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Temporal factors in motor vehicle crash deaths: Ten years later

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ABSTRACT

Objective: To assess trends in traffic fatalities on several temporal scales: year to year, by month, by day of week, and by time of day, to determine why some times correspond with higher rates of crash deaths, and to assess how these trends relate to age, the role of the deceased, and alcohol consumption. *Method:* Traffic fatalities were identified using the Fatality Analysis Reporting System (FARS) for 1998 through 2014 and assessed for their time of occurrence. Three days that, on average, contained particularly high numbers of crash deaths were then assessed in greater detail, considering the age of the deceased, role of the deceased (vehicle occupant, bicyclist, motorcyclist, or pedestrian), and the blood alcohol content of either the driver (for passenger vehicle occupants) or the deceased. *Results:* Annual crash fatality totals were much lower in 2014 than in 1998, but the decrease was not steady; a marked drop in crash deaths occurred after 2007 and continued until 2014. On average the most fatalities per day occurred in July and August (116 per day), followed closely by June, September, and October. During the week, the greatest number of fatalities on average occur on weekend days, and during the day the most fatalities tend to occur between the hours of 3 p.m. and 7 p.m. Holidays like Independence Day and New Year's Day show elevated crash fatalities, and a greater percentage of these crashes involved alcohol, when compared with adjacent days. *Conclusion:* Certain days and times of year stand out as posing an elevated crash risk, and even with the decrease in average daily fatalities over the past decade, these days and times of year have remained consistent. *Practical application:* These results indicate focused areas for continued efforts to reduce fatal crashes.

1. Introduction

The number of fatal traffic collisions in the United States has fallen markedly in the past 20 years. While this trend is encouraging, more than 30,000 people still are killed on US roads every year. Understanding the characteristics of fatal crashes is essential when developing strategies to prevent them.

Farmer and Williams (2005) addressed the temporal patterns and factors in traffic fatalities during 1986–2002, with the goal of identifying possible sources of the marked day-to-day variation from the mean. That study examined traffic fatality counts by month, weekday, and hour and determined which days of the year averaged the greatest number of collision deaths for passenger vehicle occupants, motorcyclists, and pedestrians. It further examined a sample high fatality day for each type of fatality by age group of the deceased, and blood alcohol concentration (BAC). For passenger vehicle occupants the driver's BAC was used, while for nonoccupants the analysis considered the BAC of the deceased. That work showed that annual traffic deaths declined during the study period, that summer and fall saw the highest rates of collision fatalities, and that passenger vehicle occupant fatalities spiked around times of increased holiday travel. Fatalities occurring around major US holidays like New Year's Eve and Independence Day involved elevated BACs at higher rates than those on nonholidays.

The current study is a follow-up to that work and examines the same trends during the period between 1998 and 2014. While fatality figures have dropped consistently during this period, the current analysis finds that many of the previously identified trends still hold. The most crash-related fatalities occurred during summer and fall months and around certain holidays with periods of increased recreational travel. More fatalities occurred on weekend days than during the workweek, and they tended to happen most often in the afternoon and evening between the hours of 3 p.m. and 9 p.m.

2. Method

The current analysis examines the electronically coded descriptions of fatal crash data collected and compiled by the National Highway Traffic Safety Administration (NHTSA) within the Fatality Analysis Reporting System (FARS) over the 17-year period from 1998 to 2014. This period was chosen for analysis because each day of the week occurred exactly 887 times, and each day of the year (except February 29) covered each day of the week either 2 or 3 times. FARS annually compiles and reports the characteristics of vehicle collisions on public roads that result in a

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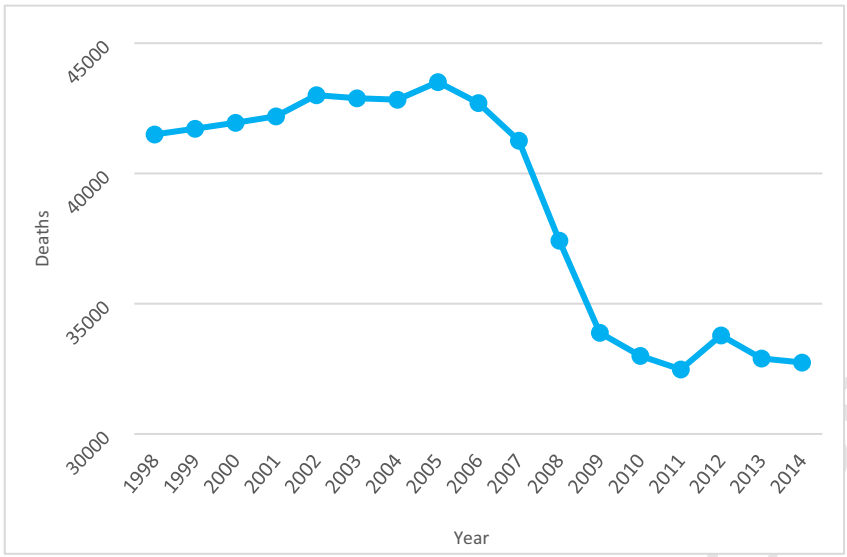

Fig. 1. Annual traffic fatality totals from FARS data, from 1998 to 2014.

fatality within 30 days of the crash. These data include, for example, temporal information about fatal crashes, demographic characteristics of the deceased, information about the BACs of those involved in the crash, and details of the environmental features of the crash time and location. In addition, for drivers and pedestrians for which BAC data are not reported, NHTSA obtains estimates of BAC using a multiple imputation procedure and includes these in FARS (Subramanian, 2002). Within the period of interest, the data for all crashes included the month of the crash, but 110 observations lacked the exact date on which the crash occurred. Vehicle miles traveled (VMT) data for the relevant years were obtained from the Federal Highway Administration (Federal Highway Administration, 2014).

This analysis examines trends in traffic fatalities over the 17-year study period in search of days and times of year that correspond with especially high numbers of crash deaths. The days presenting the greatest number of crash deaths were considered in concert with the role of the person killed: passenger vehicle occupant, pedestrian, bicyclist, and motorcyclist. The passenger vehicle distinction, here, excludes commercial or heavy trucks, but includes pick-up trucks, minivans and full-sized vans. The crash figures on these days of interest were then compared to days exactly one week before and one week after to control for confounds and to determine if that specific day differed from those around it (see Fig. 1).

3. Results

3.1. Overall

There were 659,765 total fatalities during this 17-year period, an average of about 3234 deaths per month, and 106 per day. The number of traffic fatalities per year rose slightly until 2005 and then declined steeply during the Great Recession, leveling off in 2011. The Great Recession in the US occurred between December 2007 and June 2009. Fatality numbers vary significantly from this average day-to-day, however, and this variation follows similar trends to those identified in Farmer and Williams (2005).

On average, the greatest number of fatalities occurred during August and July (116 per day), followed closely by June and October (113 per day), and September (112 per day). When adjusted for vehicle miles traveled, this trend shifts slightly to show more fatalities in the fall months than the summer. The greatest number of fatalities per billion VMT occurred in September (14.2), followed by October (14.0), and July (13.8) (see Table 1).

3.2. Day of the week

The most fatalities occurred on Saturdays (139 average per day), while the fewest occurred on Tuesdays (89 per day). Once again, this follows the trend reported by Farmer & Williams, but each day's average fatality figure is considerably lower (see Fig. 2).

3.3. Time of day

Regarding time of day, the highest numbers of fatalities occurred between 3 and 7 p.m., covering evening rush-hour travel. The fewest fatalities occurred during the early hours of the morning, between 3 and 6 a.m. (see Fig. 3).

3.4. Overall average worst days

With the exception of New Year's Day, all of the 10 worst days (on average) occurred in the summer months often clustered around dates that coincided with holiday weekends, specifically Independence Day and Labor Day. Of the 10 worst days listed here, four were also among the 10 worst days reported in Farmer and Williams (2005), while others occurred around the same time of year (several dates fall at the beginning of both August and September). The greatest number of fatalities in a single day within the period of interest occurred on October 9, 1999

Table 1
Crash deaths by month of year and vehicle miles traveled (VMT), 1998–2014.

	VMT (in millions)	Deaths	Deaths per billion VMT	Average deaths per day
January	3,734,114	48,365	13.0	92
February	3,571,983	44,234	12.4	93
March	4,141,669	50,388	12.2	96
April	4,154,141	52,183	12.6	102
May	4,314,506	56,941	13.2	108
June	4,314,153	57,626	13.4	113
July	4,404,864	61,011	13.8	116
August	4,653,604	61,335	13.2	116
September	4,042,315	57,345	14.2	112
October	4,260,253	59,516	14.0	113
November	4,005,318	55,783	13.9	109
December	4,047,276	55,038	13.6	104

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