

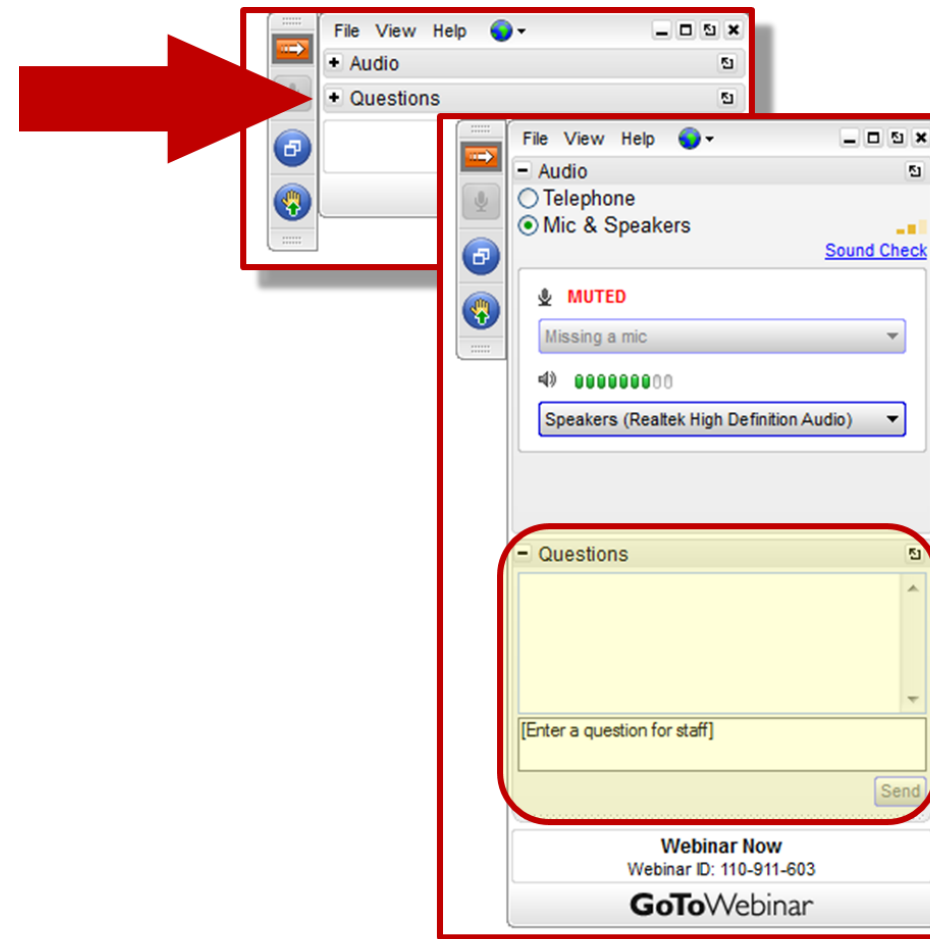
Florida Department of Transportation  
State Safety Office  
Crash Data Academy

# Vulnerable Road Users

## Part 2, Motorcycle Data

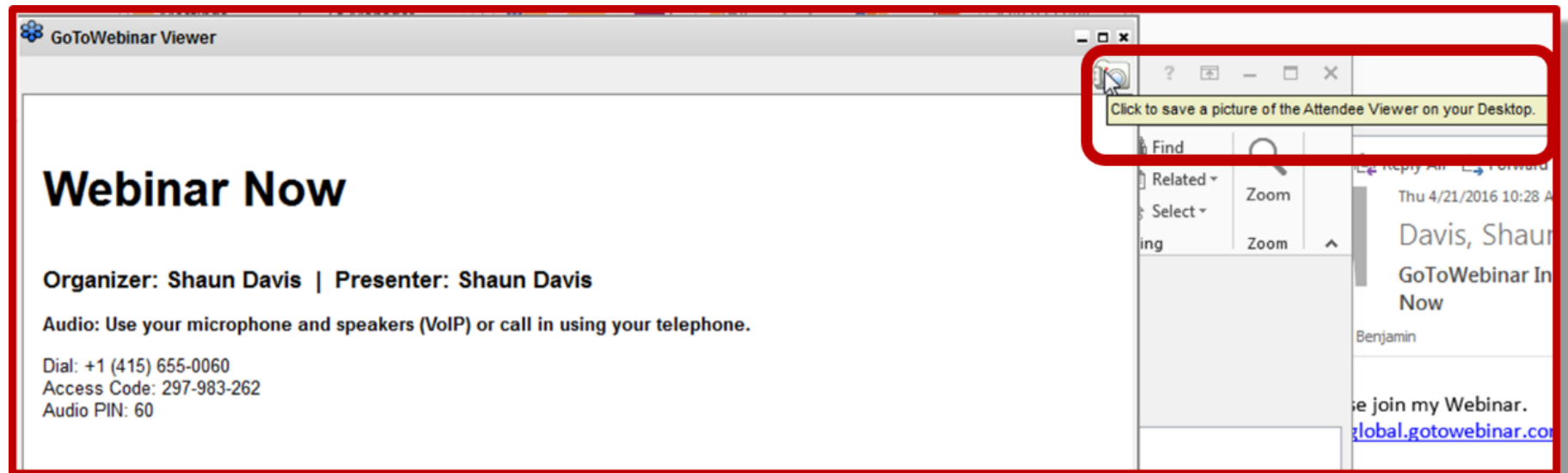
# How to ask a question:

- Control panel on right side of screen
- Use question pane
  - Type questions and comments
  - Click send



# How to capture the webinar window:

- Webinar viewer
  - Top, right corner
- Camera icon



# Crash Data Academy: Motorcycle Data

Presenter:

**Dr. Chan-Young Lee**

**Center for Urban Transportation Research**

# Top 10 Leading Causes of Death in the United States in 2011, by Age Group<sup>1</sup>

National Highway Traffic Safety Administration's National Center for Statistics and Analysis

R A N K	Cause and Number of Deaths											Years of Life Lost <sup>2</sup>
	Infants Under 1	Toddlers 1-3	Young Children 4-7	Children 8-15	Youth 16-20	Young Adults 21-24	Other Adults			Elderly 65+	All Ages	
							25-34	35-44	45-64			
1	Perinatal Period 11,931	Congenital Anomalies 448	Malignant Neoplasms 381	<b>MV Traffic Crashes 785</b>	<b>MV Traffic Crashes 3,424</b>	<b>MV Traffic Crashes 3,300</b>	Accidental Poisoning 7,652	Malignant Neoplasms 11,717	Malignant Neoplasms 161,469	Heart Disease 475,100	Heart Disease 596,577	Malignant Neoplasms 24% (9,188,476)
2	Congenital Anomalies 5,013	Accidental Drowning 380	<b>MV Traffic Crashes 287</b>	Malignant Neoplasms 693	Suicide 2,167	Suicide 2,449	Suicide 6,100	Heart Disease 10,635	Heart Disease 105,842	Malignant Neoplasms 397,107	Malignant Neoplasms 576,691	Heart Disease 19% (7,291,475)
3	Heart Disease 309	Homicide 363	Congenital Anomalies 158	Suicide 492	Homicide 2,154	Accidental Poisoning 2,301	<b>MV Traffic Crashes 5,569</b>	Accidental Poisoning 8,075	CLRD <sup>6</sup> 19,678	CLRD <sup>6</sup> 121,869	CLRD <sup>6</sup> 142,943	CLRD <sup>6</sup> 4% (1,714,895)
4	Homicide 290	Malignant Neoplasms 259	Accidental Drowning 151	Homicide 303	Accidental Poisoning 1,109	Homicide 2,300	Homicide 4,185	Suicide 6,599	Chronic Liver Disease 19,613	Stroke 109,323	Stroke 128,932	Stroke 4% (1,429,919)
5	Influenza/ Pneumonia 204	<b>MV Traffic Crashes 247</b>	Homicide 129	Congenital Anomalies 281	Malignant Neoplasms 690	Malignant Neoplasms 801	Malignant Neoplasms 3,499	<b>MV Traffic Crashes 4,425</b>	Diabetes 18,700	Alzheimer's 84,032	Alzheimer's 84,974	Accidental Poisoning 4% (1,394,750)
6	Septicemia 178	Heart Disease 138	Exposure to Smoke/Fire 96	Heart Disease 169	Heart Disease 403	Heart Disease 564	Heart Disease 3,301	Homicide 2,519	Stroke 16,910	Diabetes 52,402	Diabetes 73,831	Suicide 4% (1,393,748)
7	Stroke 134	Influenza/ Pneumonia 101	Heart Disease 92	Accidental Drowning 163	Accidental Drowning 273	Accidental Drowning 249	Diabetes 686	Chronic Liver Disease 2,449	Accidental Poisoning 15,427	Influenza/ Pneumonia 45,363	Influenza/ Pneumonia 53,609	<b>MV Traffic Crashes 3% (1,297,257)</b>
8	<b>MV Traffic Crashes 93</b>	Exposure to Smoke/Fire 89	Influenza/ Pneumonia 52	CLRD <sup>6</sup> 113	Congenital Anomalies 212	Congenital Anomalies 184	HIV 666	Diabetes 1,842	Suicide 15,379	Nephritis/ Nephrosis 37,796	Nephritis/ Nephrosis 45,591	Diabetes 3% (1,119,576)
9	Nephritis/ Nephrosis 76	MV Nontraffic Crashes <sup>4</sup> 79	CLRD <sup>6</sup> 49	<b>MV Nontraffic Crashes<sup>4</sup> 84</b>	Accidental Falls 86	Pregnancy, Child Birth 119	Stroke 530	Stroke 1,718	<b>MV Traffic Crashes 9,424</b>	Septicemia 26,746	Suicide 39,518	Perinatal Period 2% (942,864)
10	Malignant Neoplasms 70	Septicemia 55	MV Nontraffic Crashes <sup>4</sup> 37	Influenza/ Pneumonia 79	Influenza/ Pneumonia <sup>5</sup> 81	Influenza/ Pneumonia 116	CLRD <sup>6</sup> 505	HIV 1,619	Septicemia 7,414	Hypertension Renal Disease 23,272	Accidental Poisoning 36,280	Chronic Liver Disease 2% (761,320)
<b>ALL<sup>3</sup></b>	23,985	3,572	2,205	4,885	12,983	15,669	43,748	69,893	506,562	1,831,844	2,515,458	All Causes 100% (38,536,588)

<sup>1</sup>Overall, motor vehicle crashes are the 12th leading cause of death. When ranked by specific ages, they are the leading cause of death for each age 8, 13, 14 and 16 through 25.

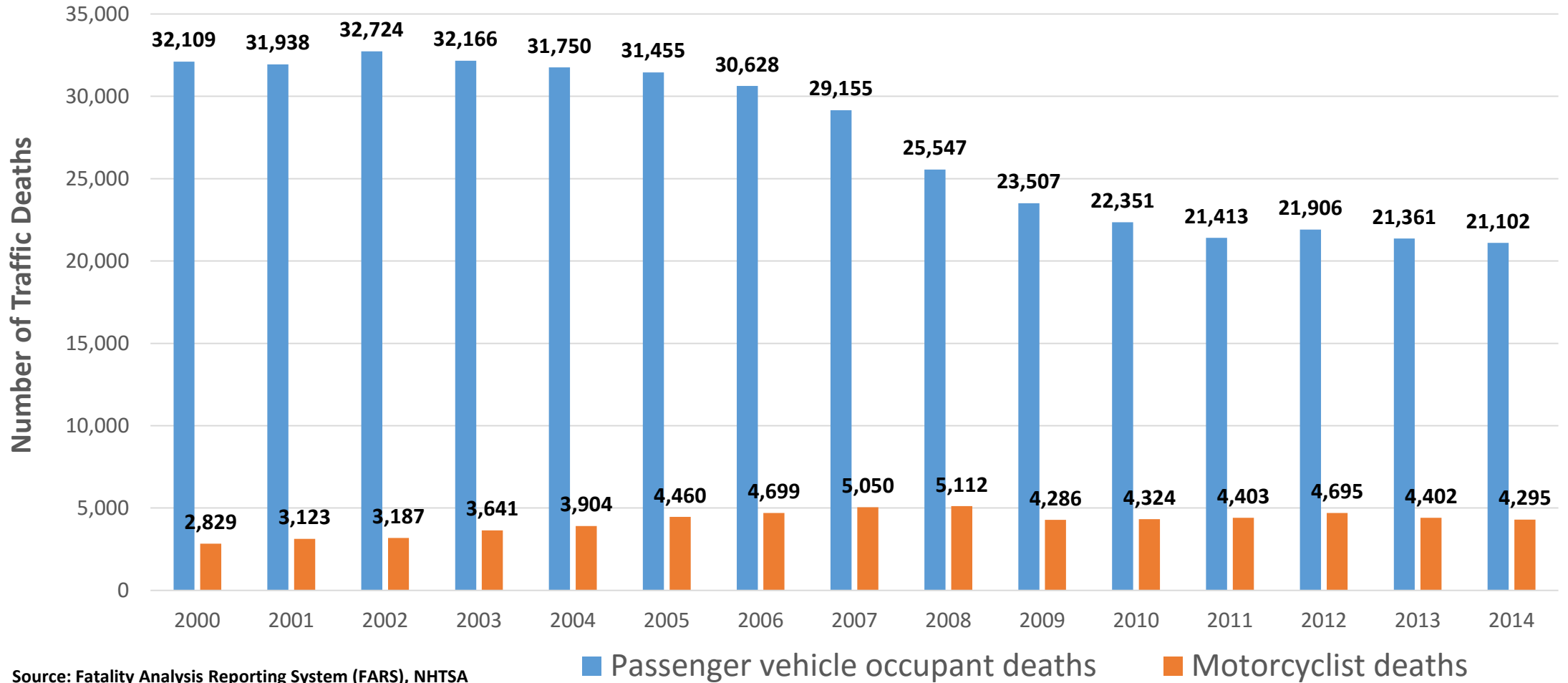
<sup>2</sup>Number of years calculated based on remaining life expectancy (2009 data from CDC) at time of death; percentages calculated as a proportion of total years of life lost due to all causes of death.

<sup>3</sup>Not a total of top 10 causes of death.

<sup>4</sup>A motor vehicle nontraffic crash is any vehicle crash that occurs entirely in any place other than a public traffic way.

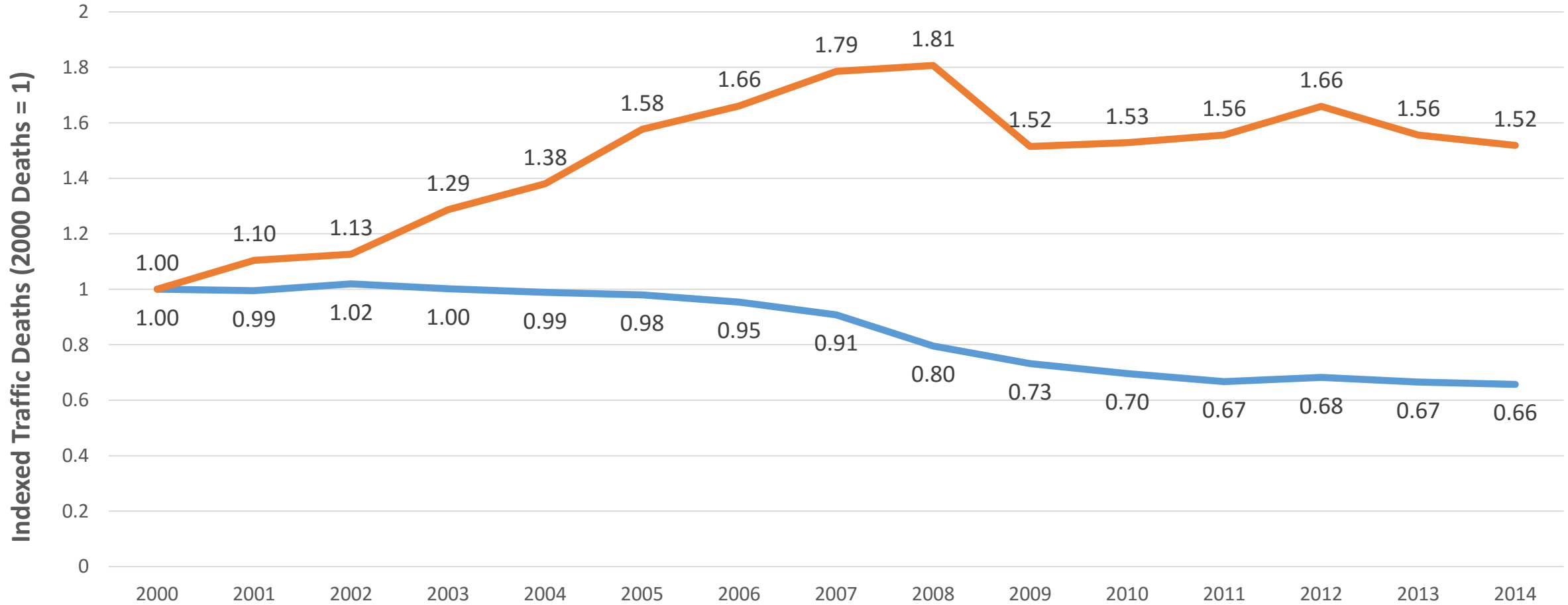
<http://www-nrd.nhtsa.dot.gov/Pubs/812203.pdf>

# Motorcycle Fatalities vs. Traffic Fatalities in U.S. (2000-2014)



Source: Fatality Analysis Reporting System (FARS), NHTSA

# Indexed MC Fatalities vs. Traffic Fatalities in U.S. (2000 Deaths = 1)



Source: Fatality Analysis Reporting System (FARS), NHTSA

— Passenger vehicle occupant deaths

— Motorcyclist deaths

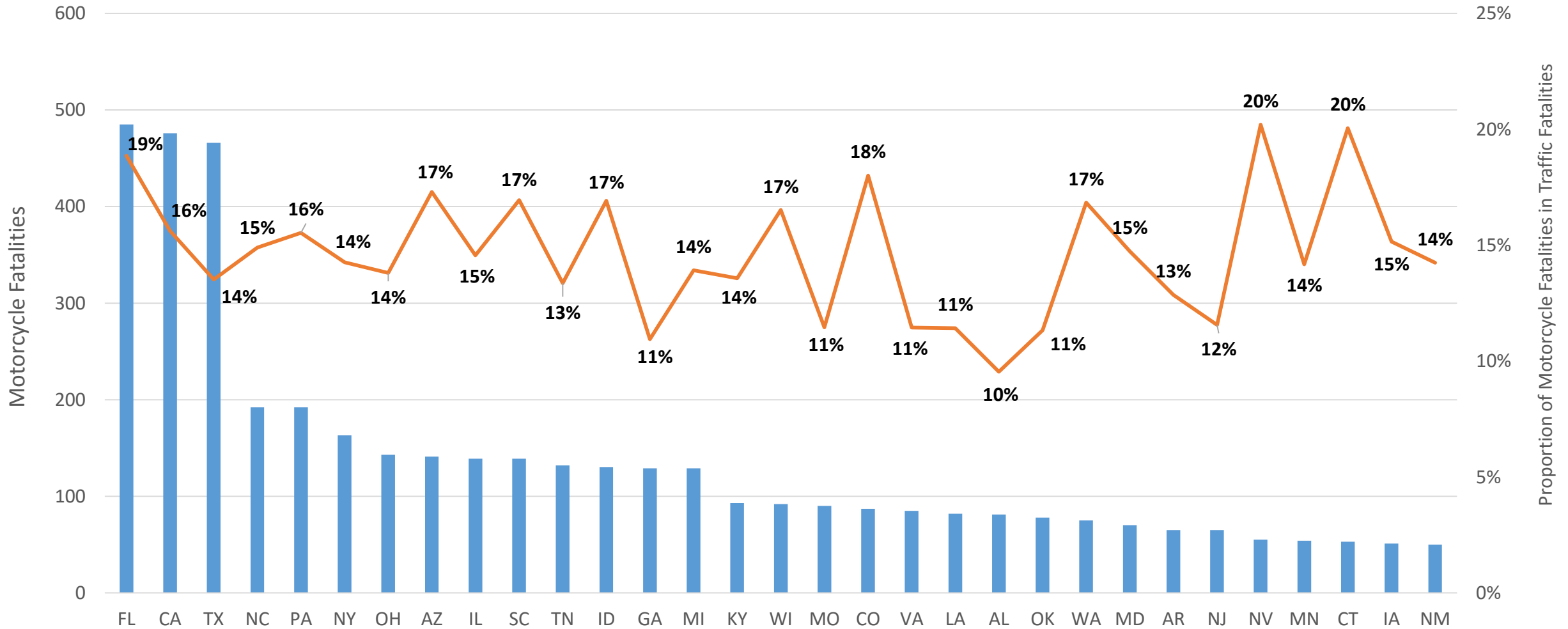




# More motorcycles?

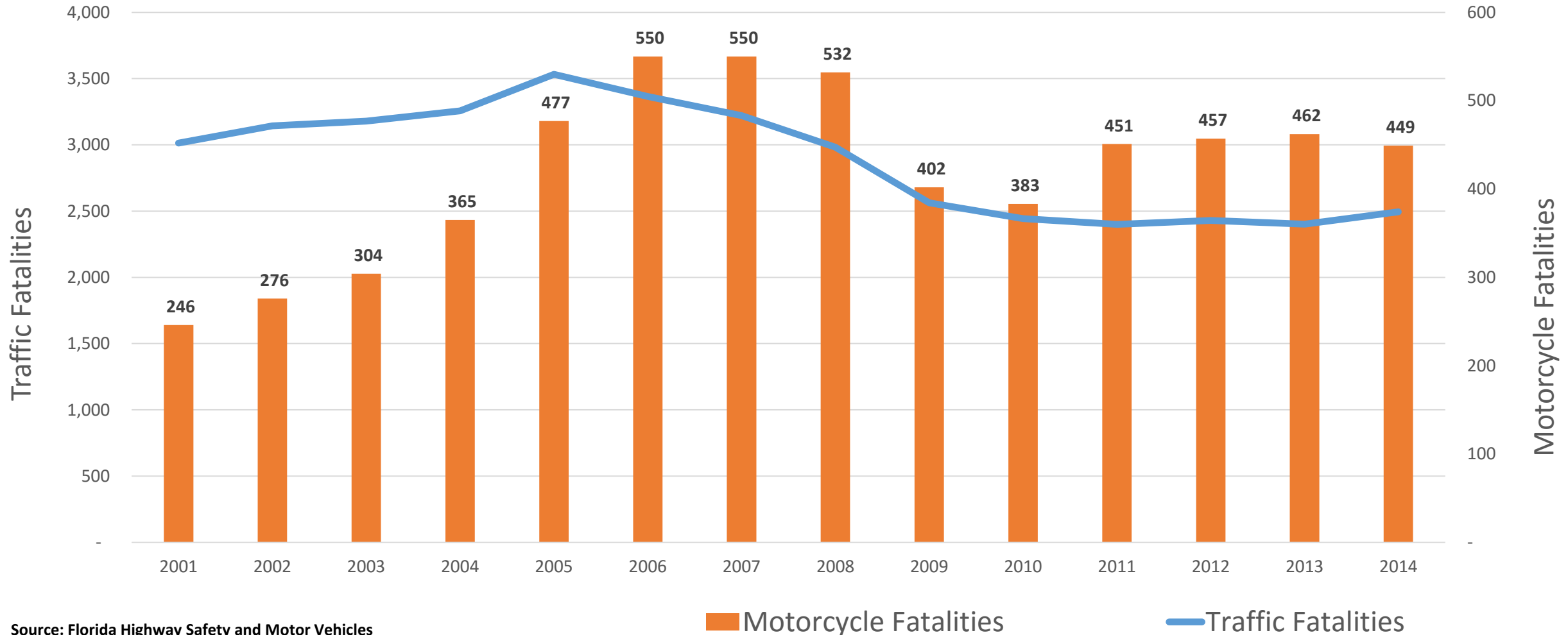
- Registration: up by 90% (between 2000 and 2014)
- Motorcycles are the one means of transportation that is more vulnerable to injuries and death compared to other motor vehicles.
- Unlike auto or other vehicle drivers, motorcycle riders are more vulnerable due to the lack of protection offered by the vehicle, and riders usually separate from the motorcycle at some point during a crash.

# Motorcycle Fatalities (Ave. 2012-2014)



Source: Fatality Analysis Reporting System (FARS), NHTSA

# Traffic Fatalities vs. Motorcycle Fatalities in Florida

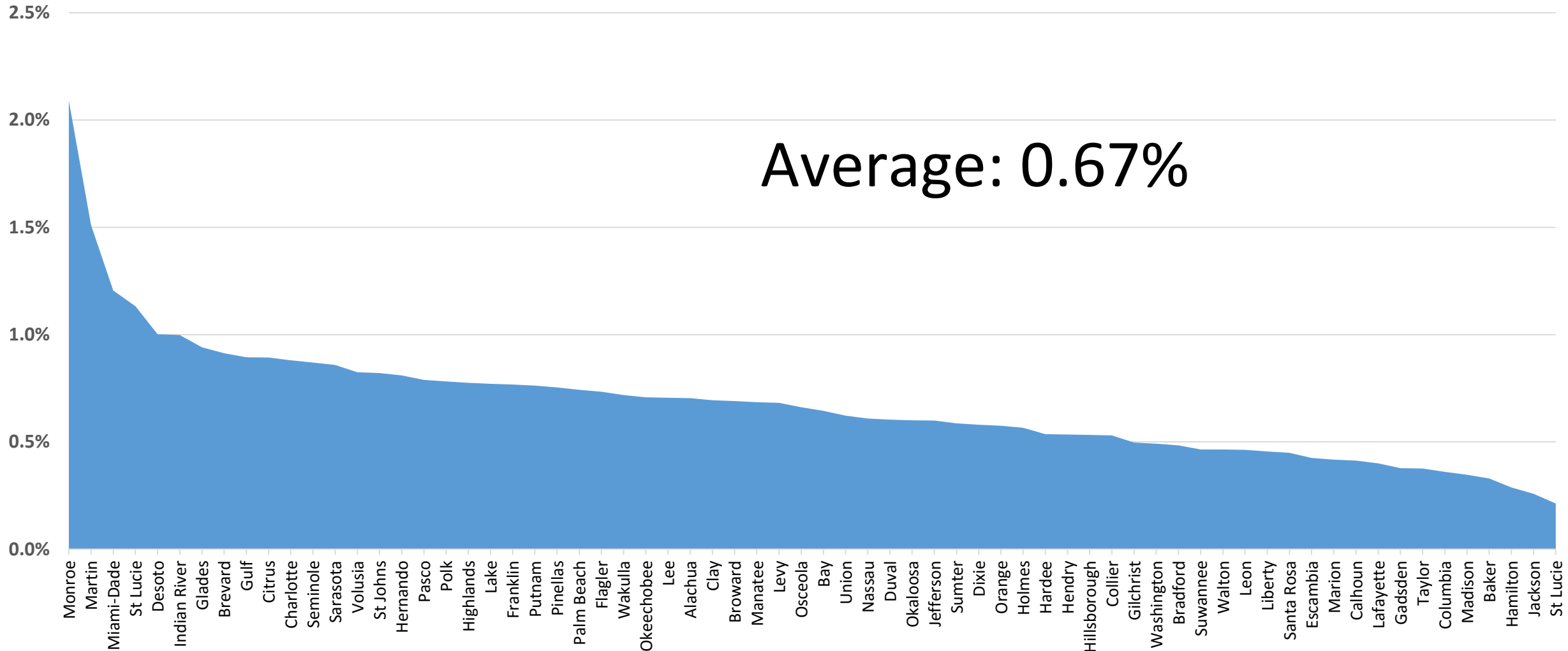


Source: Florida Highway Safety and Motor Vehicles

Motorcycle Fatalities

Traffic Fatalities

# Based on Florida vehicle classification information (2012-2014)



# Motorcycles represent

- About 3 percent of registered motor vehicles in Florida
- Less than 1 percent of traffic on Florida roadways

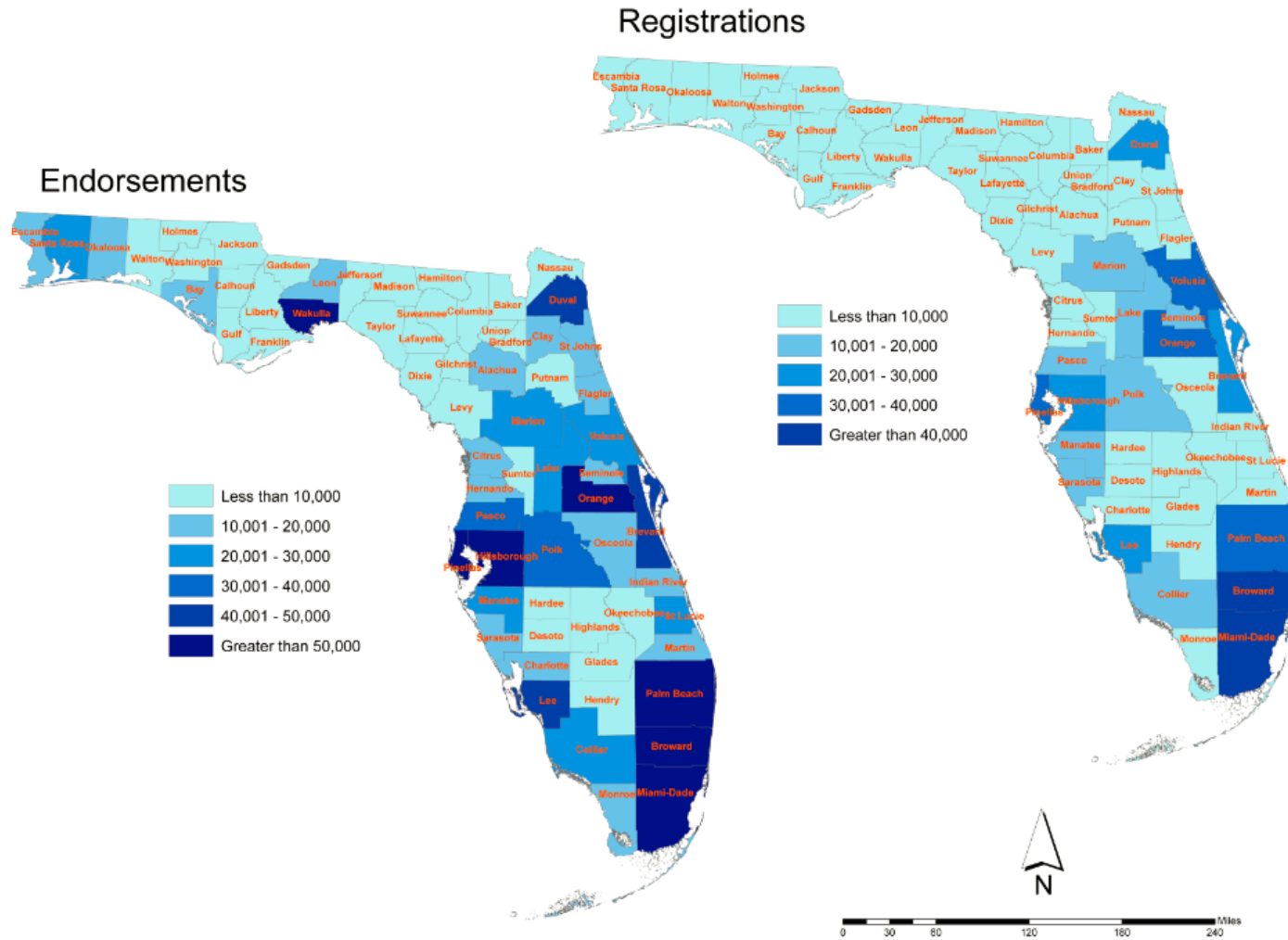


**18-20 percent**  
of traffic fatalities in Florida

# Florida is a great place to ride motorcycles

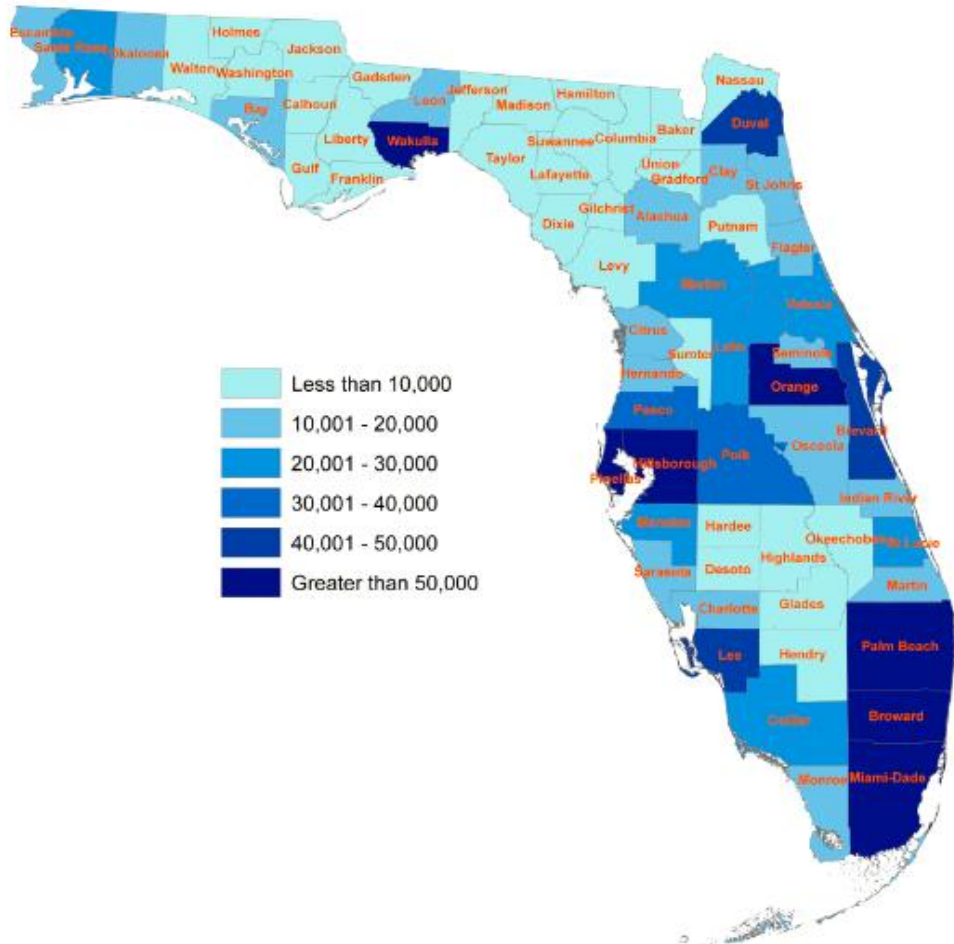


# Florida Motorcycle Endorsement and Registration by County (2014)

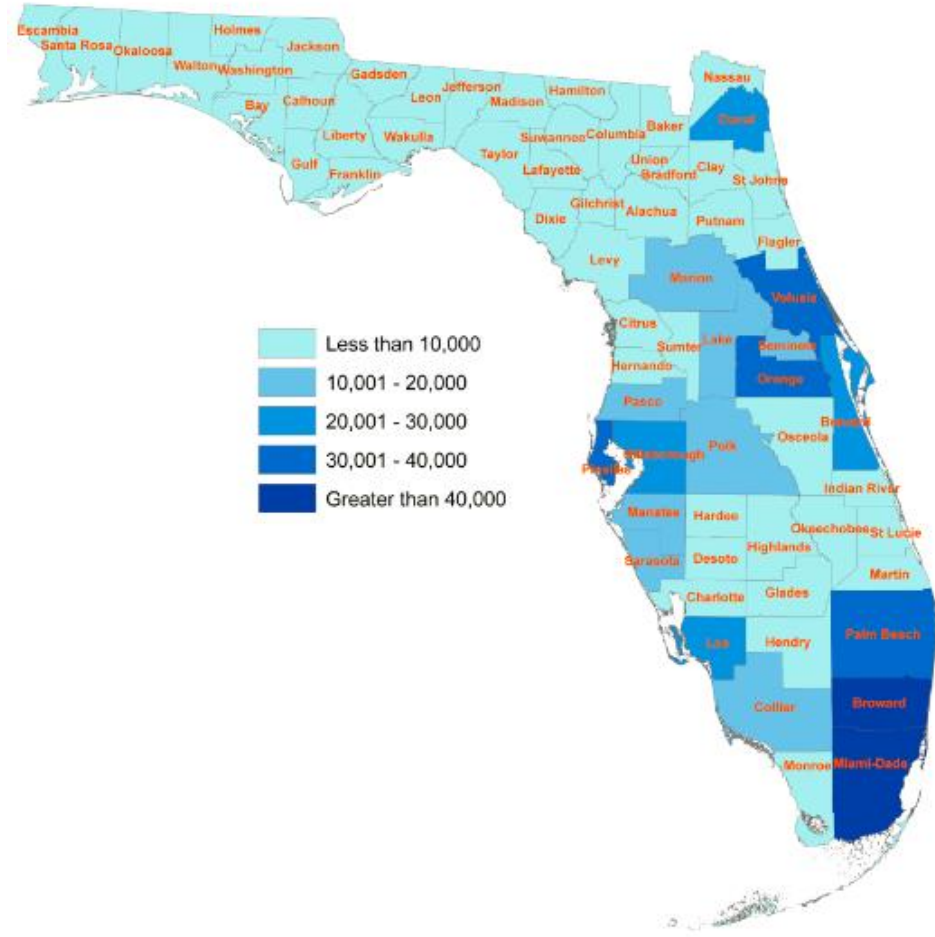


# Florida Motorcycle Endorsement and Registration by County (2014)

Endorsements



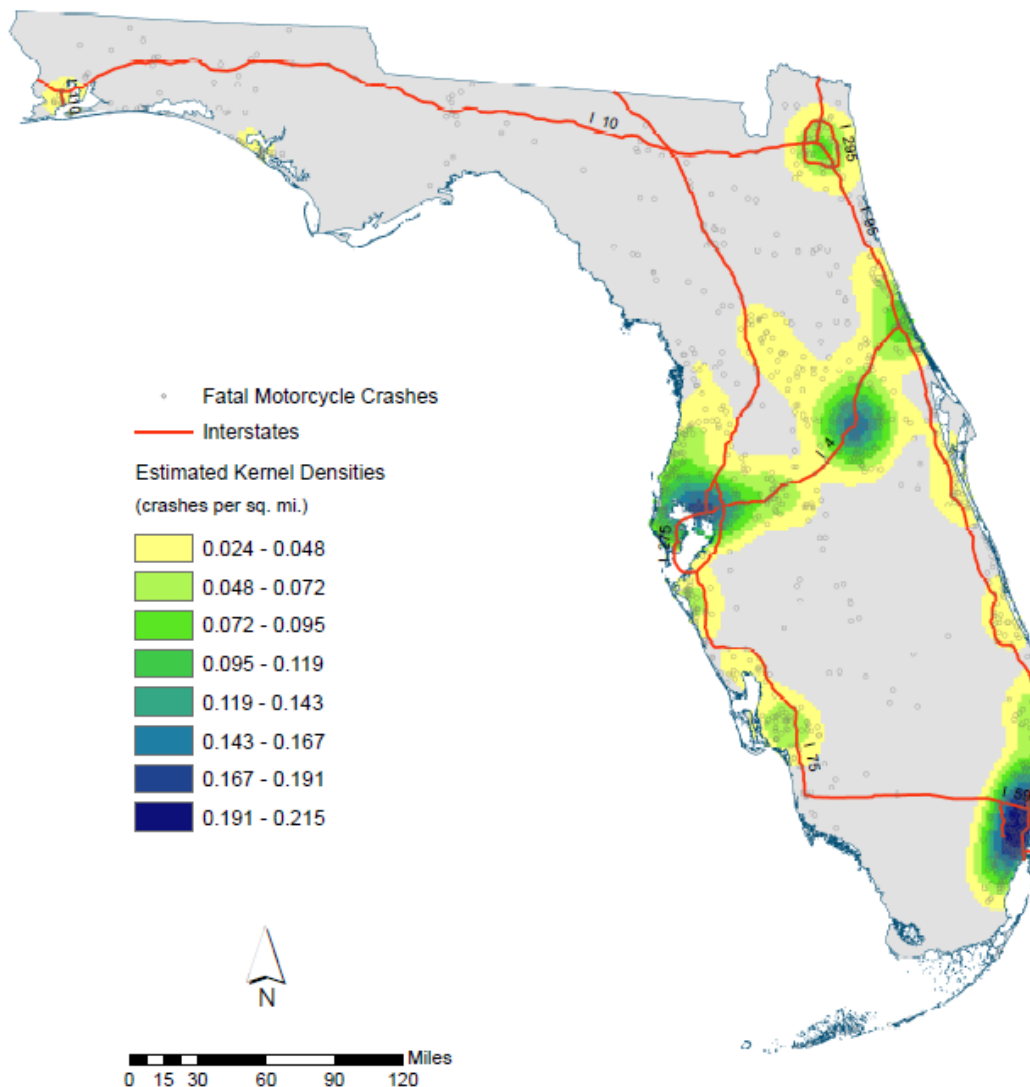
Registrations





# Top Ten-15 Counties (2012-2014)

	County	Fatalities %	Cumulative %
1	Miami-Dade	10.6%	10.6%
2	Broward	9.1%	19.7%
3	Hillsborough	8.2%	27.9%
4	Orange	6.5%	34.4%
5	Volusia	5.2%	39.6%
6	Pinellas	5.1%	44.7%
7	Duval	4.7%	49.4%
8	Palm Beach	4.1%	53.5%
9	Lee	3.6%	57.1%
10	Polk	3.1%	60.1%
11	Brevard	3.0%	63.1%
12	Pasco	2.5%	65.6%
13	Marion	2.1%	67.8%
14	Lake	1.9%	69.7%
15	Manatee	1.9%	71.6%

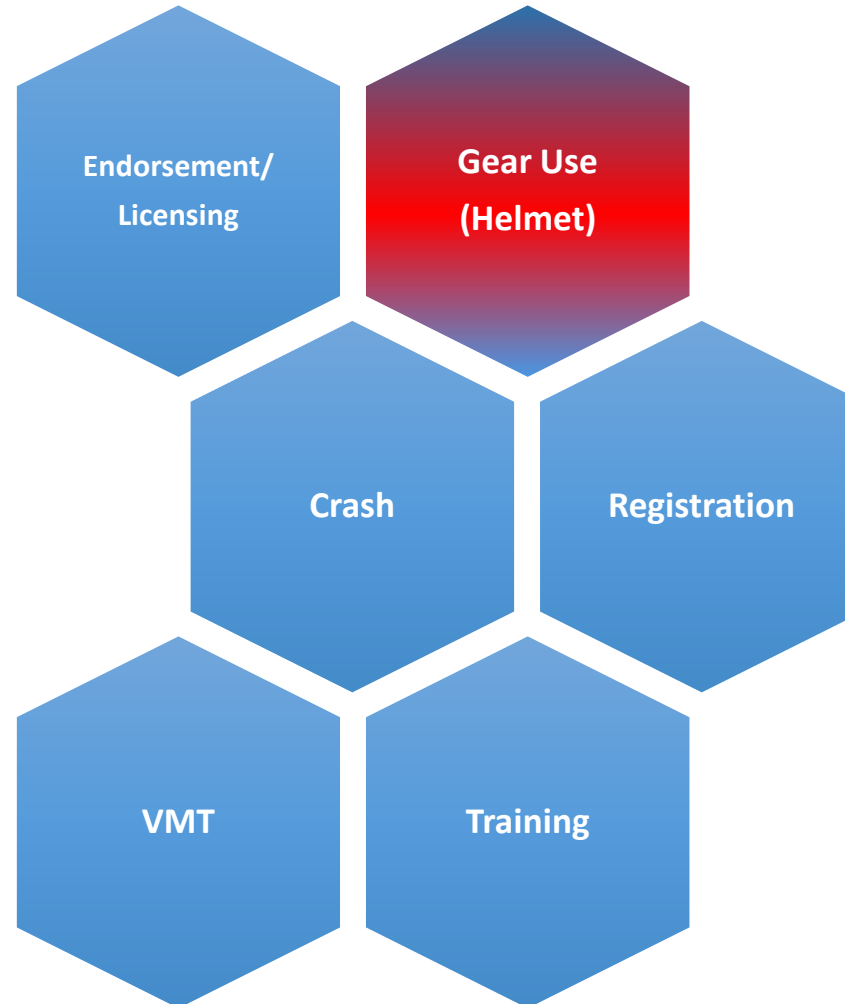


Source: Florida Highway Safety and Motor Vehicles

# Motorcycle Data



# Motorcycle data collection and analysis



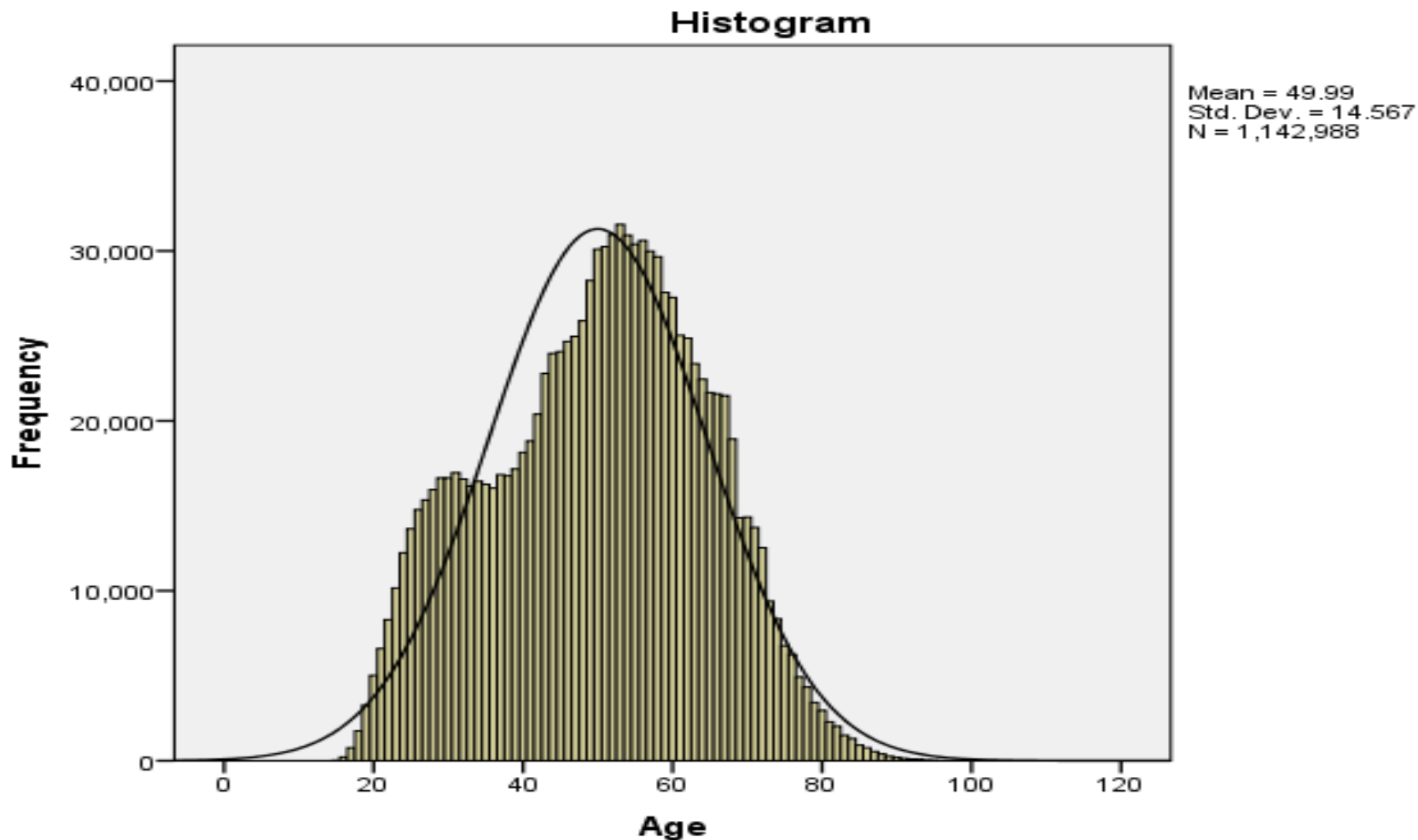
# How to Measure the Use of Helmet

- Discusses the advantages and disadvantages of three common data collection methods for motorcycle helmet use
  - Stated-Preference (SP) survey
  - Crash data
  - Observational survey

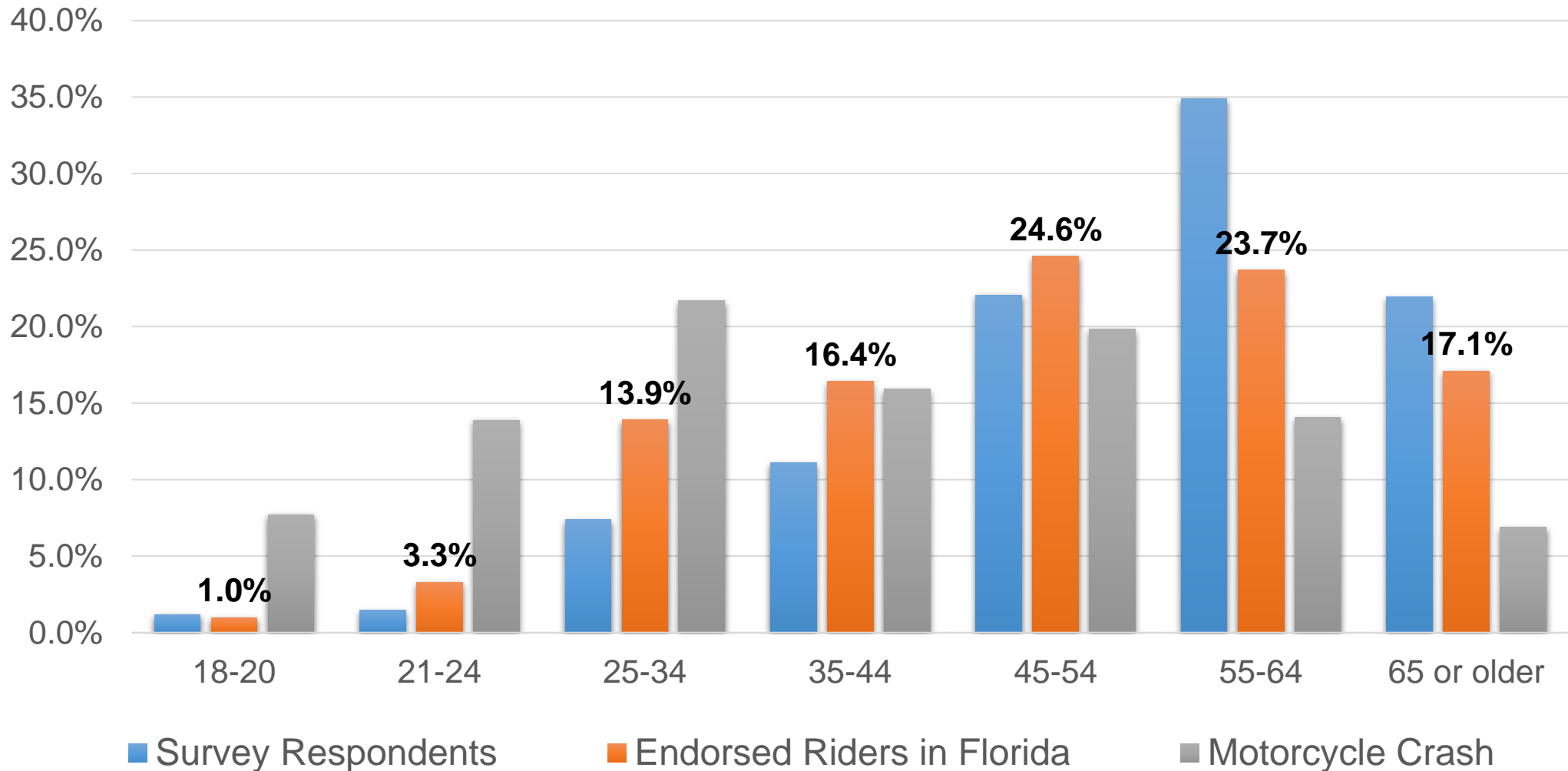
# Which of the following best describes your use of a motorcycle helmet?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I always wear a helmet when riding a motorcycle	2086	54.7	60.4	60.4
	I wear a helmet most of the time	556	14.6	16.1	76.5
	I wear a helmet on limited occasions (long distance trips, winter season, etc.)	478	12.5	13.8	90.3
	I seldom or never wear a helmet	335	8.8	9.7	100.0
	Total	3455	90.5	100.0	
Missing	System	362	9.5		
Total		3817	100.0		

# Endorsed Motorcyclists in Florida



# Simple Random Sampling (SRS)



# Strong Statistical Association

		What type of motorcycle do you ride most often?										Sample Size
		Cruiser	On/Off road	Scooter	Sport	Supersport	Standard	Sport-Touring	Touring	Trike	Other:	
Age:	18-20	19.4%	11.1%	2.8%	33.3%	27.8%	2.8%				2.8%	36
	21-24	15.8%	3.9%		32.9%	25.0%	5.3%	9.2%	1.3%		6.6%	76
	25-34	22.9%	2.0%	1.2%	38.0%	20.0%	3.7%	5.7%	4.5%		2.0%	245
	35-44	40.4%	2.0%	1.0%	17.3%	14.0%	4.8%	6.8%	11.0%		2.8%	399
	45-54	46.0%	1.6%	0.8%	6.7%	4.9%	5.7%	7.2%	21.6%	1.2%	4.3%	989
	55-64	41.6%	1.6%	1.9%	3.8%	1.5%	6.9%	8.0%	28.4%	3.2%	3.2%	1269
	65 or older	36.8%	0.9%	3.3%	2.8%	1.4%	6.8%	8.2%	27.0%	9.6%	3.2%	571



# Stated-Preference (SP) Surveys

- Low response rate (Survey Fatigue)
- Sampling
  - Motorcycle Endorsement or Registration
- Difficult to quantify
  - 80 trips/100 trips vs. 90 trips/100 trips
- Cognitive bias can also be introduced easily
  - Reliability of self-response data is questionable for socially undesirable behaviors

# Stated-Preference (SP) Surveys

- Can collect a broad range of information
  - Behavioral characteristics

			Age:							Total	
			Under 18	18-20	21-24	25-34	35-44	45-54	55-64		65 or older
Which of the following best describes your use of a motorcycle helmet in Florida?	I always wear a helmet when riding a motorcycle	Count	1	29	56	166	227	525	695	374	2073
		% within Age:	50.0%	85.3%	78.9%	71.2%	60.1%	55.6%	57.2%	67.4%	60.4%
	I wear a helmet most of the time	Count	0	3	8	42	61	157	208	74	553
		% within Age:	0.0%	8.8%	11.3%	18.0%	16.1%	16.6%	17.1%	13.3%	16.1%
	I wear a helmet on limited occasions (long distance trips, winter season, etc.)	Count	0	1	3	18	55	156	181	62	476
		% within Age:	0.0%	2.9%	4.2%	7.7%	14.6%	16.5%	14.9%	11.2%	13.9%
	I seldom or never wear a helmet	Count	1	1	4	7	35	107	131	45	331
		% within Age:	50.0%	2.9%	5.6%	3.0%	9.3%	11.3%	10.8%	8.1%	9.6%
Total	Count	2	34	71	233	378	945	1215	555	3433	
	% within Age:	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	

# Crash Data



# Florida Traffic Crash Report

FLORIDA TRAFFIC CRASH REPORT				HIGHWAY SAFETY & MOTOR VEHICLES, TRAFFIC CRASH RECORDS NEIL KIRKMAN BUILDING, TALLAHASSEE, FL 32399-0537	
LONG FORM <input checked="" type="checkbox"/>		SHORT FORM <input type="checkbox"/>		UPDATE <input type="checkbox"/>	
(Electronic Version)					
Date of Crash 03/Oct/2015 09:42 PM	Time of Crash 03/Oct/2015 09:42 PM	Date of Report 03/Oct/2015 12:00 AM	Invest. Agency Report Number	HSMV Crash Report Number	
<b>CRASH IDENTIFIERS</b>					
County Code 03	City Code 50	County of Crash HILLSBOROUGH	Place or City of Crash TAMPA	Within City Limits Yes	Time Reported 03/Oct/2015 09:52 PM
					Time Dispatched 03/Oct/2015 09:54 PM
Time on Scene 03/Oct/2015 10:25 PM	Time Cleared Scene 03/Oct/2015 11:30 PM	Completed Yes	Reason (if Investigation NOT Completed)		
					Notified By Law Enforcement

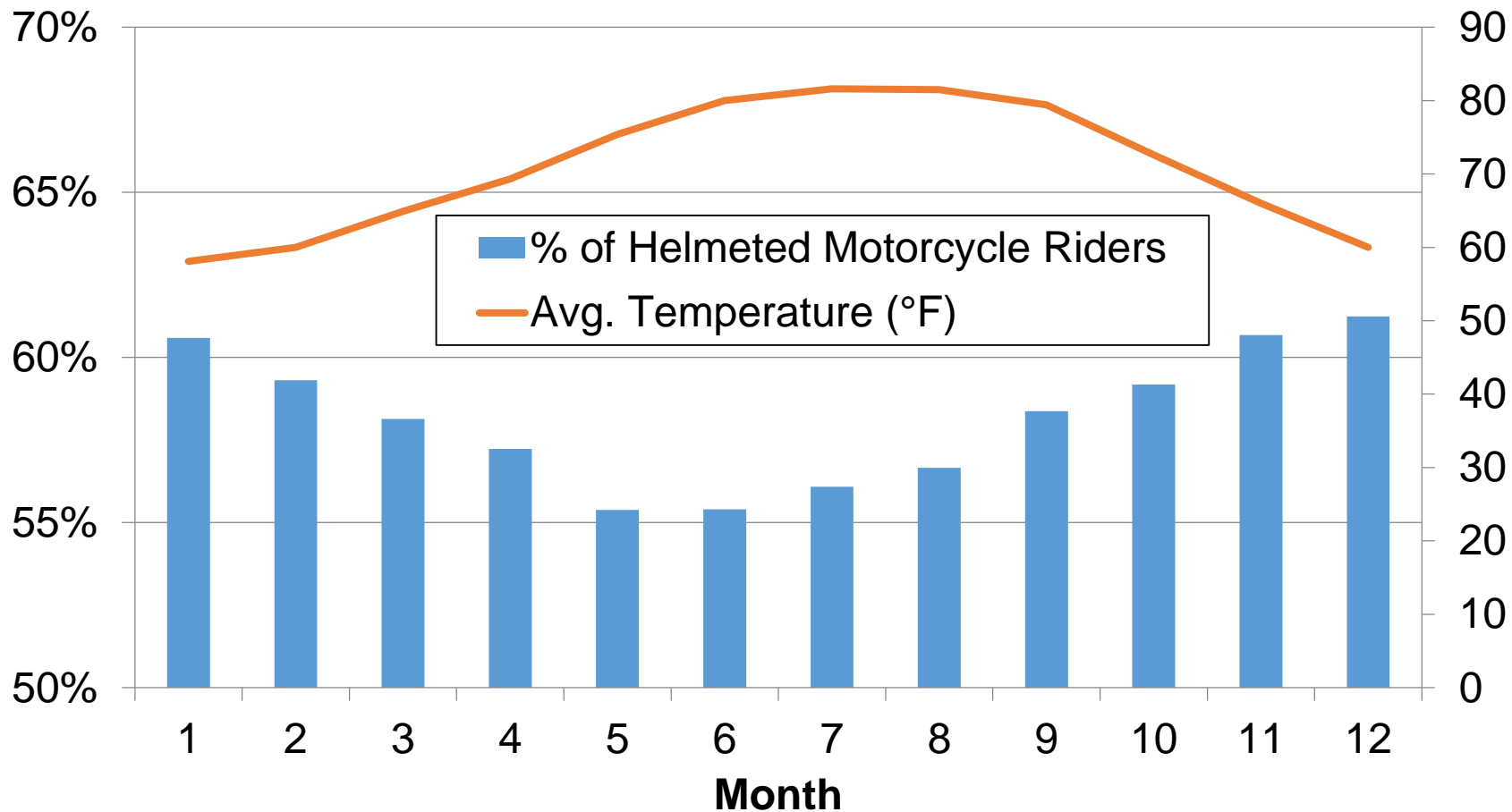
Person# 2	Description 1 Driver	Vehicle # 2	Name	Date of Birth	Sex 1 Male	Phone Number	Re-Exam No
Address		City TAMPA	State FL	Zip Code 33647			
Driver License Number	State FL	Expires	DL Type 5 E/Operator	Req. End. 1 Yes	Injury Severity 1 None	Ejection 1 Not Ejected	
Restraint System	Air Bag Deployed	Helmet Use 1 DOT-Compliant Motorcycle Helmet	Eye Protection 1 Yes	Seating Location Seat 77 Other (explain in narrative)	Seating Location Row 77 Other Row	Seating Location Other	
Drivers Actions at Time of Crash (first) 1 No Contributing Action			Drivers Actions at Time of Crash (second)		Driver Distracted By 1 Not Distracted	Vision Obstruction 1 Vision Not Obscured	
Drivers Actions at Time of Crash (third)			Drivers Actions at Time of Crash (fourth)		Drivers Condition at Time of Crash 1 Apparently Normal		
Suspected Alcohol Use 1 No	Alcohol Tested	Alcohol Test Type	Alcohol Test Result	BAC	Suspected Drug Use 1 No	Drug Tested	Drug Test Type
Source of Transport to Medical Facility 1 Not Transported		EMS Agency Name or ID		EMS Run Number	Medical Facility Transported To		

# Motorcycle Crash Data in Florida

## PPE Information Collected in Florida Traffic Crash Reports

Information Collected Up to October 2010	More Specific Information Collected After October 2010
<ul style="list-style-type: none"> <li>• Safety Equipment Use               <ul style="list-style-type: none"> <li>1 Not in Use</li> <li>2 Seat Belt/Shoulder Harness</li> <li>3 Child Restraint</li> <li>4 Air Bag – Deployed</li> <li>5 Air Bag – Not Deployed</li> <li>6 Safety Helmet</li> <li>7 Eye Protection</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Helmet Use (HU)               <ul style="list-style-type: none"> <li>1 DOT-Compliant Motorcycle Helmet</li> <li>2 Other Helmet</li> <li>3 No Helmet</li> </ul> </li> <li>• Eye Protection (EP)               <ul style="list-style-type: none"> <li>1 Yes</li> <li>2 No</li> <li>3 Not Applicable</li> </ul> </li> </ul>

# Helmet Use by Month in FL



# Motorcycle crash data analysis

- Surrogate measure
- Systematic reporting errors due to inconsistent practices in the field and other problems
- Motorcycle Type
  - Sport Bike (Almost 80%) vs. Cruiser (40%)
- Large Sample Size - 24/7/365 days
- Low cost

# More helmeted riders died?

Create Date: 9/11/2015

## Motorcyclist Safety Equipment and Injury Levels

Helmet Type	Not Injured	Possible Injuries	Non-Incapacitating Injuries	Serious (Incapacitating) Injuries	Fatalities	Equipment Usage Total
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### Driver

DOT-Compliant Motorcycle Helmet	554	1,112	2,048	1,090	210	5,014
No Helmet	541	787	1,488	1,001	198	4,015
Other Helmet	35	38	78	53	13	217
Unknown	81	117	159	69	6	432

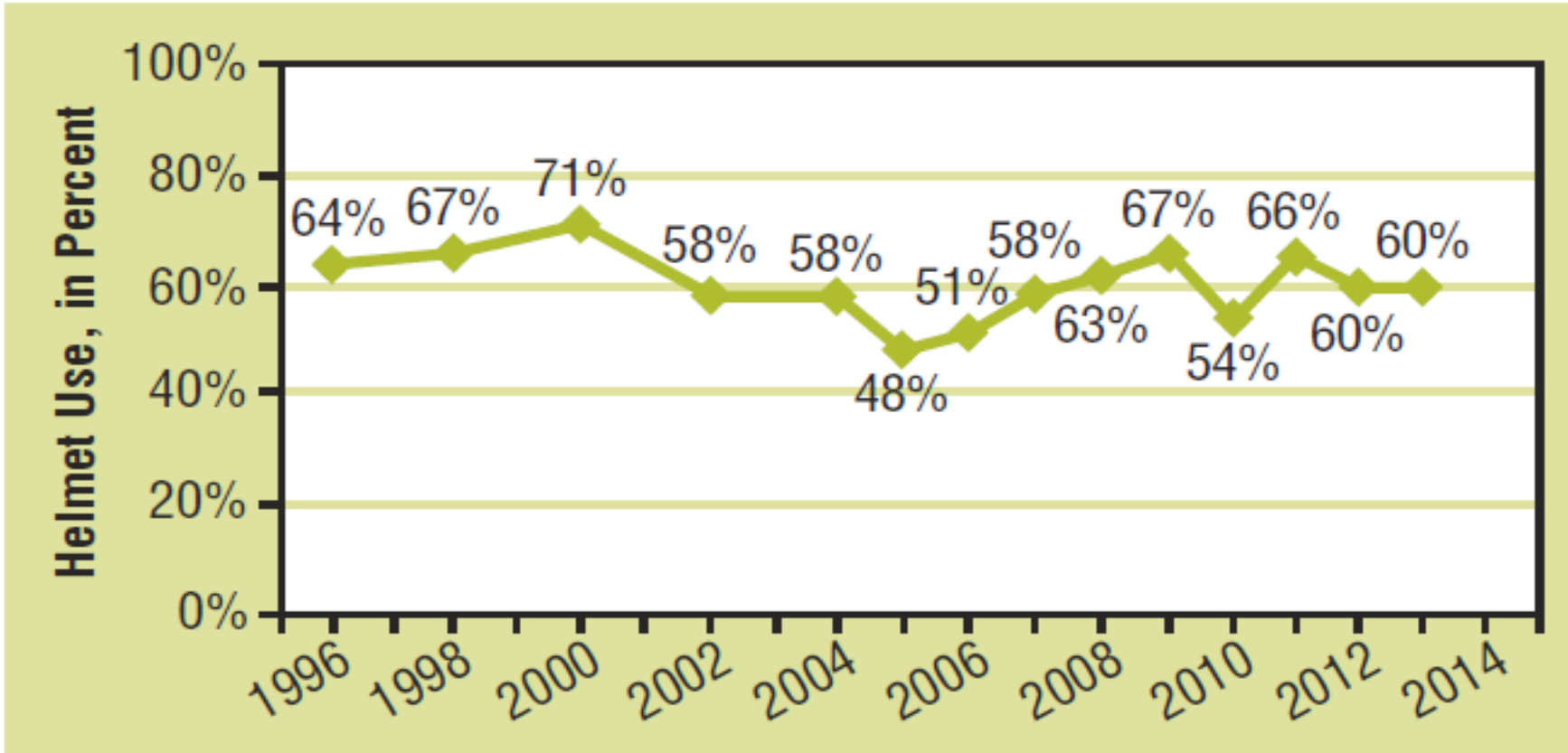


# Observational Surveys

- Less bias or error
- Sufficient sample size needed/Costly

# Sample Size Matters

Figure 1  
**Motorcycle Helmet Use, 1996–2013**



Data Source: NOPUS

<http://www-nrd.nhtsa.dot.gov/Pubs/812010.pdf>

# Many States Collect Helmet Use Information through Observational Surveys

- Most of these surveys have been conducted in conjunction with a statewide seatbelt use survey
- As a result, the methodology largely followed the Uniform Criteria for State Observational Surveys of Seat Belt Use from Title 23, Part 1240.12 of the Code of Federal Regulations
  - Sample Size/Day of week/Roadways

# Observed Use of Motorcycle Helmets in Florida

Year	DOT-Compliant	Non-Compliant	No Helmet	# of Observations
2010	52.4%	1.3%	46.3%	5,196
2011	49.2%	3.4%	47.4%	7,547
2012	47.0%	3.1%	49.9%	10,363
2013	50.7%	2.9%	46.4%	9,464
2014*	49.3%	3.3%	47.3%	7,642
Avg.	49.7%	2.8%	47.5%	8,042

\*Excluding Monroe county observations

# Observed Helmet Use by Motorcycle Type

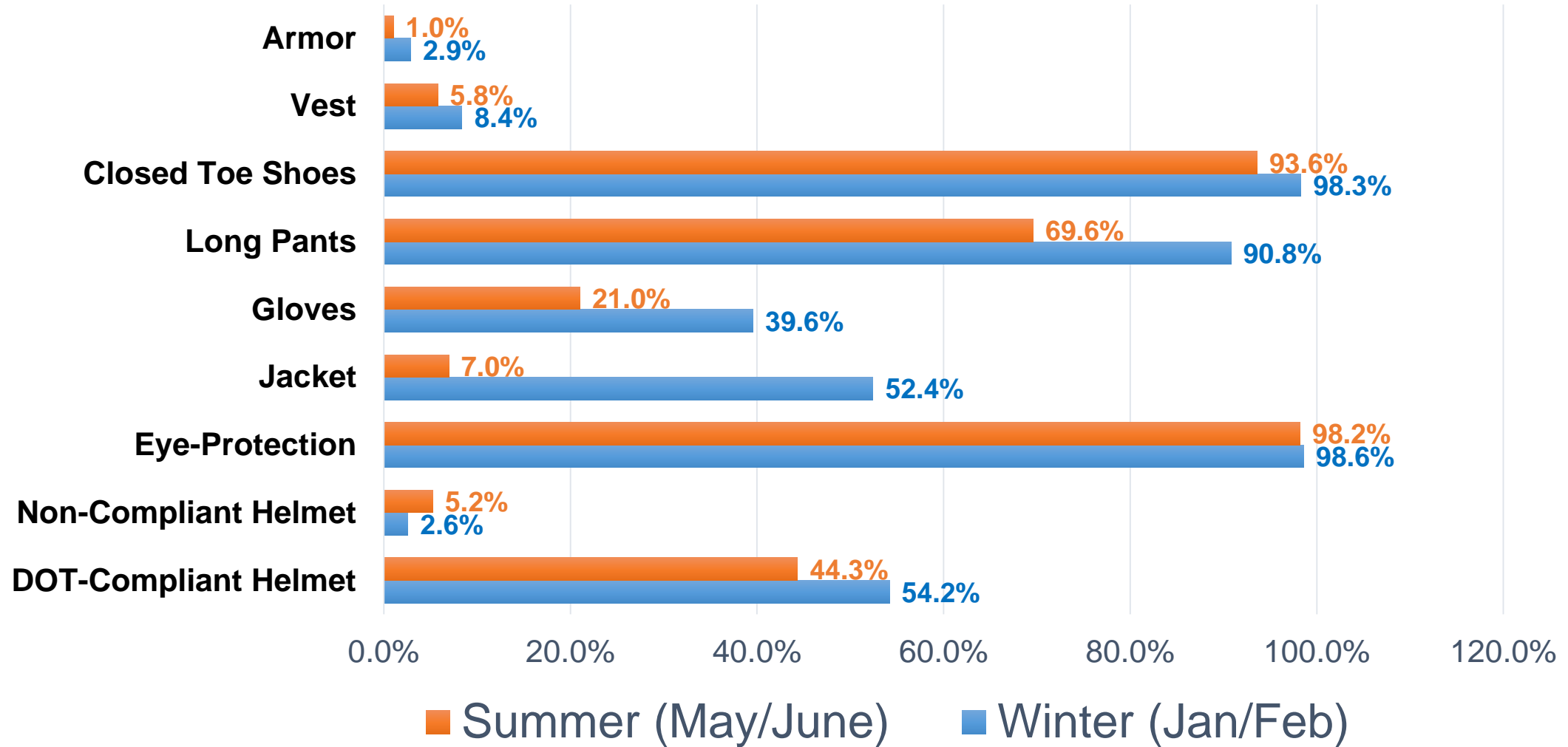
Motorcycle Type	Cruiser	Custom	Moped/ Scooter	On/Off Road	Sport Bike	Standard	Touring	Trike
<b>All DOT-Compliant</b>	<b>41.2%</b>	<b>19.1%</b>	<b>16.0%</b>	<b>52.9%</b>	<b>79.6%</b>	<b>59.6%</b>	<b>48.0%</b>	<b>48.9%</b>
Open Face	32.3%	13.6%	8.6%	5.7%	1.7%	21.2%	37.9%	43.0%
Full Face	8.9%	5.5%	7.2%	37.1%	77.9%	37.0%	10.0%	5.9%
Motocross	0.0%	0.0%	0.2%	10.0%	0.0%	1.4%	0.0%	0.0%
Noncompliant	4.7%	5.5%	1.2%	1.4%	0.4%	3.2%	4.7%	2.6%
<b>All Unhelmeted</b>	<b>54.1%</b>	<b>75.5%</b>	<b>82.8%</b>	<b>45.7%</b>	<b>20.0%</b>	<b>37.2%</b>	<b>47.3%</b>	<b>48.5%</b>
No Helmet	38.2%	54.5%	68.2%	41.4%	16.3%	29.2%	31.4%	32.9%
Decorative	15.3%	20.9%	14.6%	4.3%	2.3%	7.7%	15.6%	14.7%
Carrying	0.5%	0.0%	0.0%	0.0%	1.4%	0.3%	0.3%	1.0%
Sample Size	3011	110	2115	70	1420	349	1616	307

# Sport Bike Effect

MC Type	Observed(FL)	Helmeted (%)	Fatal Crashes (FL)
Cruiser	35%	36%	
Touring	26%	40%	
<b>Sport Bike</b>	<b>15%</b>	<b>79%</b>	<b>31%</b>
Scooter	13%	27%	
Standard	4%	66%	
On/Off Road	1%	69%	
Custom	2%	16%	
Trike	4%	46%	

# PPE use in Florida

## Winter (Jan/Feb) and Summer (May/June)



# Issues

- Resource
- Sampling issues
  - Day of Week, County, Motorcycle Type
- Quality of observer



Metric	Stated-Preference (SP) Surveys	Crash Data Analysis	Observational Surveys
Accuracy for estimating helmet use	Self-response bias can be introduced	Includes only crashed motorcycle riders; can be vulnerable to systematic errors if any data is missing data	In general, high accuracy expected; data quality can be subject to sample size and data collection method, including training of data collection personnel
Comprehensiveness	Collects a range of information, such rider demographics, characteristics, attitudes, and preferences in conjunction with helmet use	Collects a reasonable amount of information, such as gender and age; attitudes and preferences not available	Collects observable characteristics (helmet use, motorcycle type); limited to collect unobservable information; training experience, age, etc.
Cost	High	Low-cost if state collects and stores helmet information in crash data	High
Feasibility of longitudinal data	Possible	Possible	Possible
Timeliness	Can collect data and analyze in 1–2 months	Varies. 1-24 months	Can collect data and analyze in 1–2 months

# Conclusion

- Motorcycle Safety is a challenging issue
- “Data-Driven” is not a bad idea
- It will require resources
- “All models are wrong but some are useful” - George Edward Pelham Box
- **Lee, C.**, Pino, J., and Schultz, D. (2015). Measuring the Use of Motorcycle Helmets. *Transportation Research Record: Journal of the Transportation Research Board*, 2520, Transportation Research Board, National Research Council, Washington, DC., pp. 157–164. <http://dx.doi.org/10.3141/2520-18>.

# Questions?

# Next FDOT Webinars

The tentative schedule as of 5/4/2017 is:

- **Thursday, May 25th, 2017 – Vulnerable Road Users, Part 3: Crossing Guard and Safe Routes to School**
- **Thursday, June 29th, 2017 – Commercial Motor Vehicles**
- **Thursday, July 27th, 2017 – The National Highway Traffic Safety Administration’s Fatality Analysis Reporting System (FARS)**

(dates and topics subject to change)

Please contact Benjamin Jacobs at [benjamin.jacobs@dot.state.fl.us](mailto:benjamin.jacobs@dot.state.fl.us) with any questions or comments.

# Next FDOT Webinars

Register now!

<https://attendee.gotowebinar.com/rt/6969342794659219971>

The webinars generally occur on the last Thursday of the month from 2:30 pm to 3:30 pm ET.

For more information, including links to past webinars, please visit our website at:

<http://www.fdot.gov/safety/11A-SafetyEngineering/crash%20data%20academy/academy.shtm>

# Further questions?

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