS training, improved triage standardization, and more targeted trauma resource allocation. By better understanding these regional trends, policymakers and EMS administrators can refine prehospital triage strategies to optimize trauma system performance and patient outcomes.

# Questions or comments?