U.S. Department of Transportation
National Highway Traffic Safety Administration

TRAFFIC SAFETY FACTS
Research Note

NHTSA

DOT HS 812 823 | Summary of Statistical Findings | October 2019

Estimate of Motor Vehicle Traffic Crash Fatalities for the Holiday Periods of 2019

Summary

A statistical forecasting of traffic crash fatalities for the holiday periods of 2019 shows that the number of people who will have died in motor vehicle traffic crashes are: 594 for the Fourth of July (Wednesday, July 3, 2019 at 6 p.m. to Monday, July 8, 2019 at 5:59 a.m.), 448 for Labor Day (Friday, August 30, 2019 at 6 p.m. to Tuesday, September 3, 2019 at 5:59 a.m.), 454 for Thanksgiving (Wednesday, November 27, 2019 at 6 p.m. to Monday, December 2, 2019 at 5:59 a.m.), and 799 from Christmas to New Year's Day (Tuesday, December 24, 2019 at 6 p.m. to Thursday, January 2, 2020 at 5:59 a.m.).

Introduction

Generally, there are more motor vehicle traffic crash fatalities during holiday periods than during non-holiday periods due to increased travel time, more alcohol use, and excessive driving speed.[1–3] In 2017, for example, the overall average fatalities were 102 per day. In comparison, the average fatalities during six major holiday periods (New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving, and Christmas/New Year's Day) were 119 per day. Analysis and forecasting of motor vehicle traffic crash fatalities during holiday periods are useful for providing public alert and warnings that may reduce traffic crash fatalities. In this Research Note, time series technique is employed to analyze the traffic crash fatality data during four holiday periods and to make predictions. The fatalities during 2018 holiday periods are first forecasted based on the 1982–2017 historical data and then compared with the actual fatality counts in 2018. Motor vehicle traffic crash fatalities during four 2019 holiday periods are finally predicted when the actual fatality counts in 2018 are included in the time series analysis.

Data and Methodology

Time series forecasting technique, the *ARIMA* (*p*, *d*, *q*) modeling procedure, is used to predict the motor vehicle traffic crash fatalities during four holiday periods.[4] That is, the forecast is based on an inferred study of past general data behavior over time (time series). Data from the Fatality Analysis Reporting System (FARS) 1982–2016 final file, FARS 2017 annual report file, FARS 2018 Internal Data Mart, and FastFars (an Early Fatality Notification System to capture fatality counts from States more rapidly and in real-time) for the 2019 New Year's Day traffic crash fatalities were used in the data analysis. These three databases are a national census of police-reported motor vehicle crashes resulting in traffic crash fatal injuries. It is conducted by the National Center for Statistics and Analysis (NCSA) in the National Highway Traffic Safety Administration.

Results

Motor vehicle traffic crash fatalities during four holiday periods over the period 1982 to 2018 are listed in Table 1. The number of days during each holiday period is also displayed in the table. For two holiday periods, Fourth of July and Christmas/New Year's Day, which have different numbers of days within the holiday period across the years, we first get the average number of fatalities for each day of the holiday period, and use these numbers to perform a time series analysis and forecast, in the end, multiplied by days of the holiday period to get the total crash fatalities during that holiday period of the year.

Based on 1982–2017 historical data, the predicted fatalities and the 95-percent confidence limit (95% C.L.) around the forecast for the four 2018 holiday periods are shown in Table 1. We can see the prediction is fairly close to the actual fatality counts in 2018 for each of the four holiday periods: 194 versus 194 (Fourth of July), 414 versus 441 (Labor Day), 513 versus 432 (Thanksgiving), 1,093 versus 1,087 (Christmas to New Year's Day). Finally, the possible fatalities from motor vehicle traffic crashes during four 2019 holiday periods are predicted when the actual fatality counts in 2018 are included in the time series analysis. It shows that the forecasted fatalities during the four 2019 holiday periods are: 594 (Fourth of July), 448 (Labor Day), 454 (Thanksgiving); and 799 (Christmas/New Year's Day). The number of days, the time period (e.g., the

number of days is 8.5 and the time period of 8.5 days is from 12/24/2019 6 p.m. to 1/2/2020 5:59 a.m. for the 2019 Christmas to New Year's Day holiday period), and the *ARIMA* (*p, d, q*) models used in the time series analysis and forecasting for each of the four holiday periods are also displayed in Table 1.

Table 1

Number of Motor Vehicle Traffic Crash Fatalities During Fourth of July, Labor Day, Thanksgiving, and Christmas to New Year's Day Holiday Periods, 1982–2018 and Forecasted Values for 2018 and 2019

Year	Fourth of July		Labor Day		Thanksgiving		Christmas to New Year's Day	
	Fatalities	Days	Fatalities	Days	Fatalities	Days	Fatalities	Days
1982	600	3.5	628	3.5	601	4.5	1,133	10.5
1983	620	3.5	636	3.5	533	4.5	1,023	10.5
1984	223	1.5	609	3.5	558	4.5	1,404	11.5
1985	689	4.5	605	3.5	566	4.5	923	8.5
1986	611	3.5	663	3.5	598	4.5	1,289	11.5
1987	556	3.5	630	3.5	659	4.5	1,206	10.5
1988	631	3.5	592	3.5	601	4.5	1,347	10.5
1989	748	4.5	588	3.5	561	4.5	1,384	10.5
1990	268	1.5	599	3.5	563	4.5	1,214	11.5
1991	718	4.5	577	3.5	546	4.5	778	8.5
1992	535	3.5	460	3.5	403	4.5	1,135	10.5
1993	525	3.5	522	3.5	569	4.5	1,080	10.5
1994	519	3.5	494	3.5	575	4.5	1,198	10.5
1995	661	4.5	511	3.5	527	4.5	1,134	10.5
1996	629	4.5	525	3.5	588	4.5	981	8.5
1997	508	3.5	507	3.5	571	4.5	1,244	11.5
1998	479	3.5	464	3.5	602	4.5	1,104	10.5
1999	509	3.5	485	3.5	581	4.5	1,327	10.5
2000	717	4.5	529	3.5	509	4.5	1,190	10.5
2001	207	1.5	481	3.5	590	4.5	1,485	11.5
2002	685	4.5	543	3.5	551	4.5	887	8.5
2003	519	3.5	507	3.5	562	4.5	1,323	11.5
2004	524	3.5	502	3.5	574	4.5	1,196	10.5
2005	591	3.5	507	3.5	629	4.5	1,202	10.5
2006	659	4.5	508	3.5	635	4.5	1,123	10.5
2007	202	1.5	520	3.5	553	4.5	1,131	11.5
2008	494	3.5	493	3.5	507	4.5	1,096	11.5
2009	412	3.5	362	3.5	413	4.5	822	10.5
2010	393	3.5	406	3.5	431	4.5	852	10.5
2011	429	3.5	382	3.5	384	4.5	944	10.5
2012	180	1.5	394	3.5	421	4.5	952	11.5
2013	513	4.5	380	3.5	411	4.5	736	8.5
2014	401	3.5	403	3.5	467	4.5	992	11.5
2015	410	3.5	463	3.5	455	4.5	945	10.5
2016	457	3.5	438	3.5	497	4.5	1,049	10.5
2017	601	4.5	376	3.5	528	4.5	978	10.5
2018	194	1.5	441	3.5	432	4.5	1,087	11.5
2018 *Forecast [95% C.L.]*	194 [159, 230]	1.5	414 [326, 502]	3.5	513 [401, 624]	4.5	1,093 [874, 1,346]	11.5
2019 *Forecast [95% C.L.]*	594 [495, 702] *ARIMA (5,1,3)*	4.5 *7/3/19 6 p.m.* to *7/8/19 5:59 a.m.*	448 [361, 535] *ARIMA (1,0,4)*	3.5 *8/30/19 6 p.m.* to *9/3/19 5:59 a.m.*	454 [341, 566] *ARIMA (0,1,1)*	4.5 *11/27/19 6 p.m.* to *12/2/19 5:59 a.m.*	799 [638, 978] *ARIMA (1,1,0)*	8.5 *12/24/19 6 p.m.* to *1/2/20 5:59 a.m.*

Data Source: FARS 1982–2016 Final File, 2017 ARF; FARS 2018 Internal Data Mart; FastFars 2019 Data

Conclusions

Based on 1982–2018 historical motor vehicle traffic crash fatality data during four holiday periods, time series analysis technique is used to predict the traffic crash fatalities during four 2019 holiday periods. The forecasted crash fatalities are: 594 for the Fourth of July (Wednesday, July 3, 2019 at 6 p.m. to Monday, July 8, 2019 at 5:59 a.m.), 448 for Labor Day (Friday, August 30, 2019 at 6 p.m. to Tuesday, September 3, 2019 at 5:59 a.m.), 454 for Thanksgiving (Wednesday, November 27, 2019 at 6 p.m. to Monday, December 2, 2019 at 5:59 a.m.), and 799 from Christmas to New Year's Day (Tuesday, December 24, 2019 at 6 p.m. to Thursday, January 2, 2020 at 5:59 a.m.).

References

[1] Liu, C., Chen, C. L., & Utter, D. (2005, August). *Trend and pattern analysis of highway crash fatality by month and day*. (Report, DOT HS 809 855). Washington, DC: National Highway Traffic Safety Administration.

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The suggested APA format citation for this Research Note is:

National Center for Statistics and Analysis (2019, October). *Estimate of motor vehicle traffic crash fatalities for the holiday periods of 2019*. (Traffic Safety Facts Research Note. Report No. DOT HS 812 823). Washington, DC: National Highway Traffic Safety Administration.

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