



Independence Day Holiday Period Traffic Fatality Estimate, 2017

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Holiday period definition

Independence Day is July 4 and it is observed on that day. The length of the holiday period varies depending on what day of the week July 4 falls. In 2017, the holiday period is 4.25 days and extends from 6:00 p.m. Friday, June 30, to 11:59 p.m. Tuesday, July 4.¹

Method and results

The objective is to estimate the number of deaths that will occur in traffic crashes during the Independence Day holiday period based on data available several weeks before the holiday. The estimate developed here includes all traffic deaths from crashes that occur during the holiday period.²

The general procedure involves three steps. First, historical data are used to determine the average fraction holiday fatalities are of total deaths for the month. Second, total traffic deaths for the coming month in which the holiday falls are estimated using a time series forecasting model. Third, the projected total for the month is multiplied by the fraction to obtain the holiday estimate.

Holiday as percent of month. Total July deaths are the estimates published in *Injury Facts*[®] two years after the year of the estimate (e.g., the July 2015 estimate as published in the 2017 edition of *Injury Facts*[®]). This figure is used, rather than a revised estimate or the National Center for Health Statistics final count, because it closely approximates the level of accuracy that the time series estimate will give for total monthly deaths in the current year. Fatality Analysis Reporting System (FARS) data were used to obtain deaths during the holiday periods.

Table 1 shows the total traffic fatalities for the month of July and fatalities from crashes that occurred during the holiday period. Over the six most recent 4.25-day Independence Day holidays, fatalities from crashes during the holiday period averaged 15.88% of the total fatalities in July. It should be noted that the rarity of 4.25-day Independence Day holidays makes comparisons difficult. As shown in Table 1, only six such holidays have occurred since 1995, with the last one taking place in 2013.

Time series model and projection. A time series model was developed to forecast an estimate of total traffic deaths for July 2017. An Autoregressive Integrated Moving Average (ARIMA) model was constructed based on 48 months of traffic deaths recorded from May 2013 through April 2017. An ARIMA model was chosen because of the seasonal pattern in traffic deaths. The model was developed using the SPSS/PC+ Version 5.0 statistical computer package. The model forecasts total traffic fatalities for July 2017 to be 3,661.

Holiday estimate. Multiplying the projected total fatalities by the fraction obtained in the first step gives an estimate of 582 traffic fatalities from crashes during the holiday period.

Confidence interval

There is uncertainty associated with any estimate. The 90% confidence interval for the estimate of total July deaths is 3,379 to 3,968. If we assume that the fraction of July deaths that occur during the Independence Day period is normally distributed, then the 90% confidence interval for that fraction is 15.21% to 16.56%. Combining these two gives the confidence interval for the Independence Day period estimate: 514 to 657 traffic deaths.

Medically consulted injuries

Based on the current medically consulted injury to death ratio of 115:1, and rounded to the nearest hundred, the estimate of the number of nonfatal medically consulted injuries that will result from crashes during the holiday period is 66,900 with a range of 59,100 to 75,600. Medically consulted injuries are injuries serious enough that a medical professional was consulted and they are not comparable to previous disabling injury estimates.

Holiday comparison

A frequently asked question is "How much more dangerous is travel over the Independence Day holiday?" There are two aspects of this question that must be considered. First, compared to what? And, second, what about changes in the amount of driving?

We chose to compare the holiday to periods of similar length before and after the holiday. Specifically, from 6:00 p.m. Thursday to 11:59 p.m. Sunday of the weeks immediately before and after the Independence Day weekend. Table 2 shows the fatality data from FARS for comparable weekends. The average number of traffic deaths during Independence Day over those six years is 16.9% higher than the average number of traffic deaths during the comparison periods (613 vs. 524 deaths). The difference between these two means *is* statistically significant at the .05 level.

The second question concerns changes in the amount of travel, or exposure. We know of no data system that tracks changes in vehicle miles of travel by day of the year on a national basis. Lacking an objective measure of exposure change, we assume that travel is greater on holiday weekends than on nonholiday weekends.

If the assumed travel increase exceeds 16.9%, then the risk of dying in a traffic crash during the Independence Day holiday period is less than during comparable nonholiday periods. If the travel increase is less than 16.9% or if travel is actually lower, then the risk of dying on the holiday is greater than during comparable periods.

Arnold and Cerrelli (1987) also examined the variation in fatalities during holiday periods.³ They used FARS data for 1975-1985 to determine average daily fatalities for each day of the week in each month (e.g., Tuesdays in July). For the Independence Day holiday period, they found that fatalities rose 20% on July 3 and 37% on July 4, but were normal on July 2 and 5.

Evaluation

Table 3 compares the actual FARS counts with the Council's estimates for all holidays for which data are available. One-hundred-five of the 125 actual counts fall within the 90% confidence interval of the estimate.

Notes

1. The National Highway Traffic Safety Administration extends the holiday period to 5:59 a.m. the following morning in its published tabulations of holiday deaths.
2. This differs from holiday estimates published by the Council in 1991 and earlier years. Comparisons should *not* be made between the holiday data and estimates shown here and holiday data and estimates published in 1991 and earlier years.
3. Arnold, R., & Cerrelli, E.C. (1987). *Holiday Effect on Traffic Fatalities*. DOT HS 807 115. Springfield, VA: National Technical Information Service.

Table 1. Traffic Deaths During 4.25-day Independence Day Periods as a Percent of Total July Traffic Deaths.

| YEAR | JULY | INDEPENDENCE DAY PERIOD | PERCENT |
|--------------------|--------------|----------------------------|---------------|
| 1995 | 4,040 | 631 | 15.62% |
| 1996 | 3,700 | 609 | 16.46% |
| 2000 | 3,970 | 683 | 17.20% |
| 2002 | 4,210 | 662 | 15.72% |
| 2006 | 4,090 | 629 | 15.38% |
| 2013 | 3,090 | 461 | 14.92% |
| <i>6-year avg.</i> | <i>3,850</i> | <i>613</i> | <i>15.88%</i> |

Source: *Injury Facts* and FARS.

Table 2. Traffic Deaths During 4.25-day Independence Day Periods and Equivalent Nonholiday Periods.

| YEAR | INDEPENDENCE DAY PERIOD | EQUIVALENT PERIODS | |
|--------------------|----------------------------|--------------------|-------|
| | | BEFORE | AFTER |
| 1995 | 631 | 554 | 543 |
| 1996 | 609 | 625 | 488 |
| 2000 | 683 | 529 | 471 |
| 2002 | 662 | 630 | 592 |
| 2006 | 629 | 569 | 496 |
| 2013 | 461 | 393 | 396 |
| <i>6-year avg.</i> | <i>613</i> | <i>524</i> | |

Source: FARS.

Table 3. Holiday Estimate Evaluation

| YEAR | ESTIMATE | 90% C. I. | ACTUAL | YEAR | ESTIMATE | 90% C. I. | ACTUAL |
|-----------------------|----------|---------------|--------|-------------------------|----------|-----------|--------|
| New Year's Day | | | | Labor Day | | | |
| 1995..... | | (no estimate) | | 1995..... | 512 | 457 – 574 | 490 |
| 1996..... | 392 | 331 – 461 | 414 | 1996..... | 544 | 494 – 598 | 508 |
| 1997..... | 184 | 124 – 254 | 176 | 1997..... | 492 | 426 – 566 | 485 |
| 1998..... | 514 | 453 – 581 | 532 | 1998..... | 498 | 447 – 554 | 447 |
| 1999..... | 391 | 348 – 439 | 349 | 1999..... | 468 | 422 – 518 | 469 |
| 2000..... | 364 | 322 – 411 | * 458 | 2000..... | 481 | 430 – 538 | 514 |
| 2001..... | 399 | 359 – 443 | * 338 | 2001..... | 474 | 420 – 533 | 432 |
| 2002..... | 533 | 467 – 608 | 554 | 2002..... | 474 | 413 – 542 | 536 |
| 2003..... | 184 | 140 – 235 | 203 | 2003..... | 488 | 429 – 555 | 490 |
| 2004..... | 524 | 450 – 609 | 549 | 2004..... | 486 | 421 – 558 | 480 |
| 2005..... | 392 | 338 – 453 | 449 | 2005..... | 475 | 420 – 537 | 500 |
| 2006..... | 399 | 347 – 457 | 432 | 2006..... | 533 | 477 – 595 | 487 |
| 2007..... | 405 | 354 – 463 | 387 | 2007..... | 490 | 440 – 544 | 508 |
| 2008..... | 498 | 447 – 555 | * 407 | 2008..... | 439 | 384 – 501 | 473 |
| 2009..... | 445 | 394 – 502 | 458 | 2009..... | 404 | 356 – 457 | * 351 |
| 2010..... | 301 | 260 – 347 | 286 | 2010..... | 368 | 320 – 422 | 390 |
| 2011..... | 308 | 259 – 364 | 304 | 2011..... | 400 | 337 – 472 | 373 |
| 2012..... | 297 | 249 – 353 | 348 | 2012..... | 405 | 336 – 485 | 378 |
| 2013..... | 407 | 347 – 475 | * 343 | 2013..... | 394 | 338 – 459 | 371 |
| 2014..... | 156 | 124 – 194 | 126 | 2014..... | 395 | 338 – 460 | 362 |
| 2015..... | 421 | 367 – 481 | * 355 | 2015..... | 395 | 336 – 461 | 394 |
| Memorial Day | | | | Thanksgiving Day | | | |
| 1995..... | 456 | 381 – 543 | 471 | 1995..... | 527 | 465 – 596 | 519 |
| 1996..... | 478 | 411 – 552 | 494 | 1996..... | 528 | 465 – 597 | 570 |
| 1997..... | 473 | 408 – 546 | 498 | 1997..... | 541 | 480 – 609 | 554 |
| 1998..... | 470 | 419 – 528 | * 383 | 1998..... | 541 | 485 – 603 | 586 |
| 1999..... | 470 | 414 – 534 | 494 | 1999..... | 500 | 441 – 566 | * 567 |
| 2000..... | 461 | 404 – 525 | 451 | 2000..... | 497 | 432 – 570 | 497 |
| 2001..... | 468 | 419 – 523 | 499 | 2001..... | 532 | 455 – 619 | 580 |
| 2002..... | 498 | 423 – 582 | 484 | 2002..... | 575 | 493 – 667 | 527 |
| 2003..... | 464 | 396 – 542 | 472 | 2003..... | 544 | 459 – 642 | 544 |
| 2004..... | 476 | 409 – 551 | 496 | 2004..... | 556 | 476 – 646 | 556 |
| 2005..... | 471 | 410 – 540 | 512 | 2005..... | 610 | 505 – 735 | 605 |
| 2006..... | 541 | 487 – 601 | 493 | 2006..... | 555 | 500 – 615 | * 623 |
| 2007..... | 497 | 450 – 548 | 475 | 2007..... | 564 | 499 – 635 | 542 |
| 2008..... | 468 | 420 – 520 | * 414 | 2008..... | 479 | 415 – 551 | 484 |
| 2009..... | 366 | 324 – 415 | * 462 | 2009..... | 447 | 392 – 508 | 401 |
| 2010..... | 353 | 319 – 391 | 389 | 2010..... | 441 | 378 – 513 | 417 |
| 2011..... | 406 | 351 – 468 | 389 | 2011..... | 434 | 368 – 509 | 375 |
| 2012..... | 420 | 361 – 489 | 367 | 2012..... | 451 | 384 – 528 | 405 |
| 2013..... | 407 | 358 – 461 | * 334 | 2013..... | 436 | 365 – 517 | * 360 |
| 2014..... | 382 | 327 – 445 | 337 | 2014..... | 418 | 367 – 474 | 403 |
| 2015..... | 383 | 329 – 442 | 367 | 2015..... | 433 | 371 – 502 | 386 |

Source: Estimates from National Safety Council; actual counts from FARS. * = outside of 90% confidence interval.

Table 3. Holiday Estimate Evaluation (cont.)

| YEAR | ESTIMATE | 90% C. I. | ACTUAL | YEAR | ESTIMATE | 90% C. I. | ACTUAL |
|------------------|----------|-----------|--------|---------------|----------|-----------|--------|
| Independence Day | | | | Christmas Day | | | |
| 1995..... | 636 | 553 – 731 | 631 | 1995..... | 422 | 351 – 502 | * 342 |
| 1996..... | 653 | 580 – 734 | 609 | 1996..... | 145 | 113 – 182 | 136 |
| 1997..... | 469 | 411 – 535 | 492 | 1997..... | 563 | 458 – 680 | 466 |
| 1998..... | 498 | 448 – 552 | 458 | 1998..... | 406 | 350 – 468 | 354 |
| 1999..... | 503 | 446 – 567 | 499 | 1999..... | 369 | 316 – 428 | * 456 |
| 2000..... | 645 | 578 – 719 | 683 | 2000..... | 359 | 300 – 424 | 419 |
| 2001..... | 198 | 144 – 260 | 173 | 2001..... | 522 | 417 – 641 | 575 |
| 2002..... | 648 | 565 – 743 | 662 | 2002..... | 160 | 131 – 193 | * 114 |
| 2003..... | 520 | 449 – 602 | 500 | 2003..... | 529 | 438 – 636 | 488 |
| 2004..... | 522 | 451 – 602 | 502 | 2004..... | 440 | 356 – 536 | 370 |
| 2005..... | 498 | 444 – 557 | * 565 | 2005..... | 443 | 352 – 546 | 383 |
| 2006..... | 751 | 680 – 828 | * 629 | 2006..... | 415 | 332 – 507 | 379 |
| 2007..... | 203 | 160 – 251 | 184 | 2007..... | 497 | 424 – 579 | 454 |
| 2008..... | 449 | 396 – 507 | 472 | 2008..... | 432 | 371 – 500 | 409 |
| 2009..... | 381 | 336 – 431 | 398 | 2009..... | 317 | 253 – 388 | * 248 |
| 2010..... | 361 | 310 – 420 | 365 | 2010..... | 303 | 233 – 384 | 249 |
| 2011..... | 374 | 320 – 436 | 405 | 2011..... | 287 | 220 – 365 | 256 |
| 2012..... | 173 | 135 – 219 | 157 | 2012..... | 377 | 320 – 441 | 351 |
| 2013..... | 540 | 477 – 610 | * 461 | 2013..... | 105 | 82 – 132 | 88 |
| 2014..... | 385 | 328 – 450 | 347 | 2014..... | 366 | 330 – 407 | 355 |
| 2015..... | 409 | 351 – 475 | 366 | 2015..... | 307 | 259 – 362 | 273 |

Source: Estimates from National Safety Council; actual counts from FARS. * = outside of 90% confidence interval.