

# **Do Motorcycle Helmet Laws Affect Craniofacial injuries?**

**Nick S. Adams, MD**



# Do Motorcycle Helmet Laws Affect the Incidence of Craniomaxillofacial Injuries?

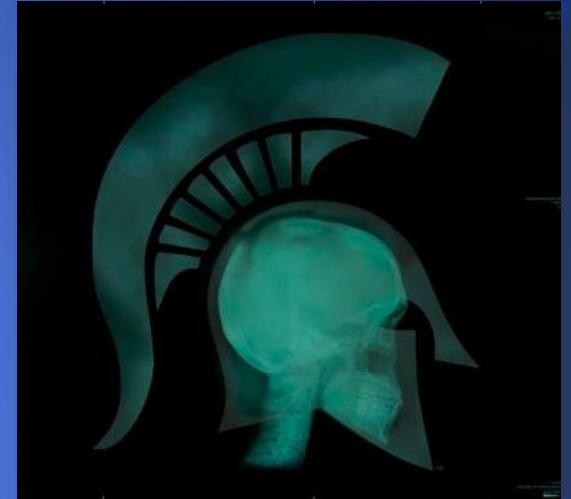
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# Institution



# Disclosures

- The authors have no disclosures

# Publication

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## PEDIATRIC/CRANIOFACIAL

### The Effects of Motorcycle Helmet Legislation on Craniomaxillofacial Injuries

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**Background:** Motorcycle helmet legislation has been a contentious topic for over a half-century. Benefits of helmet use in motorcycle trauma patients are well documented. In 2012, Michigan repealed its universal motorcycle helmet law in favor of a partial helmet law. The authors describe the early clinical effects on facial injuries throughout Michigan.

**Methods:** Retrospective data from the Michigan Trauma Quality Improvement Program trauma database were evaluated. Included were 4643 motorcycle trauma patients presenting to 29 Level I and II trauma centers throughout Michigan 3 years before and after the law repeal (2009 to 2014). Demographics, external cause of injury codes, *International Classification of Diseases, Ninth Revision* diagnosis codes, and injury details were gathered.

**Results:** The proportion of unhelmeted trauma patients increased from 20 percent to 44 percent. Compared with helmeted trauma patients, unhelmeted patients were nearly twice as likely to sustain craniomaxillofacial injuries (relative risk, 1.90), including fractures (relative risk, 2.02) and soft-tissue injuries (relative risk, 1.94). Unhelmeted patients had a lower Glasgow Coma Scale score and higher Injury Severity Scores. Patients presenting after helmet law repeal were more likely to sustain craniomaxillofacial injuries (relative risk, 1.46), including fractures (relative risk, 1.28) and soft-tissue injuries (relative risk, 1.56). No significant differences were observed for age, sex, Injury Severity Score, or Glasgow Coma Scale score ( $p > 0.05$ ).

**Conclusions:** This study highlights the significant negative impact of relaxed motorcycle helmet laws leading to an increase in craniomaxillofacial injuries. The authors urge state and national legislators to reestablish universal motorcycle helmet laws. (*Plast. Reconstr. Surg.* 139: 1453, 2017.)

**M**otorcyclists are 30 times more likely to die and five times more likely to be injured when compared mile for mile to passenger car occupants.<sup>1</sup> Motorcycle helmets have been shown to prevent nearly 40 percent of fatal injuries and 13 percent of nonfatal serious injuries.<sup>1-5</sup> However, as many as one-third of motorcycle riders still do not wear helmets, with a larger percentage

riding unhelmeted in states without universal helmet laws.<sup>3</sup> The effects of motorcycle helmet legislation on helmet use, patient injuries, and outcomes have been demonstrated.<sup>3-9</sup> However, few to no data are available evaluating the effects of motorcycle helmet laws on craniomaxillofacial trauma.

Complex facial injuries are common among motorcycle trauma patients and are over twice as

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# The Effects of Mot

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Ireland	1	2%
Netherlands	1	2%
Australia	1	2%
Other	2	4%
Unknown	20	36%

## Demographic breakdown

Type	Count	As %
Members of the public	35	63%
Practitioners (doctors, other healthcare professionals)	16	29%
Scientists	4	7%
Science communicators (journalists, bloggers, editors)	1	2%



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# Motorcycle Helmet Law

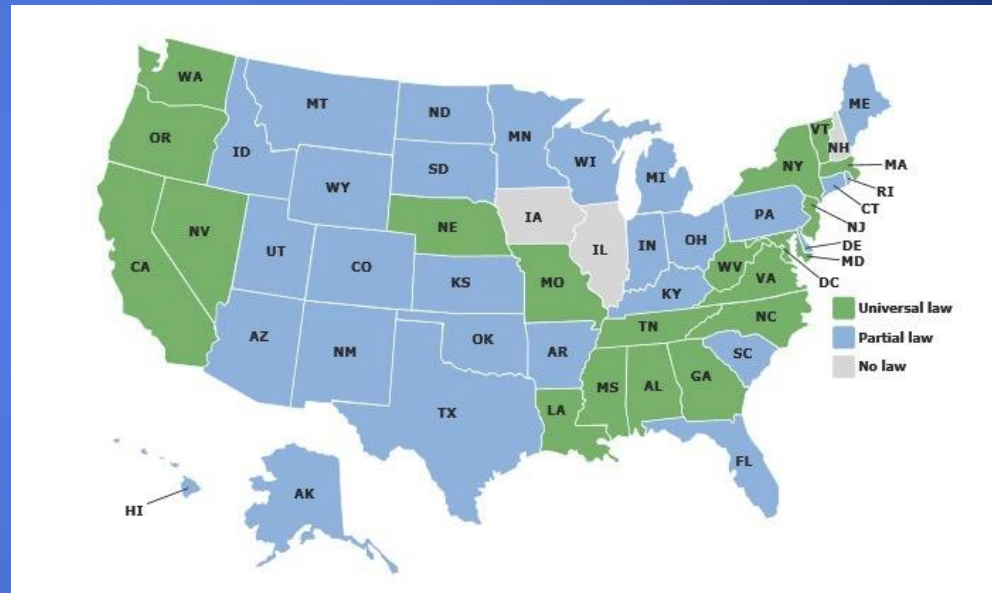
- National Highway Safety Act
  - 1966
- Act rescinded
  - 1976
- ↑ Motorcycle fatalities
  - 25-46%





# Michigan Motorcycle Helmet Law

- April 13, 2012
- $\geq 21$ yo + 2y experience
  - OR
- Safety course
  - Plus
- \$20,000 insurance



# Impact of Helmet Use

- ↓ Mortality, head trauma
- ↓ Hospital admission and cost
- ↓ Craniomaxillofacial trauma
- Do helmet laws make a difference?

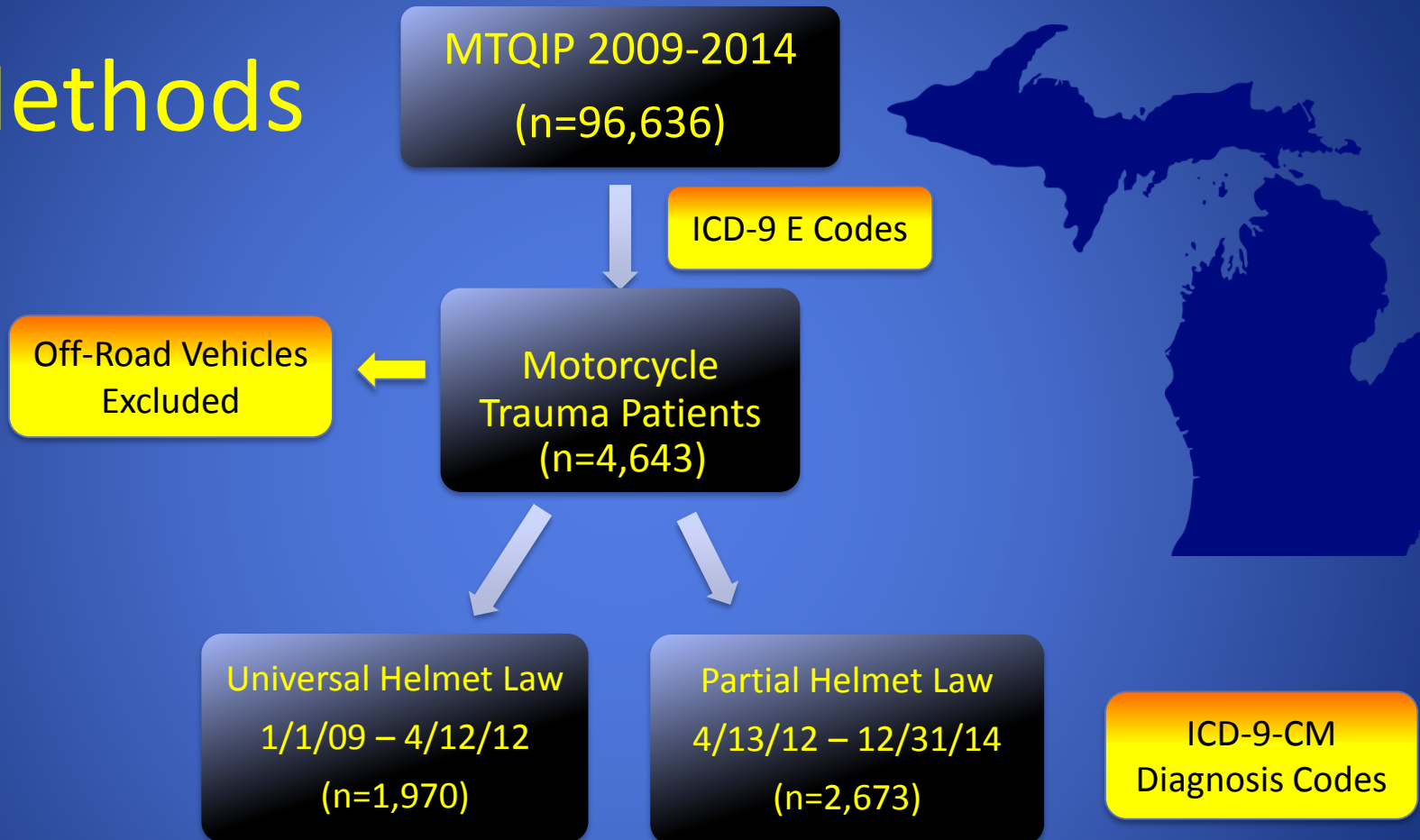


# Objective

- Assess the impact of helmet laws on motorcycle trauma patients
  - **Helmet use**
  - **Cranio-maxillofacial (CMF) injuries**
- Assess the impact of helmet use on motorcycle trauma patients
  - **CMF Injuries**



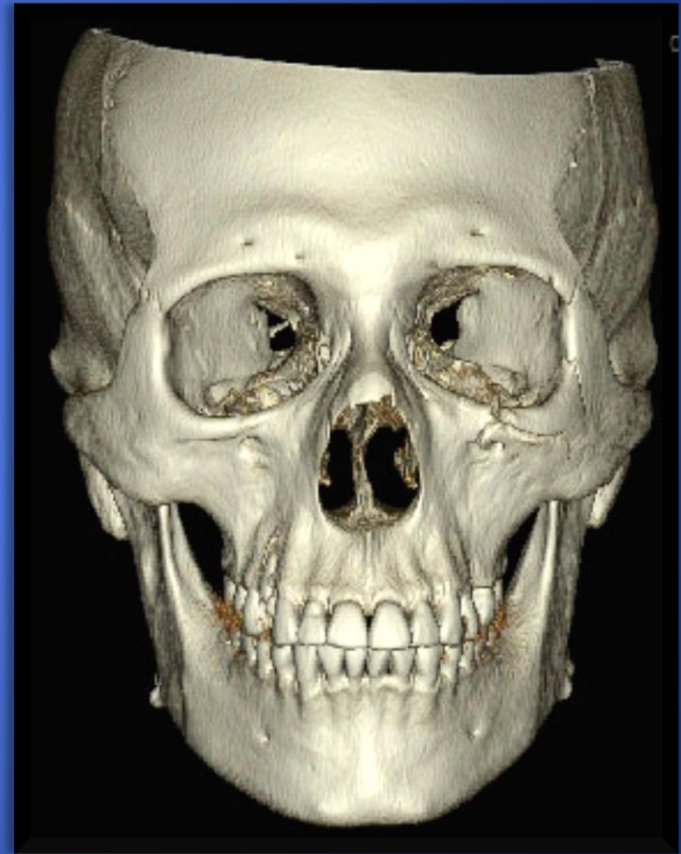
# Methods



ICD-9 E = International Statistical Classification of Disease, Ninth Revision, External Cause of Injury  
ICD-9-CM = International Statistical Classification of Disease, Ninth Revision, Clinical Modification

# ICD-9-CM Diagnosis Codes

- Facial Fracture Codes
  - Nasal Bone Fractures – 802.0-1
  - Orbital Fractures – 802.6-8
  - Malar Fractures – 802.4-5
  - Mandibular Fractures – 802.20-39
- Soft Tissue Trauma Codes
  - Facial Laceration – 873.2-7
  - Facial Abrasion – 910
  - Facial Contusion - 920





# Methods

- Statistical Analysis
  - STATA v14.1
    - Descriptive statistics
    - Chi-square test
    - Two sample t-test

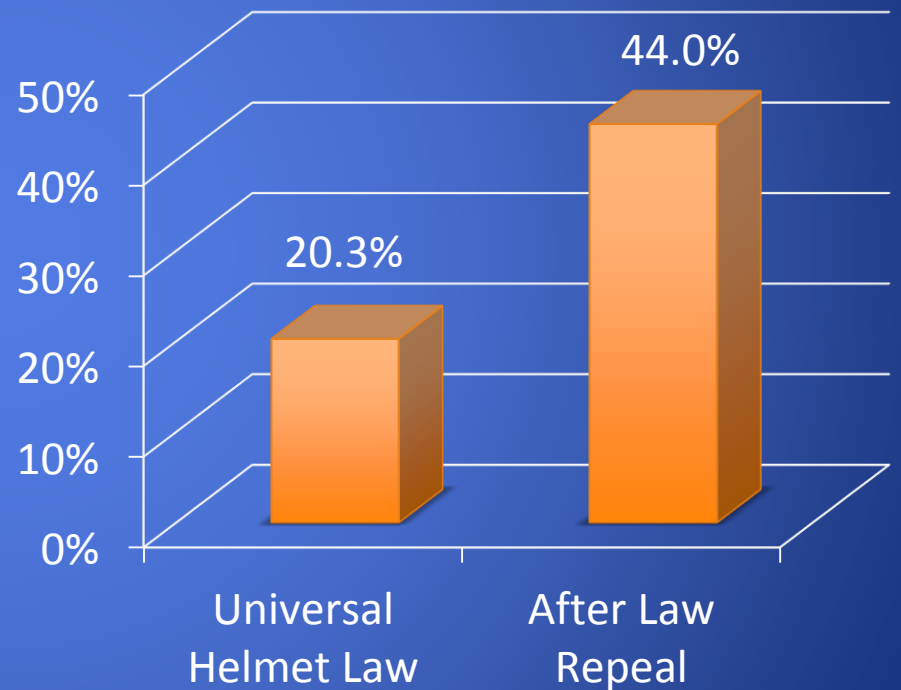




# Results

- Descriptive Statistics
  - 87% male
  - $43.7 \pm 14.7$  years
- ↑ Unhelmeted patients

Rate of Unhelmeted Trauma Patients



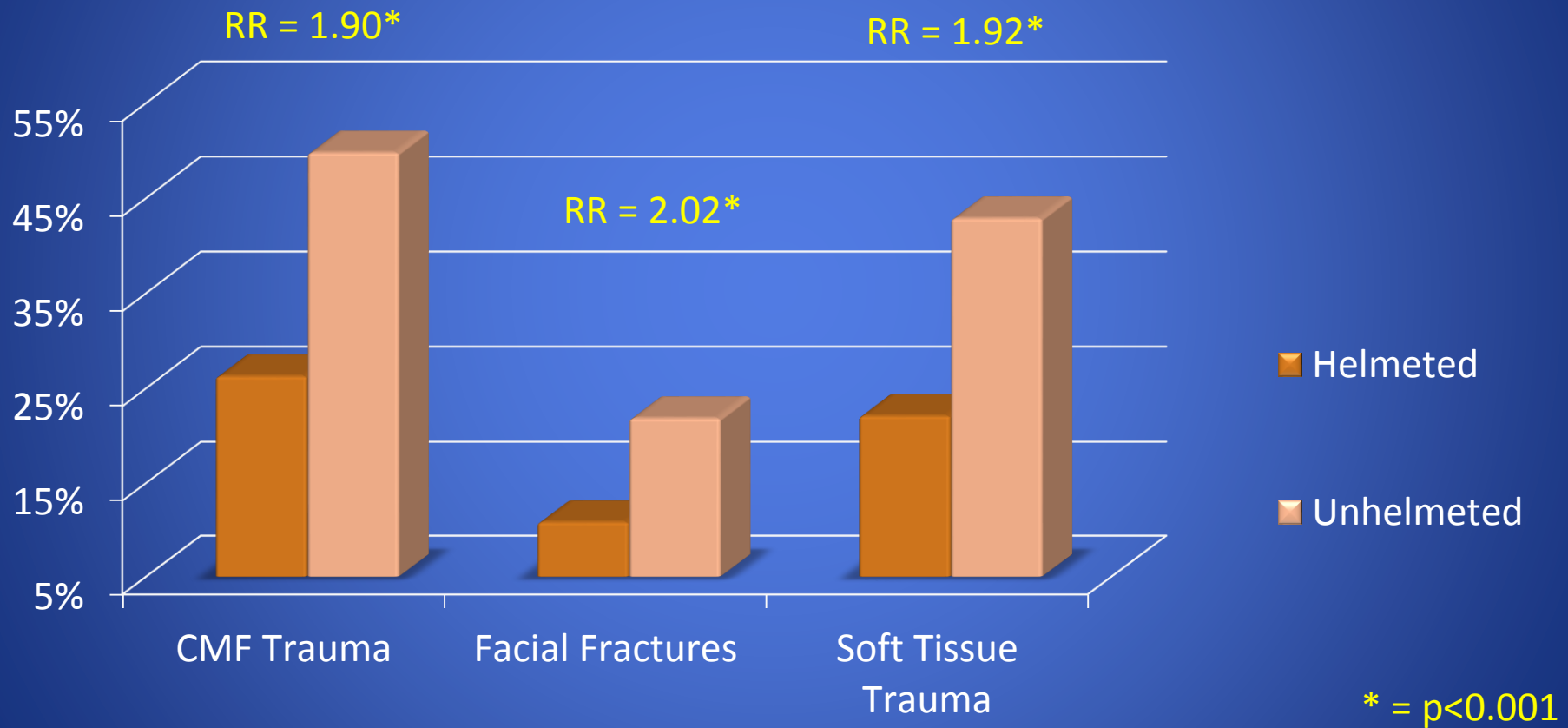
$p < 0.0001$

# Helmet vs. No Helmet

	Helmet	No Helmet	p Value
Age (y)	43.9	43.6	NS
Any EtOH - BAC (>0)	111.5	148.8	<0.0001
Intoxicated - BAC (>79)	178.4	198.6	0.0022
GCS (ED)	13.9	13.1	<0.0001
ISS	14.3	15.2	0.0100
NISS	17.7	19.5	0.0001
ICU Days	7.0	6.9	NS

BAC = Blood alcohol content (mg/dL), GCS = Glasgow Coma Scale, ISS = Injury Severity Score, NISS = New Injury Severity Score, ICU = Intensive Care Unit

# Facial Injuries: Helmet vs. No Helmet



# Helmet vs. No Helmet

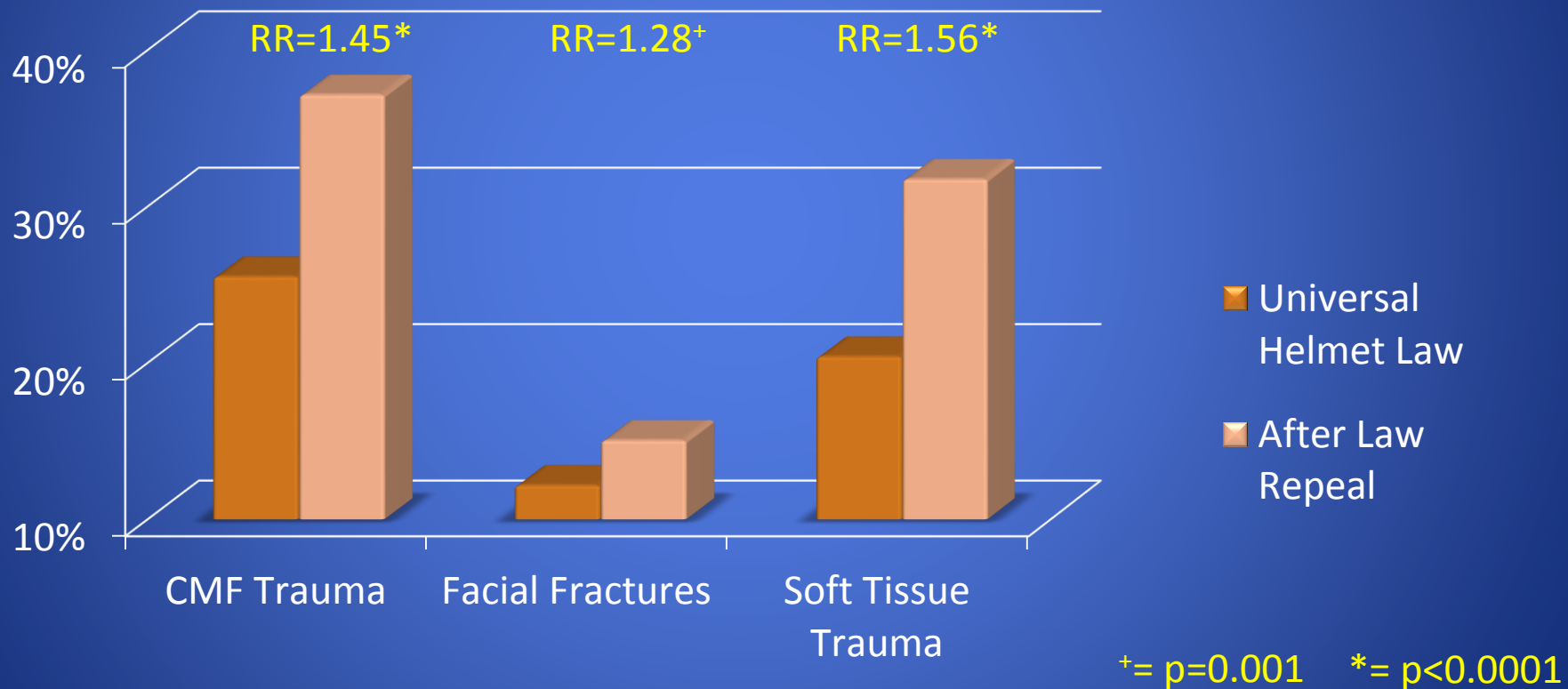
	Helmeted Patients	Unhelmeted Patients	p Value	Relative Risk
Nasal Bone Fractures	5.14%	8.96%	<0.0001	1.74
Orbital Fractures	4.96%	11.31%	<0.0001	2.28
Malar Fractures	5.38%	12.53%	<0.0001	2.33
Mandibular Fractures	1.82%	3.34%	0.005	1.83
Facial Lacerations	12.77%	23.01%	<0.0001	1.89
Facial Abrasions	7.39%	11.77%	<0.0001	1.59
Facial Contusions	6.36%	16.25%	<0.0001	2.55

# Effects of Helmet Law Repeal

	Universal Law	Partial Law	p Value
Age (y)	43.6	43.7	NS
Any EtOH - BAC (>0)	135.5	130.7	NS
Intoxicated - BAC (>79)	182.3	191.7	NS
GCS (ED)	13.7	13.6	NS
ISS	15.3	14.7	NS
NISS	19.2	18.6	NS
ICU Days	6.4	6.9	NS

BAC = Blood Alcohol Content (mg/dL), GCS = Glasgow Coma Scale, ISS = Injury Severity Score, NISS = New Injury Severity Score, ICU = Intensive Care Unit

# Facial Injuries: Effects of Helmet Law Repeal





# Effects of Helmet Law Repeal

	Universal Helmet Law	Partial Helmet Law	p Value	Relative Risk
Nasal Bone Fractures	5.84%	6.81%	0.181	1.17
Orbital Fractures	6.40%	7.59%	0.116	1.19
Malar Fractures	5.99%	8.45%	0.002	1.41
Mandibular Fractures	2.34%	2.32%	0.972	0.99
Facial Lacerations	10.86%	17.73%	<0.0001	1.62
Facial Abrasions	7.01%	9.24%	0.006	1.32
Facial Contusions	5.18%	11.11%	<0.0001	2.26

# Discussion

- Craniomaxillofacial Injuries are common
- Helmet law affect behaviors and injuries
  - Unhelmeted patients
  - More CMF trauma
- Poor health outcomes

## Long-Term Physical Impairment and Functional Outcomes after Complex Facial Fractures

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*Baltimore, Md.*

# Limitations

- Retrospective
- Evolving database
- Multiple sources
- Incomplete data
- No frontal bone/frontal sinus codes



# Conclusion

- Unhelmeted Trauma Patients
  - ↑CMF trauma by 90%
  - ↓GCS, ↑ISS, ↑NISS
- Following Repeal
  - ↑Unhelmeted trauma patients
  - ↑CMF trauma by 45%
    - Fractures (28%↑) and Soft tissue injuries (56%↑)



# Thank you!

- MTQIP

