Fatalities of Pedestrians, Bicycle Riders, and Motorists Due to Distracted Driving Motor Vehicle Crashes in the U.S., 2005–2010

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ABSTRACT

Objective. Distracted driving is an increasingly deadly threat to road safety. This study documents trends in and characteristics of pedestrian, bicycle rider, and other victim deaths caused by distracted drivers on U.S. public roads.

Methods. We obtained data from the Fatality Analysis Reporting System database from 2005 to 2010 on every crash that resulted in at least one fatality within 30 days occurring on public roads in the U.S. Following the definition used by the National Highway Traffic Safety Administration, we identified distracted driving based on whether police investigators determined that a driver had been using a technological device, including a cell phone, onboard navigation system, computer, fax machine, two-way radio, or head-up display, or had been engaged in inattentive or careless activities.

Results. The rate of fatalities per 10 billion vehicle miles traveled increased from 116.1 in 2005 to 168.6 in 2010 for pedestrians and from 18.7 in 2005 to 24.6 in 2010 for bicyclists. Pedestrian victims of distracted driving crashes were disproportionately male, 25–64 years of age, and non-Hispanic white. They were also more likely to die at nighttime, be struck by a distracted driver outside of a marked crosswalk, and be in a metro location. Bicycling victims of distracted crashes were disproportionately male, non-Hispanic white, and struck by a distracted driver outside of a crosswalk. Compared with pedestrians, bicyclists were less likely to be hit in early morning.

Conclusions. Distracted drivers are the cause of an increasing share of fatalities found among pedestrians and bicycle riders. Policies are needed to protect pedestrians and bicycle riders as they cross intersections or travel on roadways.

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Mounting evidence links the use of electronic devices with increased traffic deaths and injuries.[1–4] Even though traffic deaths are declining, deaths from distracted driving are rising, with one study attributing much of this increase to texting volume, which surpassed 100 billion monthly text messages in 2008.[5] However, there are many potential causes of distraction other than electronic devices that threaten roadway safety. Most of this research has examined aggregate fatalities and injuries from distracted driving crashes, but little is known about the characteristics of victims killed in these crashes despite extensive research on predictors of pedestrian injuries.[6–11] Policy makers and advocacy organizations need greater understanding of the characteristics of victims who are most at risk from distracted drivers.

In this study, we report the number of pedestrians, bicyclists, and motorist victims who died from distracted driving-related motor vehicle crashes from 2005 to 2010, and describe the victims' characteristics. We identified a distracted driving-related crash according to whether a driver had been using a technological device, including a cell phone, onboard navigation system, computer, fax machine, two-way radio, or head-up display, or had been engaged in inattentive or careless activities.

METHODS

We obtained comprehensive data on traffic fatalities from the Fatality Analysis Reporting System (FARS). This database records every vehicular/pedestrian crash occurring on public roadways in the United States where there is at least one fatality resulting from the crash within 30 days.[12] FARS information is compiled from various records, including police crash reports; vehicle registration and driver licensing files; vital/death certificates; and coroner, hospital, and emergency medical reports. If a crash resulted from driver impairment, FARS provides detailed data on evidence of drug or alcohol involvement, including blood alcohol content data collected by police investigators. We used driver-related crash factors provided by FARS for drivers in fatal crashes to identify whether driver distraction was a factor.

Following the definition used by the National Highway Traffic Safety Administration (NHTSA), we considered a crash to be related to distracted driving if police investigators determined that a driver had been using a technological device, including a cell phone, onboard navigation system, computer, fax machine, two-way radio, or head-up display, or had been engaged in inattentive or careless activities. The latter includes a wide range of activities, such as distraction by children, adjusting the radio, reading, talking, eating, using an electric razor, applying cosmetics, and painting nails.[13] We calculated the number of fatalities for crashes involving at least one distracted driver. We adjusted the number of fatalities by the number of vehicle miles traveled (VMT), which is a Federal Highway Administration indicator for exposure to the risk for death from motor vehicle crash.[7]

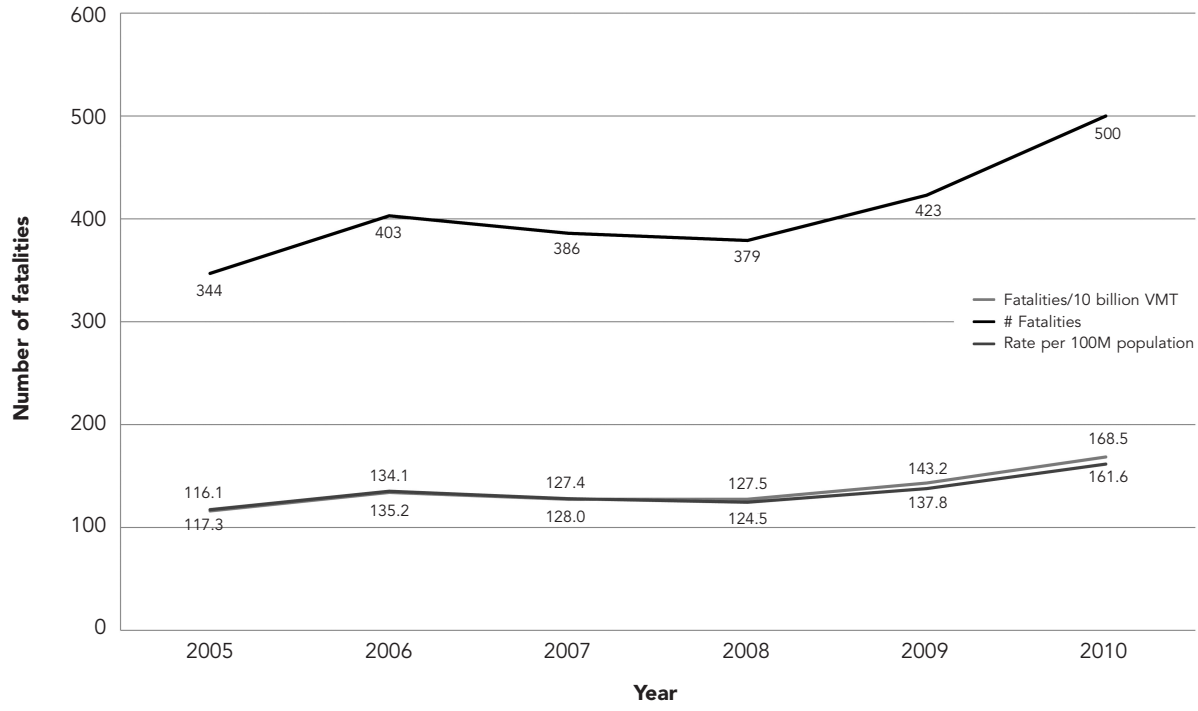
FARS data include characteristics of victims, including age, gender, race/ethnicity, whether the victim was determined by police to have been drinking alcohol, and whether the victim had physical impairments that contributed to the crash. We defined a victim as physically impaired if police determined that the victim had been ill/passed out; used a cane/crutches; or was restricted to a wheelchair, blind, emotionally impaired, or physically impaired. FARS data also comprise characteristics of the crash scene, including time of day, location of the victim (not in crosswalk/jaywalking, on road shoulder, in marked crosswalk, in parking lanes, on bike paths, on sidewalks, in medians, in driveways, in non-traffic or non-roadway areas, and in unknown locations), location of roadway (metro vs. nonmetro area), and whether the victim died at the crash scene. We defined metro vs. nonmetro location by using the 2003 rural-urban continuum codes provided by the U.S. Department of Agriculture's Economic Research Service.[14]

We calculated the unadjusted number and rate of pedestrian, bicyclist, and motorist fatalities involving crashes caused by distracted drivers and driver/crash characteristics for 2005 through 2010. We defined fatality rates as the number of fatalities per 10 billion VMT and the number of fatalities per 100 million population. We compared characteristics of the victims of distracted driving crashes with those of victims of non-distracted driving crashes. We used Stata® version 12 for all analyses.[15]

RESULTS

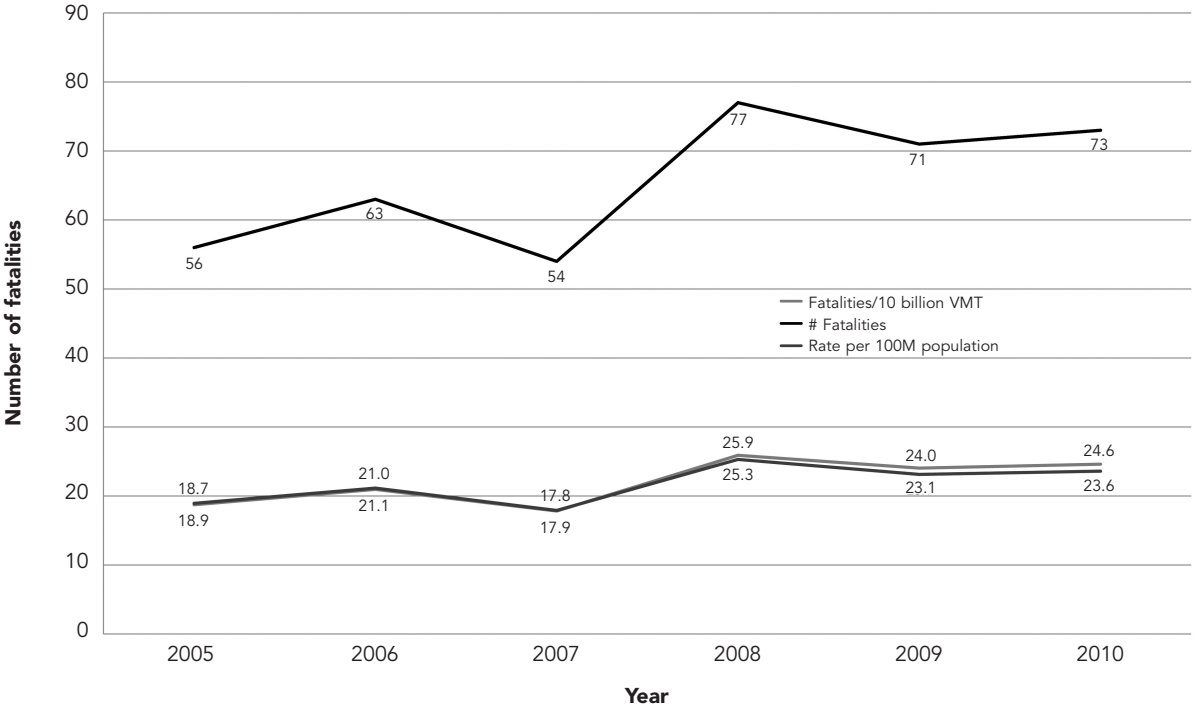
The rate of pedestrian fatalities per VMT from distracted driving crashes increased from 116.1 in 2005 to 168.6 in 2010 (Figure 1). The rate of increase was uneven over time but was steady from 2007 to 2010. The rate of bicyclist fatalities per VMT from distracted driving crashes increased from 18.7 in 2005 to 24.6 in 2010 (Figure 2). The rate of increase was uneven over time, largely due to the small number of deaths in any given year. In contrast to the trends for pedestrians and bicyclists from 2005 to 2010, fatalities per VMT for motorist victims of distracted driving crashes largely

Figure 1. Pedestrian fatalities from distracted driving crashes in the U.S.: Fatality Analysis Reporting System, 2005–2010



VMT = vehicle miles traveled

Figure 2. Fatalities of bicycle riders from distracted driving crashes in the U.S.: Fatality Analysis Reporting System, 2005–2010



VMT = vehicle miles traveled

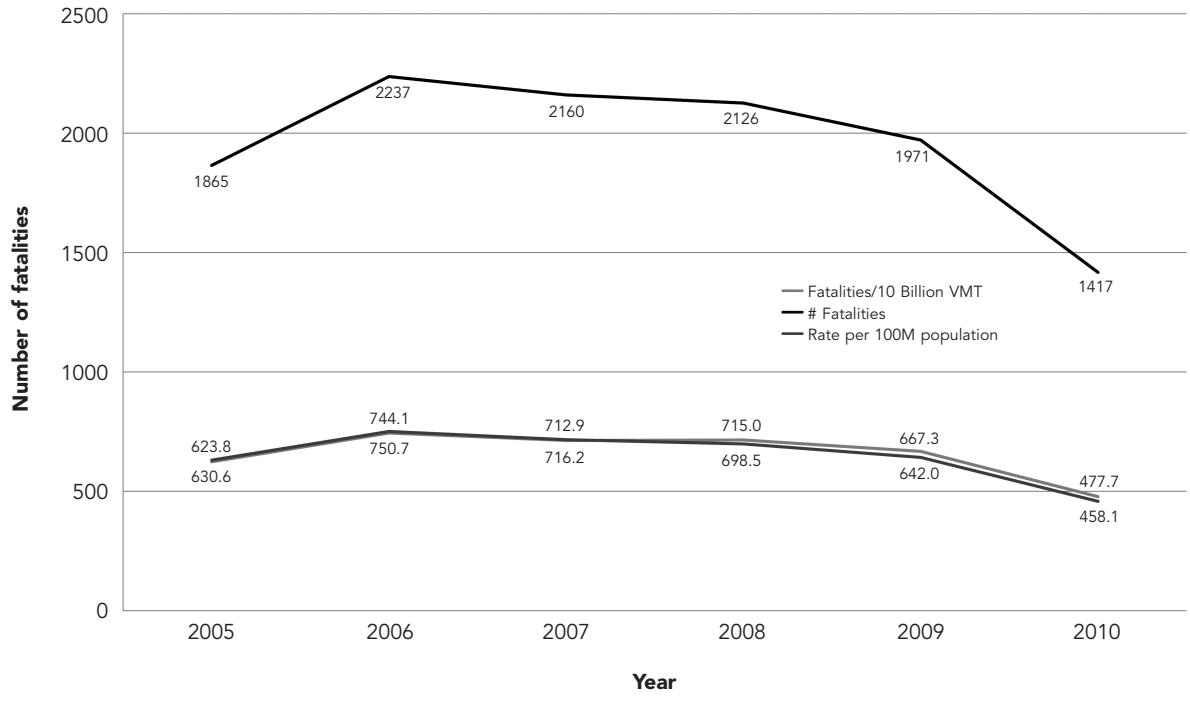
decreased in this period, from 744.1 in 2006 to 477.7 in 2010 (Figure 3).

Victim and crash scene characteristics are shown in Table 1, with comparisons made between distracted driving and non-distracted driving crashes. For pedestrian victims, there was a significant gender difference, with more pedestrian male victims than female victims (65.7% vs. 34.3%). Within age groups, 23.8% of pedestrians aged 65 years and older were victims of distracted driving crashes compared with 11.7% for bicyclists and 17.2% for motorists. Two-thirds (63.6%) of pedestrian victims were non-Hispanic white, 13.8% were Hispanic, 15.0% were non-Hispanic black, and 7.3% were of another race/ethnicity. Of pedestrians dying in a distracted driving-related crash, 3.2% had a physical disability. About half (47.2%) of pedestrian victims were struck between 6 a.m. and 6 p.m. Most pedestrian victims of distracted driving crashes (53.7%) were struck outside of a crosswalk, 12.4% were struck on a road shoulder, and 15.4% were hit in a marked crosswalk. Finally, 82.5% of pedestrian victims of distracted driving crashes were hit in a metro area, and 42.3% died at the scene.

For bicycling victims, there was a substantial gender difference, with 83.5% of victims being male. Within age groups, nearly two-thirds (64.4%) were aged 25–64 years. Non-Hispanic white bicyclists accounted for 72.2% of fatalities from distracted driving crashes compared with Hispanic (11.7%) and non-Hispanic black (13.2%) bicyclists. Distracted driving crashes claimed proportionally more bicyclists between 6 p.m. and midnight (33.8%) than at other times. Bicyclists were most likely to be hit by distracted drivers outside of a crosswalk (58.9%) than on a road shoulder (16.8%) or marked crosswalk (4.3%). The roadway location for bicycling victims of distracted driving was more often in a metro area (77.7%) than in a rural area. Overall, for both pedestrians and bicyclists, we also found that 18.6% of distracted driving-related crashes were cell phone-related in the study period. However, there was no apparent trend in this percentage over time.

Motorist victims in distracted driving crashes were less likely to be male (56.7%) and tended to be younger (32.7% aged ≤24 years) than bicyclists and pedestrian victims. Distracted driving crashes claimed proportionally more motorist victims than pedestrians and bicyclists from 6 a.m. to 6 p.m. (58.1%). However, motorist victims of distracted driving crashes were less

Figure 3. Motorist[a] fatalities from distracted driving crashes in the U.S.: Fatality Analysis Reporting System, 2005–2010



[a]Motorist fatalities include motor vehicle passengers and non-distracted drivers involved in a distracted driving-related crash. Drivers who were distracted and died in the crash were excluded.

VMT = vehicle miles traveled

Table 1. Characteristics of pedestrian, bicycle rider, and motorist fatalities from distracted driving-related crashes in the U.S.: Fatality Analysis Reporting System, 2005–2010

	Motorists[a]			*Pedestrians*			*Bicycle riders*		
Characteristic	N	*Percent*	*Rate*[b]	N	*Percent*	*Rate*[b]	N	*Percent*	*Rate*[b]
Gender									
Male	6,671	56.7	3.67	1,601	65.7	0.88	329	83.5	0.18
Female	5,103	43.3	2.81	836	34.3	0.46	65	16.5	0.04
Age group (in years)									
0–24	3,847	32.7	2.12	491	20.2	0.27	94	23.9	0.05
25–64	5,887	50.1	3.24	1,364	56.0	0.75	253	64.4	0.14
≥65	2,021	17.2	1.11	579	23.8	0.32	46	11.7	0.03
Race/ethnicity									
Non-Hispanic white	5,858	69.0	3.23	963	63.6	0.53	192	72.2	0.11
Hispanic	1,271	15.0	0.70	209	13.8	0.12	31	11.7	0.02
Non-Hispanic black	982	11.6	0.54	230	15.2	0.13	35	13.2	0.02
Other	373	4.4	0.21	111	7.3	0.06	8	3.0	0.00
Physically impaired	17	0.1	0.01	78	3.2	0.04	4	1.0	0.00
Time of day									
6:00 a.m.–11:59 a.m.	2,581	22.0	1.42	532	21.9	0.29	102	26.1	0.06
12:00 p.m.–5:59 p.m.	4,244	36.1	2.34	614	25.3	0.34	111	28.4	0.06
6:00 p.m.–11:59 p.m.	3,040	25.9	1.67	857	35.3	0.47	132	33.8	0.07
12:00 a.m.–5:59 a.m.	1,875	16.0	1.03	428	17.6	0.24	46	11.8	0.03
Non-motorist location									
Not in crosswalk	NA			1,304	53.7	0.72	231	58.9	0.13
On road shoulder	NA			302	12.4	0.17	66	16.8	0.04
In marked crosswalk	NA			375	15.4	0.21	17	4.3	0.01
Other[c]	NA			449	18.5	0.25	78	19.9	0.04
Metro area location	7,441	63.2	4.10	2,011	82.5	1.11	306	77.7	0.17
Died at scene	6,620	57.6	3.65	1,007	42.3	0.55	164	43.2	0.09

[a]Drivers who were distracted and died in the crash were excluded. Motorists include passengers and non-distracted drivers who died in a distracted driving-related crash.

[b]Per one million population

[c]Includes intersections and roadways with unknown crosswalk availability, parking lanes, bike paths, sidewalks, medians, driveways, non-traffic or non-roadway areas, and unknown locations

NA = not applicable

likely (63.2%) than pedestrian (82.5%) or bicyclist (77.7%) victims to be in crashes within metro areas, and more motorist victims died at the scene of the crash (57.6%) than did other victims.

Table 2 presents the distribution of fatalities by victim type for the study period. Most victims of distracted driving (52.4%) were the distracted drivers themselves. Another 38.4% were other motorists, 7.9% were pedestrians, and 1.3% were bicyclists. By comparison, for crashes involving non-distracted but at-fault driving, 32.4% of victims were other motorists, 6.9% were pedestrians, and 0.9% were bicyclists. Pedestrians represented a larger share of victims of crashes involving alcohol or drug use, accounting for 10.4% of all victims. The alcohol/drug-involved drivers accounted for 59.8% of deaths from these crashes.

DISCUSSION

Distracted driving is claiming an increasing number of pedestrians and bicyclists. Pedestrian and bicyclist victims of distracted driving crashes are disproportionately male, middle-aged, non-Hispanic white, and struck outside of marked crosswalks and in metro locations. Pedestrians and bicyclists account for about one out of 10 fatalities from distracted driving.

Our findings show fatality rates for motorist victims of distracted driving crashes are falling, mirroring general trends in motor vehicle fatality rates during the last several years.[16] This finding stands in contrast to the increasing trend in distracted driving fatality rates experienced by pedestrians and bicyclists. Safer vehicles are reducing motorists' risks of dying in crashes involving distraction and other causes,[17] but

Table 2. Distribution of distracted driving-related fatalities in the U.S., by victim type: Fatality Analysis Reporting System, 2005–2010

Type of fatality	*Motorists*[a] N *(percent)*	*Pedestrians* N *(percent)*	*Bicycle riders* N *(percent)*	*Distracted drivers* N *(percent)*
Distracted driving	11,776 (38.4)	2,438 (7.9)	394 (1.3)	16,074 (52.4)
Non-distracted at-fault driving[b]	55,091 (32.4)	11,694 (6.9)	1,582 (0.9)	101,660 (59.8)
Non-distracted alcohol/drug-involved driving	21,506 (28.8)	7,719 (10.4)	970 (1.3)	44,371 (59.5)

[a]Drivers who were distracted and died in the crash were excluded. Motorists include passengers and non-distracted drivers who died in a distracted driving-related crash.

[b]Non-distracted at-fault crashes involve non-distracted drivers who are found by investigators to have contributed to causing the fatal crash. These crashes include a wide range of actions such as road rage, driving under the influence of drugs/alcohol, improper lane changing or failure to keep in lane, errors in passing, failure to yield, speeding, and driving on the wrong side of the road.

pedestrians and bicyclists have little protection on roadways. In fact, our results suggest that distracted drivers were 1.6 times as likely as non-distracted drivers to fatally hit pedestrians at marked crosswalks; on road shoulders, they were nearly three times as likely to hit pedestrians. Thus, our findings highlight the need for policy solutions emphasizing primary prevention of driving while distracted. Potential solutions may include implementing clear and lighted crosswalk markings, constructing sidewalks, and creating separate bicycle lanes with barriers to separate bicyclists from traffic.

There is growing evidence that changing the built environment, which includes traffic engineering and roadway characteristics, is an effective, sustainable approach to protect pedestrians and bicycle riders.[6,9,10,18] Separating nonmotorized travel from motorized travel can greatly reduce deaths and injuries. Our study suggests that several roadway characteristics are associated with pedestrian and bicyclist fatalities. Local and state policy makers should attend to the characteristics of the built environment in zoning and redevelopment efforts. Mixing motorized vehicles with pedestrian and bicycle traffic can be lethal, particularly if the community design does not fit with existing evidence-based standards, such as speed control, separation of pedestrians and bicycle riders from vehicles, and increasing the visibility of pedestrians and bicycle riders.[6,9,11]

This study identified patterns in the demographic characteristics of victims that require further attention. Women were significantly more likely to be victims of distracted driving crashes than of other types of crashes, even though women were substantially less likely than men to be victims of a non-distracted motor vehicle crash.[7] Nevertheless, a recent study by Bose et al. found that female drivers are at greater risk of sustaining severe injuries from a motor vehicle crash than men. The authors concluded that the increased vulnerability of female drivers is related to the design of occupant safety systems, which do not comport to female body size as well as they do for men.[19] Our study results may be consistent with the increased vulnerability of women to car crashes, but further study is needed to identify the contributing mechanisms.

Non-Hispanic white people were significantly more likely than other racial/ethnic groups to be victims of distracted driving crashes, both as pedestrians and bicyclists, a finding that is consistent with a previous report of distracted driving fatalities.[5] However, it should be noted that non-Hispanic white people usually have lower fatality rates in motor vehicle crashes than other racial/ethnic groups and that our finding is specific to pedestrian and bicycle victims of distracted driving crashes.[20] The higher likelihood of victim deaths may be related to the composition of the neighborhoods in which the crashes occurred, particularly if non-Hispanic white people are walking or biking in neighborhoods that have a greater prevalence of distracted driving. This research finding needs further exploration, particularly regarding whether clustering may help explain why non-Hispanic white people are more likely to be killed in distracted driving crashes than in other types of crashes.

Limitations

This study was subject to several limitations. For one, the findings from this study should be interpreted with the understanding that we explored fatalities and not injuries. It is possible that different patterns of rates or characteristics would emerge among the patterns of injuries from distracted driving crashes. Second, the cell sizes were small for some of the characteristics of bicycle victims, such as physical disability and other race/ethnicity, which reduces the confidence in those specific estimates. However, estimates were pooled during a six-year period. Finally, data collection may be improving over time when determining whether or not crashes were related to distracted driving. However, it seems unlikely that any improvement in data collection

would differentially affect trends for one type of victim relative to other victims of motor vehicle crashes.

CONCLUSION

We found an increasing trend in the rate of fatalities for pedestrian and bicycle rider victims of distracted driving crashes. Some characteristics of the victim and crash scene may provide useful insights into further research and policy efforts. The data from this study can be used by advocates of policies to reduce distracted driving or improve the safety of the built environment for pedestrians and bicyclists.

This work was funded by the Robert Wood Johnson Foundation's Public Health Law Research Program. This study was approved by the Institutional Review Board at the University of Nebraska Medical Center.

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