2 ISSUE BRIEFS

The National Intersection Safety Problem

Identifying the Problem

An intersection, by design, is a planned location where vehicles traveling on different highways may come into conflict. The functional area of an intersection extends upstream and downstream from the physical area of the crossing streets. The different approach and crossing movements by motorists, bicyclists and pedestrians make at-grade intersections one of the most complex traffic situations that people encounter. (See Figure 1) Add the element of motorists who disregard traffic controls by speeding or making illegal turns, and the risk compounds.

Figure 1: An aerial view of an intersection showing all users

Motor vehicle fatalities are the leading cause of death for people between 15 and 44 years of age. In 2007, approximately 2.4 million intersection-related crashes occurred, representing 40 percent of all reported crashes and 21.5 percent of traffic fatalities. Intersections represent a disproportionate share of the traffic safety issue and are a national, state, and local priority.

Table 1: 2007 Intersection Crashes

	Number	Percentage
Total Fatal Crashes	37,435	
Total intersection and intersection-related fatal crashes	8,061	21.5%
Total Injury Crashes	1,711,000	
Total intersection and intersection-related injury crashes	767,000	44.8%
Total Property Damage Only (PDO) Crashes	4,275,000	
Total intersection and intersection-related PDO crashes	1,617,000	37.8%
All Crashes	6,024,000	
Total intersection and intersection-related crashes	2,392,061	39.7%

In 2007, 8,703 fatalities (21 percent of the total highway fatalities) occurred at or within an intersection. As shown in Figure 2, between 1998 and 2007, the minimum and maximum number of intersection fatalities was 8,689 and 9,362. This represents a range of 673 fatalities, and the average number of intersection fatalities in the 10-year period was 9,032.

U.S.Department of Transportation
Federal Highway Administration

Safe Roads for a Safer Future
Investment in roadway safety saves lives

FHWA-SA-10-005

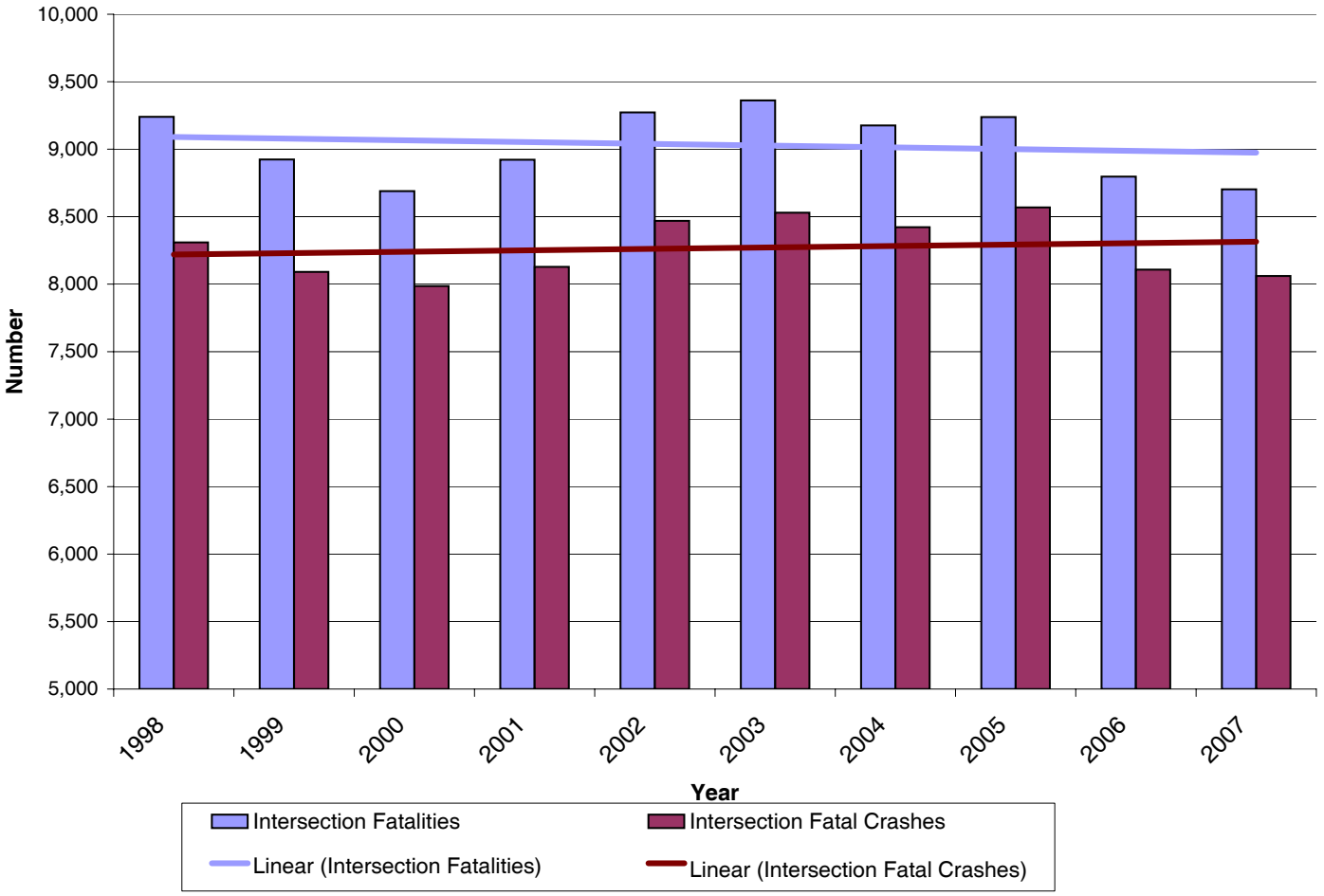

Figure 2: 1998 to 2007 Number of Fatalities and Fatal Crashes at Intersections

There was a 5.8 percent reduction in intersection fatalities between 1998 and 2007 (9,240 to 8,703). During this period the intersection fatality rate dropped 18.2 percent during a period when vehicle miles traveled increased 15.1 percent.

While the annual toll of human loss due to motor vehicle crashes has not substantially changed in the most recent 10-year period as shown by the regression lines in Figure 2, the rate of fatalities has declined due to increasing vehicle miles of travel, improved intersection design, and the more sophisticated application of traffic engineering measures. Organizations such as the Federal Highway Administration, the Institute of Transportation Engineers, American Association of State Highway and Transportation Officials, AAA, and other private and public organizations continue to devote substantial resources to help reduce the problem.

Dimensions of the Problem

Traffic Controls

Figure 3 shows the 2007 percentage of fatalities at intersections by type of traffic control present at the intersection. As shown, there is a relatively balanced distribution of fatalities occurring at intersections controlled with traffic signals (2,924, or 34 percent); stop, yield, or other regulatory signs (3,340, or 38 percent); and along streets with “no traffic control” (2,336, or 27 percent). Traffic signals have a disproportionate percentage of fatalities in urban areas (2,437, or 83 percent of 2,924). A street with no traffic control is where the traffic control device was considered not to have contributed to the fatal crash.

Although somewhat intuitive, data shows that crash fatalities are disproportionate at signalized intersections in urban areas,and a large percent of rural fatalities have regulatory signs as a factor in the crash.

Crash Type

Figure 4 shows the distribution of fatal intersection crashes by crash type. As shown, the angle-impact crashes are the highest crash type (47 percent) followed by single-vehicle crashes (30 percent). Opposite-direction crashes, including head-on and rear-end crash types, account for 15 percent and 6 percent of fatal intersection crashes, respectively.

Key Users Subgroups

Older persons.
In 2007, 2,221 of 8,703 fatalities at intersections (25 percent) involved older persons, while older persons only make up 12.4 percent of the resident U.S. population, as shown in Table 2. Older persons are overrepresented by a factor of 2 to 1 for the over-65 age group. For the over-85 age group, there is an overrepresentation of 3 to 1 in intersection fatalities compared to the age group. (See Figure 5)

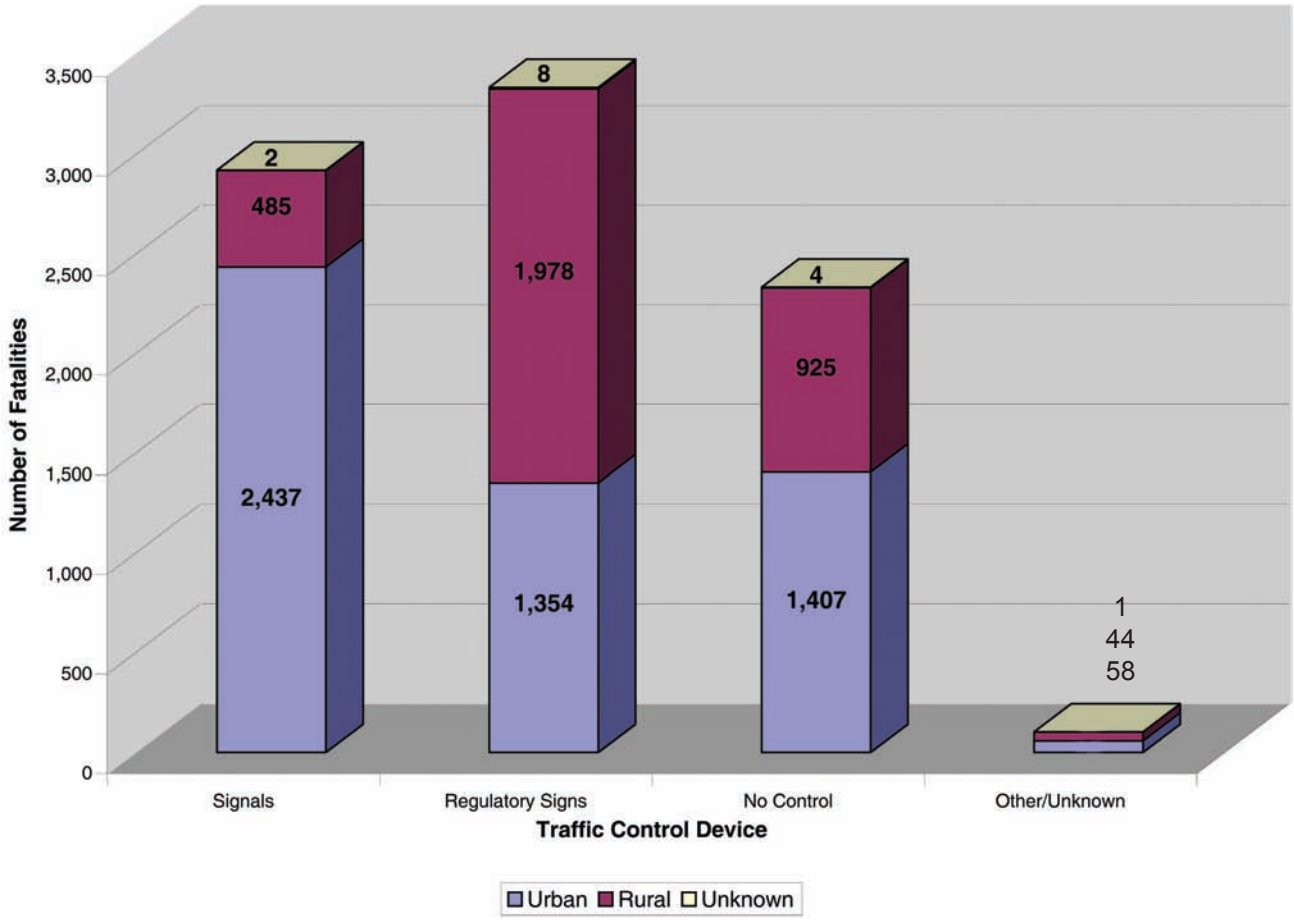

Figure 3: 2007 Fatalities at Intersections by Traffic Control Device

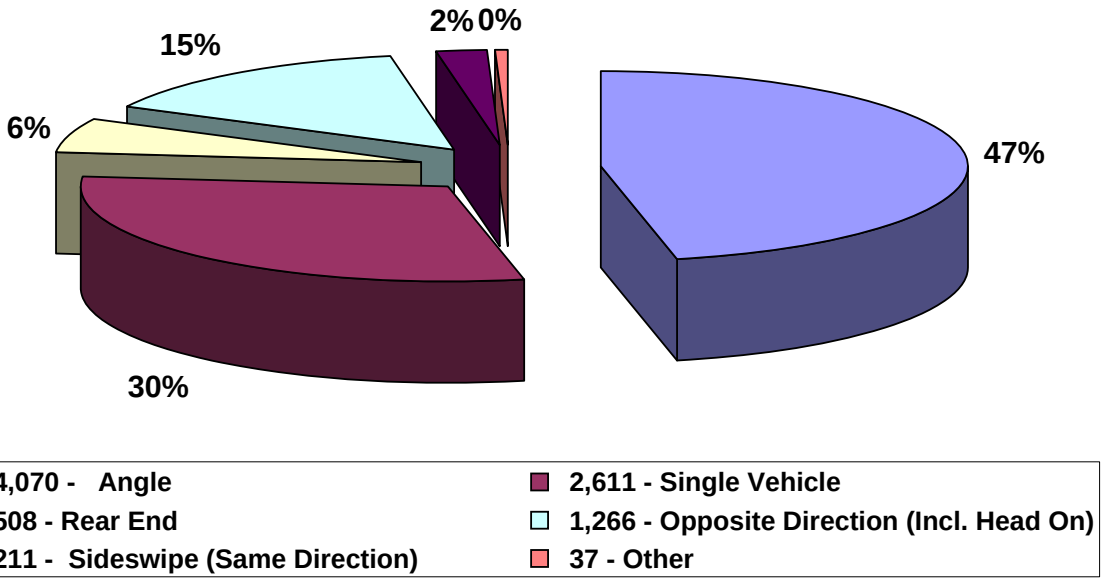

Figure 4: 2007 Fatalities at Intersections by Crash Type

Table 2: Older Population as Related to Older Person Intersection Fatalities

	Population		Intersection Fatalities		
	Number	Percentage	Number	Percentage	
					Over-representation Factor
Age 65-74 population	19,051	6.3 %	818	9.4 %	1.49
Age 75-84 population	13,138	4.3 %	931	10.7 %	2.49
Age 85+	5,334	1.7 %	453	5.2 %	3.06
	37,523	12.4 %	2,202*	25.5 %	2.06

*19 fatalities are unknown and are not included in the total percentage calculation.

Motorcyclists.
In 2007, 1,462 of 8,703 fatalities at intersections (17 percent) involved motorcyclists. In 1998, only 626 or 7 percent of intersection fatalities involved this vulnerable group.

Pedestrians.
In 2007, 1,143 of 8,703 fatalities at intersections (13 percent) involved pedestrians. There were a total of 4,699 pedestrian fatalities. Of this number 1,131, or 24 percent, occurred at intersections or concomitantly; 76 percent did not.

Bicyclists.
In 2007, 263 of 8,703 fatalities at intersections (3 percent) involved bicyclists. (See Figure 6)

The Necessity of a Multidisciplinary Approach

Due to the number of deaths, intersection safety has become a complex public health issue that cannot be solved solely by making changes in infrastructure but can be helped by a national comprehensive effort of improved intersection, vehicle, and pedestrian safety management.

Planners and engineers must evaluate the safety benefits of reconstruction or construction projects and/or operational changes planned at intersections as part of an overall program management approach to incorporate safety evaluation in the planning and design process. Alternatives must be selected that have the greatest safety benefit.

Figure 5: Older person at a crosswalk

Figure 6: Bicyclist crossing an intersection

There must be sustained and consistent law enforcement efforts both through traditional and automated methods to enforce red-light running and speeding within the intersection environment.

Multidisciplinary teams (engineers, enforcement, human factors professionals, and others) should engage in intersection safety audits, since they can have a broader perspective on crash causes and countermeasures. The intersection safety audit teams should engage in innovative and strategic thinking. Engineers ultimately must delicately balance the requirement for efficient traffic movement and congestion reduction and, at the same time, the need to protect vehicle occupants and pedestrians from the consequences of dangerous vehicle maneuvers and unwise pedestrian behavior.

Resources

Fatality Analysis Reporting System (FARS). FARS is a Web-based encyclopedia that allows for retrieval of fatal crash data between 1996 and 2007 and is housed on the NHTSA Website at http://www-fars.nhtsa.dot.gov/Main/index.aspx.

FHWA Office of Safety Intersection Safety Website: crash facts - http://safety.fhwa.dot.gov/intersection/crash_facts/#data.

Traffic Safety Facts 2007 (Final Edition), NHTSA - http://www-nrd.nhtsa.dot.gov/Pubs/TSF2007FE.PDF.