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Assessing the Potential Benefit of Adaptive Headlighting Using Crash Databases	September 1999
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16. Abstract

This report used 11 years of data from the Fatality Analysis Reporting System (FARS 1987-1997) to investigate the sensitivity to light level in three crash scenarios in which various forms of adaptive headlighting might have safety benefits. The scenarios included fatal pedestrian crashes at intersections, on dark roads, and single-vehicle run-off-road crashes on dark, curved roads.

Each scenario's sensitivity to light level was evaluated in two ways. In the first method, the seasonal pattern of crashes throughout the year was compared to the seasonal pattern of light level in three daily time periods (twilight, daylight, and nighttime), applying the same twilight-zone logic as Owens and Sivak (1993). Both of the fatal crash scenarios that involve pedestrians tracked the seasonal fluctuation in light level during this period, showing a decline in crashes during the twilight periods in the spring and summer, and an increase in crashes during the fall and winter. The daylight and nighttime control periods, in which light level is fixed, showed no similar trend. In contrast, the single-vehicle run-off-road scenario failed to show any influence of light level, and seems to be significantly associated with alcohol use. In the second method, the number of fatal crashes was compared across the changes to and from daylight savings time, within time periods in which an abrupt change in light level occurs relative to official clock time. Once again, scenarios involving pedestrians were most sensitive to light level, while single-vehicle run-off-road crashes showed little effect of light level.

The results suggest that adaptive lighting may produce the greatest measurable safety benefit when it addresses the problem of pedestrian vulnerability in darkness.

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