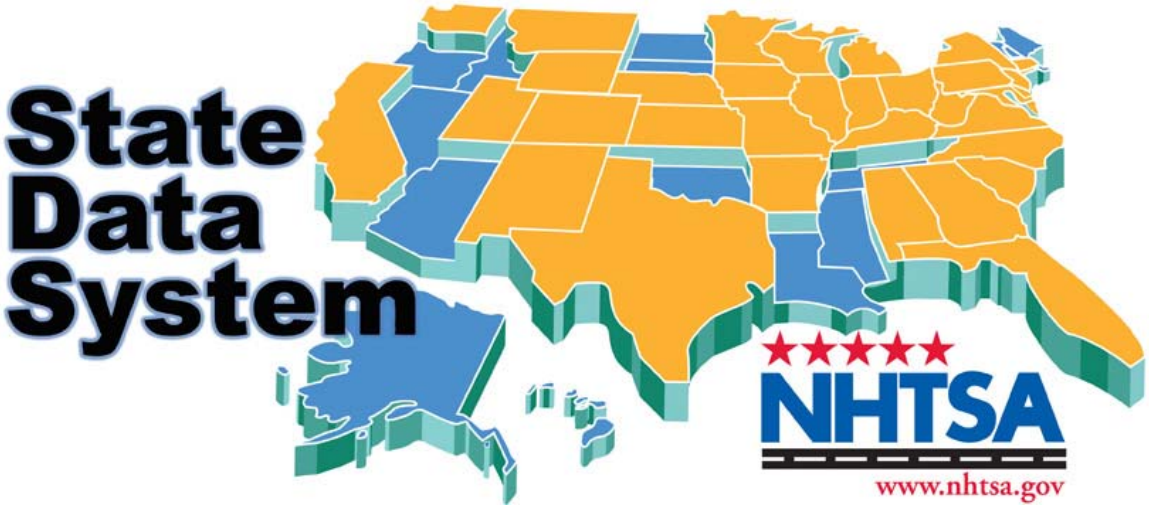

How SDS Data Have Been Used

State Data System (SDS) data are essential to NHTSA crash research and traffic safety policy development. SDS provides data not available in any of NCSA's other data systems. While the Fatality Analysis Reporting System (FARS) only has fatal crash data, SDS includes valuable data on injury and property-damage-only crashes as well. In contrast to the data in the National Automotive Sampling System General Estimates System (NASS-GES), the State Data System consists of census data taken directly from police accident reports. What follows is a partial list of published research and evaluations conducted in the last five years using SDS data.

Effectiveness of LED Stop Lamps for Reducing Rear-End Crashes: Analyses of State Crash Data (DOT HS 811 712), 2/13

Nathan Greenwell, NCSA

This report used SDS data to analyze the crash-reduction benefits of LED stop lamps and LED center high-mounted stop lamps (CHMSL) using real-world crash data. Previous work on this subject included laboratory experiments that suggest LED lamps were more beneficial than incandescent lamps at preventing rear-impact collisions. NHTSA statistically compared the overall ratio of rear-impact crashes to a control group of frontal impacts before and after the switch to LED.
http://www-nrd.nhtsa.dot.gov/Pubs/811712.pdf

Relationships Between Fatality Risk, Mass, and Footprint in Model Year 2000–2007 Passenger Cars and LTVs – Final Report (DOT HS 811 665) 8/12

Charles J. Kahane, Ph.D., NCSA

Mass reduction while holding a vehicle's footprint (size) constant is a potential strategy for meeting footprint-based CAFE and GHG standards. An important corollary issue is the possible effect of mass reduction that maintains footprint on fatal crashes. One way to estimate these effects is statistical analyses of societal fatality rates per VMT, by vehicles' mass and footprint, for the current on-road vehicle fleet. Societal fatality rates include occupants of all vehicles in the crash as well as pedestrians. The analyses comprised MY 2000–2007 cars and LTVs in CY 2002–2008 crashes. Fatality rates were derived from FARS data, 13 State crash files, and registration and mileage data from R.L. Polk.
http://www-nrd.nhtsa.dot.gov/Pubs/811339.pdf

The Effectiveness of Underride Guards for Heavy Trailers (DOT HS 811 375), 10/10

Kirk Allen; Ph.D.; NCSA

This report is a statistical analysis of crash data aimed at determining the effectiveness of FMVSS-compliant underride guards at preventing fatalities and serious injuries in crashes where a passenger vehicle impacts the rear of a tractor-trailer. As part of the research, Florida crash files from NHTSA's State Data System were analyzed. The primary findings include the following: Data from Florida and North Carolina showed decreases in fatalities and serious injuries to passenger vehicle occupants when rear-ending a tractor-trailer subsequent to the implementation of FMVSS 223 and 224. In Florida, there is an observed 27 percent reduction in fatalities for trailers that should be equipped with FMVSS-compliant underride guards and a 7 percent reduction in fatalities or serious injuries; however, neither reduction is statistically significant at the 0.05 level.
http://www-nrd.nhtsa.dot.gov/Pubs/811375.pdf

Booster Seat Effectiveness Estimates Based on CDS and State Data (DOT HS 811 338) 07/10

Robert Sivinski, NCSA

Statistical analyses based on NASS CDS data from 1998-2008 and 17 combined years of State data from Kansas, Washington, and Nebraska estimate the effects of early graduation from child restraint seats to booster seats and of early graduation from booster seats to lap and shoulder belts. The principal findings are that among 3- and 4-year-olds there is evidence of increased risk of injury when restrained in booster seats rather than with the recommended child restraints. This increase depends on injury severity, and may be as large as 27 percent for non-disabling to fatal injuries. This effect may be more pronounced in the 3-year-olds, although sample sizes are too small to draw statistical conclusions. Among 4- to 8-year-olds there is strong evidence of reduced risk of injury when restrained by booster seats rather than lap and shoulder belts. The magnitude of this effect for the combined database is a 14 percent reduction in risk of any type of injury, but the effect

varies depending on data source and injury severity. Estimates varied from no effect to a 45 percent reduction of MAIS ≥2 injuries based on CDS data.
http://www-nrd.nhtsa.dot.gov/Pubs/811338.pdf

The Effectiveness of ABS in Heavy Truck Tractors and Trailers (DOT HS 811 339) 07/10

Kirk Allen, NCSA

Federal Motor Vehicle Safety Standard No. 121 mandates antilock braking systems (ABS) on all new air-braked vehicles with a GVWR of 10,000 pounds or greater. ABS is required on tractors manufactured on or after March 1, 1997, and air-braked semi-trailers and single-unit trucks manufactured on or after March 1, 1998. The primary findings of this report are the following:

- The best estimate of a reduction by ABS on the tractor unit in all levels of police-reported crashes for air-braked tractor-trailers is 3 percent. This is based on data from seven States and controls for the age of the tractor at the time of the crash. This represents a statistically significant 6-percent reduction in the crashes where ABS is assumed to be potentially influential, relative to a control group, of about the same number of crashes, where ABS is likely to be irrelevant.
- In fatal crashes, there is a non-significant 2-percent reduction in crash involvement, resulting from a 4-percent reduction in crashes where ABS should be potentially influential. The age of the tractor at the time of the crash is not important. Rather, external factors of urbanization, road speed, and ambient lighting are influential and are accounted for in the final estimate.
- Among the types of crashes that ABS influences, there is large reduction in jack-knives, off-road over-turns, and at-fault involvements in collisions with other vehicles (except front-to-rear collisions). Counteracting are an increase in the number of involvements of hitting animals, pedestrians, or bicycles and, only in fatal crashes, rear-ending lead vehicles in two-vehicle crashes.

http://www-nrd.nhtsa.dot.gov/Pubs/811339.pdf

An Analysis of Speeding-Related Crashes: Definitions and the Effects of Road Environments (DOT HS 811 090) 02/09

Cejun Liu and Chou-Lin Chen

Speeding is reported in the Fatality Analysis Reporting System (FARS) as a driver-level attribute that combines “driving too fast for conditions" or "in excess of posted speed limit.” There is a growing need to parse out these two factors, especially for those designing countermeasures. The report, using data from the State Data System quantifies the extent of these two aspects related to speeding using data from six States whose police accident reports actually parse these out. The result of this analysis shows that this really depends on the severity of the crash. In fatal crashes, about 55 percent of all speeding-related crashes were due to “exceeding posted speed limits” as compared to the 45 percent that were due to “driving too fast for conditions.” The comparable percentages for

speeding-related injury crashes were 26 percent versus 74 percent and those for PDO (property-damage-only) crashes were 18 percent versus 82 percent. The second aspect examined in this study is how these crashes, which related to the factors "driving too fast for conditions" or "exceeding posted speed limit," were affected by roadway environments. It shows that the speeding-related crashes that were due to "driving too fast for conditions" were more likely to have occurred on roads with higher speed limits (50+ mph) as compared to other crashes. Roadway environments analyzed also include: roadway surface conditions, roadway alignment, and intersection/intersection-related roadway segment.
http://www-nrd.nhtsa.dot.gov/Pubs/811090.PDF

Incidence of Pedestrian and Bicyclist Crashes by Hybrid Electric Passenger Vehicles Technical Report (DOT HS 811 204) 9/09

Refaat Hanna, NCSA

This study examines the incidence rates of pedestrian and bicyclist crashes that involved hybrid electric vehicles (HEV) and to compare the results to internal combustion engine (ICE) vehicles under similar circumstances. State crash files from NHTSA's State Data System were used to measure the incidence rates of pedestrian and bicyclist crashes by HEVs and to compare the incidence rate with their peer ICE vehicles. The purpose of the study is to compare the crash experience of two different types of vehicles; it is not to make national estimates of problem size. This study found that pedestrian and bicyclist crashes involving both HEVs and ICE vehicles commonly occurred on roadways, in zones with low speed limits, during daytime and in clear weather, with higher incidence rates for HEVs when compared to ICE vehicles. Incidence rate of pedestrian crashes in scenarios when vehicles make a turn was significantly higher for HEVs when compared to ICE vehicles. There was no statistically significant difference in incidence rate of pedestrian crashes involving HEVs when compared to ICE vehicles when both type of vehicles were going straight.
http://www-nrd.nhtsa.dot.gov/Pubs/811204.PDF

The Effectiveness of Amber Rear Turn Signals for Reducing Rear Impacts (DOT HS 811 115), 4/09

Kirk Allen; Ph.D.; NCSA

Federal Motor Vehicle Safety Standards mandate that rear turn signals be either amber or red in color. Analysis of NHTSA's State Data System was conducted on 26 make-models of passenger vehicles that switched rear turn signal color during model years 1981 to 2005. The primary conclusion is that amber rear turn signals are 5.3% more effective than red rear turn signals at preventing involvement in crashes where a careful driver would typically use the turn signals. The result is shown to be statistically significant and consistent with other published analyses on the influence of rear turn signal color.
http://www-nrd.nhtsa.dot.gov/Pubs/811115.PDF

Fatalities and Injuries in Motor Vehicle Backing Crashes. Report to Congress (DOT HS 811 144) 11/08

Rory Austin

The U.S. Congress required the Secretary of Transportation to examine fatalities and injuries in backing crashes in Public Law Number 109-59, Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) Section 2012 and to transmit a report about such crashes by January 1, 2009. A backover is a crash which occurs when a driver reverses into and injures or kills a nonoccupant such as a pedestrian or a bicyclist. Backovers can occur either on a public roadway or not on a public roadway, i.e., in a driveway or in a parking lot. The former are called traffic backovers and the latter nontraffic backovers. There are also "other backing crashes" that are not backovers, i.e., they do not involve a pedestrian or other nonoccupant, that occur when, for example, a driver backs into a tree or pole or when a driver backs out of a driveway or parking space and is struck by another vehicle. Together, backover crashes and other backing crashes are referred to as backing crashes.

The National Highway Traffic Safety Administration's (NHTSA) existing Fatality Analysis Reporting System (FARS) and National Automotive Sampling System - General Estimates System (NASS-GES) already provide information regarding backing crashes that occur on public trafficways. However, data regarding nontraffic backovers (and other backing crashes), those which occur on private roads, driveways, and parking lots, have not routinely been collected by NHTSA. In response to SAFETEA-LU Sections 2012 and 10305 and Section 2(f) of the Cameron Gulbransen Kids Transportation Safety Act of 2007, NHTSA developed the Not in Traffic Surveillance (NiTS) system to collect information about all nontraffic crashes, including nontraffic backover crashes. Combining the 221 NiTS backover fatalities with the annual average of 71 FARS backover fatalities produces an estimate of 292 total annual backover fatalities. The estimate of 292 annual backover fatalities is larger than the estimated 183 fatalities stated in the November 2006 Report to Congress *Vehicle Backover Avoidance Technology Study*, but NHTSA believes that the new estimate reflects a refinement in the methodology rather than a substantial change in the problem size. The estimated 14,000 NiTS backover injuries when combined with the 4,000 NASS-GES backover injuries produces an estimate of 18,000 total annual backover injuries.

Most backover fatalities and injuries involve passenger vehicles. Among cases where the type of the striking vehicle is known, 78 percent of the backover fatalities and 95 percent of the backover injuries involved passenger vehicles. While people of all ages are victims of backovers, this report confirmed that children under 5 years old and adults 70 and older have an elevated risk of being backover victims compared to the rest of the population. Backover fatalities happen in a variety of areas with the most common area being the driveway, closely followed by other residential areas, public roadways, and nonresidential parking lots. Backover injuries tend to happen more frequently in nonresidential parking lots than other areas. (Pg: 8 - For benchmarking the total number of crash injuries, both traffic and nontraffic, NHTSA turned to its State Data System…)
http://www-nrd.nhtsa.dot.gov/Pubs/811144.PDF

Trends in Non-Fatal Traffic Injuries: 1996–2005 (DOT HS 810 944), 05/08

Marc Starnes

An analysis of three major databases of the National Highway Traffic Safety Administration (NHTSA) shows that from 1996 through 2005, the annual number of "incapacitating" injuries due to motor vehicle crashes decreased by 25 to 28 percent. Incapacitating is a category of injury severity that represents the most severe non-fatal injuries. An incapacitating injury is a nonfatal injury that prevents the injured person from walking, driving, or normally continuing the activities the person was capable of performing before the injury occurred. This report utilizes three databases from NHTSA's National Center for Statistics and Analysis (NCSA). The databases are used separately to analyze trends in non-fatal motor vehicle injuries. Data was individually examined from the Fatality Analysis Reporting System (FARS) from 1996 through 2005, the National Automotive Sampling System General Estimates System (GES) from 1996 through 2005, and 25 States in the State Data System (SDS) from 1996 through 2004. A significant reduction was seen in the overall non-fatal injury counts in each of the FARS, GES, and SDS databases. The GES and SDS annual injury counts dropped by 23 percent and 9 percent respectively, while an 11-percent drop in non-fatal injuries was seen in the FARS database of fatal crashes. The largest percentage decline in the FARS database (25%), GES database (28%), and SDS database (25%) occurred among the most severe injuries, referred to as incapacitating injuries. The rate of non-fatal injuries per crash also declined in each of the three databases. These reductions in non-fatal injuries seen in FARS, GES, and SDS have taken place despite a 20-percent increase in vehicle miles traveled. Concurrent with these declines in non-fatal injuries, the number of FARS fatalities rose by 3 percent. The decline in injuries noted in this report is correlated to the many improvements in vehicle safety and driver and passenger behavior that have taken place in the last decade. These improvements include, but are not limited to: an increased use of seat belts and child safety seats, reductions in drunk driving, as well as an expansion throughout the vehicle fleet of air bags and electronic stability control.
http://www-nrd.nhtsa.dot.gov/Pubs/810944.PDF

Statistical Analysis of the Effectiveness of Electronic Stability Control (ESC) Systems – Final Report (DOT HS 810 794), 7/07

Jennifer N. Dang; Office of Planning, Evaluation, & Budget

NHTSA's State Data System was used to evaluate the effectiveness of Electronic Stability Control (ESC) systems in reducing various types of crash involvements. SDS allowed examination of crash data from 1997 to 2003 using vehicle identification number information to compare specific make/models of passenger cars and SUVs with ESC versus earlier versions of the same make/models. The results showed statistically significant reductions in run-off-road crashes, rollover crashes, single-vehicle crashes, culpable involvements in police-reported multi-vehicle, and all police-reported crashes for vehicles equipped with an ESC system.

http://www.nhtsa.dot.gov/staticfiles/DOT/NHTSA/NCSA/Regulatory%20Evaluation/static%20-%20PDF%20file/DOT%20HS%20810%20794.pdf

Vehicle Aggressiveness in Real World Crashes (in Proceedings 19th Technical Conference on the Enhanced Safety of Vehicles DOT HS 809 825), 6/05

Rory A. Austin; Office of Vehicle Safety Planning and Analysis

NHTSA identified vehicle compatibility as one of its five priorities. One important component of vehicle compatibility in head-on and side impact crashes is vehicle aggressiveness. Aggressivity of a vehicle is defined as the fatality or injury risk for occupants of other vehicles with which it collides. More aggressive vehicles are more likely to produce serious injuries to occupants of the vehicles with which they collide than less aggressive vehicles. Vehicle aggressiveness was determined using five years of police reported crashes from seven states in NHTSA's State Data System (SDS). The results demonstrated the relationship between a vehicle's aggressiveness and its body style, mass, and other physical characteristics. For the most part, the results confirm the importance of physical characteristics for understanding vehicle aggressiveness measured from police reported crashes.
http://www-nrd.nhtsa.dot.gov/pdf/nrd-01/esv/esv19/05-0248-O.pdf

Preliminary Results Analyzing the Effectiveness of Electronic Stability Control (ESC) Systems (DOT HS 809 790), 9/04

Jennifer N. Dang; Office of Planning, Evaluation, & Budget

NHTSA's State Data System was used to evaluate the effectiveness of Electronic Stability Control (ESC) systems in reducing single vehicle crashes in various domestic and imported cars and SUVs. SDS allowed examination of crash data from 1997 to 2002 using vehicle identification number information to compare specific make/models of passenger cars and SUVs with ESC versus earlier versions of the same make/models. The preliminary results showed statistically significant reductions in single vehicle crashes in certain passenger cars and SUVs equipped with an ESC system.
http://www.nhtsa.dot.gov/cars/rules/regrev/evaluate/809790_files/809790.pdf

Analysis of the Rollover Propensity of Fifteen-Passenger Vans (DOT HS 809 735), 5/04

Rajesh Subramanian; NCSA

NHTSA's State Data System was used to assess the rollover propensity of 15-Passenger Vans with increasing occupancy. SDS allowed examination of propensity metrics of 15-passenger vans with other types of passenger vehicles such as cars, SUVs, Pickup Trucks and Minivans. The results showed that the disparity in the risk of rollover between full occupancy and nominal occupancy (driver only) was most pronounced for 15-Passenger Vans as compared to other passenger vehicles.
http://www-nrd.nhtsa.dot.gov/pdf/nrd-30/NCSA/Rpts/2004/809735.pdf

Assessing the Influence of Child Safety Campaigns (DOT HS 809 698), 11/03
John Kindelberger and Marc Starnes; NCSA

NHTSA's State Data System was used to examine the success of child safety campaigns designed to encourage drivers to seat children age 12 and under in the back seat. SDS enabled examination of child-positioning patterns over the years in airbag and non-airbag vehicles. The results showed children moving from the front seat to the back seat, particularly in airbag vehicles, over the years. This outcome was a validation of the influence of child safety campaigns instituted in the mid-nineties.
http://www-nrd.nhtsa.dot.gov/pdf/nrd-30/NCSA/RNotes/2003/809-698.pdf

New Car Assessment Program; Rollover Resistance (RIN 2127-AI81), 10/03
Patrick Boyd and Dr. Riley Garrott; NHTSA Office of Rulemaking

This document modified NHTSA's rollover resistance ratings in its New Car Assessment Program (NCAP) to include dynamic rollover tests after considering comments to NHTSA's previous document. The NCAP rollover resistance ratings in the 2004 model year were determined using the system established by this document, and that system was developed in part through analysis of SDS data.
http://www.nhtsa.dot.gov/cars/rules/rulings/RollFinal/index.html

Vehicle Weight, Fatality Risk and Crash Compatibility of Model Year 1991-99 Passenger Cars and Light Trucks (DOT HS 809 662), 10/03
Charles J. Kahane, Ph.D.; NHTSA Office of Planning, Evaluation & Budget

SDS data from eight states in combination with other data were used to analyze the crash compatibility of cars and light trucks/vans. This database enabled comparison of fatality rates per billion vehicle miles of light cars, heavy cars, pickup trucks, SUVs and vans.
http://www.nhtsa.dot.gov/cars/rules/regrev/evaluate/pdf/809662.pdf

Evaluation of Rear Window Defrosting and Defogging Systems (DOT 809 724), 3/03
Christina Morgan; NHTSA Office of Planning, Evaluation & Budget

SDS files were used to examine whether there were proportionately fewer backing-up and changing-lane crashes involving cars with rear-window defoggers than crashes involving cars without rear-window defoggers. The main analyses found that rear window defoggers have no effect on changing-lane and backing-up crashes in conditions when they are most likely used (when raining or snowing, during early morning, or during winter).
http://www.nhtsa.dot.gov/cars/rules/regrev/evaluate/rearwindow-report/Index.html

The Rollover Propensity of Fifteen-Passenger Vans (DOT 01-030), 04/01
W. Riley Garrott, Barbara Rhea, Rajesh Subramanian, Gary J. Heydinger

This study is composed of three parts: a review of crash data to look at the record of fifteen-passenger vans; measurement of the Static Stability Factors (SSF) of a fifteen-passenger van, a seven-passenger van, and a minivan; and a simulation analysis of the handling characteristics of an unloaded and loaded fifteen-passenger van.
http://www-nrd.nhtsa.dot.gov/Pubs/01-030.PDF

Analysis of the Crash Experiences of Vehicles Equipped with Antilock Braking Systems – An Update (DOT HS 808 758), 08/98
Hertz, Ellen, Ph. D.; Hilton, Judith, and Johnson, Delmas Maxwell

Data from NHTSA's Fatality Analysis Reporting System (FARS) and State Data System (SDS) were used to analyze the crash experience of ABS-equipped and non-ABS-equipped vehicles for passenger cars (PCs) and light trucks and vans (LTVs). This study updates the results of work published by NHTSA in 1995 using FARS data for 1995 -1996 and SDS data for Florida, Maryland, Missouri, and Pennsylvania for 1995 - 1996. These states were chosen for the study as each, for the period shown, recorded the vehicle identification number (VIN), which is used to determine if specific makes/models of vehicles are equipped with ABS. As with the earlier work, separate analyses were conducted for PCs and LTVs, for each type of ABS system (rear and all wheel), for each of several crash types and each type of road surface (favorable and unfavorable). This analysis also crashed considered crashes involving pedestrians in addition to the four crash types studied earlier. The findings for PCs study also presents a summary from a review of the literature on the crash experience of DRL-equipped are similar to the earlier results, i.e., a significant reduction in avoiding non-fatal frontal crashes was found. Side impacts and run-off-road crashes on unfavorable surfaces, however, were no longer predicted to increase for PCs. In addition, decreases were found for crashes involving PCs and pedestrians. For all wheel LTVs, increases in fatal rollover and side impact crashes were found. For rear-wheel LTVs, an increase was not found for frontal crashes, as was shown in the previous study.
http://www-nrd.nhtsa.dot.gov/Pubs/808-758.PDF

The Effect of Decreases in Vehicle Weight on Injury Crash Rates (DOT 808-575), 01/97

This study was conducted as a part of the effort by the National Highway Traffic Safety Administration (NHTSA) to study the effect of changes in vehicle size on the crashes, injuries, and fatalities of passenger car and light truck occupants. This study focuses on the effect on fatal and incapacitating injuries resulting from a reduction of one hundred pounds in vehicle weight.
http://www-nrd.nhtsa.dot.gov/Pubs/808-575.pdf

If you would like more information about how State Data System data has been used or have other questions about SDS, please contact Nancy Bondy, Technical Manager.

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