Access to Trauma Care in California

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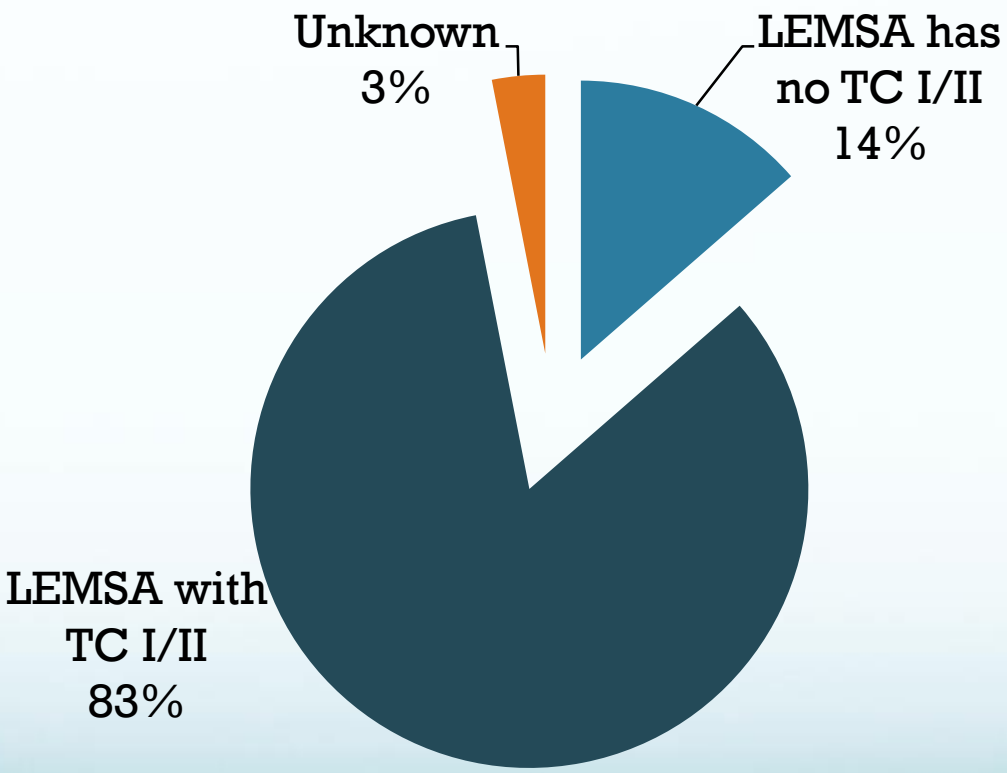
Trends in California

- 1996-2006, n= 752,706
- Proportion of those with severe injuries admitted to TC I/II increased from 39.3% to 49.7%
  - If TC I/II in county: 82.4%
  - If no TC I/II in county: 30.8%
  - Likelihood ratio: 0.35

Hsia et al, J Trauma, 2010; 68 (1) : 217–224

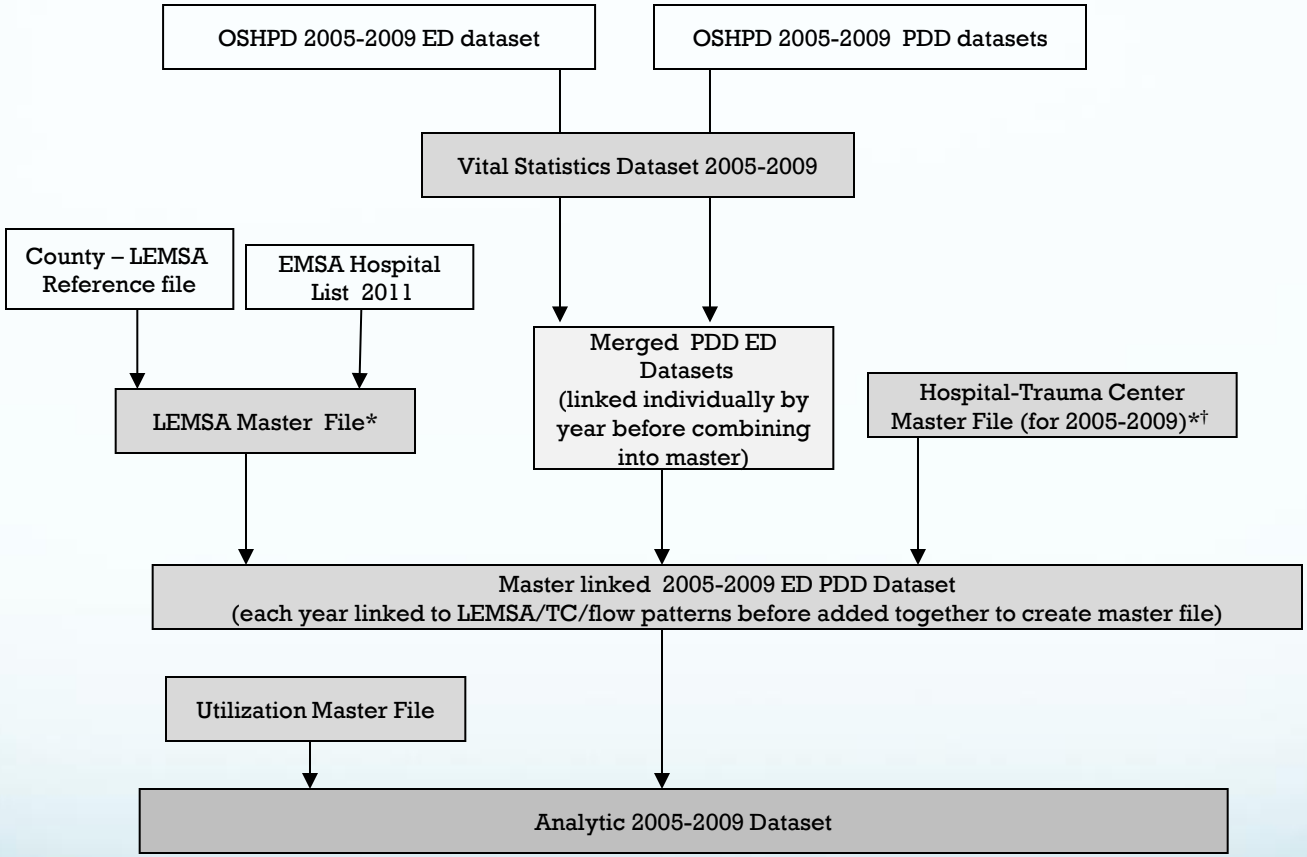
Distribution of Population and Access to TC I/II



Current research question

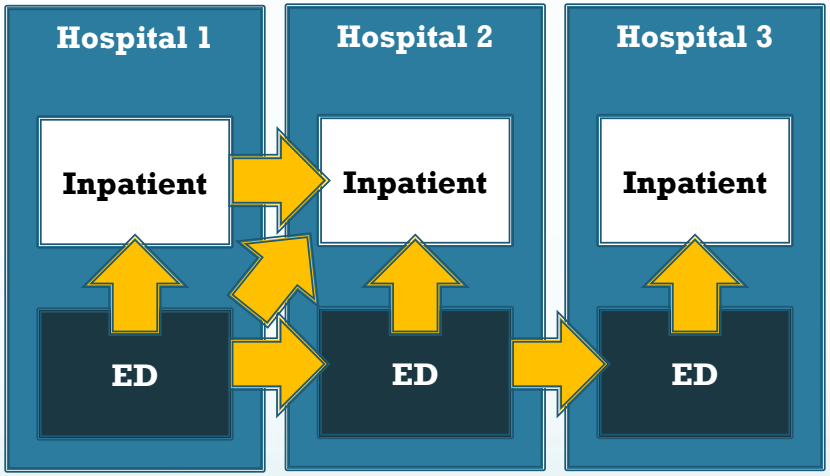
1. Are there variations in triage patterns across counties?
2. How do they differ in counties with and without trauma centers?

Methods: Data



Methods: Hospital and ED visit linkage

- Included all permutations of admission pathways through an ED or inpatient hospitalization.



Outcomes: Triage definitions

- Determined ISS for patients using the ICDPIC program for STATA that maps ICD9 diagnoses to injury severity.
- Defined triage for patients with an ISS>15 as follows:

Field Triage ("Primary Triage")	Re-triage ("Secondary Triage")	No triage to TC I/II
Brought directly to a TC I/II	Visited a non-TC I/II before transfer to a TC I/II	None of the hospitals visited were a TC I/II

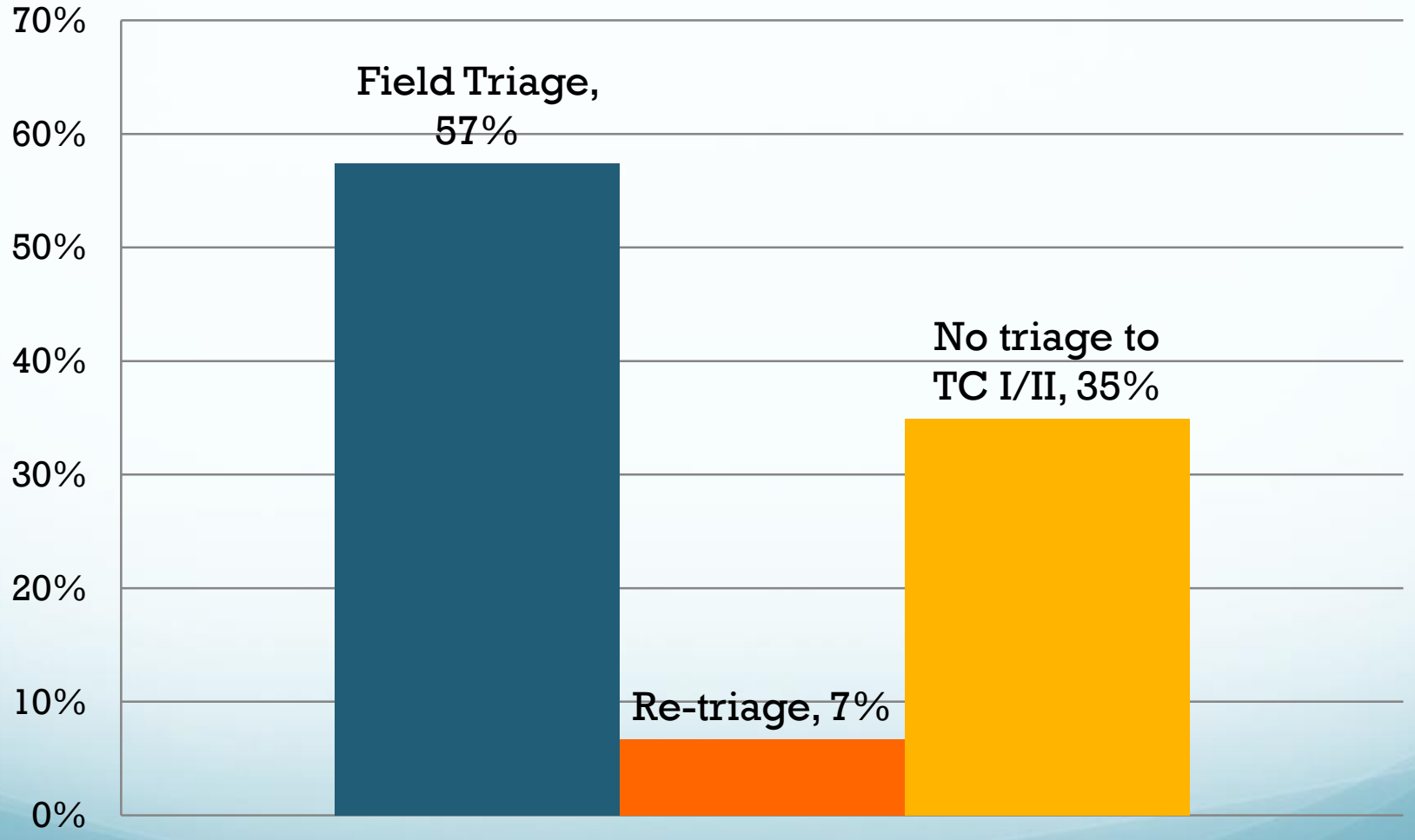
Methods

- Inclusion Criteria
  - Include patients hospitalized for injury as defined by ICD9 code.
  - Injury Severity score >15

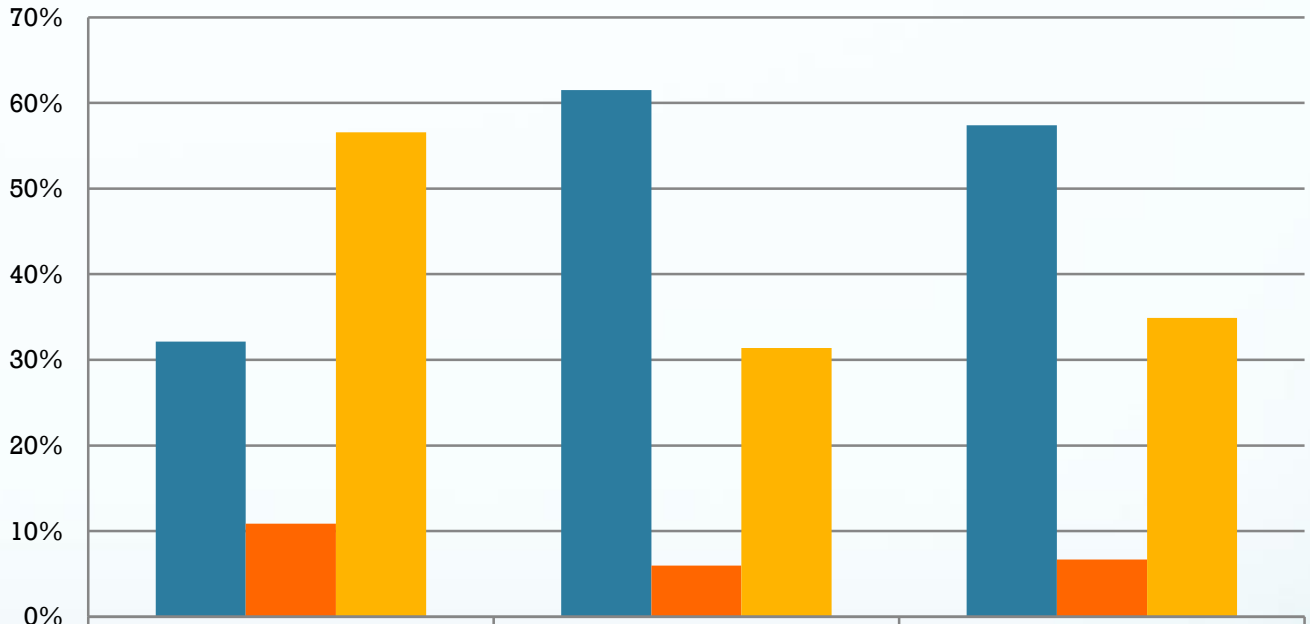
Results

- Number of patients admitted for injury during study period (2005-2009) = 561,075
  - ISS>15 = 67,845 (12%)

Overall Triage Patterns for ISS > 15

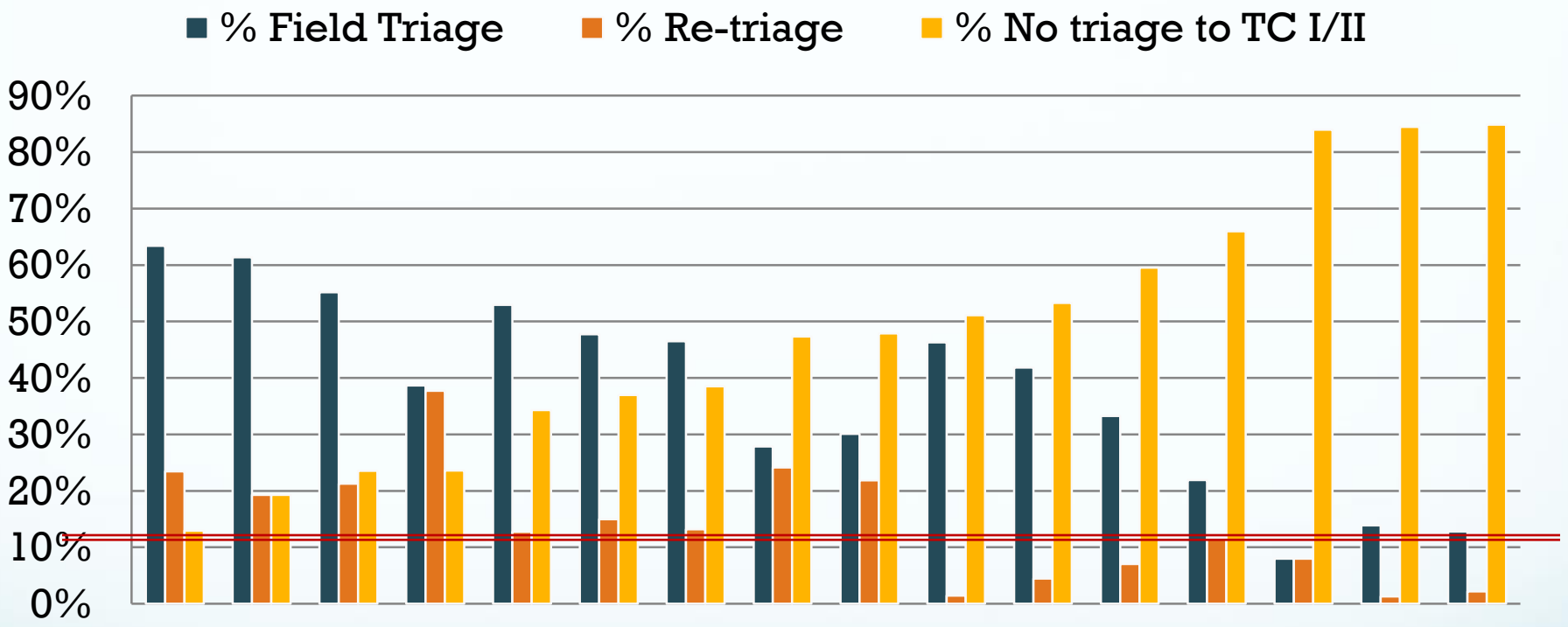


Triage Patterns for ISS > 15 by LEMSAs with or without TC I/II

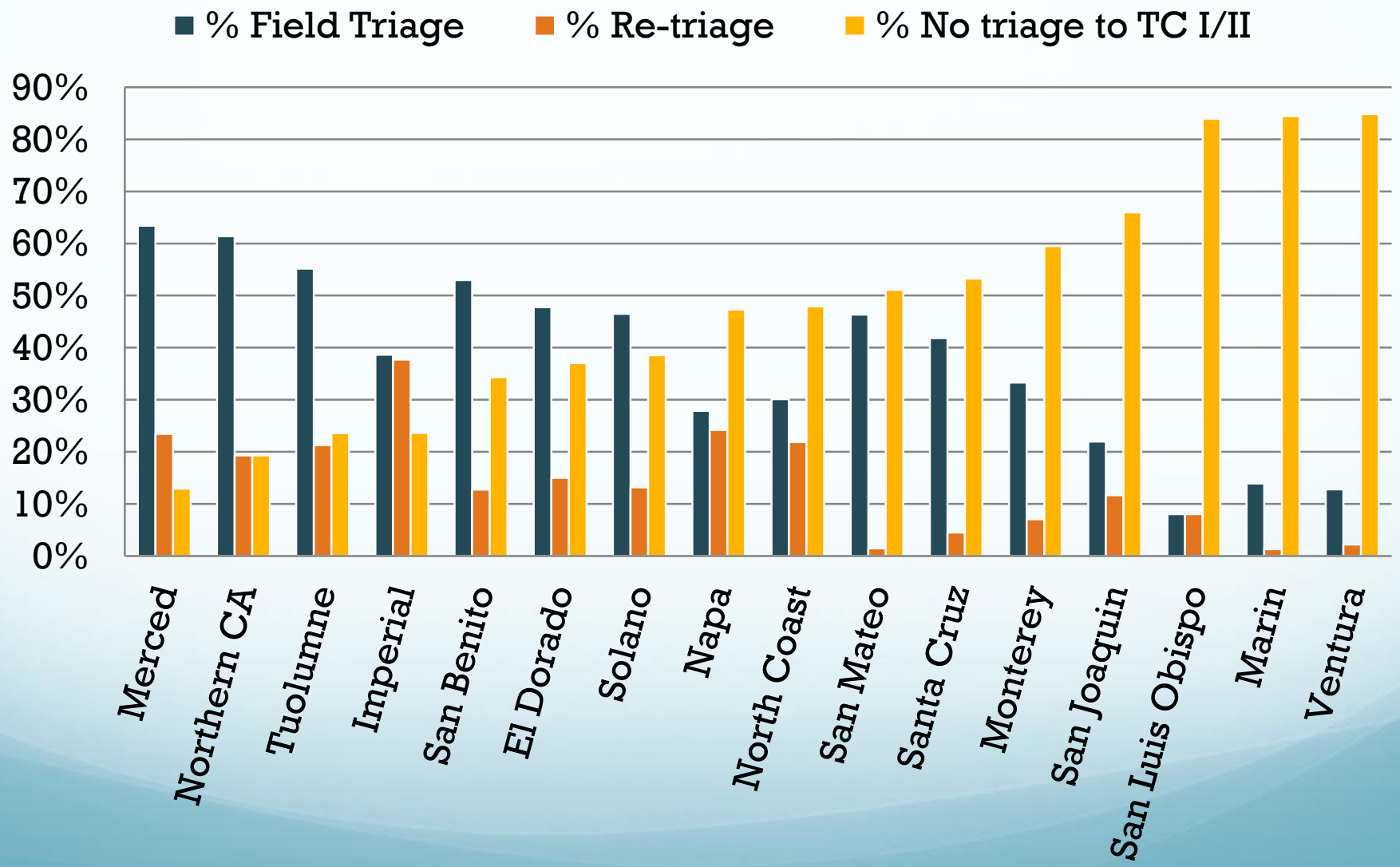


	LEMSAs without TC I/II	LEMSAs with TC I/II	Overall
Field Triage	32%	61%	57%
Re-triage	11%	6%	7%
No triage to TC I/II	57%	31%	35%

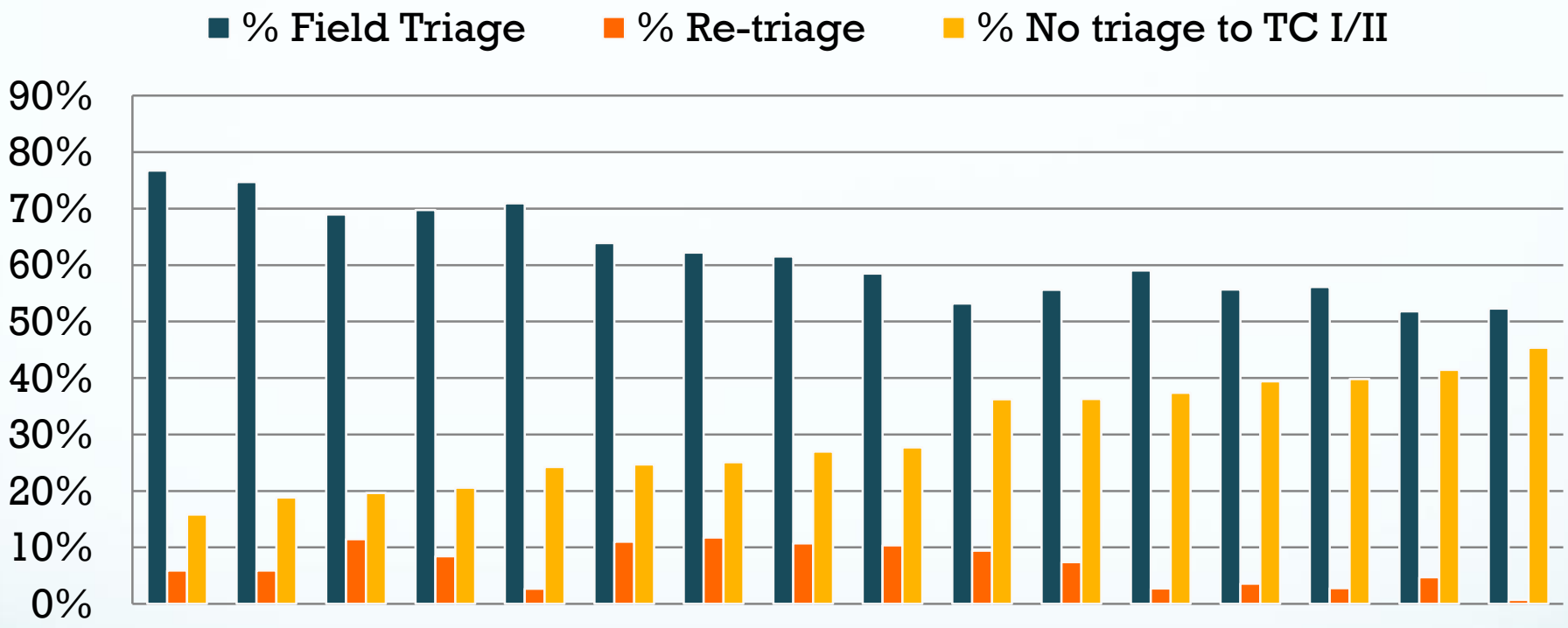
Triage Patterns for ISS > 15 in LEMSAs without TC I/II



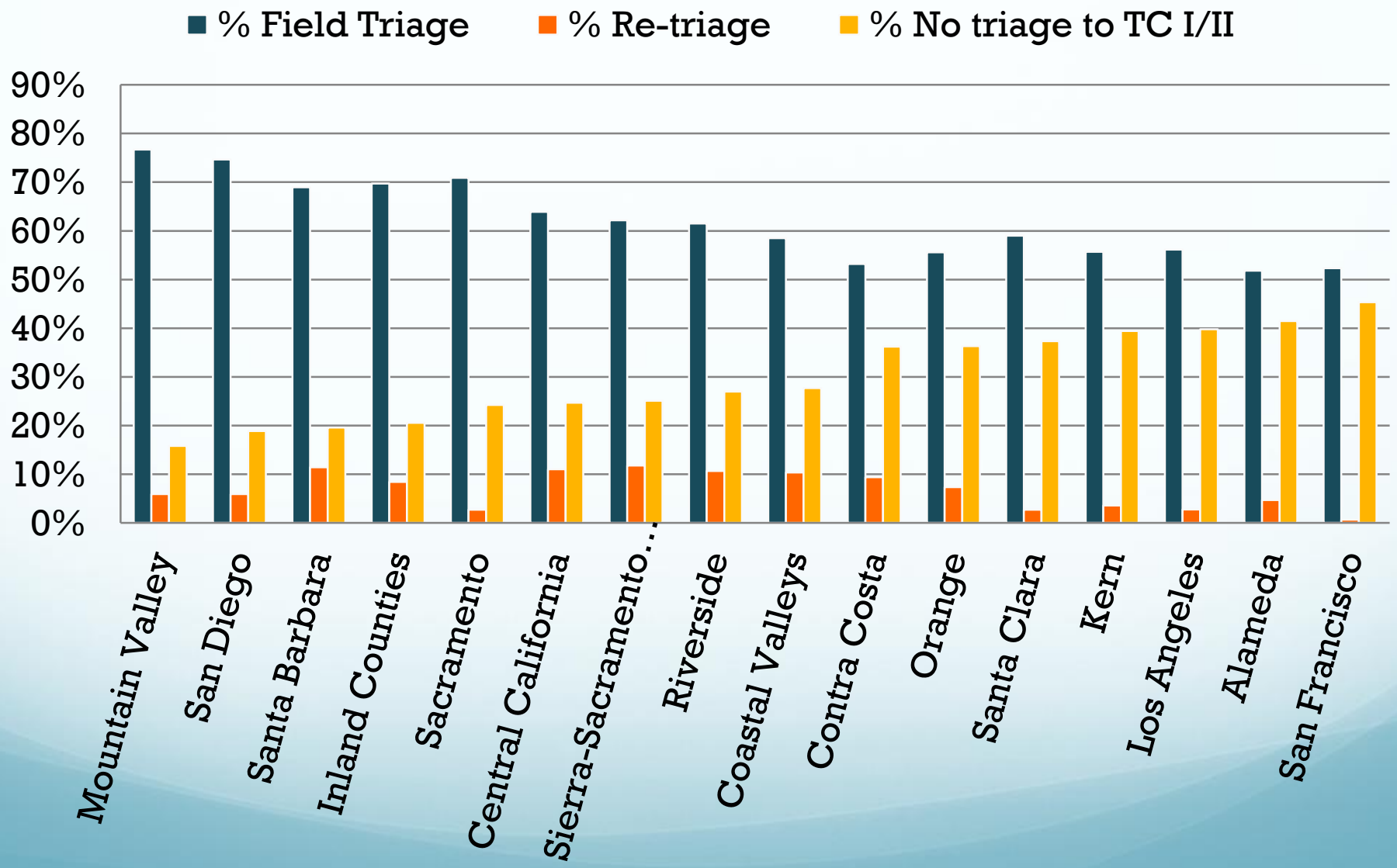
Triage Patterns for ISS > 15 in LEMSAs without TC I/II



Triage Patterns for ISS > 15 in LEMSAs with TC I/II



Triage Patterns for ISS > 15 in LEMSAs with TC I/II



Limitations

- No prehospital information
- No perfect adjustment for injury severity
- Issue of elderly and "under-triage"
- Caution in message (do not want to over-triage)
- Dissociate concept of "no triage" with "bad"

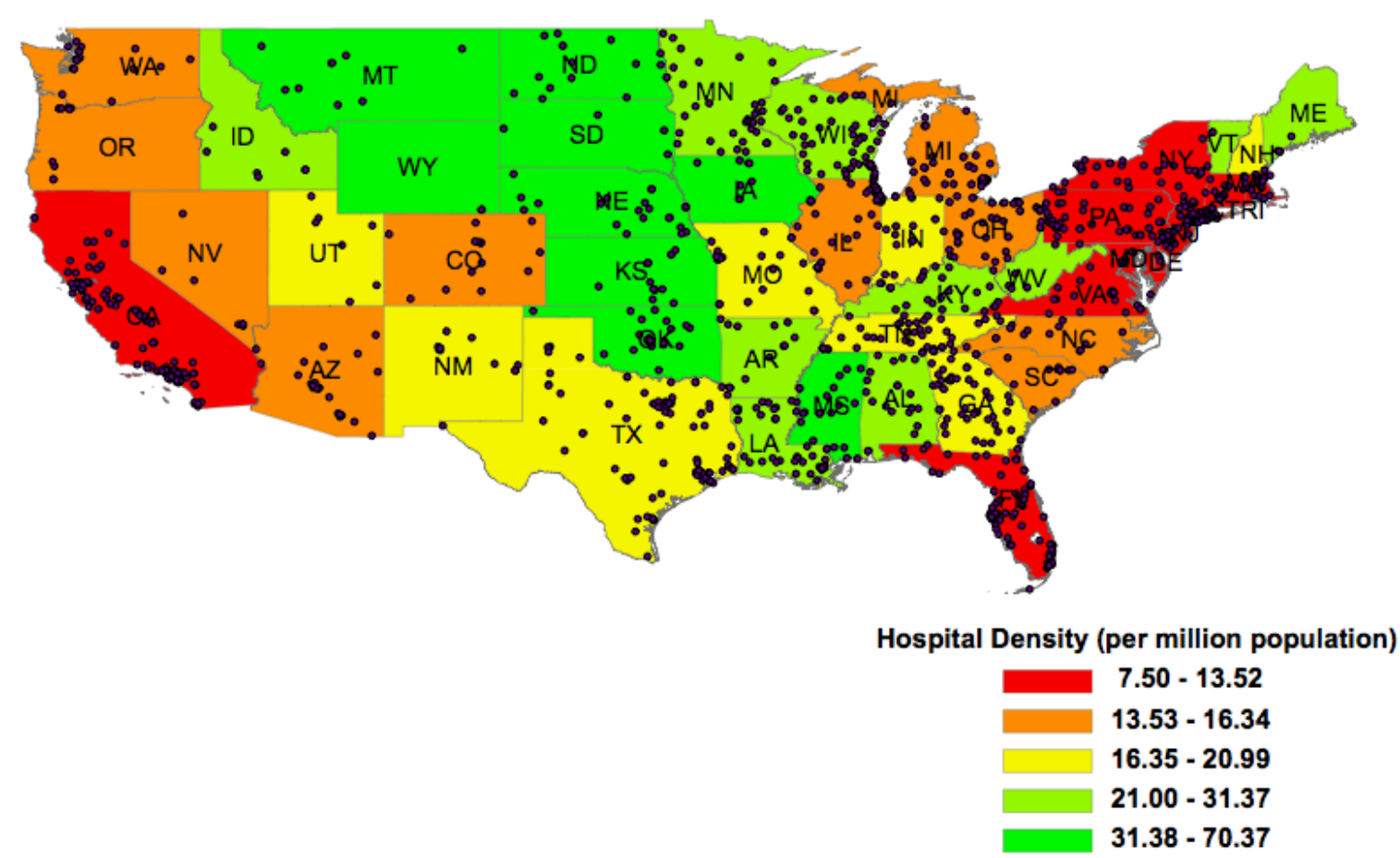
Summary

- Rates of no triage to TC I/II are high in CA
  - Overall = 35%
    - In LEMSAs with TC I/II = 32%
    - In LEMSAs without TC I/II = 57%
- Rates of no triage to TC I/II are variable within LEMSAs
  - LEMSAs with TC I/II = 16% to 45%
  - LEMSAs without TC I/II = 13% to 85%

Summary

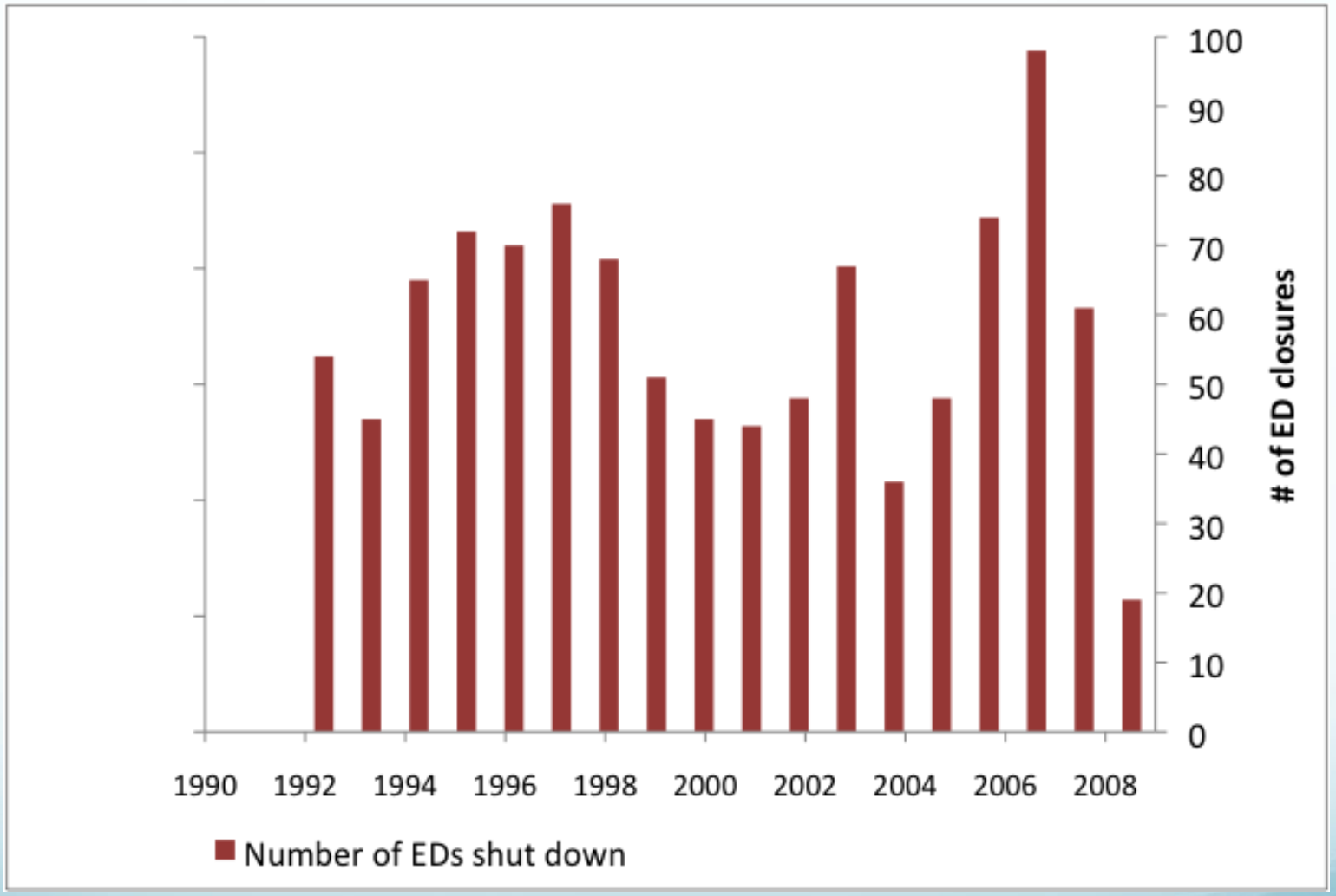
- Re-triage is variable (but relatively low) between LEMSAs and when comparing LEMSAs with or without TC I/II:
  - LEMSAs with TC I/II = 3% to 12%
  - LEMSAs without TC I/II = 1% to 38%

Non-rural ED Closures in the U.S., 1990-2009



Hsia, Kellermann, Shen, JAMA, 2011; 305 (19): 1978-1985

Emergency Department Closures in the U.S., 1990-2009



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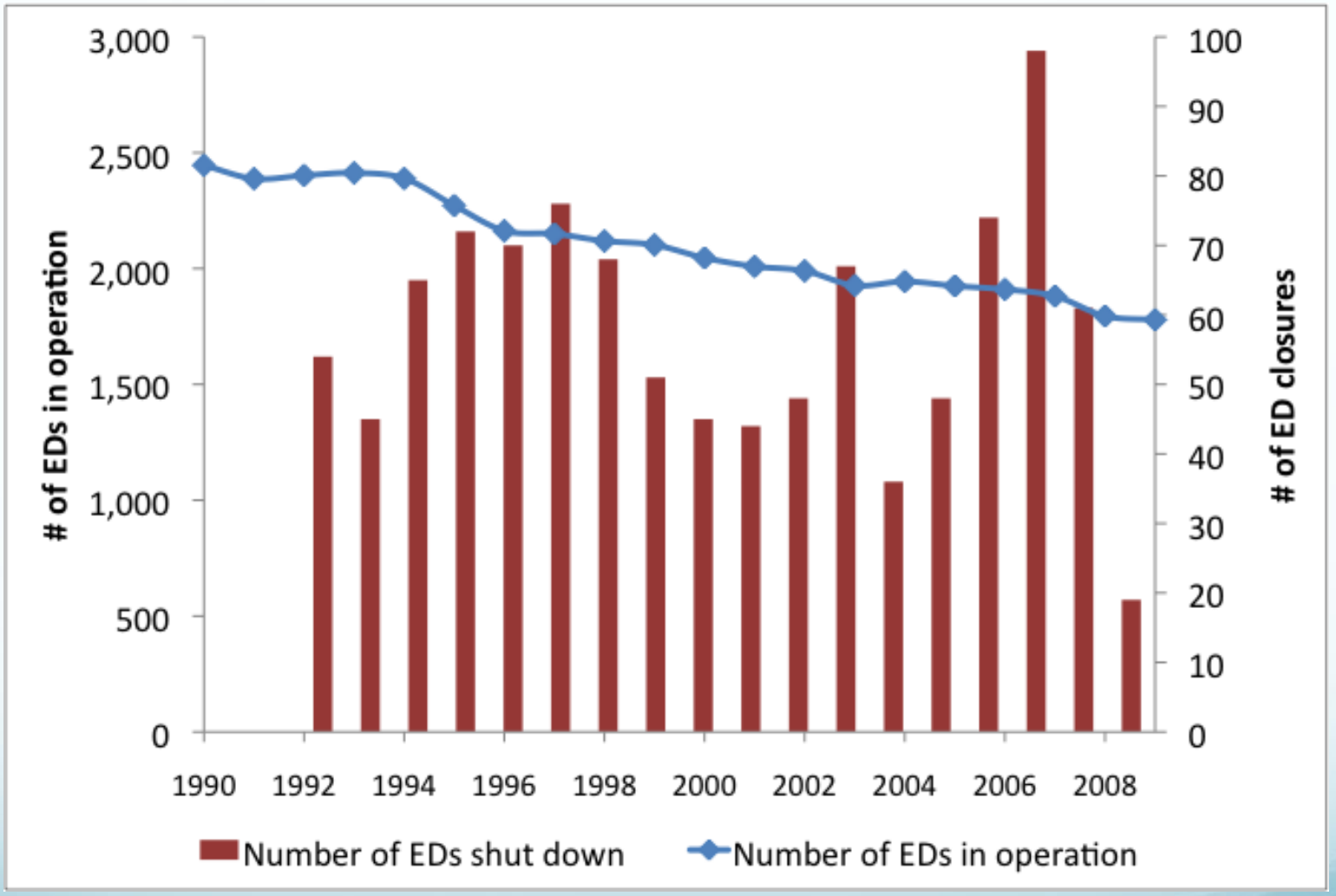
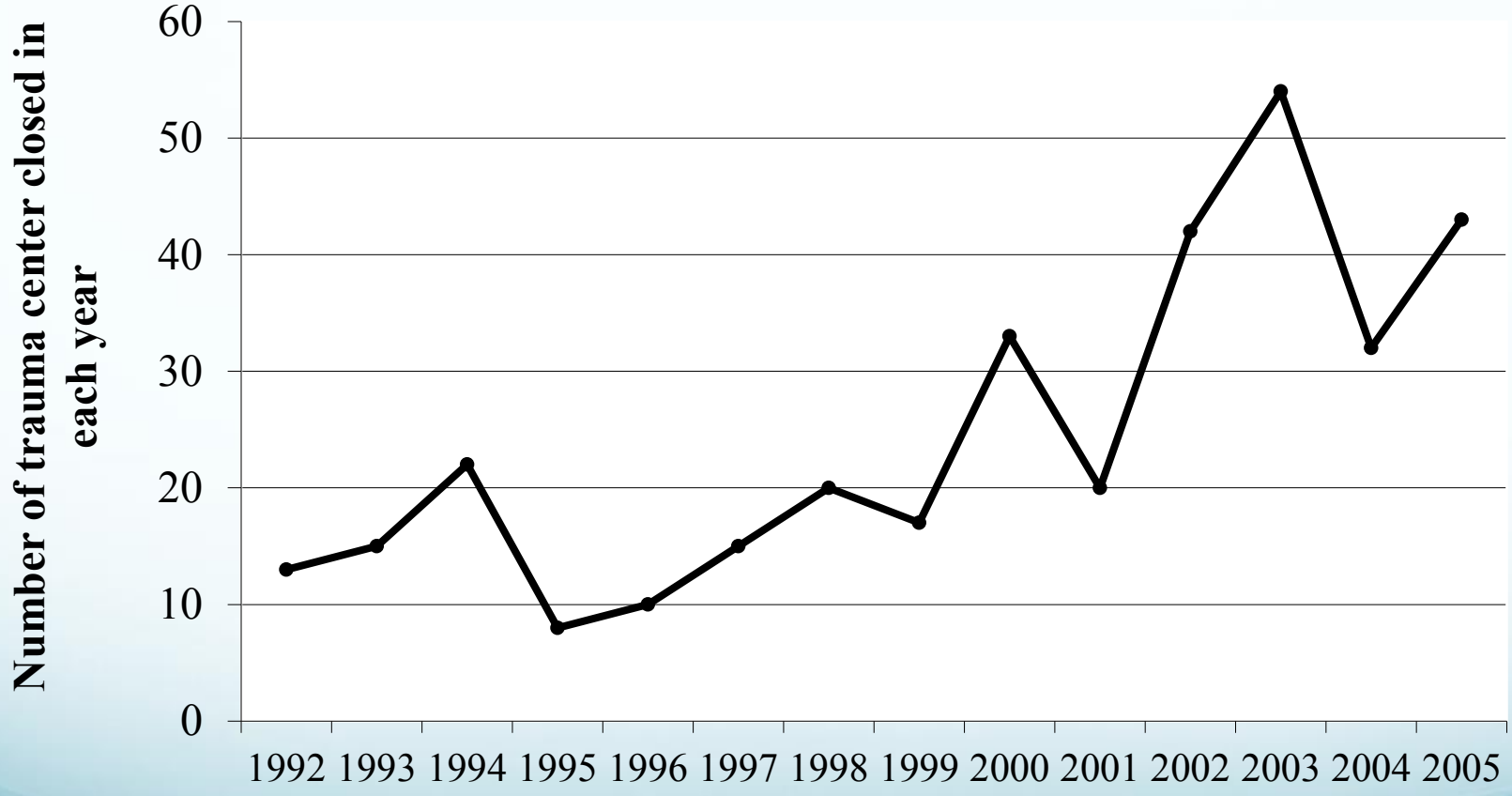


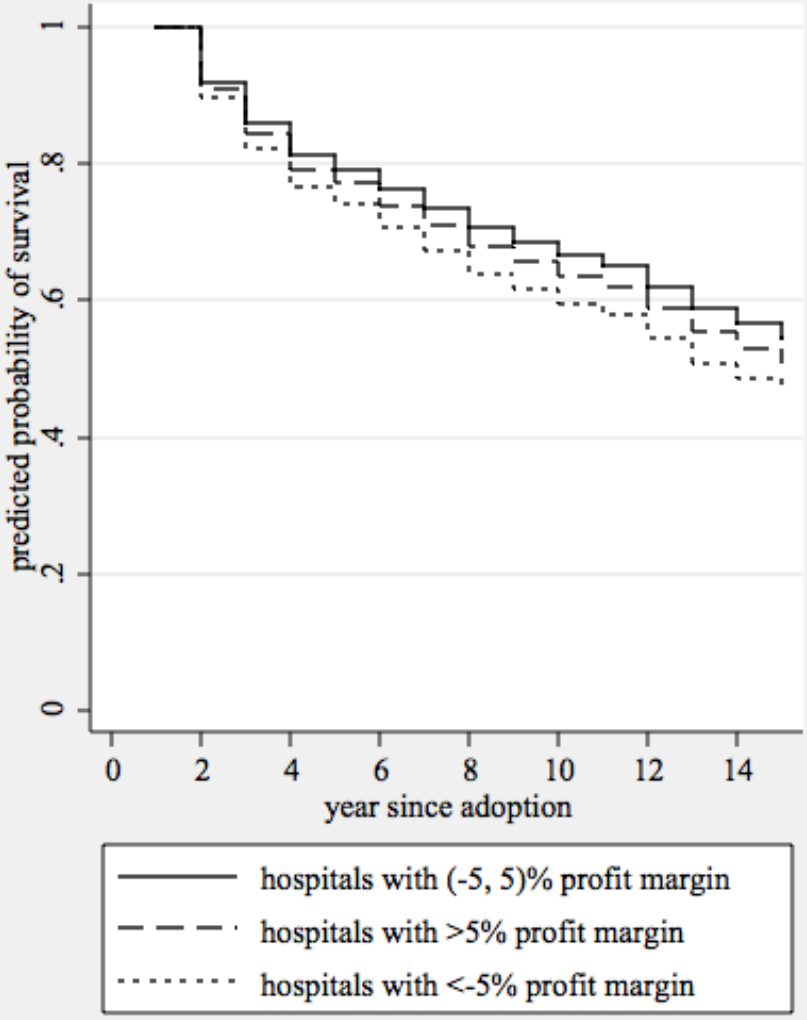
Hsia, Kellermann, Shen, JAMA, 2011; 305 (19): 1978-1985

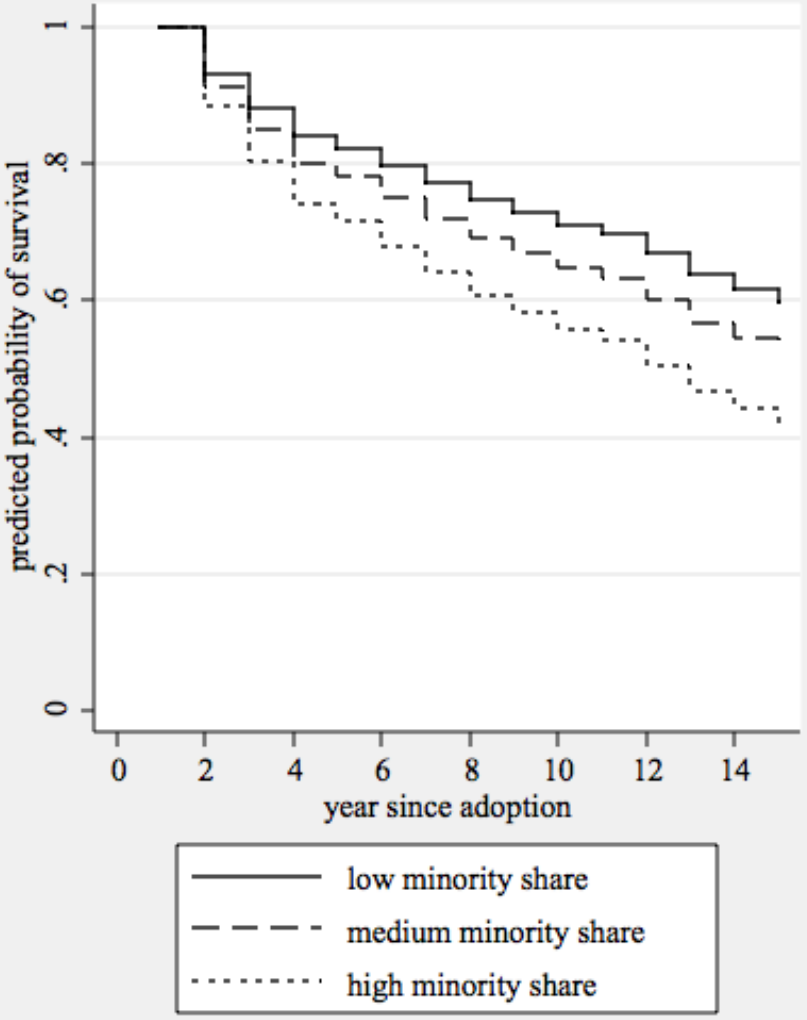
Trauma Center Closures in the U.S., 1992-2005



Shen, Hsia, Kuzma, Medical Care 2009; 47 (9): 968-978

Low profit margins and high % minorities = increased “death rate” of trauma centers





Discussion/ Feedback

Additional slides

Methods: Operating Assumptions

1. An admission within 2 days of an ED visit for trauma is likely to be related to a trauma.

2. If an index admission is associated with an ED visit states the patient was discharged home, assume the ED disposition to be incorrect.

3. Trauma Center status was assigned by year. If a TC was designated mid-year, the center was considered to be a trauma center for the entire calendar year containing the month of designation.

4. To determine order of >=3 visits where >=2 visits dates are the same:
   - Assume >=2 ED visits to the same hospital on the same day are the same ED visit
   - Assume if >=3 visits where the hospital for the ED and PDD visit are the same represent an admission from the ED to that hospital.
     - If the 3rd visit is an ED visit on the same date, assume the 3rd ED visit was the 1st hospital visited
     - If the 3rd visit is a PDD admit on the same date, assume the 3rd PDD visit followed the other two.

Methods

- Exclusion Criteria
  - Record linkage number missing
  - Date of service missing
  - Admission listed as "scheduled visit"
  - Hospital not listed as a "general acute care hospital"
  - Exclude if location of hospital visited could not be determined
  - Exclude cases with multiple PDD and ED visits where order of visits could not be determined (ex: >3 visits on the same day where all hospitals were different)
  - Exclude if gender not listed

Methods

- Variables
  - Demographics (age, race, gender)
  - Insurance Status
  - Injury severity (ISS, tmpm, iciss)
  - Charlson and Elixhauser comorbidities
  - Urban/rural designation of first hospital visited.
  - Mechanism of injury (derived from ecodes)

Results: Unadjusted Odds Death and 95% CI

Triage Flow pattern	**60-Day**	**1-year**
Primary	0.73 (0.72, 0.75)	0.57 (0.56, 0.58)
Secondary	0.66 (0.62, 0.70)	0.51 (0.48, 0.53)
No Triage to TC	Ref	Ref

Results: 60-Day Mortality and Undertriage by LEMSA