

California Enhanced Motorcycle Collision Data Project

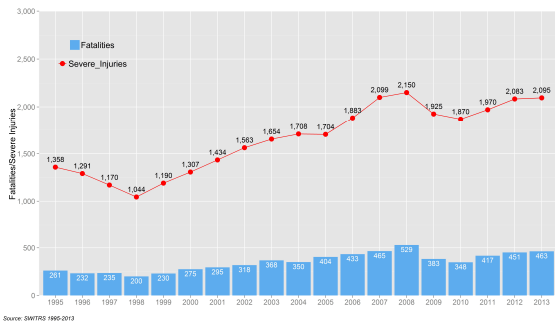
Rice et al. UC Berkeley SafeTREC

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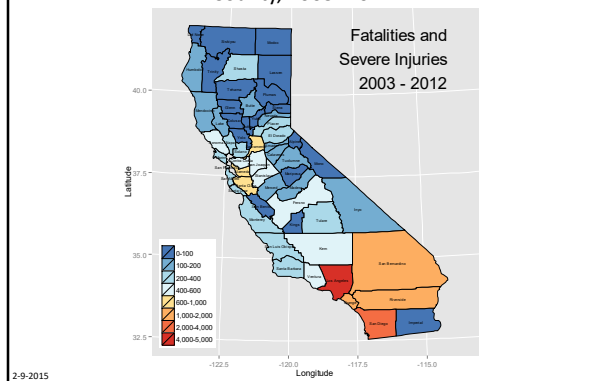
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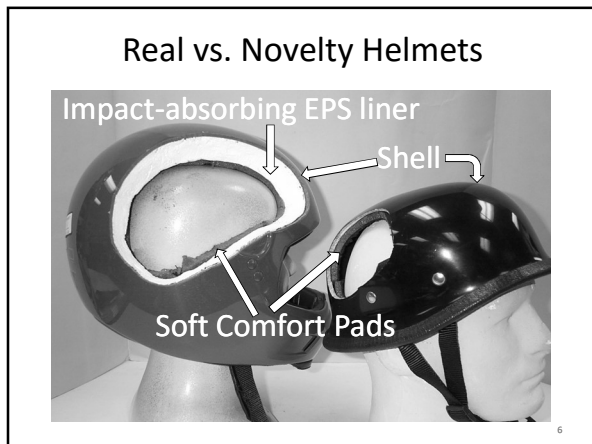
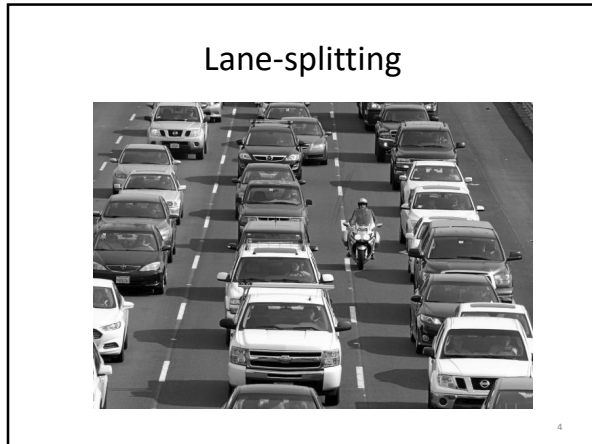
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Motorcycle Collision Fatalities and Severe Injuries, California, 1995-2013



Summary of MC Fatalities and Severe Injuries by County, 2003~2012





Just Because It's Got a DOT Sticker
Doesn't Mean It's a Real Helmet

**10 DECALS
REFLECTIVE**



[http://www.ebay.com/itm/RED-Reflective-DOT-D-O-T-Approved-Helmet-Decal-Sticker-
/230630377732?hash=item35b2a44904:m:mF8lrW4Cu97vzUUHJ5B1FDQ&vxp=mtr](http://www.ebay.com/itm/RED-Reflective-DOT-D-O-T-Approved-Helmet-Decal-Sticker-/230630377732?hash=item35b2a44904:m:mF8lrW4Cu97vzUUHJ5B1FDQ&vxp=mtr)

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Enhanced Motorcycle Collision Data Project

- Two-year project
- California Highway Patrol
- University of California Berkeley
- Funding from Office of Traffic Safety

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Objectives

- Collect information during motorcycle collision investigations that is more detailed than normally collected
- One-year period (Aug 2012 - July 2013)
- All CHP-investigated collisions
- Include local law enforcement agencies

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Data Collection

- One-page supplemental data form
- CHP officers used a secure web site
- Local agencies sent hard copy forms
- Corresponding collision reports also submitted by all agencies
- Key entry and linkage to supplemental form data
- Linkage to data from SWITRS database

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CALIFORNIA MOTORCYCLE COLLISION SUPPLEMENTAL DATA FORM

CONFIDENTIAL - Not for public release. Do not release at local area or agency level.

1-DATE OF INCIDENT	2-TIME OF INCIDENT	3-PLACE	4-OFFICER ID#	5-AGENCY #
6-LICENSE ENDORSEMENT: <input type="checkbox"/> M-1 <input type="checkbox"/> M-2 <input type="checkbox"/> Valid M/C Permit <input type="checkbox"/> None				
7-MOTORCYCLIST SOBRIETY: <input type="checkbox"/> BAC <input type="checkbox"/> N/A				
8-WHEELS ON MOTORCYCLE: <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4				
9-WAS LANE SPLITTING INVOLVED? <input type="checkbox"/> Yes <input type="checkbox"/> No				
10-WAS MOTORCYCLE REAR-ENDED? <input type="checkbox"/> Yes <input type="checkbox"/> No				
11-REAR MOTORCYCLE REAR-ENDED OTHER VEHICLE? <input type="checkbox"/> Yes <input type="checkbox"/> No				
12-SPEED OF MOTORCYCLE: _____ MPH				
13-SPEED OF SURROUNDING TRAFFIC: _____ MPH <input type="checkbox"/> N/A				
MOTORCYCLIST		PASSENGER		
14-RIDER TRANSPORTED: <input type="checkbox"/> Yes <input type="checkbox"/> No				
15-TYPES OF INJURY (check all that apply)				
<input type="checkbox"/> Head <input type="checkbox"/> Neck <input type="checkbox"/> None visible <input type="checkbox"/> Torso <input type="checkbox"/> Arm/Leg <input type="checkbox"/> Facial		<input type="checkbox"/> Head <input type="checkbox"/> Neck <input type="checkbox"/> None visible <input type="checkbox"/> Torso <input type="checkbox"/> Arm/Leg <input type="checkbox"/> Facial		
16-TYPE OF HELMET:				
<input type="checkbox"/> Full Face <input type="checkbox"/> 3/4 Helmet <input type="checkbox"/> 3/4 Helmet <input type="checkbox"/> Modular up <input type="checkbox"/> Modular down <input type="checkbox"/> Modular up <input type="checkbox"/> Modular down <input type="checkbox"/> Modular unknown <input type="checkbox"/> None		<input type="checkbox"/> Full Face <input type="checkbox"/> 3/4 Helmet <input type="checkbox"/> 3/4 Helmet <input type="checkbox"/> Modular up <input type="checkbox"/> Modular down <input type="checkbox"/> Modular up <input type="checkbox"/> Modular down <input type="checkbox"/> Modular unknown <input type="checkbox"/> None		
17-APPEARS TO MEET DOT STANDARD:				
<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown		
18-STANDARD LABEL ON HELMET:				
<input type="checkbox"/> DOT <input type="checkbox"/> DOT/SMELL <input type="checkbox"/> DOT/VOICE <input type="checkbox"/> No Label <input type="checkbox"/> Unknown		<input type="checkbox"/> DOT <input type="checkbox"/> DOT/SMELL <input type="checkbox"/> DOT/VOICE <input type="checkbox"/> No Label <input type="checkbox"/> Unknown		
19-COLLISION DAMAGE TO HELMET:				
<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown		
20-HELMET REMAINED ON HEAD DURING COLLISION:				
<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown		
21-REFLECTIVE MATERIAL:				
<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown		

California Motorcycle Collision Supplemental Data Form, version June 13, 2012

Collected Information

Lane-Splitting

- Was motorcyclist lane-splitting?
- Speed of the motorcycle
- Speed of surrounding traffic
- Rear-end status

Helmet Characteristics

- Helmet type (full-face, open-face, modular, half-helmet)
- Helmet standard labeling (DOT, Snell, etc)
- DOT-compliance (per officer)
- Helmet damage
- Helmet retention

Collected Information

Other Information

- Body region injured (head, neck, torso, arm/leg)
- Fatality
- Driver license type
- Blood alcohol content
- Use of high visibility or reflective gear
- Whether rider was transported by EMS

Local Agency Participation

- Local law enforcement agencies invited
- No funding or incentives
- Office of Traffic Safety encouraged participation
- 300 agencies in CA write collision reports
- 83 participated in study
- Mostly small/medium departments
- Some larger agencies limited submissions

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Table 1. Supplemental data form submission by agency type

Agency Type	Collisions*	Forms Submitted	%
CHP	7,394	6,275	85
Local agency	5,553	1,545	28

* Identified using SWITRS

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Table 2. Final data set by agency type and injury/fatality status

	Injury or Fatal Resulted		Total
	No	Yes	
	233	1,061	Agency Type
	1,469	4,849	
Total	1,702	5,910	CHP

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Analyses conducted to date

- Lane-splitting injury outcomes
- Head injury
- Neck injury

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Lessons Learned

- Make the supplemental data form “officer-proof”
- Improve linkage of supplement form to rest of report
- Recruit large (urban) police departments to collaborate

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Lane-splitting Analysis

- We compared riders who were lane-splitting at the time of collision with those who were not lane-splitting
 - Personal and collision characteristics
- Among lane-splitting riders, we compared injury outcomes by the manner in which they were lane-splitting
 - Head, neck, torso, and extremity injury

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Lane-splitting riders were:

- Using better helmets
- Traveling at lower speeds
- More often riding on weekdays and during commute hours.
- Less often carrying a passenger
- Less often under the influence of alcohol
- Less likely to suffer a head injury (9% vs 17%)
- Less likely to suffer a torso injury (19% vs 29%)
- Less likely to suffer a fatal injury (1.2% vs 3.0%)

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Association between style of lane-splitting and injury

- There was no meaningful increase in injury incidence until traffic speed exceeded roughly 50 MPH;
- Motorcycle speed differential is a stronger predictor of outcomes; and
- Speed differentials of up to 15 MPH were not associated with changes in injury occurrence.

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Analysis: Association between helmet type and risk of HEAD INJURY

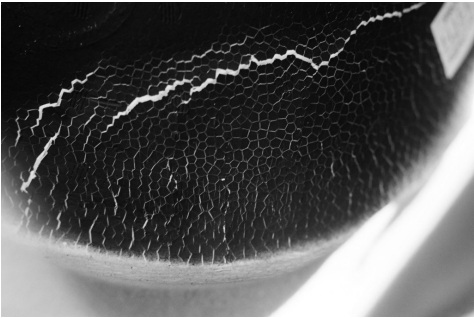
- Motorcycle helmets overall well-recognized as very protective against head and brain injury.
- Most studies use “yes/no” helmet information.
- Studies with specific helmet type information tend to be small studies.

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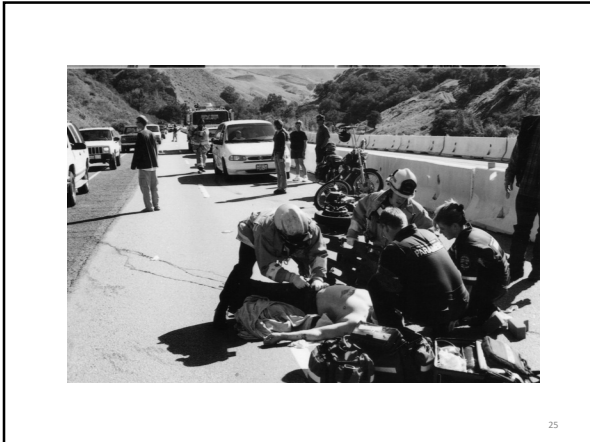
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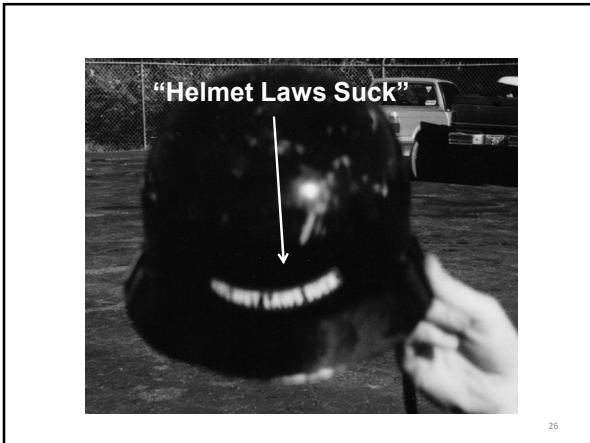
- Our data present an opportunity to compare injury outcomes across several helmet types.
- We defined a novelty helmet as a half-helmet that the officer determined was not compliant with the DOT standard. The presence (or absence) of a DOT label was not used in our definition because of the common use of fraudulent DOT labels in California.

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Results

Our models demonstrate that:

- Full-face ----- 
- Modular helmets ----- 

were the most protective against head injury.

Followed by

- Open-face 
- Half-helmets ----- 
- Novelty helmets ----- 

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Table 2. Head injury risk ratios* and 95% confidence intervals

Helmet Type**	RR	95% CI
Full-Face	1	-
Modular	1.08	0.81-1.44
Open-Face	1.69	1.41-2.03
Half-Helmet	1.91	1.66-2.20
Novelty Helmet	2.78	2.33-3.32

*Adjusted for age, sex, alcohol use, operator status, and motorcycle speed
** Overall p < 0.001

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Results (cont)

- Riders using novelty helmets were almost 3 times as likely to suffer head injury as riders using full-face helmets.

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Analysis: Association between helmet type and risk of NECK INJURY

- Most studies have found that helmets do not cause neck injury.
- A small number reported that helmets cause neck injury or increase injury severity.
- Goldstein, 1986, has been adopted by the anti-helmet community as “proof” that helmets cause neck injury.
- Our recently published re-analysis of Goldstein’s data suggest that his models were egregiously inadequate, and that helmets were mildly protective against neck injury.

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Analysis: Association between helmet type and risk of NECK INJURY (cont')

- Using our data, we compared the incidence of neck injury across helmet types.

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Results

- No evidence that helmets cause neck injury.
- Neck injury incidence ranged from 9% to 11%.
- P-value from multivariate regression model was 0.88.
- We did identify several characteristics that were predictors of neck injury:
 - Higher age
 - Elevated BAC
 - Greater motorcycle speed
 - Broadside or head-on collision types

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Next Steps

- Hospital discharge and ED data
 - Injury diagnoses
 - Injury severity (AIS scores)
 - Treatment
 - Hospital charges and length of stay
- Link data to our motorcycle riders using date, time, age, sex.
- Institutional approvals are pending

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Questions?

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