

Utilizing severity to interpret changing trends of hospitalized injury rates in the United States, 1988-2007

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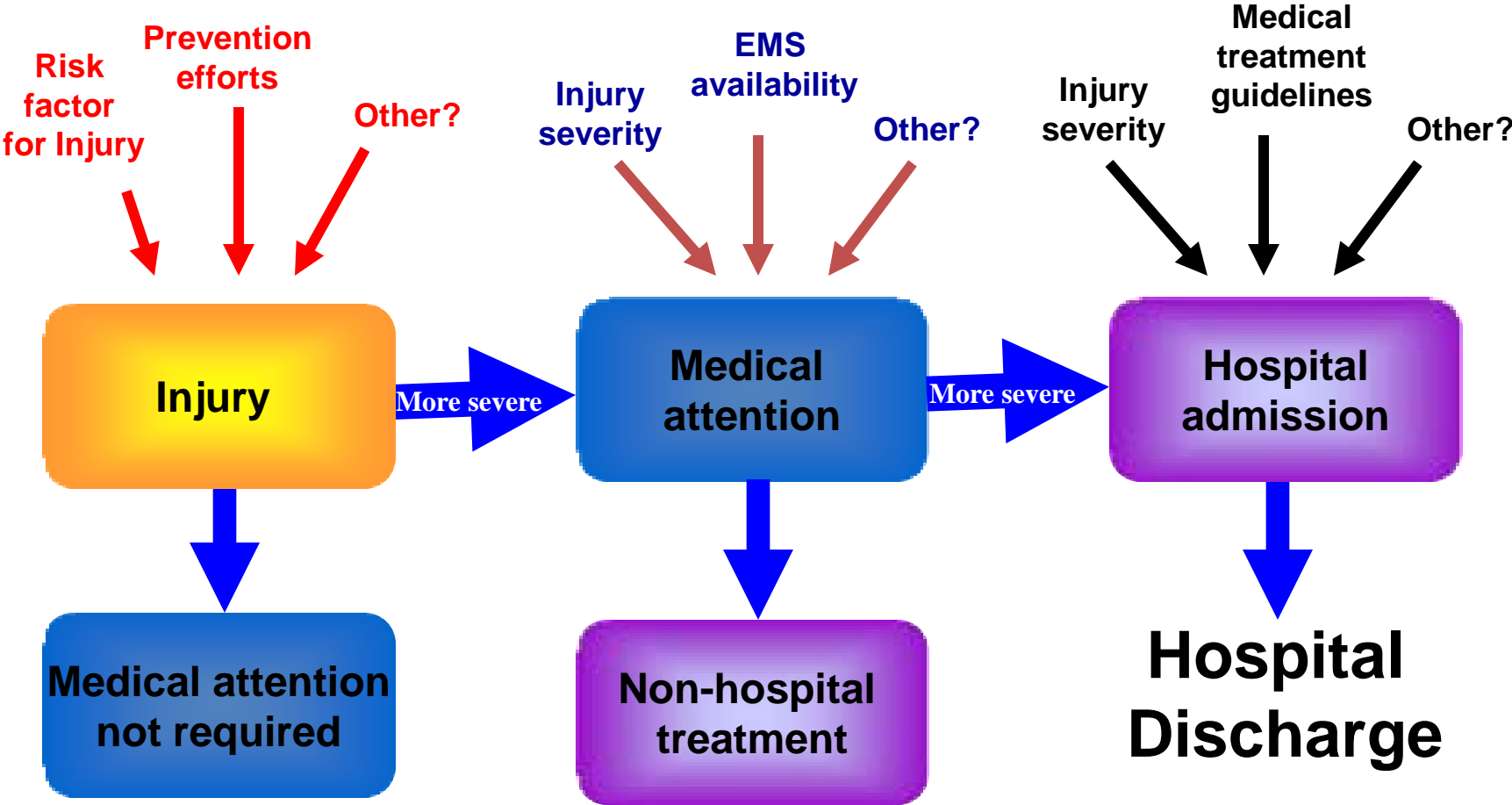
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2. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, Office of Analysis and Epidemiology

Background

- **Injury hospital discharge rates for persons 25-64 decreased between 1988-2000 and increased slightly between 2001-2007.**
- **Injury death rates remained steady from 1988-2007**
- **Factors contributing to the decreased rates of injury hospital discharges are not well understood**

What factors influence injury hospital discharges?



Objectives

- **Examine trends in injury hospital discharges for patients aged 25-64 from the past two decades by diagnosis and severity to provide insight into the effects of changes in injury incidence and in health care delivery.**

Methods--Data Source

Data source for injury severity

- **Healthcare Cost and Utilization Project Nationwide Inpatient Sample (HCUP-NIS): 2003-2007**
 - **HCUP-NIS is an all-payer inpatient care database with data from 5 to 8 million hospital stays from about 1,000 hospitals**
 - **Data are collected from**
 - ✓ **States participating in HCUP; for 2007, these states comprise 95 percent of the U.S. population**
 - ✓ **The NIS is sampled to approximate a 20-percent stratified sample of U.S. community hospitals.**

Methods--Data Source

Data source for trends

- **National Hospital Discharge Survey (NHDS): 1988-2007**
 - NHDS is a national probability sample survey of inpatient discharge records selected from non-Federal, short-stay hospitals.
 - Data are collected by
 - ✓ manual review of medical records (55%), medical abstract form
 - ✓ automated system (45%), computerized data files containing machine-readable medical record data

Methods—Injury definition

- Discharges with a *first-listed* diagnosis corresponding to an injury ICD-9-CM code were selected
- Barell Matrix defines:
 - Injury -- (ICD-9CM) 800.00-909.2, 909.4, 909.9-994.9, 995.5, 995.80-995.85
 - Body regions
 - TBI
 - Upper and Lower Extremities

Methods—Survival Risk Ratio (SRRs)

Injury severity measured using SRR

- Number of patients with any injury related ICD-9-CM codes were obtained for each code from HCUP-NIS by discharge status (dead or alive)
- SRRs for each ICD-9-CM injury diagnosis code calculated as:

$$\text{SRR} = \frac{\text{Number discharged (alive)}}{\text{Number discharged (dead+ alive)}}$$

- SRR values range from 0 (no patients survived) to 1 (all patients survived)

Methods—Injury Severity

- **Discharge severity score**
 - Severity score for each discharge in NHDS is the minimum SRR among all injury related ICD-9-CM codes for the discharge.

Example	Diagnosis 1	Diagnosis 2	Diagnosis 3
ICD-9-CM Codes	800.25	806.00	415.19
SRR	0.236	0.865	Not injury

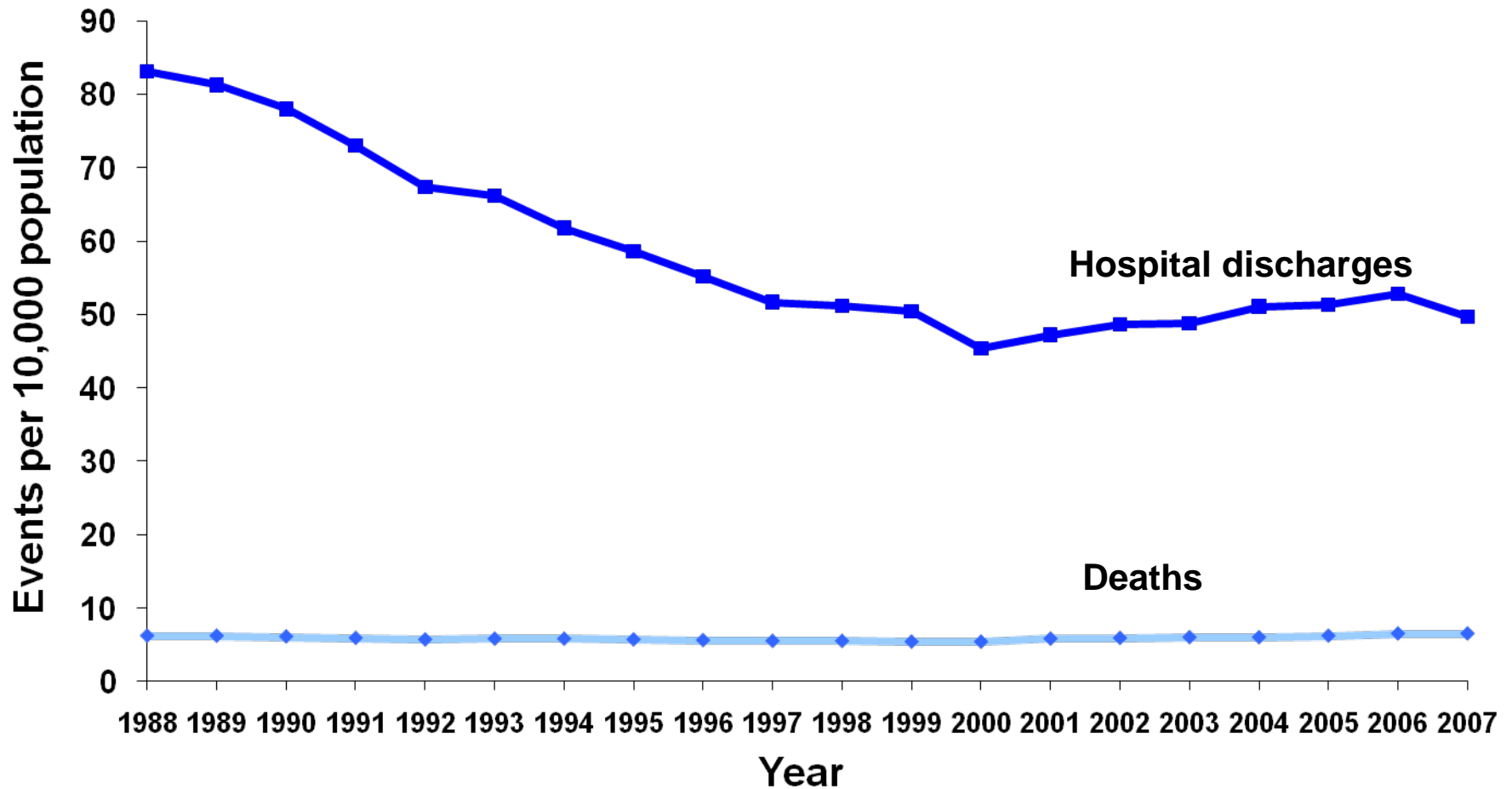
The minimum SRR= $\text{Min}(0.236, 0.865)=0.236$

- **Discharge categorized into 3 levels of severity**
 - **Least Severe:** $0.99 \leq \text{minimum SRR} \leq 1.0$
 - **Moderately Severe:** $0.95 < \text{minimum SRR} < 0.99$
 - **Most Severe:** $0.0 \leq \text{minimum SRR} \leq 0.95$

Methods—Analyze trends

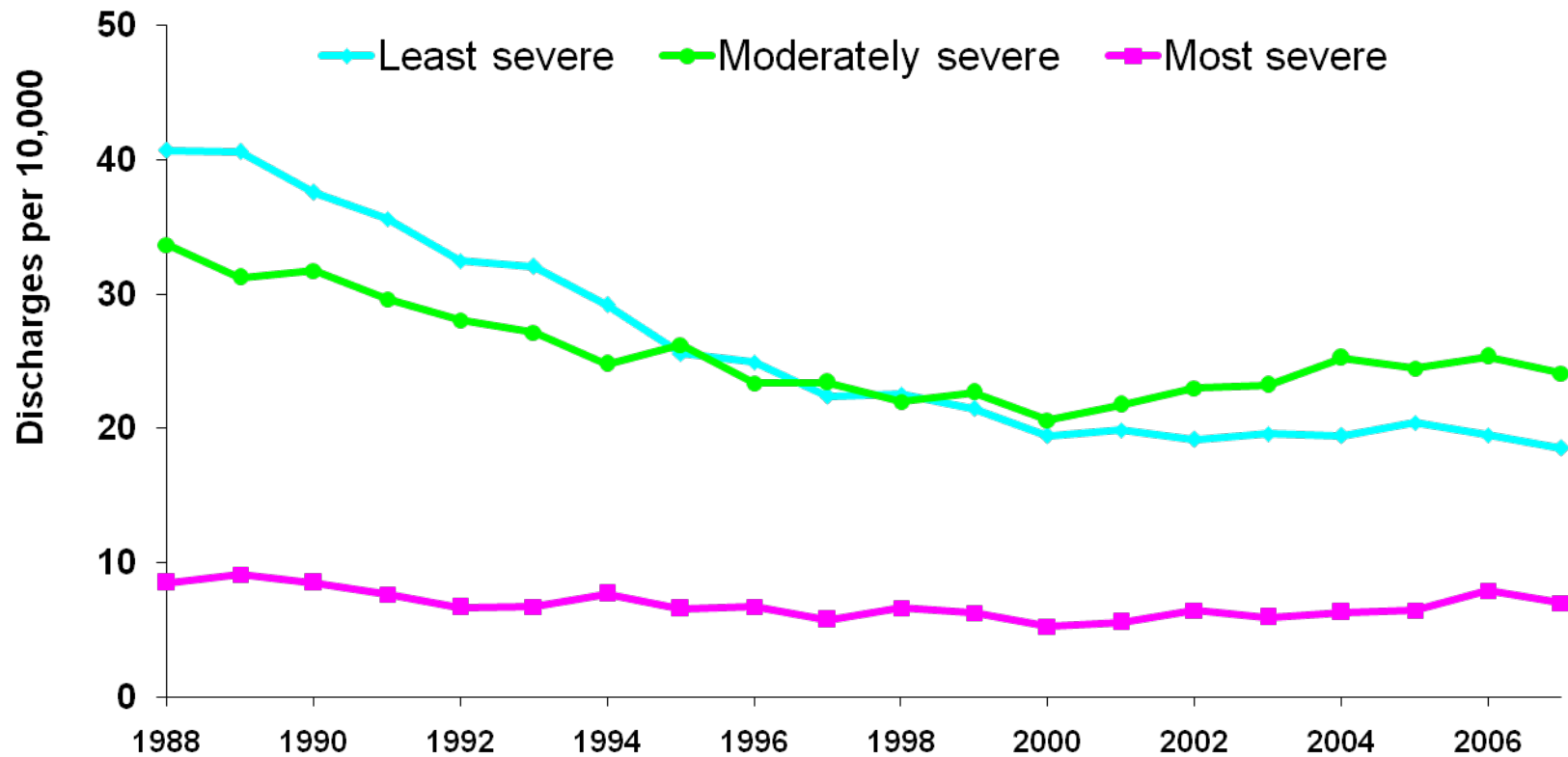
- Annual injury discharge rates per 10,000 population calculated for 3 severity levels for NHDS 1988-2007
- Standard errors calculated using SUDAAN
- Estimate and test average annual percent change in discharge rates using Joinpoint regression program

Injury rates -- hospital discharges and deaths: Persons 25-64 years of age, 1988-2007



Injury hospital discharge rates by level of severity

United States, Ages 25-64, 1988-2007



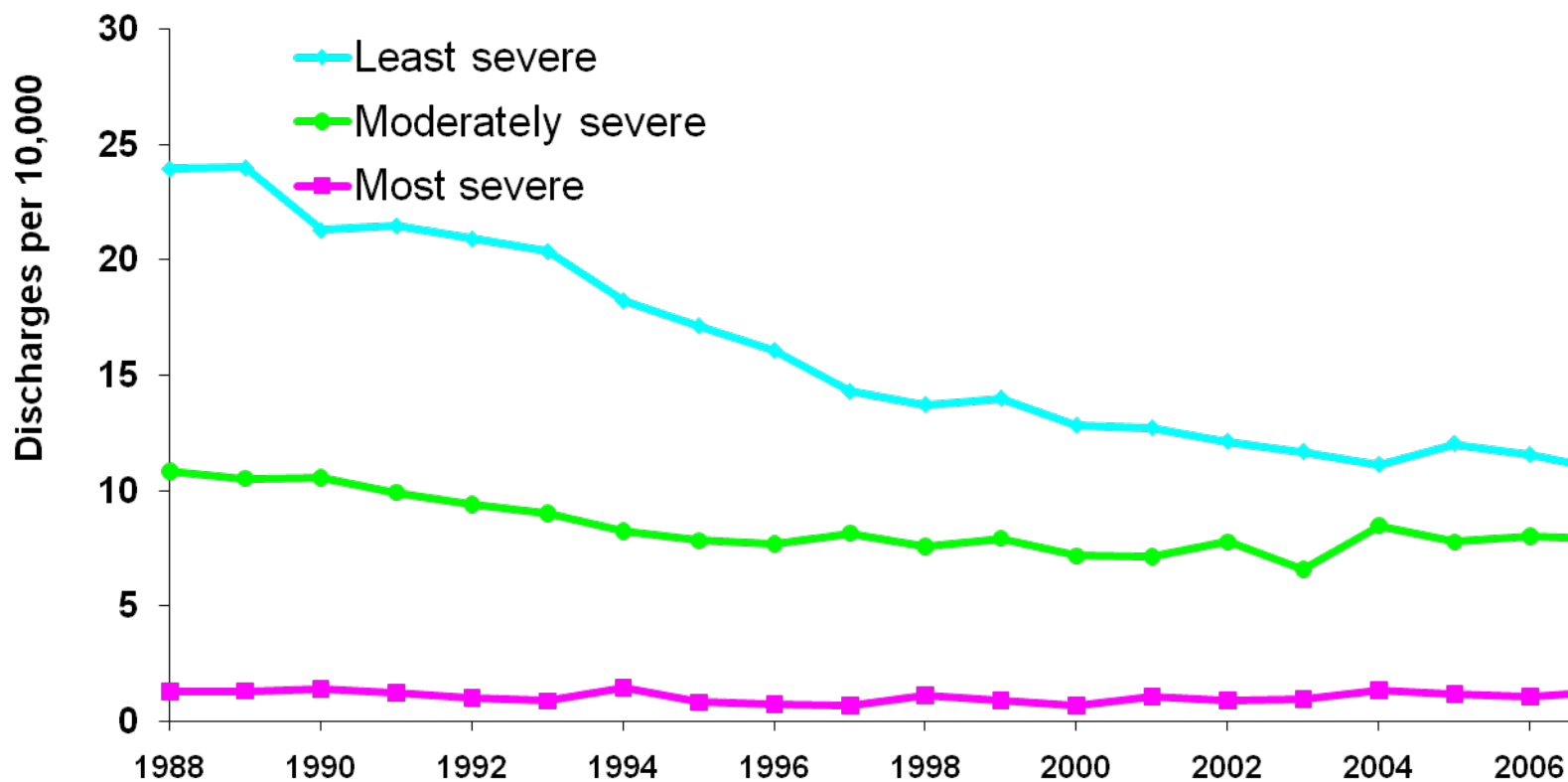
Data source: HCUP / AHRQ Nationwide Inpatient Sample and NCHS / CDC National Hospital Discharge Survey

Average annual percent change in hospital discharge rates United States, Ages 25-64, 1988-2007

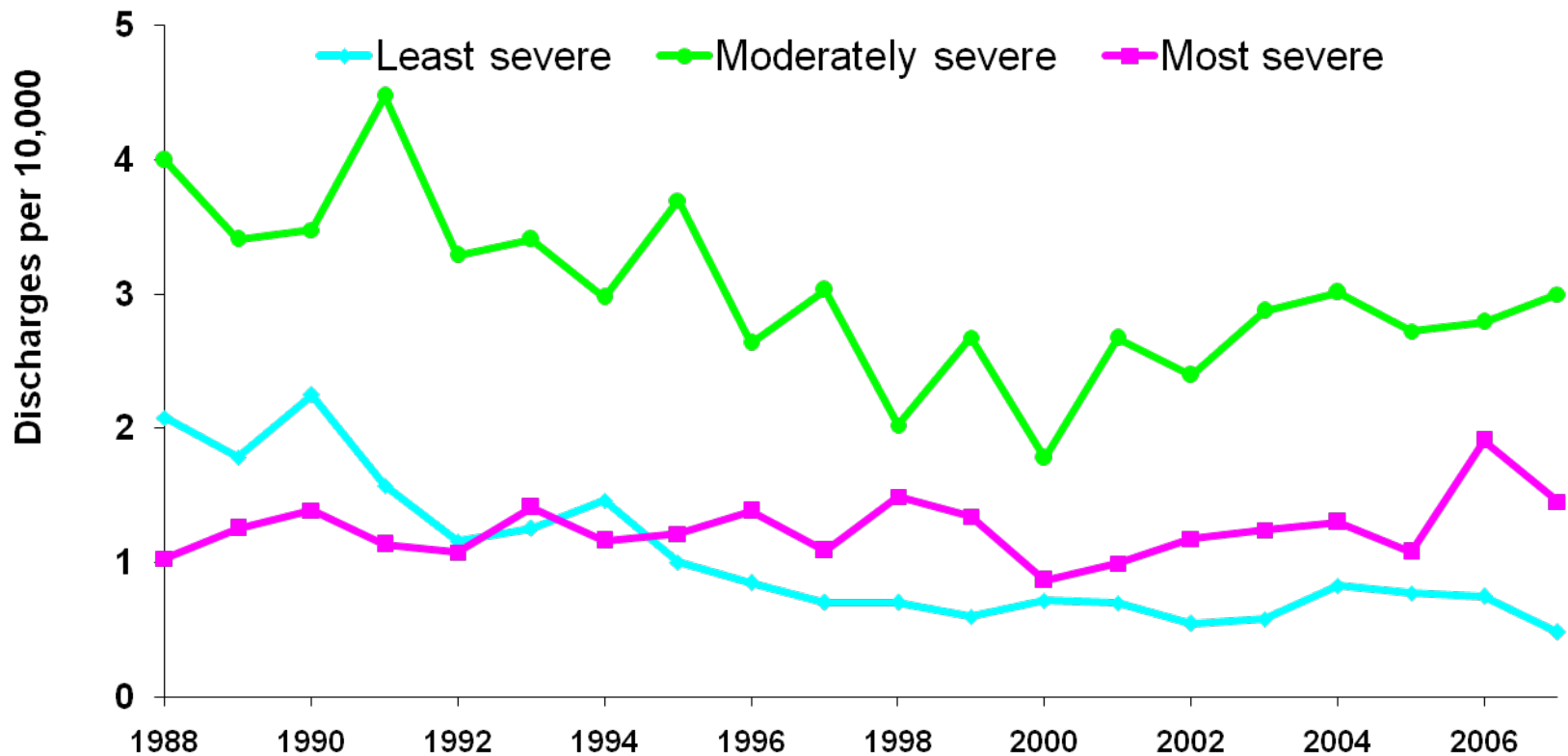
	Least severe	Moderately Severe	Most Severe
All injury	-4.4*	-1.7*	-1.6*
Traumatic Brain Injury	-6.6*	-1.9*	.9
Extremity injuries	-4.5*	-1.9*	-1.0

* Average Annual Percentage change is statistically significant from zero.

Injury hospital discharge rates for lower and upper extremity injuries United States, Ages 25-64, 1988-2007



Injury hospital discharge rates for traumatic brain injuries United States, Ages 25-64, 1988-2007



Discussion – Severity measure

Overall, trends in injury hospital discharges by empirically derived severity measures provide insight into the decreasing rates.

Limitations of severity measure:

- Severity is measured by probability of death while hospitalized.
 - Deaths occurring outside of the hospital account for at least two thirds of all injury deaths.
 - Using this measure, injuries which are disabling but are unlikely to lead to death are not considered severe.
- SRRs were calculated using the data for 2003-2007. Changes in the probability of survival during the time period might bias the severity rankings.

Discussion - Trends

- **Trends in injury hospital rates indicate**
 - **Least Severe injuries decreased at a faster rate than Moderately Severe and Most Severe from 1988-2007.**
 - **Much of the decrease from 1988–2000 in injury hospital discharge rates for persons 25–64 years of age is due to a decrease in the rates of least severe injury hospital discharges.**
- **Fewer minor (least severe) injuries being discharged over time could be explained by the following:**
 - **Decreases in minor injury incidence due to prevention measures.**
 - **Changes in the health care delivery for minor injuries.**