Time to Party: A Comparative Analysis of Holiday Drinking and Driving

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Abstract
Research has widely documented that drinking and driving, and traffic crashes in general, rise on various holidays and special occasions. But while it is well known that crashes rise on such dates, surprisingly little research has systematically compared the various holidays to determine which result in the most drinking and driving and, therefore, merit the greatest concern for policymakers. In this study, crashes on 14 major holidays and special occasions in California are compared to assess rises in fatal and injury drinking and driving crashes compared to comparable non-holidays, controlling for day of the week and month of the year. Analysis indicates that concerns with excessive drinking and driving during winter holidays is largely well founded, that interest in drinking and driving during summer holidays is also well considered, and that nighttime drinking and driving following the Super Bowl is both quite excessive and predictable.

Introduction
Data sources have amply documented that levels of drinking and driving, and traffic crashes in general, increase on holidays (1-3). California's *Annual Report of Fatal and Injury Motor Vehicle Collisions* annually details the number of persons killed and injured in alcohol-related (AR) and non-alcohol-related crashes for six different holiday periods. In its most recent 2001 edition, the *Report* documents that more people were killed and injured in AR crashes during the (3-1/4 day) Labor Day period (551) than during any of the other holiday periods of the year; for 2000, the most people were killed or injured during the July 4th (4-1/4 day) holiday period (659).

Nationally, the number of persons killed during holiday periods and the percent of those killed who were in alcohol-related crashes is reported annually in the National Highway Traffic Safety Administration's *Traffic Safety Facts*. Presenting data for the same six holiday periods as reported by California's SWITRS, the 2002 edition of *Facts* indicates that the greatest number of deaths nationally in 2002 occurred during the fourth of July holiday (683), while the highest percentage of AR deaths occurred Labor Day (55%); in 2001, the greatest number of deaths occurred during Christmas (604) while the highest percentage of AR deaths occurred during the Fourth of July (62%).

While data have demonstrated that crash levels are high on holidays, systematic analyses demonstrating just how high-holiday crashes are compared to each other or to non-holiday crashes are far less available. Indeed, a literature search for this study turned up few items and almost nothing relating to holiday drinking and driving.

In 1987, Arnold and Cerrelli (4) examined the effect of holidays on traffic fatalities for 1975-1985. They found no "significant" change in fatalities – compared to the same day of the week the same month – for President's Day, Columbus Day and Veterans Day; and a

decrease in fatalities on Christmas (-11%). In contrast, they found significant increases on Memorial Day (32%), July 4th (37%), Labor Day (35%), Thanksgiving (19%), and New Year's (64%). Additional results showed that fatalities sometimes spike on days around holidays, most notably Christmas (increases in crashes the four days before Christmas, decreases the five days after), New Year's (no increase the day before or after), July 4th (20% increase the day before), and Thanksgiving (42% increase the day before).

Limitations of the Arnold and Cerrelli study should be noted. First, their definition of statistical significance was established in an a priori manner, where "deviations of greater than 10% (from "normalized fatalities" levels for any given day) were declared “statistically significant" without formal testing. Second, the data were not analyzed by hour of the day, so it is unclear whether holiday crashes are an all day phenomenon or typically just a nighttime problem.

Another study of holiday – or more specifically "special event" – crashes concerned itself with the Super Bowl (5). Redelmeier analyzed Super Bowl Sundays from 1975-2001 and determined that, in the hours after the Super Bowl, there was a 41% increase in fatalities nationally. Similar results were also reported for non-fatal injuries. "Alcohol-positive" fatalities increased by about 80% during those hours, while AR injuries increased slightly less. The study did not systematically compare Super Bowl crash mortality to that of other holidays, except to note that the "41% increase in fatalities after the Super Bowl telecast exceeds the relative increase in fatalities [reported by NHTSA] for New Year's Eve".

While little formal research exists to help DUI program or policy experts, law enforcement or the general public in setting priorities about holiday/special event drinking and driving, the importance of this data is considerable. Many agencies, including most government and private traffic safety organizations, focus their drinking and driving prevention efforts at certain times of the year.

By far, the most common period for DUI prevention/enforcement activities extends from Thanksgiving through New Year's. But while this period has garnered the most attention from policymakers, and has clearly been high in drinking and driving, the absence of confirmation that this period is the best one to target for DUI raises concerns – particularly in light of results in the lead author's preliminary research about excessive DUI on occasions such as the summer holidays, the Super Bowl and St. Patrick's Day.

The present study has been designed to systematically examine drinking and driving crashes for 14 different holiday and special occasion periods of the year. In doing so, it allows a determination not just of whether drinking and driving fatalities and injuries increase during given periods, but also of how each holiday or special occasion of the year compares to each of the other holidays/special occasions.

Methods

California alcohol-involved fatal and injury crashes for 1994-2002 are analyzed using data from the state's "integrated" traffic records system, SWITRS. (Data are unavailable before 1994.) Data are examined for both the absolute number of alcohol-involved crashes as well as the proportion of all crashes that are alcohol-involved. Each of these indicators provides unique information about drinking and driving levels. Examining alcohol-involved crashes as a proportion of all crashes provides a rough means of controlling for general traffic exposure, that is, the level of general vehicle transportation on the roadway.

The 14 most prominent holidays and special occasions of the year are each broken down into daytime and nighttime crash periods: a lower drinking and driving period from 4 am – 5 pm, and a higher one from 5 pm – 4 am. Holidays and special occasions examined are: New Year's (5:00pm Dec 31 – 3:59 am January 2); President's Day (5 pm Friday – 3:59 am Tuesday); Saint Patrick's Day (12 am March 17 – 3:59 am March 18th); Easter (12 am Sunday – 3:59 am Monday); Cinco de Mayo (12 am May 5 – 3:59 am May 6); Memorial Day (5 pm Friday – 3:59 am Tuesday); Independence Day (5:00 pm July 3 – 3:59 am July 5); Labor Day (5:00 pm Friday - 3:59 am Tuesday); Columbus Day (5:00 pm Friday – 3:59 am Tuesday); Halloween (12 am October 31 – 3:59 am Nov 1): Veteran's Day (12 am Nov 11 – 3:59 am Nov 12); Thanksgiving (5:00 pm Wednesday Nov 24 – 3:59 am Monday Nov 29); Super Bowl (12 am Sunday – 3:59 am Monday); Christmas (5:00 pm Dec 24 – 3:59 am Dec 26).

To help account for variability in crash patterns across days of the week and months of the year (that is, seasonal differences), control variables for each have been introduced in Poisson log-linear and logistic regression models. Log-linear models are employed for the variable "total number of AR crashes." The model used is: log (crash count) = f (months, days of week, holiday periods). Logistic regression models are employed for the proportion of crashes that are AR; that is, log (p/1-p) = f (explanatory variables), where p is the proportion of nighttime/daytime fatal+injury crashes among all fatal+injury crashes.

Estimators of holiday crash over-representation are presented in Tables 1 and 2. It is important to note that each estimator in the Tables can be directly translated into an odds ratio measure of over-representation of drinking and driving crashes since estimators vary directly as a function of e^x. Therefore, a "model estimator" of 1.0 in the Tables means that x=1.0, and can be translated into an over-representation of DUI crashes of 172% on that holiday compared to other non-holiday crashes the same month of the year and day of the week. In this case, if x=1.0, $e^x = e^1 = 2.72$, or an odds ratio estimate of 2.72 and an over-representation of 172% (2.72-1).

Results

An analysis of nighttime AR fatal and injury crashes in Tables 1 and 2 shows clearly that, annually, excessively high drinking and driving levels concentrate most notably during three periods. These are the winter holidays (Christmas, New Year's), summer holidays (Memorial Day, Independence Day, Labor Day), and the nighttime period following the Super Bowl (typically the last Sunday in January).

As Table 1A shows, the most over-represented AR crash periods of the year, New Year's and the Super Bowl, evidence nine-year "overall" over-representation levels of 44% (estimator = .37) and 41% (estimator = .34), respectively. In other words, AR fatal and injury crashes were 44% and 41% greater than would have been expected for comparable non-holiday periods that month and day of the week. With respect to elevated AR crash levels, the New Year's and the Super Bowl periods are followed by Christmas, with an over-representation level of 26% (estimator = .23).

Summer holidays show lower overall drinking and driving over-representation levels than do winter holidays. Memorial Day's over-representation is 16% (estimator = .15), Independence Day's is 15% (estimator = .14), and Labor Day's is 5% (estimator = .05). Interestingly, while estimates of AR crash over-representation for summer holidays are

not as elevated for winter holidays/special occasions, Table 1A shows that high AR crash rates are a regular summer holiday phenomenon, occurring in nearly two out of every three years. Labor Day, for example, had elevated AR crash levels in six out of the nine years examined – as frequently as for New Year's and Christmas.

Table 1: Estimators[a] of Holiday Alcohol-Involved Fatal and Injury Crash Over-representation, California, 1994-2002

A. Nighttime crashes

Holiday	1994	1995	1996	1997	1998	1999	2000	2001	2002	Over all	# Years Over-Represented
New Year's	-.14	-.19+	.79***	.96***	.56***	.32**	.13	.78***	1.33***	.37 ***	6
Super Bowl	.39***	.23+	.41***	.48***	.28*	.36**	.37**	.16	.45***	.34 ***	8
Presidents	.06	.20*	.26***	.02	.01	.16+	.09	-.07	.12	.10 ***	3
St. Patrick's	-.80***	.22	-.24+	.37*	-.50*	.38*	-.10	-.05	-.14	-.13 *	2
Easter	-.09	.07	-.14	.26	-.31*	-.05	.18	.02	-.63***	-.36 ***	0
Cinco de mayo	-.04	-.02	.03	.06	.18	-.08	.01	.08	.08	.08 +	0
Memorial	.25***	.28***	.16*	.17*	.12	-.04	.24**	.00	.11	.15 ***	5
Independence	.35***	.14	.50***	.50***	-.23*	.03	.60***	.83***	.04	.14 ***	5
Labor Day	.33***	.02	.12+	.17*	.02	.18*	-.06	.15*	.19*	.05 +	6
Columbus	.18*	.04	-.07	-.13	.17*	-.07	.05	-.13	-.13	-.06 *	2
Halloween	.13	.00	.10	-.04	-.44***	.06	.00	-.02	-.06	-.14 **	0
Veterans	.20+	.10	-.00	-.09	.08	.33**	.14	.11	.18	.19 ***	2
Thanksgiving	-.03	-.14+	.06	.17*	.05	.01	.02	-.23*	.00	-.01	1
Christmas	.06	.23*	.65***	.05	.44***	.23*	.00	.47***	.73***	.23 ***	6

B: Daytime crashes

Holiday	1994	1995	1996	1997	1998	1999	2000	2001	2002	Over all	# Years Over-Represented
New Year's	.54***	.33*	.70***	.90***	.95***	.88***	.16	.39+	1.62***	.60 ***	8
Super Bowl	-.13	.05	.13	-.08	.15	.03	.2424	.11	-.28	.05 +	0
Presidents	.16	.34*	.07	-.12	.12	-.04	.09	.02	.18	.10	1
St. Patrick's	-.10	-.52	-.26	-.14	-.2.02*	-.98+	-.16	-.09	-.54+	-.26 *	0
Easter	.23	-.18	-.08	-.45	-.14	-.03	-.05	.36+	.16	-.21 *	1
Cinco de mayo	.27	.17	.21	-.54*	-.22	-.43	-.14	.46**	.17	.10	1
Memorial	.14	.25+	.06	-.06	.01	-.09	.06	.02	.35*	.09 +	2
Independence	-.05	-.03	.67***	.51**	.12	-.12	.42*	.14	-.10	.13 *	3
Labor Day	.06	.35*	.12	.31*	.23+	.17	-.17	.13	.18	.09 +	3
Columbus	.25+	.19	-.05	-.22	-.09	.10	-.33+	-.15	-.03	-.07	1
Halloween	-.03	-11	.01	.25	-.02	.08	.09	.10	-.14	-.00	0
Veterans	.53***	-.05	.17	.29	.27	-.46	-.10	.06	-.02	.15 *	1
Thanksgiving	.16	.20	.12	-.10	-.12	-.38*	.06	-.01	-.00	.01	0
Christmas	.52***	.49**	.66***	.63**	.69***	.34+	.54***	.74***	.95***	.59 ***	9

[a] Poisson log-linear model estimators controlling for month and day of the week

+ p<.10; * p<.05; ** p<.01; *** p<.001

Table 2: Estimators[a] of Over-representation of Holiday Alcohol-Involved Fatal and Injury Crashes as a Proportion of All Fatal and Injury Crashes, California, 1994-2002

A. Nighttime crashes

Holiday	1994	1995	1996	1997	1998	1999	2000	2001	2002	Overall	# Years Over-Represented
New Year's	.16	.01	1.04***	1.16***	.91***	.49***	.46***	1.24***	1.78***	.69 ***	7
Super Bowl	.37**	.44**	.45***	.30*	.36*	.25+	.17	.19	.51***	.34 ***	7
Presidents	.01	.03	.22**	.02	-.05	.20*	.11	.03	.01	.07 *	2
St. Patrick's	.15	.37*	.22	.40*	.40+	.53**	-.15	-.13	-.27	.11 *	4
Easter	.04	-.25+	.24+	.29	.25	-.01	.36*	-.02	-.30+	.05	2
Cinco de mayo	.01	-.13	.06	.06	-.17	.44**	-.00	-.02	.03	.02	1
Memorial	.26***	.20*	.08	.17*	.19*	-.03	.24**	.17+	.21*	.18 ***	7
Independence	.13**	.72***	.46***	.47***	.27*	-.02	.71***	.85***	.57***	.44 ***	8
Labor Day	.35***	.18+	.12	.24**	.14	.30***	-.00	.17*	.18*	.18 ***	6
Columbus	.06	-.06	-.01	-.14	.18*	-.05	.08	-.01	-.13	.00	1
Halloween	.07	-.14	-.16	-.19	-.12	-.08	-.06	-.26	-.19	-.12 **	0
Veterans	.09	.08	.05	-.04	.02	.42**	.06	-.03	.24+	.11 **	2
Thanksgiving	.30***	.17*	.19*	.01	.05	.29**	.20*	-.06	.13	.14 ***	5
Christmas	-.18+	.56***	1.10***	.85***	.87***	.58***	.19	.83***	1.25***	.58 ***	7

B. Daytime Crashes

Holiday	1994	1995	1996	1997	1998	1999	2000	2001	2002	Overall	# Years Over-Represented
New Year's	.94***	.60***	.92***	1.06***	1.29***	1.15***	.50**	.75***	1.96***	.91 ***	9
Super Bowl	-.20	.23	.09	-.33	.20	-.13	.06	.11	-.24	.01	0
Presidents	0.19	.24+	.06	-.11	.09	.03	.14	.16	.12	.11 *	1
St. Patrick's	-.03	-.34	-.25	-.15	-1.93+	-.87	-.18	-.16	-.67*	-.33 **	0
Easter	.37*	-.47	-.14	-.42	.02	-.00	.11	.30	.12	.02	1
Cinco de mayo	0.34	.19	.12	-.59*	-.56+	-.38	-.05	.39*	.14	-.00	1
Memorial	.19	.25+	.08	-.07	.11	-.03	.14	.07	.50***	.01	1
Independence	-.10	.10	.60**	.49*	.21	-.20	.50*	.14	-.15	.19 **	3
Labor Day	.10	.32*	.15	.41**	.36*	.29+	-.08	.16	.20	.20 ***	4
Columbus	.24+	.18	-.07	-.19	-.03	.08	-.27	-.07	.00	.01	1
Halloween	-.00	-.20	-.23	.18	-.06	-.01	.05	-.05	-.25	-.03	0
Veterans	.49*	-.02	.28	.03	.26	-.39	-.15	-.02	.07	.09	1
Thanksgiving	.14*	.34*	.27+	-.19	-.06	-.13	.25	.00	.14	.11 *	3
Christmas	.44**	.85***	1.06***	.84***	1.10***	.76***	.87***	1.13***	1.42***	.87 ***	9

[a] Poisson logistic regression estimators controlling for month and day of the week

+ p<.10; * p<.05; ** p<.01; *** p<.001

It is interesting to examine the four special occasion drinking days of the year – Super Bowl, St. Patrick's Day, Cinco de Mayo and Halloween. As Table 1A shows, while Super Bowl is among the highest periods of excessive drinking and driving (and indeed has been over-represented in drinking and driving crashes in fully eight out of the nine years examined), there is little evidence of extra drinking and driving for the other three special occasions. For example, despite concern that Halloween is becoming an adult drinking holiday, there is no evidence to indicate that excessive drinking and driving is becoming more common on that day (overall estimator = -.14; over-representation [or] = -13%).

Table 2A shows the over-representation of nighttime AR fatal and injury crashes as a proportion of all fatal and injury crashes. This ratio helps control (standardize) for changes in the amount of holiday travel. While results in Table 2A are often similar to those in

Table 1A, over-representation in Table 2A is notably more pronounced on three particular holidays: New Year's estimator jumps from .37 (or = 44%) to .69 (or = 100%), Independence Day's from .14 (15%) to .44 (55%), and Christmas' from .23 (26%) to .58 (78%). Also of note in Table 2A is that St. Patrick's Day over-representation rises from a -.13 (-12%) to +.11 (12%), and Labor Day rises from .05 (5%) to .18 (or = 19%). Interestingly, the highly protective effect of Easter, estimator = -.36 (or = -70%), declines to a non-significant +.05 (or = 5%). In other words, it appears that the large decline in AR crashes on Easter may be more attributable to low crashes/driving in general, than to a major drop in drinking and driving.

Tables 1B and 2B provide the same respective kinds of data as 1A and 2A, except that crashes occur during daytime. As in the previous Tables, Christmas and New Year's evidence very elevated drinking and driving. Indeed, levels for these periods are even more pronounced during the day than at night.

Most holidays and special occasions show increases in drinking and driving during daytime and nighttime hours that are similar. For example, estimators for Memorial and Labor Days are fairly similar during both day and night. Two holiday periods, however, differ notably from this pattern: Super Bowl Sunday and St. Patrick's Day. In both cases it is clear that excess drinking is a nighttime, not daytime, phenomenon. Of particular note is that, while there is clear evidence of excess drinking and driving on the night of the Super Bowl, there is no evidence that drivers are excessively drinking and driving prior to the game.

Discussion

Results of this study suggest that the longstanding concern with excessive drinking and driving during the winter holidays is largely well founded, although the Thanksgiving period should not be included in this group. Recent interest in dealing with drinking and driving during the summer holidays is also well considered, although some of the rise in DUI rates for summer holidays is likely to be attributable to the general rise in drinking and driving during the summer. Once summer DUI levels are controlled, summer holiday drinking and driving, while high, is not quite as excessive as winter holiday levels.

A final date that should be of particular concern to drinking and driving policymakers is the Super Bowl. Nighttime drinking and driving on Super Bowl Sunday, while not quite the highest of the year, is an even more predictable phenomenon year in and year out. As Table 1 demonstrates, in eight of the nine years analyzed, AR drinking and driving fatalities and injuries rose significantly on Super Bowl Sunday night.

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