

INDIANA TRAFFIC SAFETY FACTS

May 2007



MOTORCYCLES 2006

Designing and implementing effective traffic safety policies requires data-driven analysis of traffic accidents. To help in the policy-making process, the Indiana University Center for Urban Policy and the Environment is collaborating with the Indiana Criminal Justice Institute to analyze data from the Vehicle Crash Records System database, maintained by the Indiana State Police. Research findings will be summarized in a series of Fact Sheets on various aspects of traffic accidents, including alcohol-related crashes, light trucks, large trucks, speeding, children, motorcycles, occupant protection, and young drivers. Additional briefs will provide information on county and municipality data. Portions of the content in these reports are based on guidelines provided by the U.S. National Highway Traffic Safety Administration (NHTSA). These Fact Sheets, combined with an annual Indiana Crash Fact Book, serve as the analytical foundation of traffic safety program planning and design in Indiana.



In 2005, there were 4,553 motorcycle rider fatalities and approximately 87,000 motorcyclists injured in the United States.¹ Although motorcycles accounted for only 2 percent of all registered vehicles, motorcycle riders represented 12 percent of all U.S. vehicle occupant fatalities. Furthermore, motorcyclist fatalities have been increasing. From 1997 to 2004, the rate of fatalities per 10,000 registered motorcycles in the U.S. went from 5.5 to 6.7 (a 21.8 percent increase). Additionally at the national level, the National Highway Traffic Safety Administration (NHTSA) estimated that in 2005, approximately 27 percent of motorcycle operators involved in fatal collisions had blood alcohol concentrations above legal limits.²

The state of Indiana has experienced similar trends in motorcycle collisions and resulting fatalities. This fact sheet examines several aspects of motorcycle collisions within the state, including fatality and injury rates among riders, alcohol-related collisions, helmet use and effectiveness, licensing statistics, traffic citations and violations, and the overall geography of motorcycle collisions in the state. Summary data and national comparisons are taken from the Fatality Analysis Reporting System (FARS), maintained by the National Highway Traffic Safety Administration (NHTSA). Data specific to Indiana are drawn from the Vehicle Crash Records System (VCRS) from 2003 to 2006, maintained by the Indiana State Police.

INDIANA MOTORCYCLE COLLISIONS, REGISTERED MOTORCYCLES, AND INJURY STATUS

In 2006, there were more than 2,500 motorcycle collisions in Indiana (see Table 1), a 2 percent reduction from 2005. Collisions were split equally between single and multiple vehicle crashes (not shown). There were 92 fatal collisions that resulted in 96 fatalities, consisting of 85 motorcycle operators and 11 passengers. All but three operators were males; all but one of the passengers were female. The 2006 fatality total was 14 fewer than in 2005 (12.7 percent decrease). The percent of total Indiana traffic fatalities generated by motorcycle crashes has grown since 1994.

Although collisions per 10,000 registered motorcycles in Indiana decreased substantially from 1994 to 2006, the number of motorcycle fatalities per registered motorcycle remained roughly constant, suggesting that the probability of a fatal outcome from

¹National Center for Statistics and Analysis. "Motorcycles," *Traffic Safety Facts: 2005 Data* (DOT HS 810 620). National Highway Traffic Safety Administration. Washington, D.C.

²National Center for Statistics and Analysis. 2005. "Impaired motorcycle operators involved in fatal crashes," *Traffic Safety Facts: CrashStats* (DOT HS 809 939). National Highway Traffic Safety Administration. Washington, D.C. October.

Table 1: Overview of Indiana motorcycle collisions, 1994-2006

Year	Motorcycle collisions	Number of motorcycles involved in fatal collisions	Persons killed	Fatal motorcycle collisions		Registered motorcycles	Per 10,000 registered motorcycles			Total Indiana traffic fatalities	Motorcycle percentage of total traffic fatalities
				Single vehicle	Multiple vehicle		Indiana collisions	Indiana fatalities	U.S. fatalities		
1994	2,410	66	64	29	37	97,017	248.4	6.6	6.2	971	6.6%
1995	2,251	68	65	23	45	96,394	233.5	6.7	5.7	960	6.8%
1996	1,844	59	62	25	34	96,710	190.7	6.4	5.6	984	6.3%
1997	1,899	47	48	18	29	98,252	193.3	4.9	5.5	935	5.1%
1998	2,063	71	69	32	39	104,106	198.2	6.6	5.9	982	7.0%
1999	2,149	67	67	36	31	108,716	197.7	6.2	6.0	1,020	6.6%
2000	2,279	73	73	29	44	118,796	191.8	6.1	6.7	886	8.2%
2001	na	85	75	29	56	128,130	na	5.9	6.5	909	8.3%
2002	na	89	88	46	43	134,881	na	6.5	6.5	792	11.1%
2003	2,151	82	81	30	52	145,948	147.4	5.5	6.9	833	9.7%
2004	2,621	105	108	39	66	154,739	169.4	7.0	7.0	947	11.4%
2005	2,630	113	110	50	63	164,423	160.0	6.7	7.3	938	11.7%
2006	2,573	92	96	38	54	162,683	158.2	5.9	na	896	10.7%

Source: NHTSA FARS, except 2006 estimates = Indiana State Police VCRS data, extract dated April 9, 2007. 1996-2006 registered motorcycles from Indiana BMV, extract dated April 9, 2007. 1994-95 from Center for the Advancement of Traffic Safety (CATS), Purdue University, 2000 *Crash Factbook*. Motorcycle collisions 1994-2002, CATS 2000 *Crash Factbook*. U.S. rate per 10,000 motorcycles: NHTSA, *Traffic Safety Facts 2005*, p. 28, Table 10. na=not available.

collisions has increased. Since 2000, Indiana has either been at or slightly below the U.S. fatality rate per 10,000 registered motorcycles. Indiana's fatality rate has dropped from 7.0 in 2004 to 5.9 in 2006. Nonetheless, it has consistently led the Great Lakes region from 1994 to 2006 (see Table 2).³ Although this might be linked in part to different motorcycle usage rates, Indiana's annual rates are still comparatively high.

Based on Indiana's VCRS, slightly more than 11,000 individuals riding on motorcycles were involved in crashes during the 2003-2006 period (see Table 3).⁴ As noted earlier, fatalities declined from 2005 to 2006, although the total number of motorcyclists involved in collisions increased slightly. From

2004 through 2006, about 73 percent of motorcycle riders suffered some form of injury in Indiana motorcycle crashes.

Table 2: Motorcycles involved in fatal collisions per 10,000 registered motorcycles

Year	Michigan	Minnesota	Wisconsin	Illinois	Ohio	Indiana	Indiana rank (high to low)
1994	6.44	3.63	3.89	7.86	4.79	6.63	2
1995	6.56	3.06	2.85	5.49	4.96	6.78	1
1996	4.10	3.62	3.08	6.37	5.29	6.45	1
1997	4.08	2.02	3.32	4.57	4.83	4.90	1
1998	3.66	3.21	3.83	4.85	5.16	6.74	1
1999	4.98	2.37	3.44	4.76	5.05	6.15	1
2000	4.72	2.59	4.36	6.45	5.00	6.22	2
2001	4.90	2.77	3.45	5.45	4.66	5.91	1
2002	4.28	2.97	4.02	4.31	4.92	6.52	1
2003	3.79	3.68	4.29	5.48	4.77	5.63	1
2004	3.57	2.75	3.45	5.69	4.50	7.06	1
2005	4.71	2.89	3.07	5.40	5.78	7.48	1

Source: registered motorcycles: Highway Statistics, various years. US Dept of Transportation, Federal Highway Administration, Office of Highway Policy Information. Fatality data = FARS.

³The NHTSA Great Lakes Region is defined as Indiana, Illinois, Michigan, Ohio, Minnesota, and Wisconsin.

⁴Fatality data reported from the Indiana VCRS extract for the years 2003 through 2005 do not exactly match fatality data reported for Indiana from NHTSA FARS data. It is unclear why this has been the case, although it could be related to the reclassification of vehicle units that can occur from time to time as new information about fatal collisions is made available.

Table 3: Individuals in motorcycle collisions, by injury status

Injury status incidence					
Operators	2003	2004	2005	2006	Totals
Fatal	67	85	101	85	338
Incapacitating	303	338	312	348	1,301
Nonincap + possible	1,202	1,402	1,380	1,367	5,351
Blank, unknown, no injury	803	698	708	709	2,918
Subtotal	2,375	2,523	2,501	2,509	9,908
Passengers					
Fatal	9	12	2	11	34
Incapacitating	42	52	45	60	199
Nonincap + possible	206	217	179	209	811
Blank, unknown, no injury	62	8	12	5	87
Subtotal	319	289	238	285	1,131
All motorcyclists					
Fatal	76	97	103	96	372
Incapacitating	345	390	357	408	1,500
Nonincap + possible	1,408	1,619	1,559	1,576	6,162
Blank, unknown, no injury	865	706	720	714	3,005
Grand total	2,694	2,812	2,739	2,794	11,039
Probability of injury status					
Among operators					
Fatal	2.8%	3.4%	4.0%	3.4%	3.4%
Incapacitating	12.8%	13.4%	12.5%	13.9%	13.1%
Nonincap + possible	50.6%	55.6%	55.2%	54.5%	54.0%
Among passengers					
Fatal	2.8%	4.2%	0.8%	3.9%	3.0%
Incapacitating	13.2%	18.0%	18.9%	21.1%	17.6%
Nonincap + possible	64.6%	75.1%	75.2%	73.3%	71.7%

Source: Indiana State Police VCRS data, extract dated April 9, 2007

The probability among motorcycle operators of a fatal injury dropped slightly in 2006 (from 4 to 3.4 percent). Motorcycle passengers were slightly more likely than operators to suffer a fatal injury (3.9 percent).

ALCOHOL-RELATED MOTORCYCLE COLLISIONS

Alcohol use is a frequent factor in motorcycle collisions. NHTSA's 2000 to 2004 estimates of alcohol-related fatal motorcycle crashes hovered around 30 percent.⁵ Considering

all motorcycle collisions, about 11 percent of Indiana motorcycle operators in 2006 were linked to alcohol (see Table 4). If collisions rather than individuals are considered, about 11 percent of crashes were alcohol-related in 2006 (this includes drivers of other non-motorcycle vehicles that collide with or are hit by motorcycles; see Table 5).⁶ About 41 percent of fatal motorcycle collisions were alcohol-related in 2006. Alcohol appears to be a factor in single-vehicle motorcycle crashes more frequently than multiple vehicle collisions. It should be emphasized here that "alcohol-related" does not necessarily mean alcohol caused the crash, but that alcohol was one of the (possibly several) factors contributing to the collision.

In 2006, more than 40 percent (35) of the 85 fatalities among Indiana motorcycle operators were alcohol-related. Further, alcohol-related motorcycle crashes were more dangerous than non-alcohol crashes and generated higher proportions of fatal and incapacitating injuries (see Table 4). The percent of individuals with fatal or incapacitating injuries was typically twice as high in alcohol-related motorcycle crashes as in non-alcohol collisions (the "alcohol lethality ratio") from 2003 to 2006. During this period, the 12 percent of motorcycle operators classified as alcohol-related fatal crashes accounted for 39 percent of all motorcycle operator fatalities.

AGE OF MOTORCYCLE OPERATORS

National surveys of motorcycle fatalities have suggested that older motorcyclists contributed disproportionately to the

⁵National Center for Statistics and Analysis. 2005. "Impaired motorcycle operators....," Table 2.

⁶For purposes of the Indiana (VCRS) data supporting this analysis, "alcohol related crashes" are defined based on information from the Indiana Officer's Standard Crash Report input to the VCRS. A record is alcohol-related if:

1. Primary factor = "Alcoholic beverages" OR
2. Contributing circumstance = "Alcoholic beverages" OR
3. BAC test result > 0 for driver or non-motorist OR
4. Apparent physical condition = "Had been drinking" for driver or non-motorist OR
5. OWI (operating while intoxicated) citation issued to driver.

NHTSA performs imputation routines to re-estimate state level alcohol involvement, which increases the percentage of motorcycle collisions thought to be alcohol-related. Information reported here is based only on non-imputed alcohol data included in the VCRS.



Table 4: Alcohol status of Indiana motorcycle operators involved in collisions

No alcohol/injury status	2003	2004	2005	2006	Grand Total
Fatal	38	58	61	50	207
Incapacitating	233	276	259	297	1,065
Blank, unknown, no injury	723	642	662	660	2,687
Nonincap + possible	1,056	1,232	1,234	1,216	4,738
Subtotal	2,050	2,208	2,216	2,223	8,697
Fatal + incap percentage	13.2%	15.1%	14.4%	15.6%	14.6%
Alcohol-related / Injury status					
Fatal	29	27	40	35	131
Incapacitating	70	62	53	51	236
Blank, unknown, no injury	80	56	46	49	231
Nonincap + possible	146	170	146	151	613
Subtotal	325	315	285	286	1,211
Fatal + incap percentage	30.5%	28.3%	32.6%	30.1%	30.3%
Grand Total	2,375	2,523	2,501	2,509	9,908
Alcohol lethality ratio	2.30	1.87	2.26	1.93	2.07
Percent classified as alcohol-related motorcycle crashes					
All operators	13.7%	12.5%	11.4%	11.4%	12.2%
Fatalities	43.3%	31.8%	39.6%	41.2%	38.8%
Incapacitating	23.1%	18.3%	17.0%	14.7%	18.1%

Alcohol lethality ratio = ratio of alcohol-related fatal + incap percentage to non-alcohol fatal + incap percentage.
Source: Indiana State Police VCRS data, extract dated April 9, 2007.

Table 5: Alcohol-related collisions involving motorcycles, all vehicles

Motorcycle collisions	2003	2004	2005	2006	Grand Total
Single vehicle	1,103	1,214	1,209	1,290	4,816
Alcohol-related	176	187	161	175	699
Alcohol percentage of single vehicle	16.0%	15.4%	13.3%	13.6%	14.5%
Multiple vehicles	1,324	1,350	1,376	1,283	5,333
Alcohol-related	152	128	132	113	525
Alcohol percentage of multiple vehicle	11.5%	9.5%	9.6%	8.8%	9.8%
Total collisions	2,427	2,564	2,585	2,573	10,149
Alcohol-related	328	315	293	288	1,224
Alcohol percentage of total	13.5%	12.3%	11.3%	11.2%	12.1%
Fatal motorcycle collisions					
Single vehicle	27	35	45	38	145
Alcohol-related	11	16	20	19	66
Alcohol percentage of single vehicle	40.7%	45.7%	44.4%	50.0%	45.5%
Multiple vehicles	48	55	59	54	216
Alcohol-related	20	12	22	19	73
Alcohol percentage of multiple vehicle	41.7%	21.8%	37.3%	35.2%	33.8%
Total fatal collisions	75	90	104	92	361
Alcohol-related	31	28	42	38	139
Alcohol percentage of total	41.3%	31.1%	40.4%	41.3%	38.5%

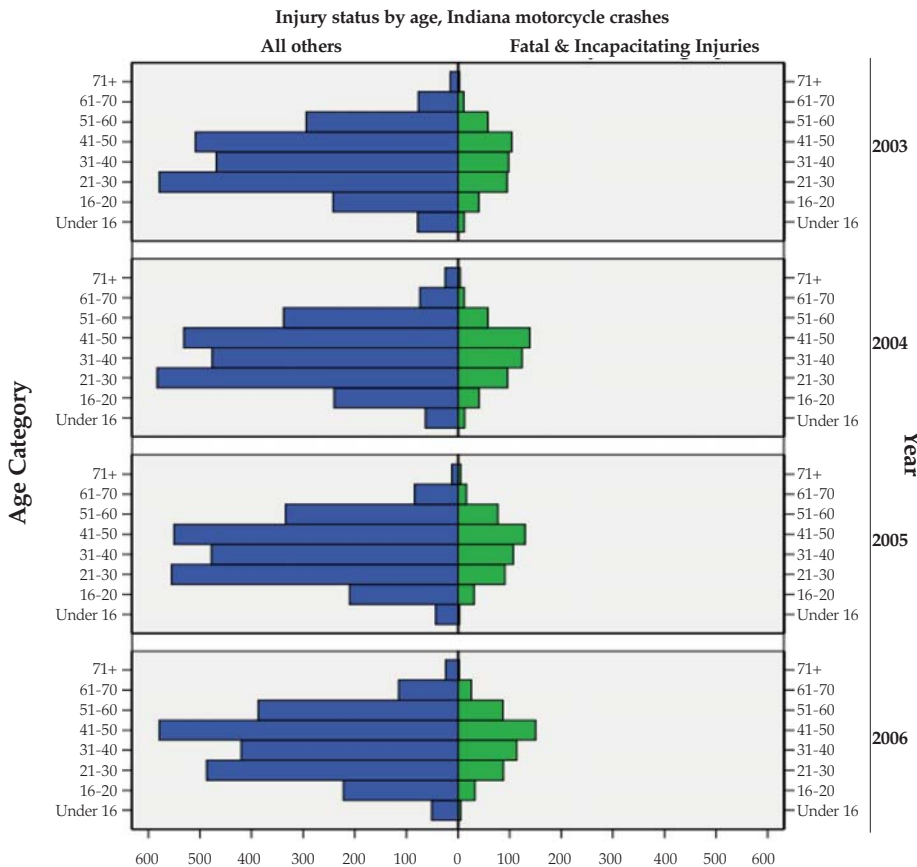
Source: Indiana State Police VCRS data, extract dated April 9, 2007.

increase in motorcycle fatalities.⁷ To a large extent, this was true in Indiana during the 2003 to 2006 period, where motorcycle riders between the ages of 41 and 50 accounted for the largest numbers of fatalities and incapacitating injuries (see Figure 1). Regarding all other motorcycle collisions, the 21 to 30 year old age group had accounted for the largest number of less serious motorcycle collisions (minor or no injuries) from 2003 to 2005, but by 2006 the 41 to 50 year old age group had the largest number of non-lethal crashes. In 2003, a rider 40 years or older represented just over a third of all fatalities, whereas by 2006, half the motorcycle riders killed in crashes were older than 40. Since 2003, motorcyclists over 40 have developed higher risks of fatal or incapacitating injury from motorcycle crashes (see Table 6). Indiana collision data from 2003 to 2006 suggest that the risk of serious injury or death is related to the age of the motorcycle rider, although risk drops for riders over 60.

Although driver license status is detailed later, it deserves emphasis here that younger motorcycle operators involved in Indiana crashes were less likely than older operators to have a valid motorcycle endorsement or motorcycle license (see Table 7). From 2003 through 2006, motorcycle operators under 21 had the smallest percentages of appropriate motorcycle licenses, although there were improvements in each year's percentage. Older motorcycle operators were more likely to have proper motorcycle endorsements, and by 2006 more than half of motorcycle operators 41 and older involved in crashes were properly

⁷Highway Loss Data Institute. 2005. *Fatality Facts 2005: Motorcycles*. Insurance Institute for Highway Safety. Available at http://www.iihs.org/research/fatality_facts/motorcycles.html, accessed February 7, 2007.

Figure 1: Indiana motorcycle collisions by age and injury status, 2003-2006



Source: Indiana State Police VCRS data, extract dated April 9, 2007.

Table 6: Indiana motorcycle collisions, age-weighted risk of fatality-incapacitating injury status

Age category	2003	2004	2005	2006	Grand Total	N
Under 21	14.0%	15.3%	12.0%	12.3%	13.5%	1,305
21-40	15.6%	17.3%	16.0%	18.2%	16.8%	4,844
41-60	16.7%	18.5%	19.0%	19.7%	18.6%	4,322
Over 60	13.3%	14.4%	17.9%	16.4%	15.7%	498
N	2,671	2,793	2,720	2,785		10,969

Note: Age-weighted fatal-incapacitating injury risk = sum of fatal and incapacitating injuries within age category divided by the sum of all individuals in motorcycle crashes within that age category. N = total motorcycle riders in VCRS where age and injury status are known.

Source: Indiana State Police VCRS data, extract dated April 9, 2007.

Table 7: Percentage of Indiana motorcycle operators with proper motorcycle licenses involved in collisions, as percentage of all operators in age group

Age category	2003	2004	2005	2006	Grand Total	N
Under 21	14.9%	22.1%	27.0%	30.5%	23.8%	936
21-40	16.1%	28.4%	31.9%	43.4%	29.8%	4,248
41-60	23.2%	35.2%	40.7%	51.6%	38.6%	3,773
Over 60	17.6%	37.9%	53.2%	55.1%	43.4%	459
N	2,159	2,391	2,418	2,448		9,416

Note: N = cases where age and license status are known.

Source: Indiana State Police VCRS data, extract dated April 9, 2007.

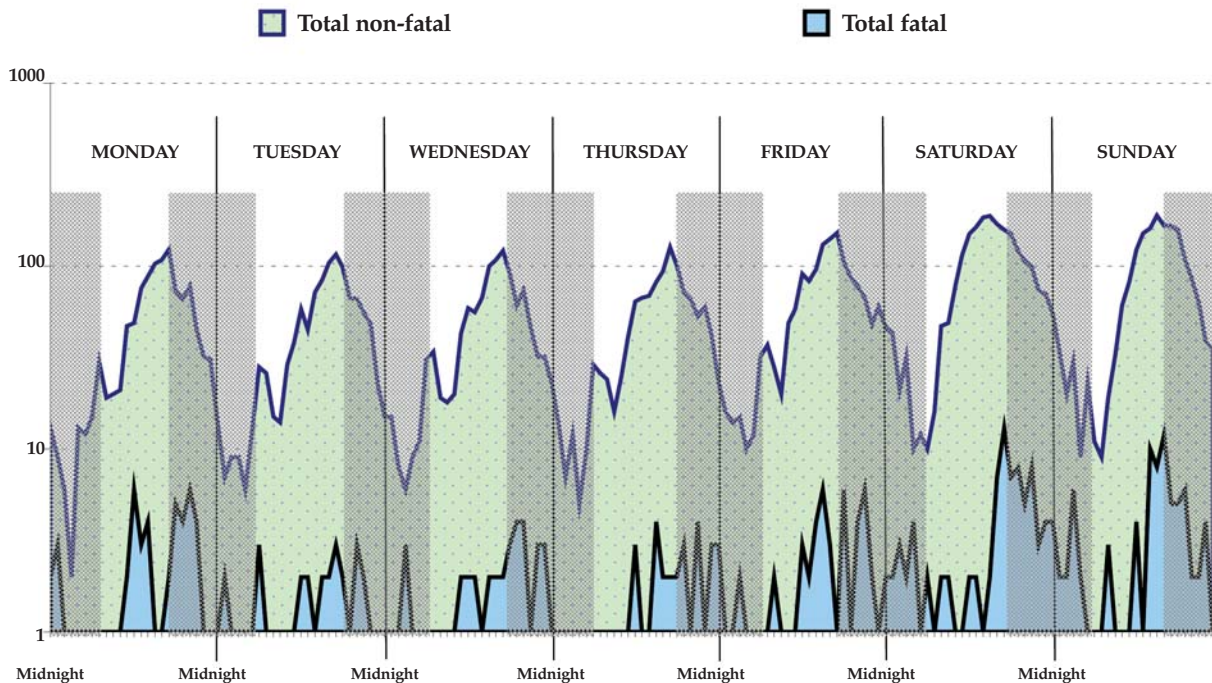
licensed. Nonetheless, the number of improperly licensed motorcycle operators continues to be a factor when considering the age distribution of operators involved in crashes.

TIMING AND INCIDENCE OF MOTORCYCLE COLLISIONS

Motorcycle crashes are more likely to occur on certain days and at certain times. Figure 2 shows the pattern of Indiana motorcycle crashes aggregated from 2003 through 2006 across each hour of the day for each day of the week; the vertical lines represent midnight and the shaded bands indicate the approximate periods of darkness (from 6 pm to 6 am). Like all traffic collisions, motorcycle crashes exhibit a characteristic time-day pattern across the week, with both fatal and non-fatal collisions peaking typically in the late afternoon or early evening on Fridays, Saturdays, and Sundays. Non-fatal motorcycle crashes occur disproportionately during morning rush hour, lunchtime, and evening rush hour. The time pattern of fatal collisions is obviously more sporadic, and differs from other collisions in a few significant ways. First, although non-fatal collisions increase from about 6 am to noon each day Monday through Thursday, fatal motorcycle crashes appear less frequently during those time periods. Second, from Friday at midnight to approximately 6 am Saturday, non-fatal collisions declined substantially, but fatal collisions appear to increase.



Figure 2: Indiana motorcycle collisions by day and time, non-fatal versus fatal collisions, combined years 2003-2006



Years = 2003 through 2006
 Vertical lines = midnight
 Gray shaded bands represent approximate periods of darkness
 Source: Indiana State Police VCRS data, extract dated April 9, 2007.

DRIVERS LICENSE STATUS OF MOTORCYCLE OPERATORS IN INDIANA COLLISIONS

Nationally, about 24 percent of motorcycle operators involved in fatal crashes were improperly licensed in 2005.⁸ Indiana law (IC 9-24-8) requires motorcycle operators to have either a motorcycle learner permit, a motorcycle endorsement to the operator's license, or a motorcycle license. The absence of a drivers license with proper motorcycle endorsements of any type appears to be a factor in many Indiana motorcycle crashes (see Table 8). In Indiana, it has been typical for more than two-thirds of crashes to involve operators not licensed for motorcycles, although this ratio improved during the 2003-2006 period. This

percentage has increased annually since 2003, from about 19 percent to 46 percent, but still reflects a disproportionate number of motorcycles operated by improperly licensed individuals. Similar findings hold for fatal and incapacitating

Table 8: Drivers license status of Indiana motorcycle operators involved in collisions

Where license status is known	2003	2004	2005	2006	Grand Total
Motorcycle operators in all crashes					
Motorcycle licenses	406	739	873	1,136	3,154
All other	1,763	1,659	1,556	1,315	6,293
Total	2,169	2,398	2,429	2,451	9,447
Motorcycle licenses percentage of total	18.7%	30.8%	35.9%	46.3%	33.4%
Fatal or incapacitating injury					
Motorcycle licenses	70	123	148	188	529
All other	267	274	252	235	1,028
Total	337	397	400	423	1,557
Motorcycle licenses percentage of total	20.8%	31.0%	37.0%	44.4%	34.0%

Note: Motorcycle license includes motorcycle license, motorcycle learners permit, or motorcycle endorsement to other operators license. All other includes other drivers license types, including no license.
 Source: Indiana State Police VCRS data, extract dated April 9, 2007.

⁸Comparatively, about 10 percent of all operators of passenger vehicles involved in fatal accidents did not have a valid license in 2005. See Table 91, page 126, and Table 64, page 100, in National Center for Statistics and Analysis. 2005. *Traffic Safety Facts 2005*, (DOT HS 810 631). National Highway Traffic Safety Administration. Washington, D.C.

Table 9: Indiana motorcycle collisions, by helmet use and injury status

All motorcycle riders					
Operators	2003	2004	2005	2006	Grand Totals
With helmets					
Fatal	20	27	20	19	86
Incapacitating	79	110	103	119	411
Nonincap + possible	451	606	498	583	2,138
Unknown or no injury	258	269	245	246	1,018
Subtotal	808	1,012	866	967	3,653
Without helmets					
Fatal	56	70	83	77	286
Incapacitating	266	280	254	289	1,089
Nonincap + possible	957	1,013	1,061	993	4,024
Unknown or no injury	607	437	475	468	1,987
Subtotal	1,886	1,800	1,873	1,827	7,386
Totals					
Fatal	76	97	103	96	372
Incapacitating	345	390	357	408	1,500
Nonincap + possible	1,408	1,619	1,559	1,576	6,162
Unknown or no injury	865	706	720	714	3,005
Subtotal	2,694	2,812	2,739	2,794	11,039
Percent all crashes w/o helmets	70.0%	64.0%	68.4%	65.4%	66.9%
Percent fatal crashes w/o helmets	73.7%	72.2%	80.6%	80.2%	76.9%
Non-helmet risk factor					
Fatal	1.20	1.46	1.92	2.14	1.64
Incapacitating	1.44	1.43	1.14	1.29	1.31

Note: non-helmet risk factor = ratio of fatal or incapacitating percentage of subtotal with helmets to fatal or incapacitating percentage of subtotal without helmets.

Source: Indiana State Police VCRS data, extract dated April 9, 2007

injury collisions: although the percentage of appropriately licensed motorcycle operators has increased since 2003, by 2006 more than one-half of motorcycle operators involved in the most serious crashes were not properly licensed.⁹

USE OF HELMETS IN MOTORCYCLE COLLISIONS

Motorcycle helmet use affects injury severity in motorcycle crashes. Motorcycle riders experience fewer serious injuries if they wear helmets, and helmets are widely acknowledged to reduce fatalities from motorcycle crashes.¹⁰ Nationally,

motorcycle helmet use has dropped from 63 percent in 1994 to 51 percent in 2006, with helmet use in the Midwest estimated to be about 50 percent.¹¹ Among the six Great Lakes states, only Michigan requires all riders to wear helmets. Indiana, Wisconsin, Ohio, and Minnesota require only riders under age 18 to wear helmets, and Illinois has no helmet requirements at all.¹²

Approximately two-thirds of motorcycle riders involved in and more than four-fifths of riders killed in Indiana crashes in 2006 did not wear a helmet (see Table 9). Although the percentage of individuals without helmets decreased for all motorcycle collisions from 2003 to 2006 (from 70 to 65 percent), the proportion of individuals without helmets in fatal collisions increased from 73 percent in 2003 to 80 percent in 2006. Overall, helmet use is associated with lower probabilities of death or incapacitating injury in Indiana. In 2006, motorcycle riders without helmets were slightly more than twice as likely to experience a fatal crash as compared to riders who wore a helmet. Further, people without helmets were more likely to be injured.

PRIMARY CAUSES REPORTED IN INDIANA MOTORCYCLE COLLISIONS

The Indiana Officers Standard Crash Report requires investigating officers to indicate the “primary cause” of a collision, which includes 48 possible causes classified as contributing circumstances attached to the driver, the vehicle, or the environment. For this fact sheet, these possible causes were re-organized into

⁹Based on other analyses of VCRS data not shown in the table, driver license status does not appear to affect injury severity—licensed and unlicensed motorcyclists have similar injury status patterns.

¹⁰See Sosin, D.M., J.J. Sacks and P. Holmgren. 1990. “Head injury—associated deaths from motorcycle crashes, relationship to helmet use laws,” *Journal of the American Medical Association* 264(18) November. ; and D.C. Norvell and P. Cummings, 2002, “Association of helmet use with death in motorcycle crashes: a matched-pair cohort study,” *American Journal of Epidemiology* 156(5): 483-487. Also, repeal of helmet laws is strongly associated with increased injuries and injury severity. See A. Muller, 2004, “Florida’s motorcycle helmet law repeal and fatality rates,” *American Journal of Public Health* 94(4): 556-558, April; and G.H. Bledsoe and G. Li, 2005, “Trends in Arkansas motorcycle trauma after helmet law repeal,” *Southern Medical Journal* 98(4): 401-02.

¹¹Glassbrenner, D. and J. Ye, 2006. “Motorcycle helmet use in 2006—overall results,” *Traffic Safety Facts—Research Note*. (DOT HS 810 678). National Center for Statistics and Analysis. National Highway Traffic Safety Administration. Washington, D.C. November.

¹²American Motorcycle Association. 2007. State Motorcycle Laws. Available at <http://www.amadirectlink.com/legisltn/laws.asp>, accessed March 11, 2007.



Table 10: Indiana motorcycle collisions and fatal collisions by primary cause

All motorcycles collisions	2003	2004	2005	2006	Grand Total	Percentage of subtotal
Mechanical problem	54	50	47	56	207	2.0%
Driver impairment	114	115	97	94	420	4.1%
Outside circumstances	125	174	177	193	669	6.6%
Distraction	8	55	56	74	193	1.9%
Potential traffic violations	1,225	1,227	1,222	1,177	4,851	47.8%
Infrastructure	83	89	85	96	353	3.5%
Driving actions	319	388	368	370	1,445	14.2%
Unknown, blank, or other	499	466	533	513	2,011	19.8%
Subtotal	2,427	2,564	2,585	2,573	10,149	100.0%
Collisions with fatality						
Mechanical problem	2	2	-	-	4	1.1%
Driver impairment	5	8	6	5	24	6.6%
Outside circumstances	1	2	3	3	9	2.5%
Distraction	-	1	4	-	5	1.4%
Potential traffic violations	45	44	61	59	209	57.9%
Infrastructure	-	-	-	1	1	0.3%
Driving actions	19	23	25	21	88	24.4%
Unknown, blank, or other	3	10	5	3	21	5.8%
Subtotal	75	90	104	92	361	100.0%

Note: primary factors coded as follows:

Mechanical problem = Accelerator Failure or Defective, Brake Failure or Defective, Engine Failure or Defective, Headlight Defective or Not On, Other Lights Defective, Steering Failure, Tire Failure or Defective

Driver impairment = Alcoholic Beverages, Driver Asleep or Fatigued, Driver Illness, Illegal Drugs, Prescription Drugs

Outside circumstances = Animal on Roadway, Glare, Pedestrian Action, Severe Crosswinds

Distraction = Cell Phone Usage, Driver Distracted (Explain in Narrative), Other Telematics in Use, Passenger Distraction

Potential traffic violations = Disregard Signal/Reg Sign, Failure to Yield Right of Way, Following Too Closely, Improper Lane Usage, Improper Passing, Improper Turning, Insecure/Leaky Load, Oversize/Overweight Load, Speed too Fast for Weather Conditions, Unsafe Backing, Unsafe Speed, Violation of License Restriction, Wrong Way on One Way

Infrastructure = Holes/Ruts in Surface, Lane Marking Obscured, Obstruction Not Marked, Road Under Construction, Roadway Surface Condition, Shoulder Defective, Traffic Control Problem, Utility Work, View Obstructed

Driving actions = Jackknifing, Left of Center, Overcorrecting/Oversteering, Ran Off Road Left, Ran Off Road Right

Source: Indiana State Police VCRS data, extract dated April 9, 2007.

an eight-part categorization that includes mechanical problems, driver impairment, outside circumstances, distraction, potential traffic violations, infrastructure, driving actions, and unknown.¹³ The results for the 2003-2006 period are shown in Table 10.

Considering all motorcycle crashes in this way suggests that nearly one-half of all collisions are linked to potential traffic violations. This percentage climbs to nearly 58 percent when the focus is on fatal motorcycle crashes. “Driving actions” (e.g., oversteering, running off road, etc.) by motorcycle operators or the drivers of other vehicles is the next most frequently cited primary factor.

CITATIONS LINKED TO INDIANA MOTORCYCLE CRASHES

To what extent are traffic or other citations present in Indiana motorcycle crashes? The Indiana Officers Standard Crash Report includes information indicating whether individuals involved in crashes received a citation. Citations are classified as infractions, misdemeanors, or felonies. As shown in Table 11, few infractions, misdemeanors, or felonies were issued in motorcycle collisions in Indiana during 2003 to 2006. For example, among the 1,639 motorcycle operators receiving fatal or incapacitating injuries over the four years, approximately 15 percent were given some type of citation. However, as shown in Table 10, just fewer than one-half (4,851) of all motorcycle crashes—and 58 percent (209) of fatal collisions—reported primary factors that could be classified as potential traffic law violations. This suggests that ordinarily, law enforcement agents do not write many citations for motorcycle crashes.

At a minimum, tickets for unlicensed motorcycle operators could have accompanied a large number of motorcycle crashes (for example, see Table 8).¹⁴

¹³The “primary cause” counts are linked to motorcycle collisions, which include single motorcycle crashes and (multi-vehicle) collisions between motorcycles and other vehicles. Therefore, these data do not distinguish between motorcycles and other vehicles. However, about one-half of total collisions each year were single-vehicle (i.e., one motorcycle).

¹⁴The relative absence of citations reported in VCRS either means (1) traffic or other criminal law violations are comparatively rare, or (2) various infractions and citations are not fully reported into the VCRS system.

Table 11: Indiana motorcycle collisions, by issuance of citations

Operators and injury status	2003	2004	2005	2006	Grand Totals
Total motorcycle operators in crashes	2,375	2,523	2,501	2,509	9,908
Motorcycle operators receiving citations					
Fatal or incapacitating injuries					
Infractions	27	25	25	41	118
Misdemeanors	27	28	24	25	104
Felonies	12	5	4	9	30
Other (minor injury, noninjury, unknown, etc.)					
Infractions	179	180	200	199	758
Misdemeanors	113	124	105	111	453
Felonies	40	40	33	25	138

Note: citation data are not mutually exclusive; individuals can receive multiple citations.

Source: Indiana State Police VCRS data, extract dated April 9, 2007

GEOGRAPHY OF INDIANA MOTORCYCLE COLLISIONS

Motorcycle crashes appear clustered in certain areas of the state. Map 1 classifies Indiana counties by the number of collisions per 10,000 registered motorcycles in each county, 2004 through 2006.¹⁵ Several counties have high motorcycle collision rates. For example, Tippecanoe, Brown, and Crawford counties have consistently reflected higher than average rates during the 2004 to 2006 period. By 2006, at least ten south central and southern Indiana counties had collision rates per 10,000 registered motorcycles in excess of the 165.5 county average. Likewise, motorcyclist fatalities have been consistently concentrated in several areas, as shown in Map 2, which illustrates all motorcycle collisions and identifies areas with high and low concentrations of motorcyclist fatalities. Three predominately urban counties in particular—Lake, Allen, and Marion—show high fatality concentrations in each of the three years, but a number of areas in northern and south central Indiana show periodically high numbers of fatalities from motorcycle collisions.

CONCLUSIONS

Motorcycle crashes in Indiana during 2003 to 2006 can be broadly profiled along several dimensions. Individuals involved in motorcycles are highly likely to be injured, with about a 3.4 percent (1-in-30) chance of a fatal injury outcome. Most operators involved in crashes were improperly licensed and were not wearing a helmet. Motorcycle collisions followed the ebb and flow of rush hour and weekend traffic flows, but motorcyclist fatalities occurred disproportionately on Fridays, Saturdays, and Sundays. When a motorcycle collision was classified as

alcohol-related, the potential for a fatal outcome increased substantially. The probability that either the motorcycle or another vehicle (if it was a multi-vehicle crash) was possibly engaging in an illegal traffic maneuver immediately preceding the crash was over 40 percent. Even so, comparatively few citations were reported from motorcycle crashes.

These findings suggest that, first, the focused use of sobriety checkpoints by law enforcement to target motorcycle operators could be an effective tactic to reduce the incidence of fatal motorcycle crashes. If located in areas with high measured motorcycle crash rates, such checkpoints could also identify opera-

tors who are not licensed properly, and presumably require them to take the written and driving test requirements for a valid Indiana motorcycle endorsement. Based on Maps 1 and 2, certain areas with above average collisions and fatality rates could be selected as sites for sobriety checkpoints.

Second, the use of sobriety checkpoints at night and during selected weekend periods (e.g., Saturday night into Sunday morning) could conceivably identify individual motorcycle operators who are above the legal alcohol limit. Such checkpoints could be part of larger campaigns against drunk driving, but could be modified to target motorcyclists.

Third, Indiana motorcycle collision data suggest that police are infrequently citing illegal actions by motorcyclists or other vehicles involved in motorcycle collisions. Focused traffic law enforcement campaigns targeting motorcycles might be one way to minimize traffic violations that lead to serious motorcycle collisions.

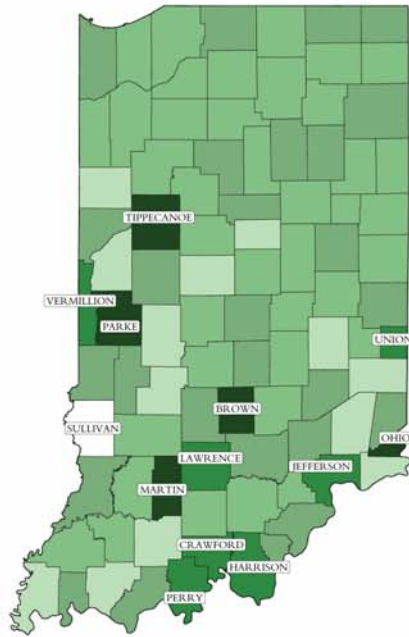
Finally, while there is overwhelming evidence that motorcycle helmets improve rider safety, two-thirds of all motorcycle collisions—and 80 percent of fatal collisions—involve riders not wearing motorcycle helmets. This raises a basic traffic safety question of whether the public costs of not wearing a helmet requirement exceed the individual benefits of freedom to go without a helmet. Health costs are higher overall because unhelmeted riders have more serious injuries and are more likely to be killed, which increases overall societal costs. More widespread helmet use would save lives, reduce injuries, and decrease economic costs. The broader implementation of helmet education programs might increase Indiana's helmet usage rate.

¹⁵Some motorcycle crashes entries in VCRS do not include geographic coordinates. The geocoded file used to construct Maps 1 and 2 consists of approximately 75 percent of all reported motorcycle collisions for 2004 through 2006. Approximately 80 percent of fatal motorcycle collisions are included in the geocoded file.



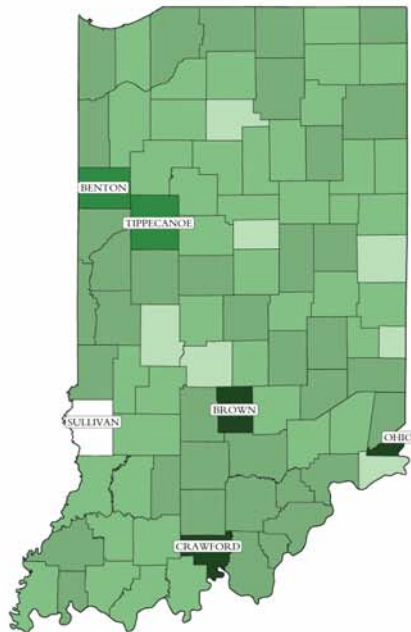
Map 1: Motorcycle collision rates by county

2004



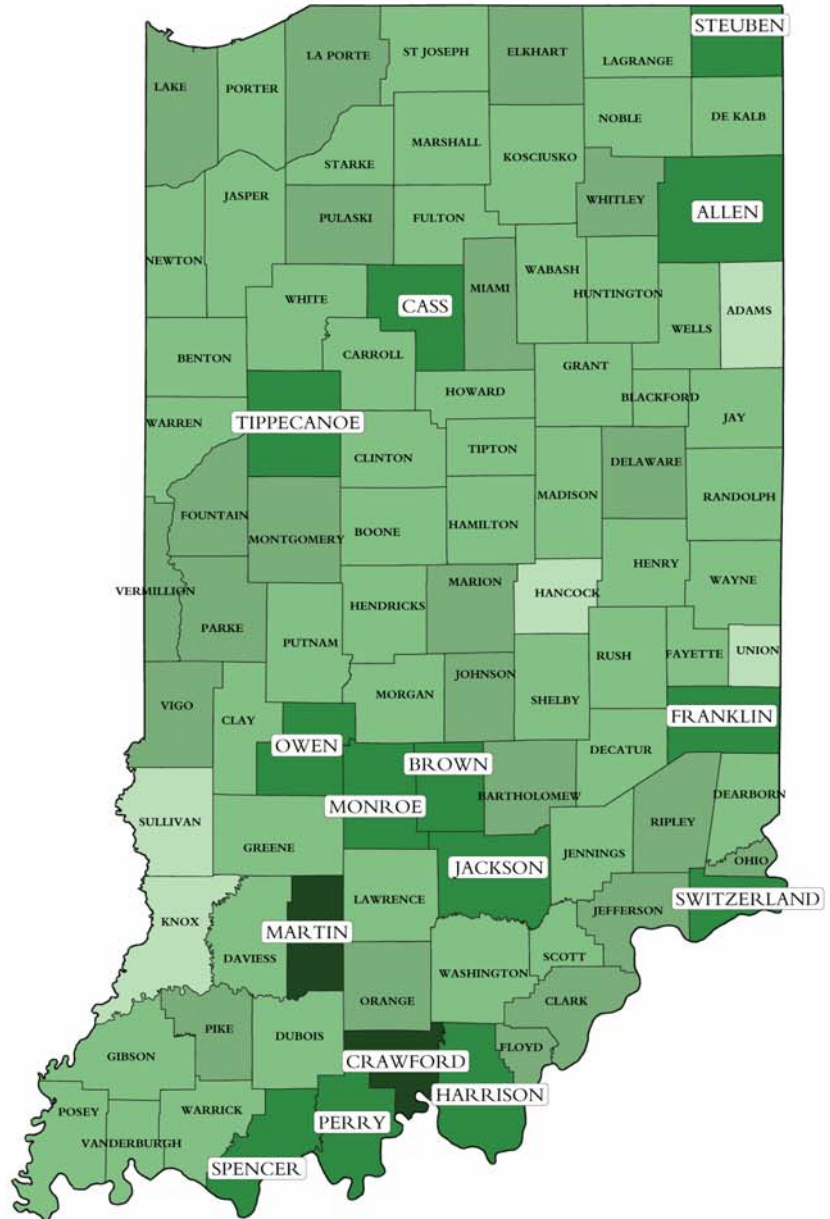
Mean = 163.6

2005



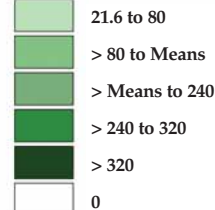
Mean = 150.3

2006



Mean = 165.5

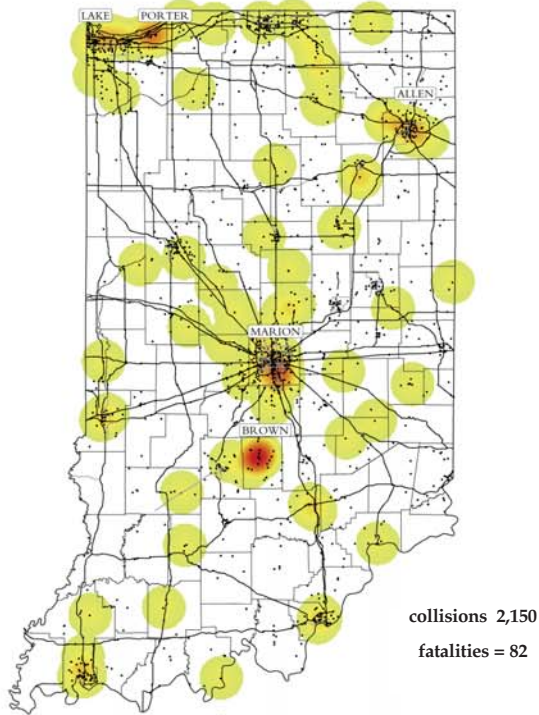
Per 10,000 registered motorcycles



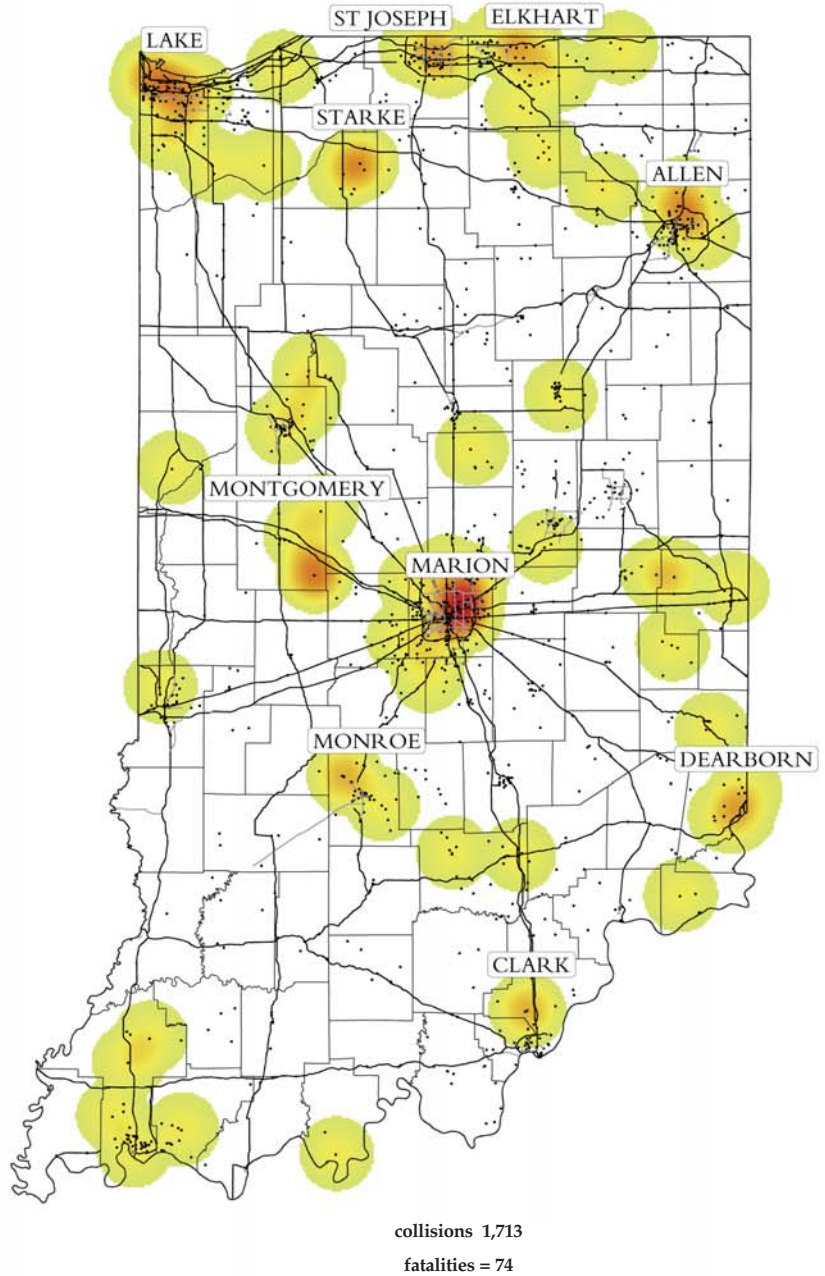
Source: Indiana State Police VCRS data, extract dated April 9, 2007

Map 2: Motorcycle collisions and fatality concentrations

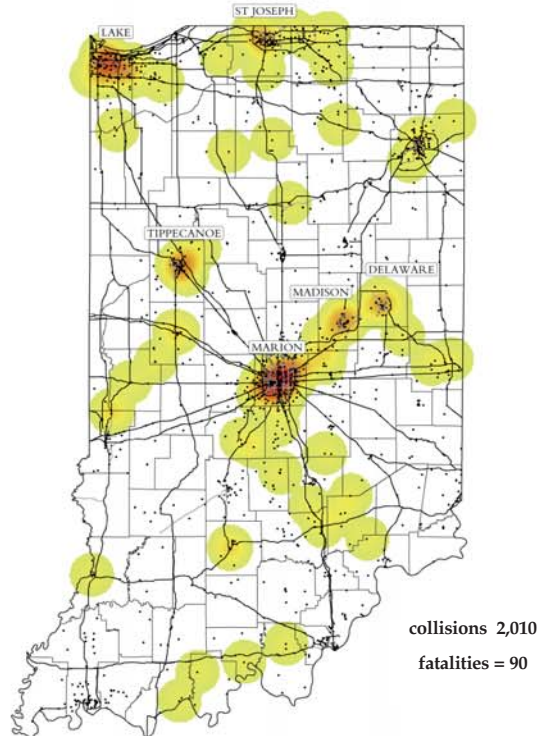
2004



2006



2005



• = collision

Fatality concentrations

- low (few fatalities in 10m radius)
- high (more fatalities in 10m radius)

— Interstates, US Highways, Primary State Highways

INDIANA TRAFFIC SAFETY FACTS



This publication was prepared on behalf of the Indiana Criminal Justice Institute by the Center for Urban Policy and the Environment. Please direct any questions concerning data in this document to ICJI at 317-232-1233.

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An electronic copy of this document can be accessed via the Center website (www.urbancenter.iupui.edu/trafficsafety), the ICJI traffic safety website (www.in.gov/cji/traffic/), or you may contact the Center for Urban Policy and the Environment at 317-261-3000.

The Indiana Criminal Justice Institute (ICJI)

Guided by a Board of Trustees representing all components of Indiana's criminal and juvenile justice systems, the Indiana Criminal Justice Institute serves as the state's planning agency for criminal justice, juvenile justice, traffic safety, and victim services. ICJI develops long-range strategies for the effective administration of Indiana's criminal and juvenile justice systems and administers federal and state funds to carry out these strategies.

The Governor's Council on Impaired & Dangerous Driving

The Governor's Council on Impaired & Dangerous Driving, a division of the Indiana Criminal Justice Institute, serves as the public opinion catalyst and the implementing body for statewide action to reduce death and injury on Indiana roadways. The Council provides grant funding, training, coordination and ongoing support to state and local traffic safety advocates.

The Center for Urban Policy and the Environment

The Indiana University Center for Urban Policy and the Environment is devoted to supporting economic success for Indiana and a high quality of life for all Hoosiers. An applied research organization, the Center was created by the Indiana University School of Public and Environmental Affairs in 1992. The Center works in partnership with community leaders, business and civic organizations, nonprofits, and government. The Center's work is focused on urban and community development, health policy, and criminal justice research essential to developing strategies to strengthen Indiana's economy and quality of life.

The National Highway Traffic Safety Administration (NHTSA)

NHTSA provides leadership to the motor vehicle and highway safety community through the development of innovative approaches to reducing motor vehicle crashes and injuries. The mission of NHTSA is to save lives, prevent injuries and reduce economic costs due to road traffic crashes, through education, research, safety standards and enforcement activity.

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