Safety implications of lane-splitting among California motorcyclists involved in collisions

Report To

California Office of Traffic Safety

By

Thomas Rice
Lara Troszak

Safe Transportation Research & Education Center
University of California Berkeley

August 6, 2014

Purpose

This document summarizes an analysis of preliminary data from the California Enhanced Motorcycle Collision Data Project. We report the prevalence of lane-splitting among approximately 8,000 motorcyclists who were involved traffic collisions in June 2012 through August 2013 and examine how other characteristics vary by whether the motorcyclist was lane-splitting.

Background

Supplemental data were collected as part of a two-year collaboration between the Safe Transportation Research & Education Center at the University of California Berkeley and the California Highway Patrol. Funding was provided by the California Office of Traffic Safety.

The goal of the project was to obtain information not usually collected during law enforcement investigations of motorcycle traffic collisions in California. A one-page supplemental data form was used during collision investigations by CHP officers and by officers at more than 80 allied law enforcement agencies in the state. CHP officers completed the forms using an encrypted web site linked to the software used to complete other traffic collision forms. Supplemental forms from allied agencies were mailed to CHP and were forwarded to UC Berkeley for key entry. CHP officers used the supplemental form from August 1, 2012 through July 31, 2013, and participating allied agencies used the form from June 1, 2012 through May 31, 2013. A small number of supplemental forms were submitted in August 2013 and those are included in this analysis.

The data collected on the form included driver license status, whether the motorcyclist was lane-splitting, speed of the motorcycle, speed of surrounding traffic, and for each motorcycle rider--helmet type, helmet standard labeling (DOT, Snell, etc), helmet damage, helmet retention, body region injured, fatality status, whether the rider was transported by EMS, BAC, and the use of high visibility or reflective gear (See attached supplemental form).

The project resulted in the creation of a new database of information from 7,836 California motorcyclists involved in collisions and the passengers involved in those collisions. Of these supplement forms, 6,333 were submitted by CHP (81%) and 1,503 were submitted by allied agencies (19%). These collisions involved a total of 8,262 motorcycle riders (7,836 operators and 426 passengers).

We refer to motorcyclists who were lane-splitting as LSM throughout this report.

Results

The first 9 tables show the distribution of selected collision and motorcyclist characteristics by the lane-splitting status of the 7,836 motorcyclists.

Of the 7,836 motorcyclists, (22%) were known to be unlicensed (Table 1). The proportion of motorcyclists that were unlicensed was moderately lower among LSM (18%) than among other motorcyclists (22%).

LSM were much less likely to have been carrying a passenger (2%) than were other motorcyclists (6%)(Table 2).

LSM were also less likely to be rear-ended (Table 3) by another vehicle (2.7%) than were other motorcyclists (4.6%).

LSM, on the other hand, were much more likely to have rear-ended another vehicle (36.4%) than were other motorcyclists (14.9%)(Table 4).

Alcohol use (Table 5) was low among these motorcyclists (3%). The prevalence of alcohol use was lower among LSM (1.3%) than it was among other motorcyclists (3.3%).

The day of week of the collision varied greatly by lane-splitting status (Table 6). Among LSM, 14.6% of collisions occurred on a Saturday or Sunday, compared with 34.9% of collisions among non-lane-splitting motorcyclists.

Time of day also varied greatly by lane-splitting status (Table 7)--59.5% of LSM were involved in collisions between 6-8:59 am or 3-5:59 pm, compared with 37.3% of motorcyclists who were not lane-splitting.

The helmets used at the time of collision also differed by lane-splitting status. LSM were more likely to be wearing a full-face helmet than other motorcyclists (79% and 64%, respectively) and less likely to be wearing a novelty helmet (1.9% and 4.1%, respectively). Motorcyclists who were not lane-splitting were more likely to wearing a 1/2- or 3/4-helmet (23%) than LSM (13%).

Patterns of injury were significantly different comparing LSM and other motorcyclists (Table 9). LSM were notably less likely to suffer head injury (9.1% vs 16.5%), torso injury (18.6% vs 27.3%), or fatal injury (1.4% vs 3.1%) than other motorcyclists. The occurrence of neck injury and arm/leg injury did not differ meaningfully by lane-splitting status.

Table 10 tabulates lane-splitting motorcyclists by whether their lane-splitting was being done with over a 10 MPH differential of speed compared to surrounding traffic and whether lane-splitting was done when surrounding traffic was traveling at speeds greater than 30 MPH. Of the 1,163 lane-splitting motorcyclists, 419 (36.1%) were lane-splitting in a manner consistent with one of the speed components (but not both), 240 (20.6%) were lane-splitting consistent with both components, and only 39 were lane-splitting consistent with neither component. A large number of these lane-splitting motorcyclists were missing information on the speed of the motorcycle and/or the surrounding traffic (40%); the manner in which these motorcyclists were lane-splitting is unknown.

Categories of motorcycle speed and traffic speed are shown in Table 11. It can be seen that a relatively small proportion of lane-splitting is done in fast flowing traffic—95 motorcyclists were lane-splitting in traffic flowing 31-50 MPH, compared with 426 motorcyclists lane-splitting in traffic following at 1-30 MPH. It can also be seen that the motorcycle speed almost always exceeds the traffic speed, at times by a considerable margin. For example, in traffic flowing at 31-50 MPH, the motorcyclist was traveling at 51-70 MPH in 29 instances.

Table 12 shows the injury status of lane-splitting motorcyclists by the manner in which they were lane-splitting. Motorcyclists were categorized by whether their lane-splitting was done in a manner consistent with safe and prudent lane splitting — consistent with the traffic speed component only, the motorcycle excess speed component only, both components, neither component, and unknown status. Motorcyclists who were lane-splitting consistent with both components had the lowest proportion of each injury type. Motorcyclists who were lane-splitting consistent with only one component had higher proportions with each injury type. Motorcyclists who were lane-splitting consistent with neither component had the highest proportion with each injury type. For example, the proportion of motorcyclists with head injury was 6.3% for those lane-splitting consistent with both components, 10.7% for those lane-splitting in traffic flowing at 30 MPH or less but exceeding the traffic speed by more than 10 MPH, 9.0% for those lane-splitting in traffic flowing faster than 30 MPH but exceeding traffic speed by less than 10 MPH, and 20.5% for those who were lane-splitting in traffic flowing at more than 30 MPH and who were exceeding traffic speed by more than 10 MPH.

Discussion

This preliminary analysis found that LSM who were involved in traffic collisions and who were included in the Enhanced Motorcycle Collision Data Project had significantly different characteristics than other motorcyclists. LSM were better helmeted than other motorcyclists. LSM were less likely to suffer head injury, torso injury, and fatal injury than other motorcyclists. They were also more likely to be involved in weekday collisions and more likely to be involved in collisions during peak traffic times (6-9 am and 3- 6 pm). LSM were less likely to be rear-ended but more likely to have rear-ended another vehicle than other motorcyclists.

Additionally, we found significant variation in the manner in which lane-splitting was done. Lane-splitting was done in traffic flowing at a range of speeds. The motorcycle speed almost always exceeded the traffic speed by a small margin but, in many cases, exceeded it greatly. We compared the proportion of collision-involved, lane-splitting motorcyclists with injury across several body regions by whether the lane-splitting was done only in traffic flowing at 30 MPH or less and that the motorcycle speed should exceed the traffic speed by no more than 10 MPH. We found that the proportion with each injury type was high when the lane-splitting was consistent with neither speed component, was lower when it was consistent with one speed component, and was lower still when it was consistent with both speed components.

This analysis has limitations. We used data from the Enhanced Motorcycle Collision Data Project. This data set is lacking information on some basic factors that are needed for a more comprehensive analysis. These factors include rider age, rider gender, motorcycle characteristics, and numerous collision and roadway characteristics. Information on these factors is being acquired in a related project and will available for inclusion in future analyses of lane-splitting. We used broad categories of traffic and motorcycle speed in this analysis; future work will include a more detailed examination of how lane-splitting characteristics vary by rider, motorcycle, collision, and roadway types.

Tables

1. License status by lane-splitting status

	Lane-Splitting							
	No		Yes		Unknown		Total	
License Status	#	%	#	%	#	%	#	%
No	5,078	77.0%	931	80.1%	60	74.1%	6,069	77.5%
Yes	1,456	22.1%	208	17.9%	17	21.0%	1,681	21.5%
Unknown	58	0.9%	24	2.1%	4	4.9%	86	1.1%
Total	6,592	100.0%	1,163	100.0%	81	100.0%	7,836	100.0%

2. Passenger status by lane-splitting status

	Lane-Splitting							
	No		Yes		Unknown		Total	
Passenger	#	%	#	%	#	%	#	%
No	6,194	94.0%	1,138	97.9%	78	96.3%	7,410	94.6%
Yes	398	6.0%	25	2.1%	3	3.7%	426	5.4%
Total	6,592	100.0%	1,163	100.0%	81	100.0%	7,836	100.0%

3. Whether motorcycle was rear-ended by lane-splitting status

	Lane-Splitting							
	No		Yes		Unknown		Total	
MC was Rear-Ended	#	%	#	%	#	%	#	%
No	6,253	94.9%	1,129	97.1%	71	87.7%	7,453	95.1%
Yes	304	4.6%	31	2.7%	4	4.9%	339	4.3%
Unknown	35	0.5%	3	0.3%	6	7.4%	44	0.6%
Total	6,592	100.0%	1,163	100.0%	81	100.0%	7,836	100.0%

4. Whether motorcycle rear-ended other vehicle by lane-splitting status

	Lane-Splitting							
	No		Yes		Unknown		Total	
MC Rear-End Other Veh.	#	%	#	%	#	%	#	%
No	5,583	84.7%	737	63.4%	65	80.2%	6,385	81.5%
Yes	979	14.9%	423	36.4%	12	14.8%	1,414	18.0%
Unknown	30	0.5%	3	0.3%	4	4.9%	37	0.5%
Total	6,592	100.0%	1,163	100.0%	81	100.0%	7,836	100.0%

5. Alcohol involvement by lane splitting status

Alcohol Involvement	Lane-Splitting							
	No		Yes		Unknown		Total	
	#	%	#	%	#	%	#	%
No	6,374	96.7%	1,148	98.7%	79	97.5%	7,601	97.0%
Yes	218	3.3%	15	1.3%	2	2.5%	235	3.0%
Total	6,592	100.0%	1,163	100.0%	81	100.0%	7,836	100.0%

6. Day of the week by lane-splitting status

Day of Week	Lane-Splitting							
	No		Yes		Unknown		Total	
	#	%	#	%	#	%	#	%
Sunday	1,068	16.2%	70	6.0%	11	13.6%	1,149	14.7%
Monday	735	11.1%	149	12.8%	9	11.1%	893	11.4%
Tuesday	775	11.8%	207	17.8%	12	14.8%	994	12.7%
Wednesday	861	13.1%	232	19.9%	16	19.8%	1,109	14.2%
Thursday	865	13.1%	201	17.3%	8	9.9%	1,074	13.7%
Friday	1,029	15.6%	198	17.0%	8	9.9%	1,235	15.8%
Saturday	1,234	18.7%	100	8.6%	15	18.5%	1,349	17.2%
Unknown	25	0.4%	6	0.5%	2	2.5%	33	0.4%
Total	6,592	100.0%	1,163	100.0%	81	100.0%	7,836	100.0%

7. Time of day by lane-splitting status

Time of Collision	Lane-Splitting							
	No		Yes		Unknown		Total	
	#	%	#	%	#	%	#	%
Mid-3:00	192	2.9%	6	0.5%	3	3.7%	201	2.6%
3:00-5:59	168	2.5%	25	2.1%	2	2.5%	195	2.5%
6:00-8:59	693	10.5%	298	25.6%	4	4.9%	995	12.7%
9:00-11:59	960	14.6%	102	8.8%	13	16.0%	1,075	13.7%
12:00-14:59	1,437	21.8%	143	12.3%	18	22.2%	1,598	20.4%
15:00-17:59	1,766	26.8%	394	33.9%	22	27.2%	2,182	27.8%
18:00-20:59	954	14.5%	168	14.4%	16	19.8%	1,138	14.5%
21:00-23:59	418	6.3%	27	2.3%	3	3.7%	448	5.7%
Unknown	4	0.1%	0	0.0%	0	0.0%	4	0.1%
Total	6,592	100.0%	1,163	100.0%	81	100.0%	7,836	100.0%

8. Helmet type by lane-splitting status

	Lane-Splitting							
	No		Yes		Unknown		Total	
Helmet Type	#	%	#	%	#	%	#	%
Full-face	4,192	63.6%	921	79.2%	47	58.0%	5,160	65.8%
1/2 Helmet	948	14.4%	98	8.4%	8	9.9%	1,054	13.5%
3/4 Helmet	567	8.6%	56	4.8%	4	4.9%	627	8.0%
Any modular	303	4.6%	42	3.6%	6	7.4%	351	4.5%
Novelty	267	4.1%	22	1.9%	5	6.2%	294	3.8%
None	160	2.4%	5	0.4%	0	0.0%	165	2.1%
Unknown	155	2.4%	19	1.6%	11	13.6%	185	2.4%
Total	6,592	100.0%	1,163	100.0%	81	100.0%	7,836	100.0%

9. Injury by lane-splitting status

	Lane-Splitting							
	No		Yes		Unknown		Total	
Body Region	#	%	#	%	#	%	#	%
Head Injury								
No	5,504	83.5%	1,057	90.9%	66	81.5%	6,627	84.6%
Yes	1,088	16.5%	106	9.1%	15	18.5%	1,209	15.4%
Neck Injury								
No	5,987	90.8%	1,078	92.7%	75	92.6%	7,140	91.1%
Yes	605	9.2%	85	7.3%	6	7.4%	696	8.9%
Torso Injury								
No	4,794	72.7%	947	81.4%	64	79.0%	5,805	74.1%
Yes	1,798	27.3%	216	18.6%	17	21.0%	2,031	25.9%
Arm/Leg Injury								
No	2,196	33.3%	480	41.3%	31	38.3%	2,707	34.5%
Yes	4,396	66.7%	683	58.7%	50	61.7%	5,129	65.5%
Fatal Injury								
No	6,388	96.9%	1,147	98.6%	78	96.3%	7,613	97.2%
Yes	204	3.1%	16	1.4%	3	3.7%	223	2.8%
Total	6,592	100.0%	1,163	100.0%	81	100.0%	7,836	100.0%

10. Speed status among lane-splitting motorcyclists

Speed Component Status	No.	%
Traffic speed*	252	21.7%
Speed differential**	167	14.4%
Neither component	39	3.4%
Both components	240	20.6%
Unknown	465	40.0%
Total	1,163	100.0%

* Motorcyclist lane-splitting in traffic flowing at 30 MPH or less

** Motorcyclist lane-splitting at no more than 10 MPH over traffic speed

11. Traffic speed by speed status among lane-splitting motorcyclists

Motorcycle speed category	Surrounding traffic speed category													
	Not moving		1-30 MPH		31-50 MPH		51-70 MPH		71-99 MPH		Unknown		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Not moving	2	2.9%	2	0.5%	1	1.1%	2	2.0%	0	0.0%	3	0.7%	10	0.9%
1-30 MPH	46	65.7%	244	57.3%	5	5.3%	1	1.0%	0	0.0%	200	43.5%	496	42.6%
31-50 MPH	18	25.7%	128	30.0%	56	58.9%	6	6.1%	0	0.0%	135	29.3%	343	29.5%
51-70 MPH	3	4.3%	39	9.2%	29	30.5%	54	54.5%	3	23.1%	59	12.8%	187	16.1%
71-99 MPH	1	1.4%	9	2.1%	4	4.2%	32	32.3%	9	69.2%	21	4.6%	76	6.5%
100+ MPH	0	0.0%	0	0.0%	0	0.0%	3	3.0%	1	7.7%	4	0.9%	8	0.7%
Unknown	0	0.0%	4	0.9%	0	0.0%	1	1.0%	0	0.0%	38	8.3%	43	3.7%
Total	70	100%	426	100%	95	100%	99	100%	13	100%	460	100%	1,163	100%

* Motorcyclist lane-splitting in traffic flowing at 30 MPH or less

** Motorcyclist lane-splitting at no more than 10 MPH over traffic speed

12. Injury by speed and speed differential status among lane-splitting motorcyclists

	Speed Component											
	Neither		Traffic Speed*		Speed Diff.**		Both		Unknown		Total	
Body Region	#	%	#	%	#	%	#	%	#	%	#	%
Head Injury												
No	31	79.5%	225	89.3%	152	91.0%	225	93.8%	424	91.2%	1,057	90.9%
Yes	8	20.5%	27	10.7%	15	9.0%	15	6.3%	41	8.8%	106	9.1%
Neck Injury												
No	32	82.1%	235	93.3%	155	92.8%	227	94.6%	429	92.3%	1,078	92.7%
Yes	7	17.9%	17	6.7%	12	7.2%	13	5.4%	36	7.7%	85	7.3%
Torso Injury												
No	23	59.0%	209	82.9%	125	74.9%	211	87.9%	379	81.5%	947	81.4%
Yes	16	41.0%	43	17.1%	42	25.1%	29	12.1%	86	18.5%	216	18.6%
Arm/Leg Injury												
No	9	23.1%	101	40.1%	57	34.1%	118	49.2%	195	41.9%	480	41.3%
Yes	30	76.9%	151	59.9%	110	65.9%	122	50.8%	270	58.1%	683	58.7%
Fatal Injury												
No	38	97.4%	249	98.8%	165	98.8%	240	100.0%	455	97.8%	1,147	98.6%
Yes	1	2.6%	3	1.2%	2	1.2%	0	0.0%	10	2.2%	16	1.4%
Total	39	100.0%	252	100.0%	167	100.0%	240	100.0%	465	100.0%	1,163	100.0%

* Motorcyclist lane-splitting in traffic flowing at 30 MPH or less

** Motorcyclist lane-splitting at no more than 10 MPH over traffic speed