Quantifying Tire-related Deaths and Injuries in U.S. Motor Vehicles

EXPANDED PRESENTATION FOR
the National Transportation Safety Board
Tire Safety Symposium

BY
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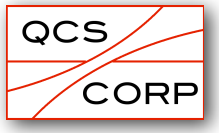
December 22, 2014



Single Vehicle Crash
1996 Ford Explorer in a Rollover Crash with Incapacitating Injuries, October, 2012
NASS/CDS Case 2012-49-186

QCS CORP

Source: NHTSA, National Automotive Sampling System, CDS XML Case Viewer
<http://www-nass.nhtsa.dot.gov/nass/cds/SearchForm.aspx>

What are tire-related crashes?

Crashes precipitated OR affected by:

A pre-crash condition of the tire (e.g. low pressure, bald tires, aged tires, tires with defects in manufacture)

AND/OR

Tire disablements: pre-crash, crash, or post-crash events (e.g., flat tires, tire detreads, debeaded tires)

How can we mitigate tire-related crashes?

By implementing effective safety strategies in the pre-crash, crash, and post-crash stages

The most effective of these are PASSIVE strategies

QCS CORP

Some Pre-crash Conditions of Tire-related Crashes

Aged tires

Defective/recalled tires

Worn tires, low-tread depth

Inappropriate tire pressure

Inappropriate tread depth

Inappropriate tire size

Inappropriate load capacity

QCS CORP

Some Pre-crash Events in Tire-related Crashes

- Tire punctures
- Tread separation (with and without loss of tire pressure)
- Sidewall, ply, cord separation
- Bead separation
- Chunking, broken cords, open cracks or splices
- Tire valve stem failures

Some Events in Tire-related Crashes

Loss of directional control

Loss of speed control

Loss of pressure

Tire debeading

Resistance to lateral acceleration

Some Post-crash Conditions in Tire-related Crashes

Vehicle disablement

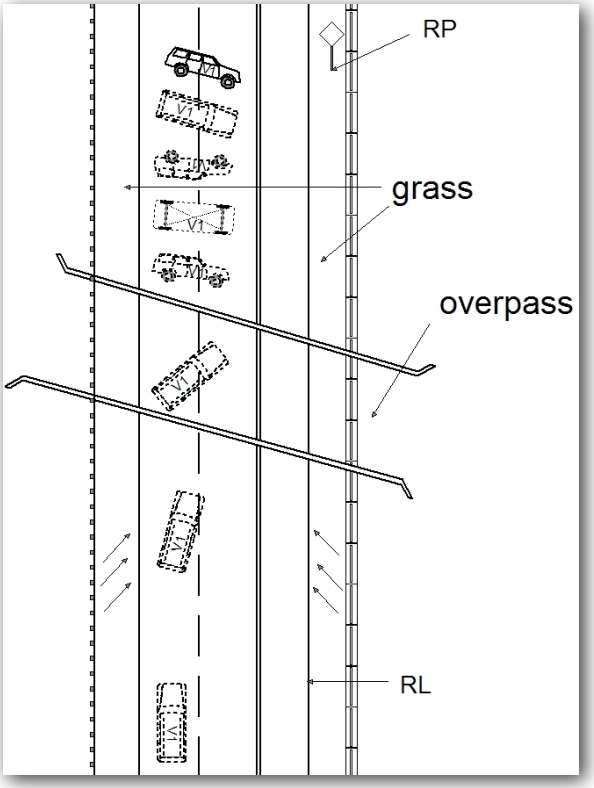
Roadway debris

Vehicle occupants become pedestrians

Categories of Tire-related Crashes

Single Vehicle Crash
1996 Ford Explorer in a Rollover Crash with Incapacitating Injuries, October, 2012
NASS/CDS Case 2012-49-186

Summary: "V 1 was traveling north on a highway. The left rear tire of V1 blow out, causing the vehicle to rotate clockwise. V1 rolled over to for [sic] five quarter turns, coming to rest on its left side."



QCS CORP

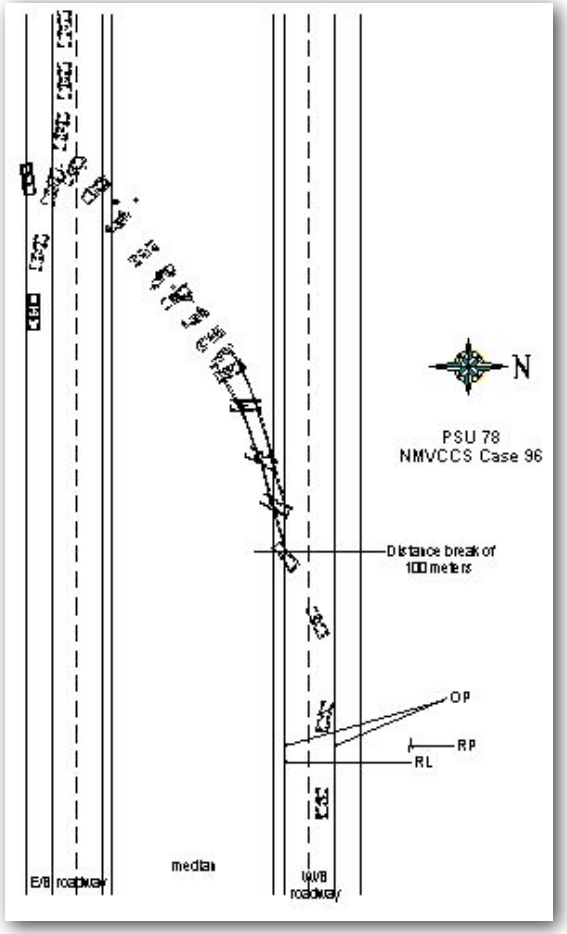
Source: NHTSA, National Automotive Sampling System, CDS XML Case Viewer <http://www-nass.nhtsa.dot.gov/nass/cds/SearchForm.aspx>

Tire-related Casualties Also Occur Beyond Specific Vehicles That Have Tire Disablements

Comprehensive casualty summaries should include all victims in multi-vehicle crashes as well as crashes involving non-motorists

Multi-vehicle Crash
NMVCSS Case 2006-78-96

Summary: "The tread separated from the right rear tire of V1 and the driver steered left, causing the vehicle to rotate counterclockwise. V1 departed the left side of the roadway into the median. V1 rolled to the right eight quarter-turns across the median. V1 then entered the eastbound lanes. The driver of V2 steered right to avoid V1, but the right side of V1 struck the left side of V2."



QCS CORP

Source: NHTSA, National Motor Vehicle Crash Causation Survey Case Viewer <http://www-nass.nhtsa.dot.gov/nass/nmvccs/SearchForm.aspx>

Tire-related Fatal Crash Involving Pedalcyclist
FARS Case 2010-190247-1

Calendar Year	ST_CASE	VEH_NO	Field	Code
2010	190247	1	VE_FORMS	1
2010	190247	1	VE_TOTAL	1
2010	190247	1	Vehicle DEATHS	0
2010	190247	1	Sequence 1	Equipment Failure (blown tire, brake failure, etc)
2010	190247	1	Sequence 2	Pedalcyclist
2010	190247	1	Sequence 3	Ran Off Roadway - Right
2010	190247	1	Sequence 4	Ditch
2010	190247	1	Sequence 5	Rollover/Overturn
2010	190247	1	FATALS	1

QCS CORP

Source: QCS Corp. abstract of FARS, 2010

Secondary Crashes May Also Be Related to Tire Disablements

Comprehensive casualty summaries should also consider post-crash conditions involving the tires such as:

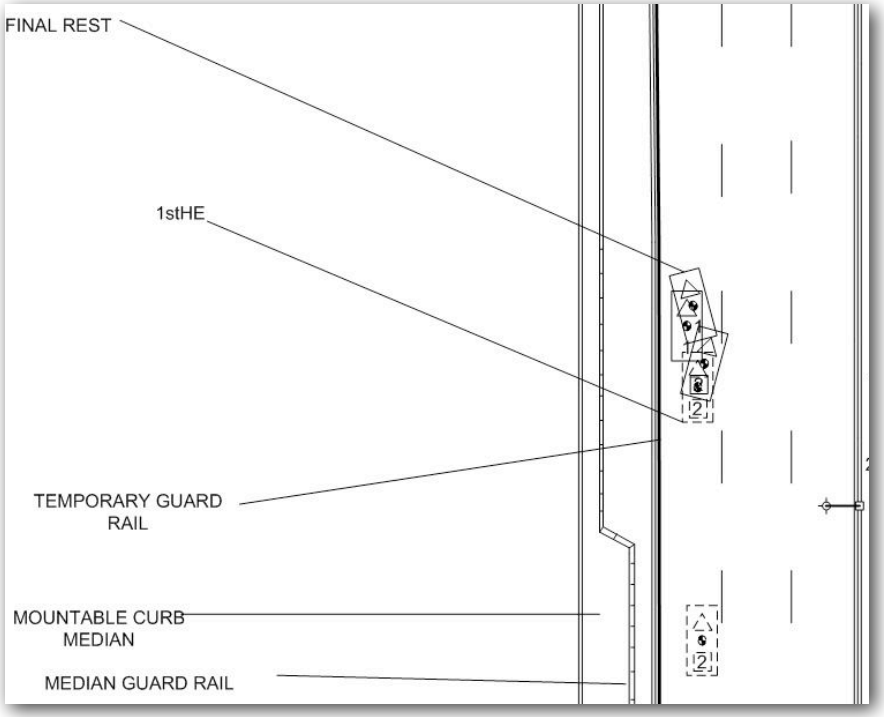
Vehicle disablement

and/or

Subsequent hazardous pedestrian exposure

Tire Failure Precedes Crash
NASS/CDS Case 1998-3-043

Summary: "...VEHICLE #1 WAS STOPPED IN TRAFFIC (DISABLED) DUE TO A FLAT TIRE. THE DRIVER WAS OUT OF THE VEHICLE ATTEMPTING TO CHANGE THE TIRE WITH ONE PASSENGER IN THE VEHICLE. VEHICLE #2 REAR ENDED VEHICLE #1 CAUSING DAMAGE AND INJURIES TO BOTH VEHICLES AND ALL THE OCCUPANTS..."



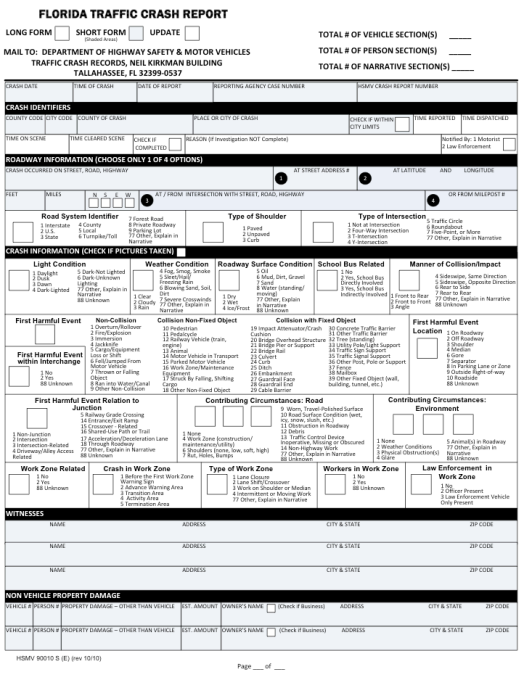
QCS CORP

Source: NHTSA, National Automotive Sampling System, CDS XML Case Viewer <http://www-nass.nhtsa.dot.gov/nass/cds/SearchForm.aspx>

Data about
Tire-related Crashes

Data Source: State Accident Data

Compiled from police accident reports
Affect quality and coverage of all databases downstream



FLORIDA TRAFFIC CRASH REPORT

LONG FORM ☐ SHORT FORM ☐ UPDATE ☐

MAIL TO: DEPARTMENT OF HIGHWAY SAFETY & MOTOR VEHICLES
TRAFFIC CRASH RECORDS, NEIL KIRKMAN BUILDING
TALLAHASSEE, FL 32399-0537

TOTAL # OF VEHICLE SECTION(S) ____
TOTAL # OF PERSON SECTION(S) ____
TOTAL # OF NARRATIVE SECTION(S) ____

CRASH IDENTIFIERS

ROADWAY INFORMATION (CHOOSE ONLY 1 OF 4 OPTIONS)

CRASH INFORMATION (CHECK IF PICTURES TAKEN)

Light Condition | Weather Condition | Roadway Surface Condition | School Bus Related | Manner of Collision/Impact

First Harmful Event | First Harmful Event within Interchange | Non-Collision | Collision with Non-Fixed Object | Collision with Fixed Object | First Harmful Event Location

First Harmful Event Relation to Junction | Contributing Circumstances: Road | Contributing Circumstances: Environment

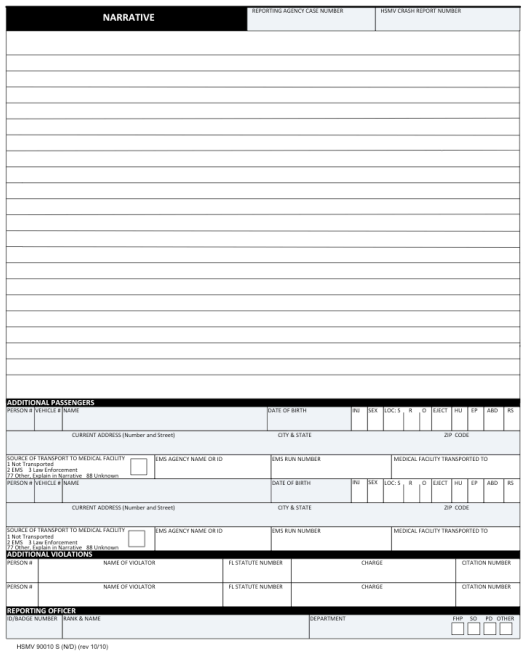
Work Zone Related | Crash in Work Zone | Type of Work Zone | Workers in Work Zone | Law Enforcement in Work Zone

WITNESSES

NON VEHICLE PROPERTY DAMAGE

HSMV 90010 S (E) (rev 10/10)

Page ___ of ___



NARRATIVE

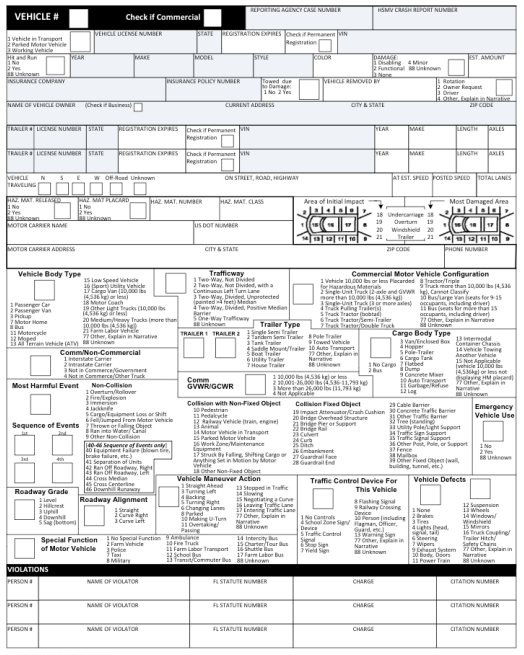
ADDITIONAL PASSENGERS

ADDITIONAL VIOLATIONS

REPORTING OFFICER

HSMV 90010 S (N/D) (rev 10/10)

Page ___ of ___



VEHICLE # | Check if Commercial

Vehicle Body Type | Trafficway | Commercial Motor Vehicle Configuration | Most Harmful Event | Sequence of Events | Comm/Non-Commercial | Trailer Type | Cargo Body Type | Roadway Grade | Roadway Alignment | Vehicle Maneuver Action | Collision with Non-Fixed Object | Collision Fixed Object | Traffic Control Device For This Vehicle | Vehicle Defects | Special Function of Motor Vehicle | Emergency Vehicle Use

VIOLATIONS

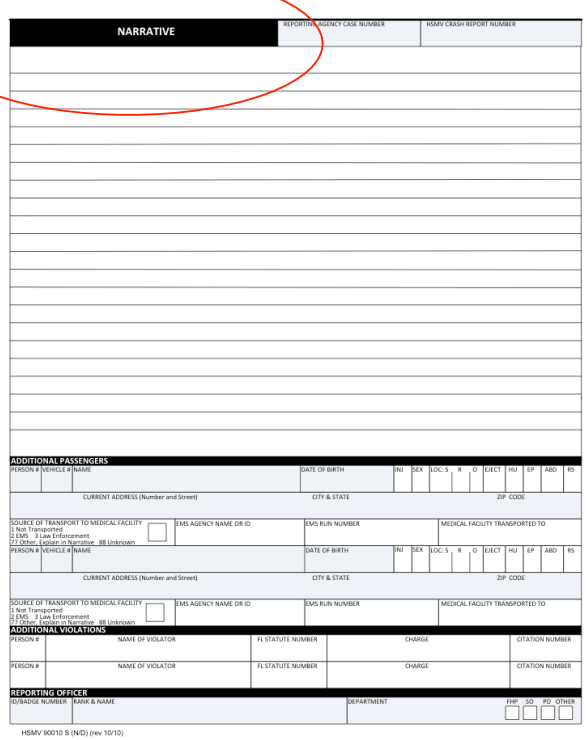
HSMV 90010 S (V/P) (rev 10/10)

Page ___ of ___

State of Florida Accident Report Form 2011

Data Source: State Accident Data

Important Usage Issue: Coverage and quality of tire-related data on police accident report forms are highly dependent on form design and the workflow of computerized data collection systems


NARRATIVE

REPORTING AGENCY CASE NUMBER | HSMV CRASH REPORT NUMBER

ADDITIONAL PASSENGERS

CURRENT ADDRESS (Number and Street) | CITY & STATE | ZIP CODE

SOURCE OF TRANSPORT TO MEDICAL FACILITY | EMS AGENCY NAME OR ID | EMS RUN NUMBER | MEDICAL FACILITY TRANSPORTED TO

ADDITIONAL VIOLATIONS

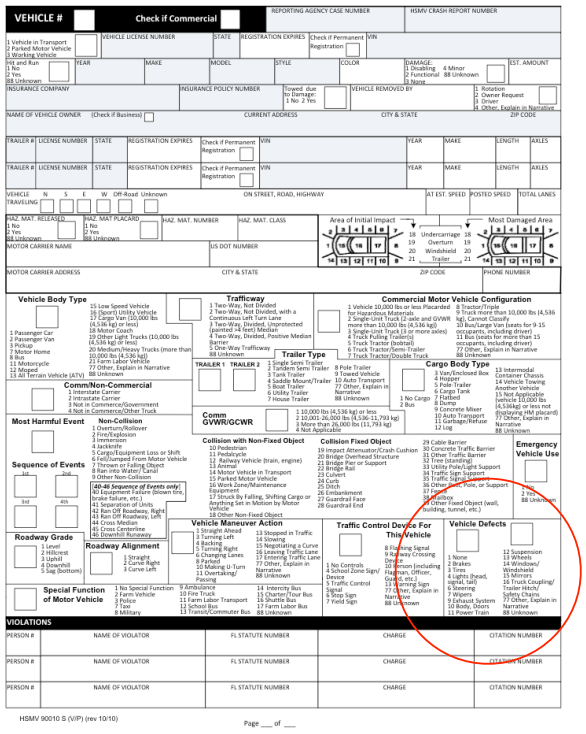
PERSON # | NAME OF VIOLATOR | FL STATUTE NUMBER | CHARGE | CITATION NUMBER

REPORTING OFFICER

ID/BADGE NUMBER | RANK & NAME | DEPARTMENT | FHP SO PD OTHER

HSMV 90010 S (N/D) (rev 10/10)

Page ___ of ___


VEHICLE # | Check if Commercial | REPORTING AGENCY CASE NUMBER | HSMV CRASH REPORT NUMBER

VEHICLE LICENSE NUMBER | STATE | REGISTRATION EXPIRES | VIN

INSURANCE COMPANY | INSURANCE POLICY NUMBER | VEHICLE REMOVED BY

NAME OF VEHICLE OWNER | CURRENT ADDRESS | CITY & STATE | ZIP CODE

TRAILER # | LICENSE NUMBER | STATE | REGISTRATION EXPIRES | VIN | YEAR | MAKE | LENGTH | AXLES

ON STREET, ROAD, HIGHWAY | AT EST. SPEED | POSTED SPEED | TOTAL LANES

MOTOR CARRIER NAME | US DOT NUMBER

MOTOR CARRIER ADDRESS | CITY & STATE | ZIP CODE | PHONE NUMBER

Vehicle Body Type | Trafficway | Commercial Motor Vehicle Configuration | Trailer Type | Cargo Body Type | Comm/Non-Commercial | Comm GVWR/GCWR | Most Harmful Event | Non-Collision | Collision with Non-Fixed Object | Collision Fixed Object | Sequence of Events | Roadway Grade | Roadway Alignment | Vehicle Maneuver Action | Special Function of Motor Vehicle | Traffic Control Device For This Vehicle | Vehicle Defects | Emergency Vehicle Use

VIOLATIONS

PERSON # | NAME OF VIOLATOR | FL STATUTE NUMBER | CHARGE | CITATION NUMBER

HSMV 90010 S (V/P) (rev 10/10)

Page ___ of ___

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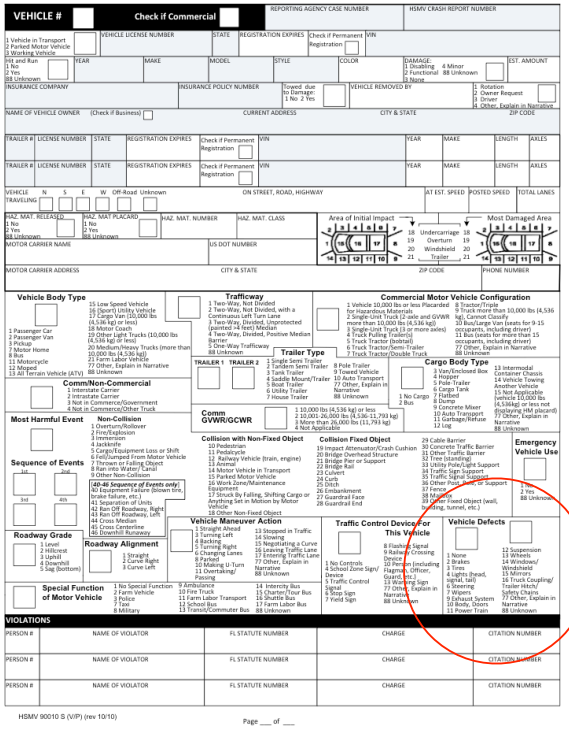


Vehicle Defects

1 None
2 Brakes
3 Tires
4 Lights (head, signal, tail)
6 Steering
7 Wipers
9 Exhaust System
10 Body, Doors
11 Power Train
12 Suspension
13 Wheels
14 Windows/ Windshield
15 Mirrors
16 Truck Coupling/ Trailer Hitch/ Safety Chains
77 Other, Explain in Narrative
88 Unknown

State of Florida Accident Report Form 2011

State Accident Data About Tire-related Crashes

State Accident Data About Tire-related Crashes

STATE	LICENSED DRIVERS IN 2012	FATALITIES IN 2012	FATALITY RATE PER 10K LICENSED DRIVERS IN 2012	FATALITIES INVOLVING LIGHT PASSENGER VEHICLES IN TIRE-RELATED CRASHES 2010-2012
Michigan	7,019,000	938	1.34	4
Wisconsin	4,057,000	615	1.52	30

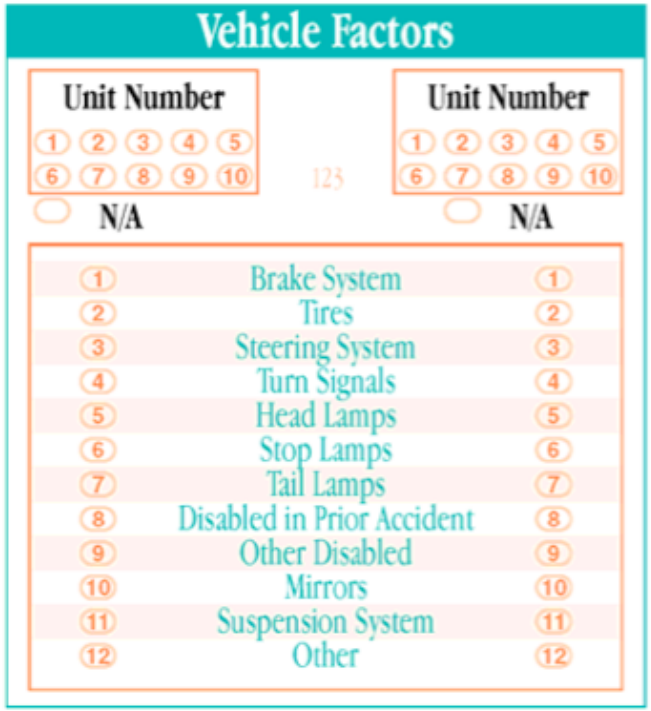
QCS CORP

Source: Traffic Safety Facts, 2012
Tire-related fatalities compiled by QCS Corp., see below for methodology

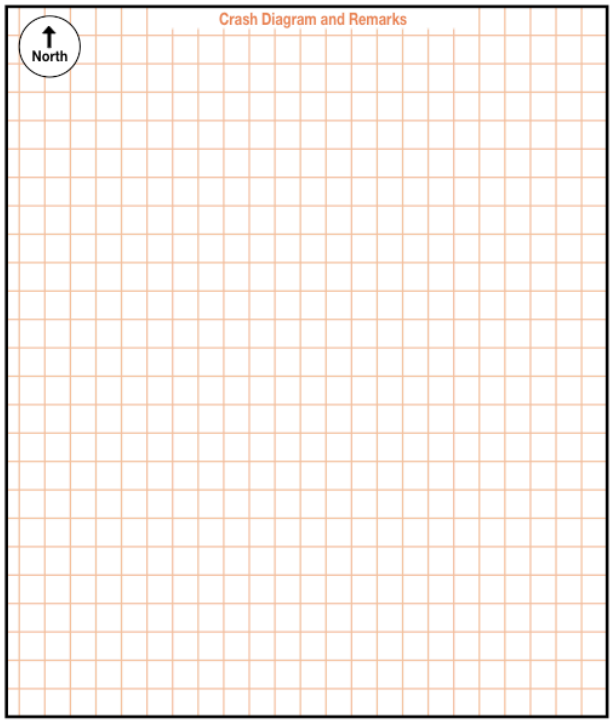
Data Source: State Accident Data

Important Usage Issue: Coverage and quality of tire-related data on police accident report forms are highly dependent on form design

Wisconsin Motor Vehicle Accident Report Form, 2007



Michigan Traffic Crash Report Form, 2004



Data Source: State Accident Data

More Important Usage Issues:

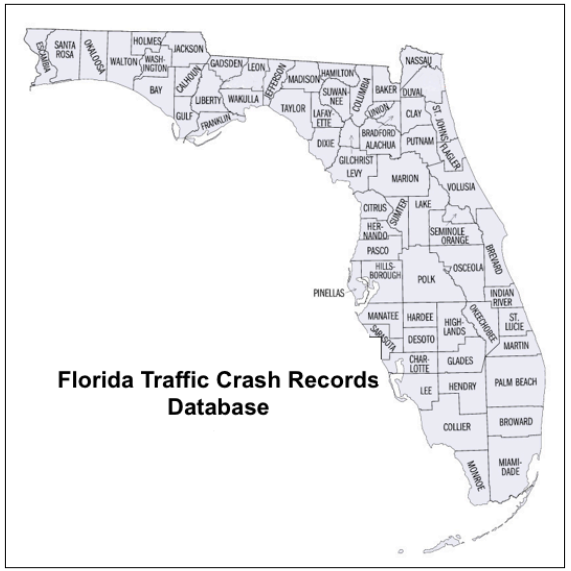
Reporting thresholds differ widely between states

Reporting of a crash often at discretion of police

Reporting of crash details depends on the training and judgment of reporting officers

Demands that research be pre-approved by states

Future utility in research threatened by privatization of state records for sale



QCS CORP

Tire-related Casualty Data from NHTSA That Begin with Crashes Reported to Police:

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

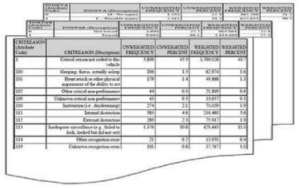
National Automotive Sampling System

General Estimates System

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

NHTSA
www.nhtsa.gov

National Motor Vehicle Crash Causation Survey
NMVCCS



2012

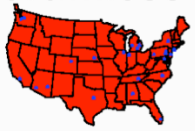
FARS

U.S. Department Of Transportation

National Highway Traffic Safety Administration

National Automotive Sampling System

Crashworthiness Data System



QCS CORP

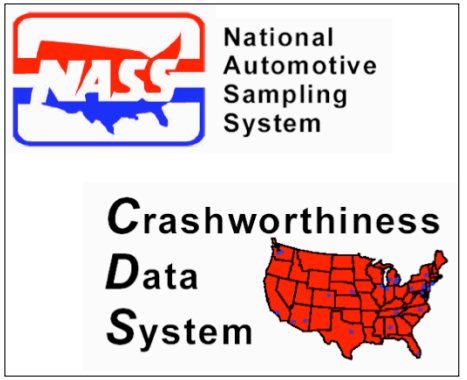
*Source: QCS Corp. summary of NASS/CDS

Data Source: NASS/CDS

NASS/CDS is a probability sample of police reported towaway crashes involving passenger cars, light trucks, and vans.

3,385 crashes were sampled in 2013 (~1 in 600 sample rate).*

An excellent resource to understand tire-related crash issues in specific cases through crash-related photography.



QCS CORP

*Source: QCS Corp. summary of NASS/CDS

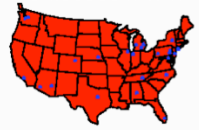
Data Source: NASS/CDS

Detailed data are gathered by trained investigators – but days or weeks after the crash.

Records an initial critical pre-crash event of “Blowout / Flat Tire” (PREEVENT = 1 since 1992)

National Automotive Sampling System

Crashworthiness Data System



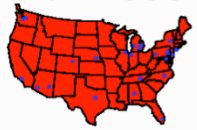
QCS CORP

Data Source: NASS/CDS

PREEVENT = 1: “Blow out or flat tire is used when a vehicle in motion loses control as the result of an immediate tire disruption. Examples include blow out, rapid air loss, tread separation, etc..”

National Automotive Sampling System

Crashworthiness Data System



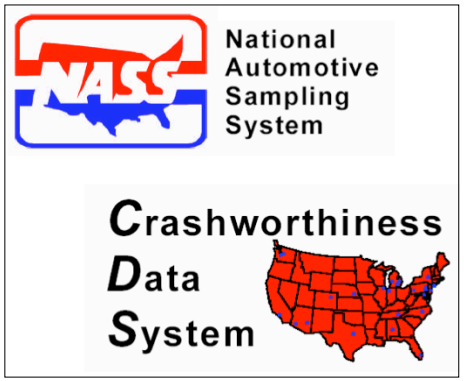
QCS CORP

Data Source: NASS/CDS

Usage Issues:

Coverage and quality of reported Tire Identification Numbers can be improved

Unusual distribution of tread-depth measurements associated with English-to-metric conversion

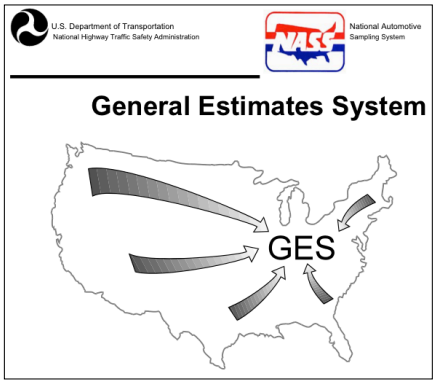


QCS CORP

Data Source: NASS General Estimates System (GES)

Detailed data are coded from police accident reports.

The coding of tire-related issues has changed over time, requiring care in time series analyses.

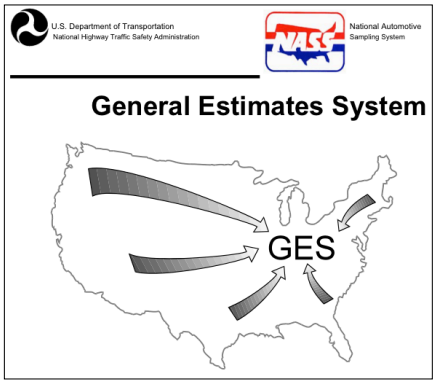


*Source: QCS Corp. summary of NASS/GES

Data Source: NASS/GES

NASS/GES is a random, probability sample of crashes reported to police involving property damage, injury, or death.

61,598 crashes were sampled in 2012 (~1 in 90 sample rate).*



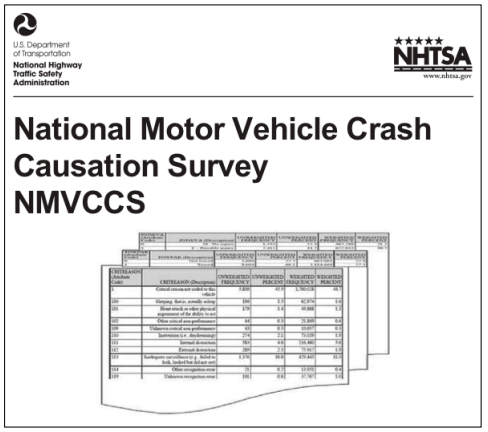
*Source: QCS Corp. summary of NASS/GES

Data Source: National Motor Vehicle Crash Causation Survey (NMVCCS)

NMVCCS was a random, probability sample of police-reported crashes occurring between 6 a.m. and midnight and to which emergency medical services had been dispatched.

2,113 crashes were sampled and fully investigated in 2005-2006.

Crash investigations could potentially have begun before an accident scene was cleared.



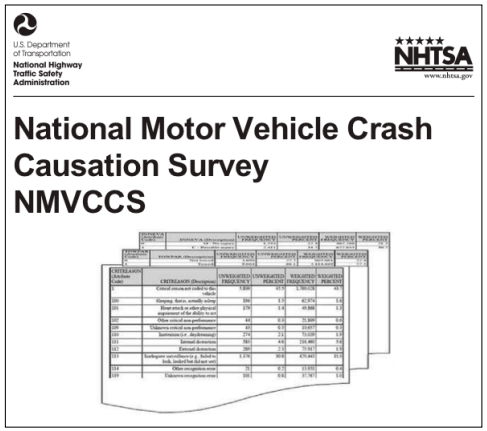
QCS CORP

Source: NHTSA, 2008, Sampling Design Used in the National Motor Vehicle Crash Causation Survey

Data Source: NMVCCS

Detailed tire data were collected about the pre- and post-crash conditions of the tires.

A pre-crash critical event of "Blow out/flat tire" initiating a crash was identified and coded: "Used when a vehicle in motion loses control as the result of a tire 'air out.'"



Source: NHTSA, 2005, NMVCCS Variable Coding Manual

Data Source: NMVCCS

Estimates by NHTSA include:

VARIABLE: PREEVENT (CRITICAL PRE-CRASH EVENT)

PREEVENT (Attribute Code)	PREEVENT (Description)	UNWEIGHTED FREQUENCY	UNWEIGHTED PERCENT	WEIGHTED FREQUENCY	WEIGHTED PERCENT
1	Blow out/flat tire	54	0.4	14,150	0.4

and

"...of the estimated 3,889,770 vehicles involved in the NMVVCS crashes, 5 percent experienced tire problems in the pre-crash phase." (Nearly 200,000 vehicles)

QCS CORP

Source: NHTSA, 2008, National Motor Vehicle Crash Causation Survey
NMVCCS DATABOOK OF NMVCCS VARIABLES, p. 298
and NHTSA, 2012, "Tire-Related Factors in the Pre-Crash Phase", p. vi

Data Source: NHTSA's Consumer Complaint Data

Date Complaint Filed: 09/11/2012
Date of Incident: 09/08/2012
Component(s): TIRES
NHTSA ID Number: 10475064

All Products Associated with this Complaint

Vehicle Make	Model	Model Year(s)
FORD	EXPLORER	1993

Tire Brand Name	Tire Line / Tire Size	Production Dates
FIRESTONE	ATX	-

Details **0 Associated Documents**

Crash: Yes **Fire:** No **Number of Injuries:** 4 **Number of Deaths:** 0
Manufacturer: FIRESTONE TIRE & RUBBER CO. , Ford Motor Company
Vehicle Identification No. (VIN): Not Available

SUMMARY:
TL*THE CONTACT OWNS A 1993 FORD EXPLORER EQUIPPED WITH FIRESTONE TIRES, TIRE LINE ATX, AND LINE SIZE P235/75R15. THE CONTACT STATED THAT WHILE DRIVING 65 MPH, THE TREAD OF THE REAR DRIVER SIDE TIRES SEPARATED. AS A RESULT, SHE LOST CONTROL OF THE VEHICLE AND FLIPPED OVER. THE VEHICLE WAS DESTROYED. A POLICE REPORT WAS FILED AND FOUR PASSENGERS HAD MINOR INJURIES. THE TIRES WERE NOT THE ORIGINAL TIRES. THE VIN WAS NOT AVAILABLE. THE FAILURE MILEAGE WAS 100,000.

QCS CORP

Data Source: TREAD Act Early Warning Reporting

Early Warning Reporting - Search Results

Information | Downloads | Documents

EWR Death & Injury Results

Go back to EWR Results Summary page.

Manufacturer Name: Cooper Tire & Rubber Co.
Reporting Category: TIRES
Reporting Period: 2014, Q2
Report Created on: Nov-24-2014 10:36 AM

Results: **2** | **All** records displayed

Tire Line: STARFIRE RS-C 2.0
Tire Size: 225/50R17
Tire Production Year: 2013

Vehicle Make: MITSUBISHI
Vehicle Model: ECLIPSE
Reported Components:

A. Unknown

Deaths: 0
Injuries: 1
TIN: RM40LDJ4713
Incident Date: 04/30/2014
Sequence ID: 1
Vehicle Model Year: 2007
State/Foreign Country: TX

QCS CORP

Source: NHTSA, http://www-odi.nhtsa.dot.gov/ewr/qb/results.cfm

Data Source: TREAD Act Early Warning Reporting

Early Warning Reporting - Search Results

Information | Downloads | Documents

EWR Property Damage Results

Go back to EWR Results Summary page.

Manufacturer Name: Cooper Tire & Rubber Co.
Reporting Category: TIRES
Reporting Period: 2014, Q2
Report Created on: Nov-24-2014 10:41 AM

Results: 31 | 1 - 15 Displayed

Tire Line: ARIZONIAN SILVER EDITION **Tire Size:** 185/65R14
SKU: W123MF444
Plant Code: U9 **Production Year:** 2012

Reported Component	Count
Other	1

Tire Line: ARIZONIAN SILVER EDITION **Tire Size:** 185/65R15
SKU: W123MF454
Plant Code: U9 **Production Year:** 2012

Reported Component	Count
Other	1

QCS CORP

Source: NHTSA, http://www-odi.nhtsa.dot.gov/ewr/qb/results.cfm

Data Source: TREAD Act Early Warning Reporting

Usage Issues Include:

Non-reporting by manufacturers

Auto manufacturers are not required to report claims for vehicles more than ten years old

Tire manufacturers are not required to report claims for tires more than five years old

Data Source: TREAD Act Early Warning Reporting

Usage Issues Include:

Restricted public access to underlying information for deaths and injury claims

Prohibited public access to warranty claims, consumer complaints, field reports, tire production counts, etc.

Lack of specificity for failure modes

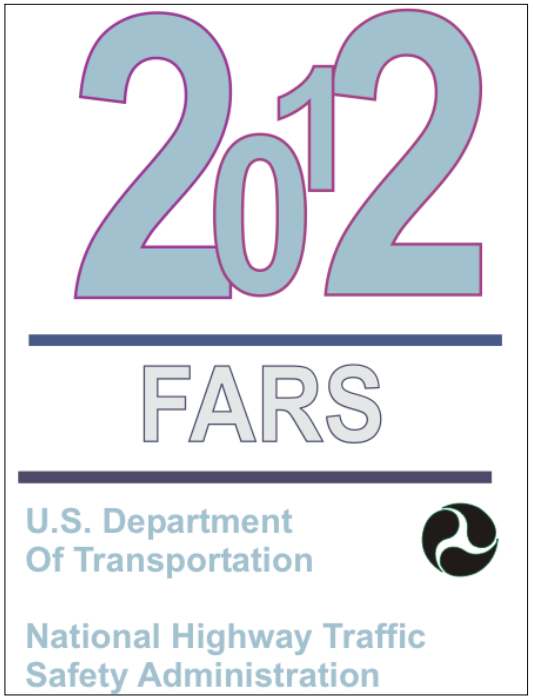
Allows reporting of summary data only

QCS CORP

Data Source: Fatality Analysis Reporting System (FARS)

Census of all crashes in US resulting in deaths within 30 days on trafficways customarily open to the public

Records factors coded from police-accident reports related to tires



QCS CORP

Finding Vehicles with Tire-related Issues in FARS, 1982-2009

1) Vehicles with any Driver Level Related Factor = Skidding, Swerving, Sliding Due to: “Debris or Objects in Road” or “Ruts, Holes, Bumps in Road” (or “Improper Tire Pressure” 82-05 only) are coded as “missing data.”
2) Vehicles with any Vehicle Related Factor (2 fields) = “Tires” are coded as “Tire-related”
3) Vehicles with any Driver Related Factor (3 fields, 4 since 1997) = “Skidding, Swerving, Sliding Due to Tire Blowout or Flat” are coded as “Tire-related”
4) Vehicles with missing data for all driver related factors AND with missing data for both vehicle-related factors are coded as “missing data.”
5) <u>All others are coded as “Not Tire Related.”</u>

QCS CORP

Finding Vehicles with Tire-related Issues in FARS, 2010-2012

1) Vehicles with any Driver Level Related Factors = Skidding, Swerving, Sliding Due to: “Debris or Objects in Road” or “Ruts, Holes, Bumps in Road” are coded as “missing data.”
2) Driver Related Factors (any of 4 fields) = Skidding, Swerving, Sliding Due to “Tire Blow-Out or Flat” are coded as “Tire-related”
3) Critical Event - Precrash = “This vehicle loss of control due to Blow Out Flat Tire” are coded as “Tire-related”
4) Factor Data File, Contributing Circumstances = “Tires” are coded as “Tire-related”
5) Vehicles with missing data for all driver related factors, AND a missing critical event, AND without any data in the FACTOR file are coded as “missing data.”
6) <u>All others are coded as “Not Tire Related.”</u>

QCS CORP

Data Source: Fatality Analysis Reporting System (FARS)

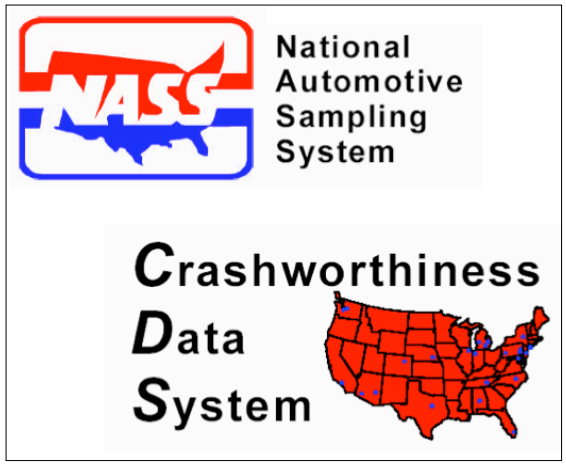
Changes in Identifying Tire-related Crashes in FARS:

Driver factors expanded from 3 fields to 4 in 1997

Critical pre-crash event added in 2010

Since 2010 more than 2 vehicle factors can be coded

Which Dataset Should We Use to Quantify Tire-related Crash Deaths?



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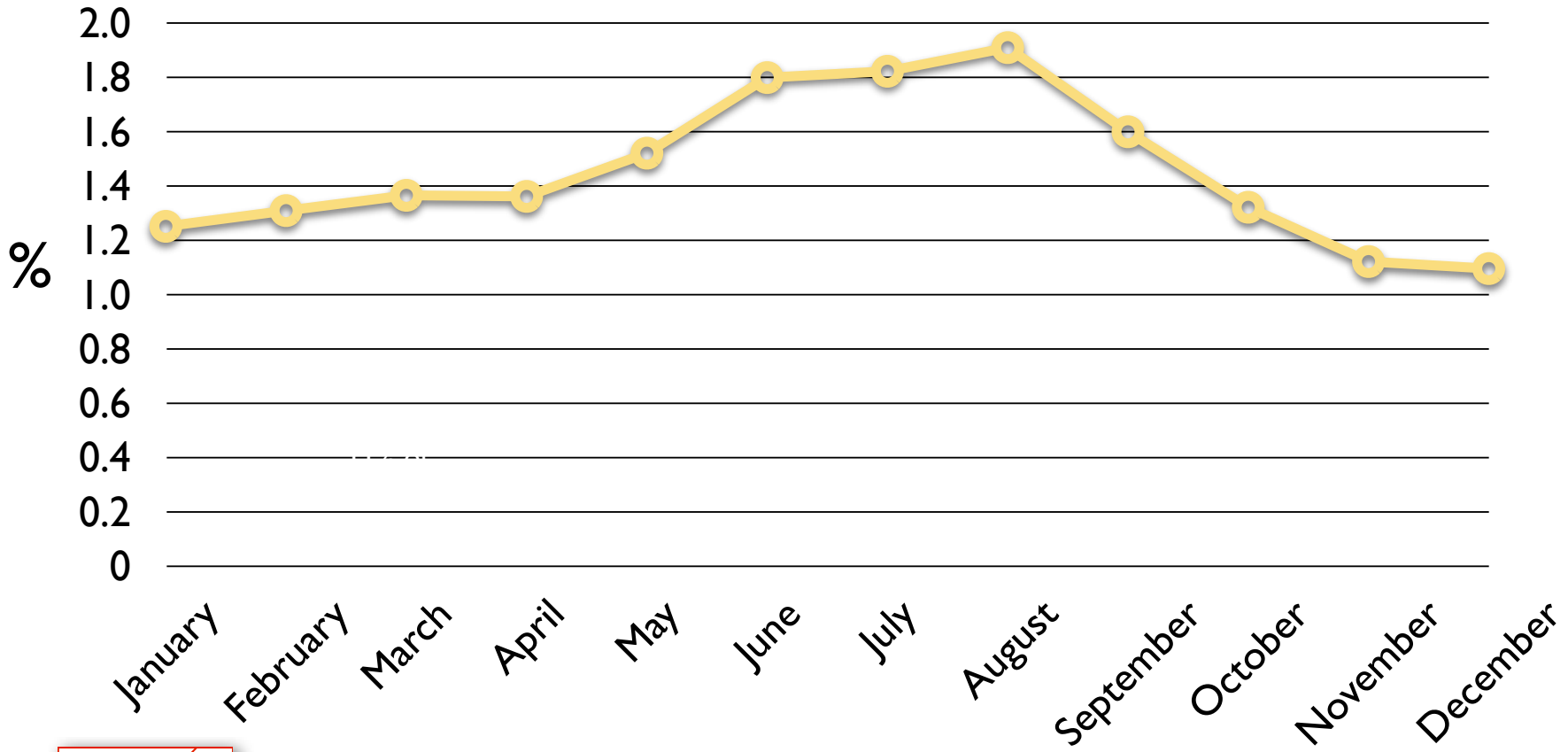
Hypothesis:

Tire failures are related to heat and climatic conditions. If the proportion of light passenger vehicles in fatal crashes shows appropriate seasonal variability, it would support the use of our methodology and the FARS data.

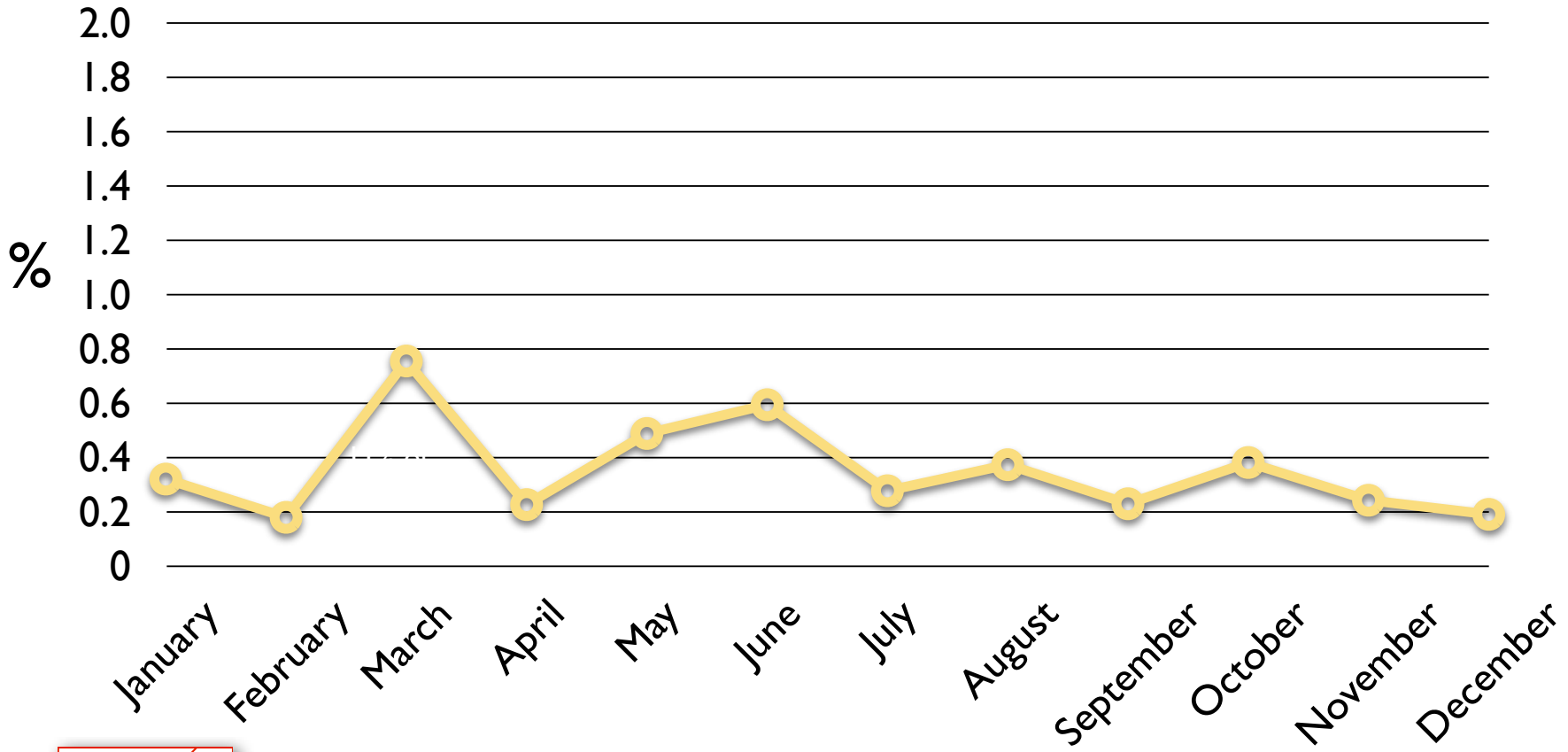
Percentage of Light Passenger Vehicles with Occupant Fatality That Have Tire-related Issues by Month of Year, Calendar Years 1982-2009, Model Years 1980-2010



QCS CORP

Source: QCS Corp. summary of FARS, VINs decoded by VINDICATOR
Note: Minimum population size for any month is 40,319

Weighted Percentage of Light Passenger Vehicles That Have Tire-related Issues by Month of Year, Calendar Years 1992-2012 Based on Critical Pre-crash Events Related to Tires



QCS CORP

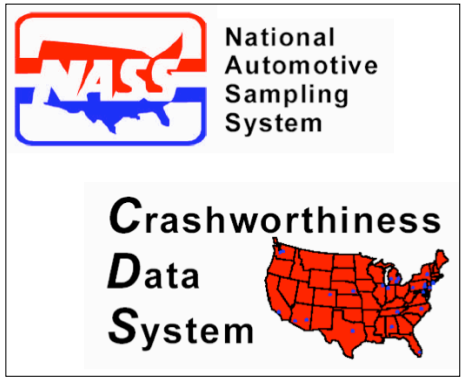
Source: QCS Corp. summary of NASS/CDS, 1992-2012
Note: Minimum unweighted sample size for any month is 12,526

Conclusion:

This comparison of FARS and NASS/CDS data supports the use of our methodology and the FARS data, rather than the NASS/CDS data.

National Automotive Sampling System Crashworthiness Data System Estimate Cited to Support Halt in Tire Aging Rulemaking:

"...light vehicle tires are performing better on the road as reflected in [NHTSA's] most recent crash data ... from 2007 through 2010 ... a 50 percent reduction in fatalities (386 to 195)..."



QCS CORP

Source: "Tire Aging: A Summary of NHTSA's Work", p. 5, p. 4

Has there been a 50 percent reduction in tire-related fatalities?

Some problems with this claim:

1) it is based on a small sample of crashes and concerns a small proportion of the sample;

2) the sample does not include all tire-related crash fatalities;

3) the "50% reduction" is not presented as a sample estimate;

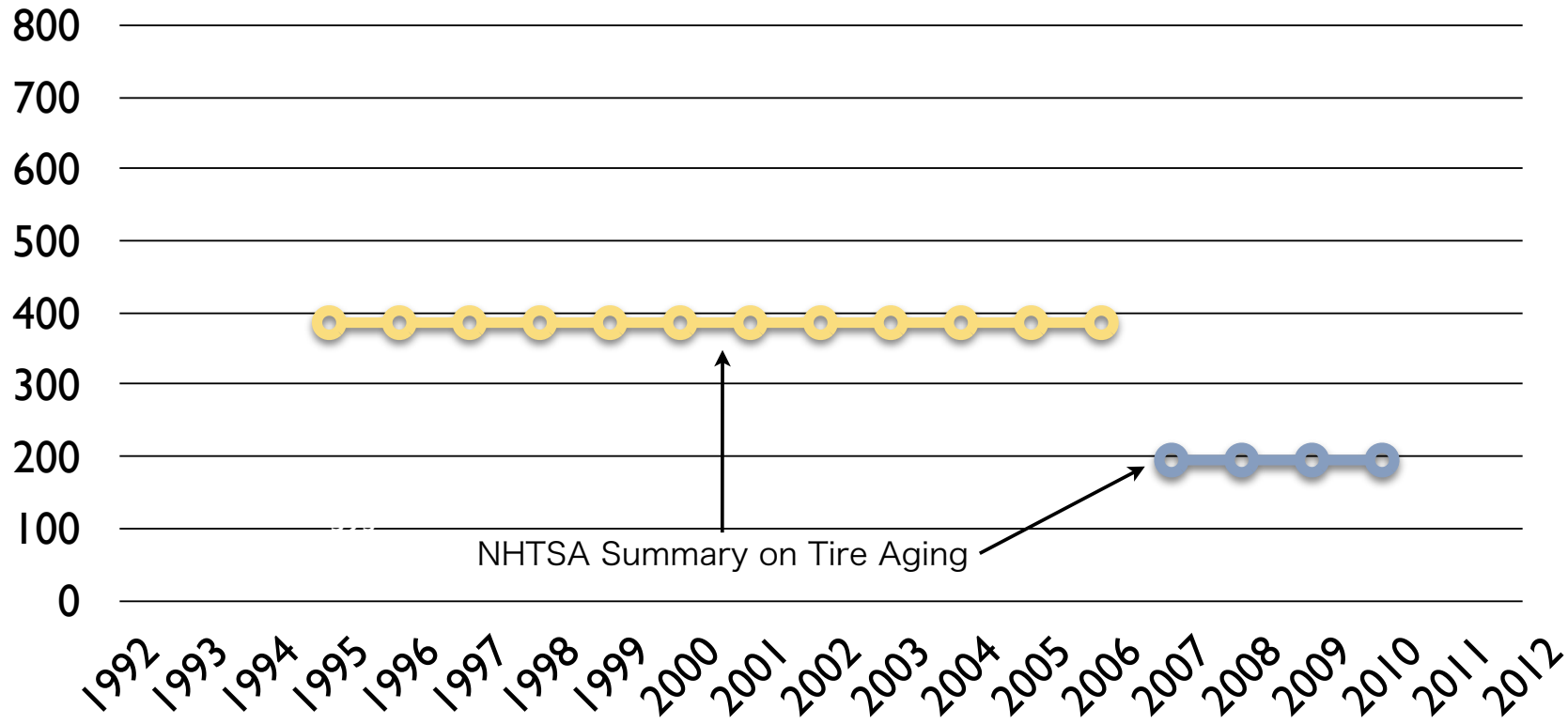
4) the sample estimate is not presented with an appropriate statistical confidence interval; and

5) the estimated reduction is contradicted by the result calculated from an actual census of crash fatalities.

QCS CORP

Source: "Tire Aging: A Summary of NHTSA's Work", p. 5, p. 4

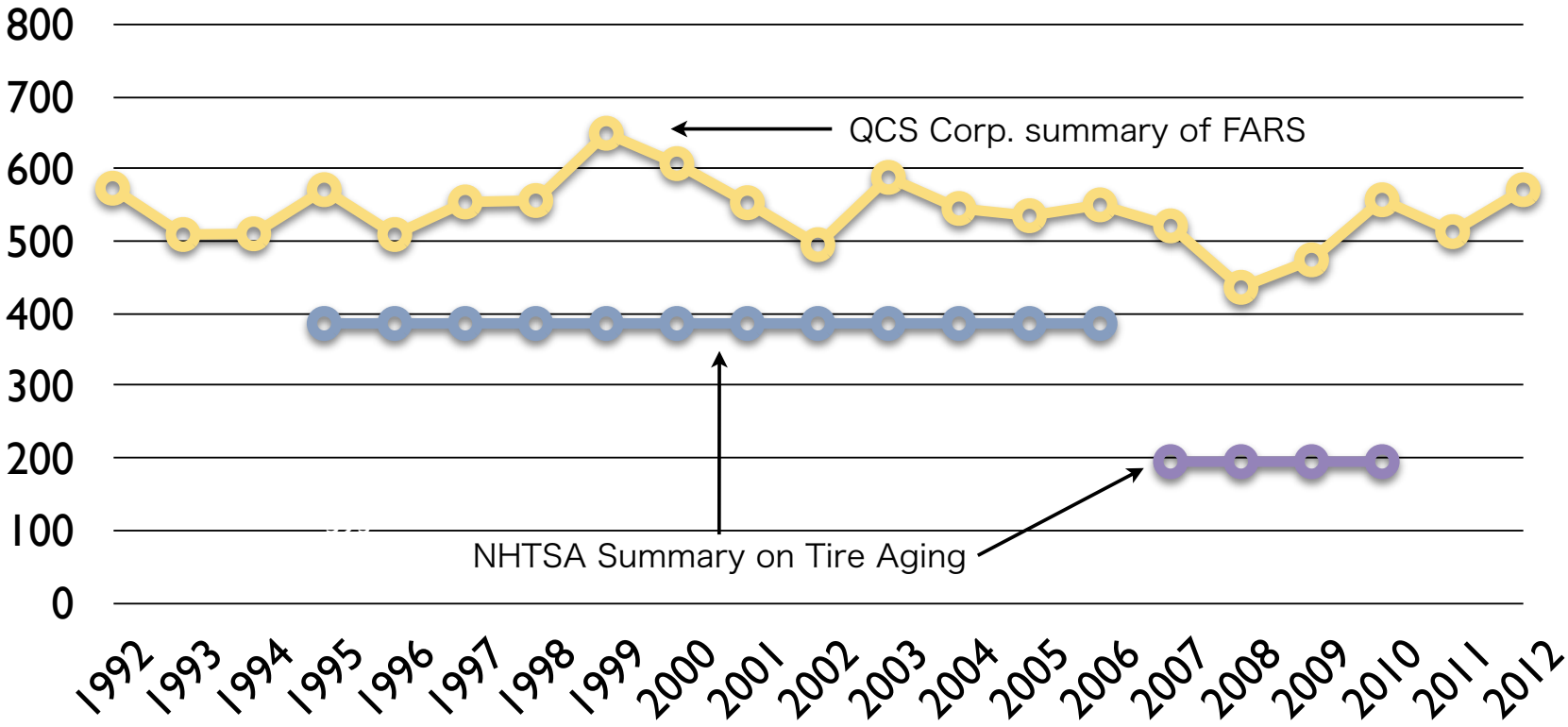
NHTSA's Summary of Annualized Average Fatalities Involving Light Passenger Vehicles "in Tire Crashes," Calendar Years 1995-2010



QCS CORP

Source: NHTSA, 2014, "TIRE AGING: A Summary of NHTSA's Work, p. 13

Occupant Fatalities in Light Passenger Vehicles with Tire-related Issues, Calendar Years 1992-2012

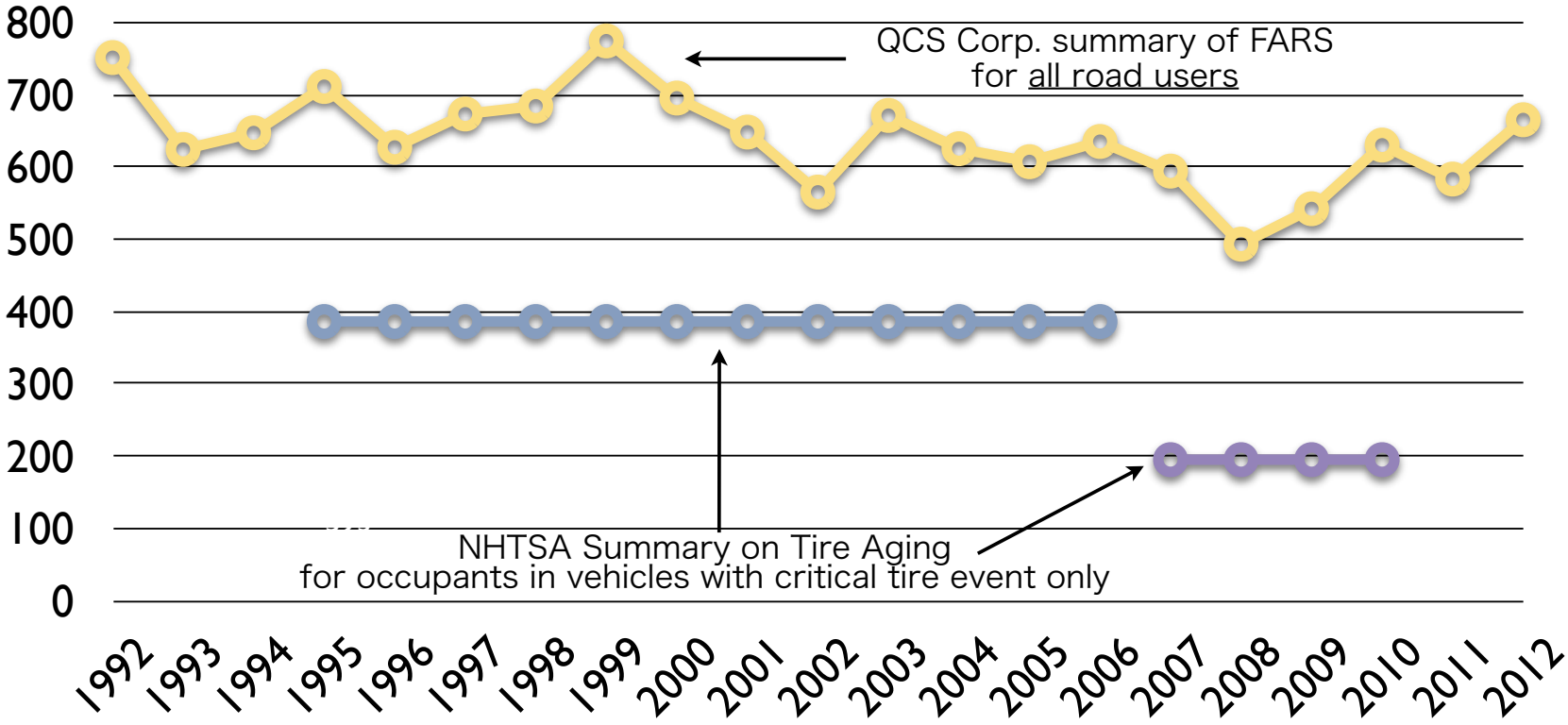


QCS CORP

Note: Vehicle type classified from police-reported body type.

Source: QCS Corp. summary of FARS and NHTSA, 2014, "TIRE AGING: A Summary of NHTSA's Work," p. 13

Fatalities in Crashes Involving Light Passenger Vehicles with Tire-related Issues, Calendar Years 1992-2012

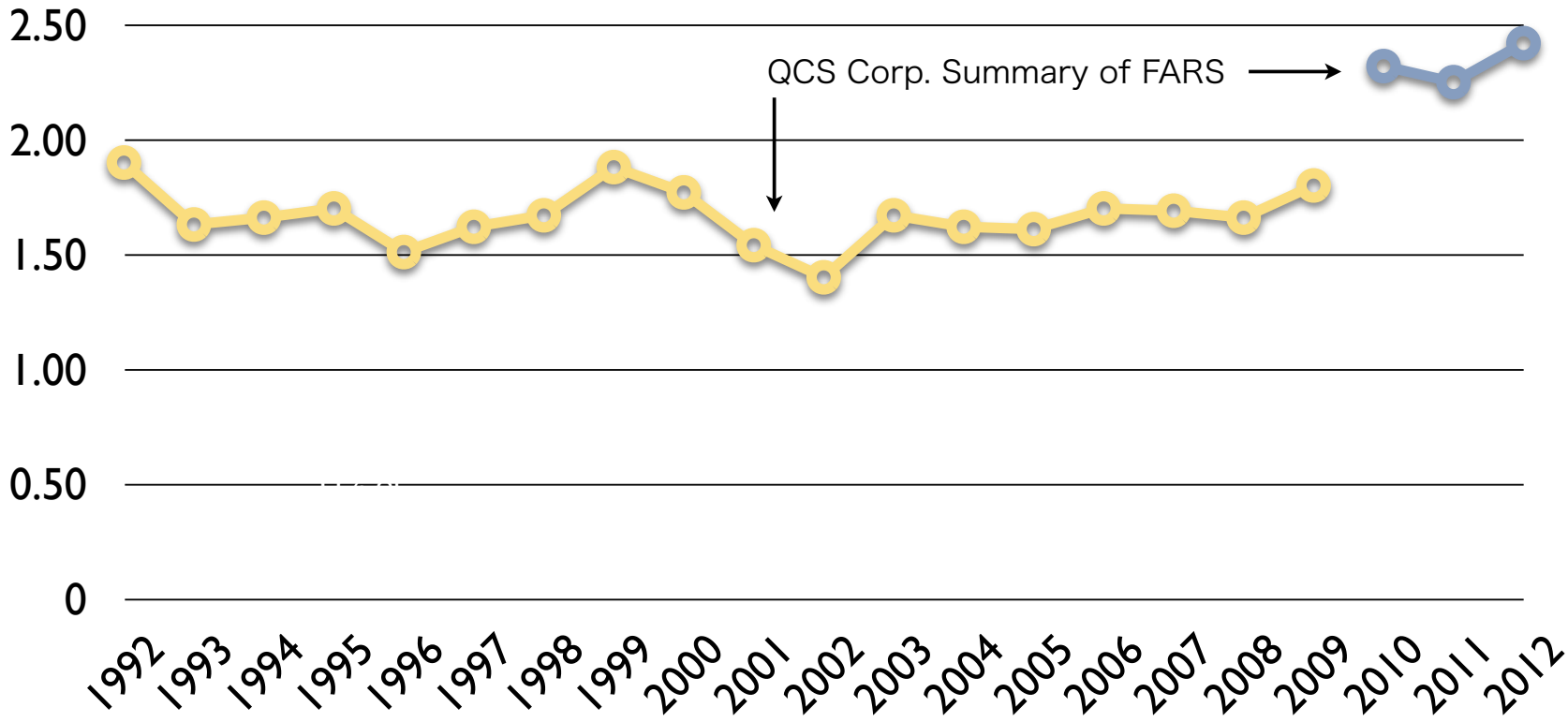


QCS CORP

Note: Counts all deaths in crash; vehicle type classified from police-reported body type.

Source: QCS Corp. summary of FARS and NHTSA, 2014, "TIRE AGING: A Summary of NHTSA's Work," p. 13

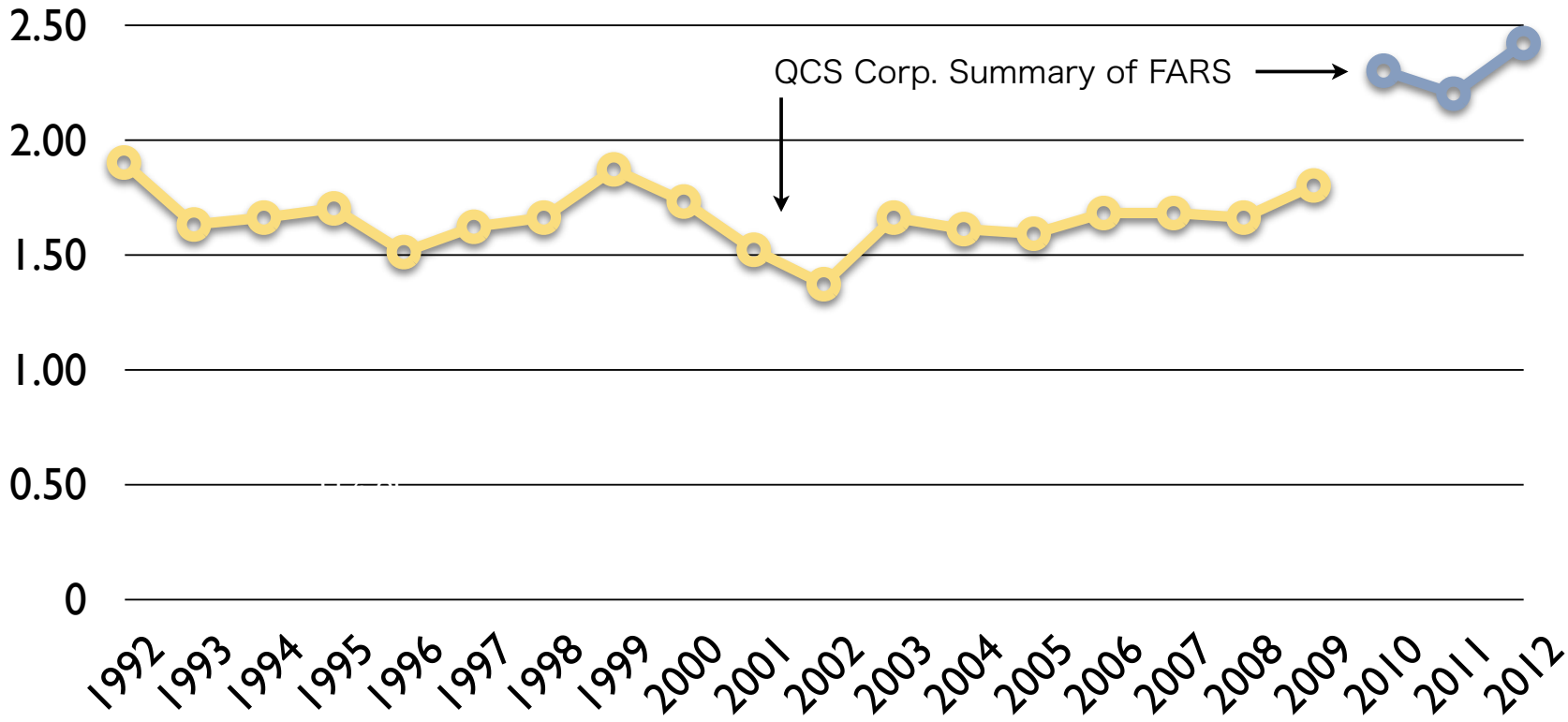
Percentage of Light Passenger Vehicles with Occupant Fatality That Have Tire-related Issues by Calendar Year 1992-2012



QCS CORP

Note: Vehicle type classified from police-reported body type.
Source: QCS Corp. summary of FARS

Percentage of Light Passenger Vehicles with Occupant Fatality That Have Tire-related Issues by Calendar Year 1992-2012 (Using Methodology Unchanged Since 1996)



Note: Vehicle type classified from police-reported body type.
Source: QCS Corp. summary of FARS

Effects of Changes in Identifying Tire-related Crashes in FARS:

99.2% of the tire-related crashes with fatalities in light passenger vehicles in 1997-2012 in would have been identified without the additional fields in the database added after 1996.

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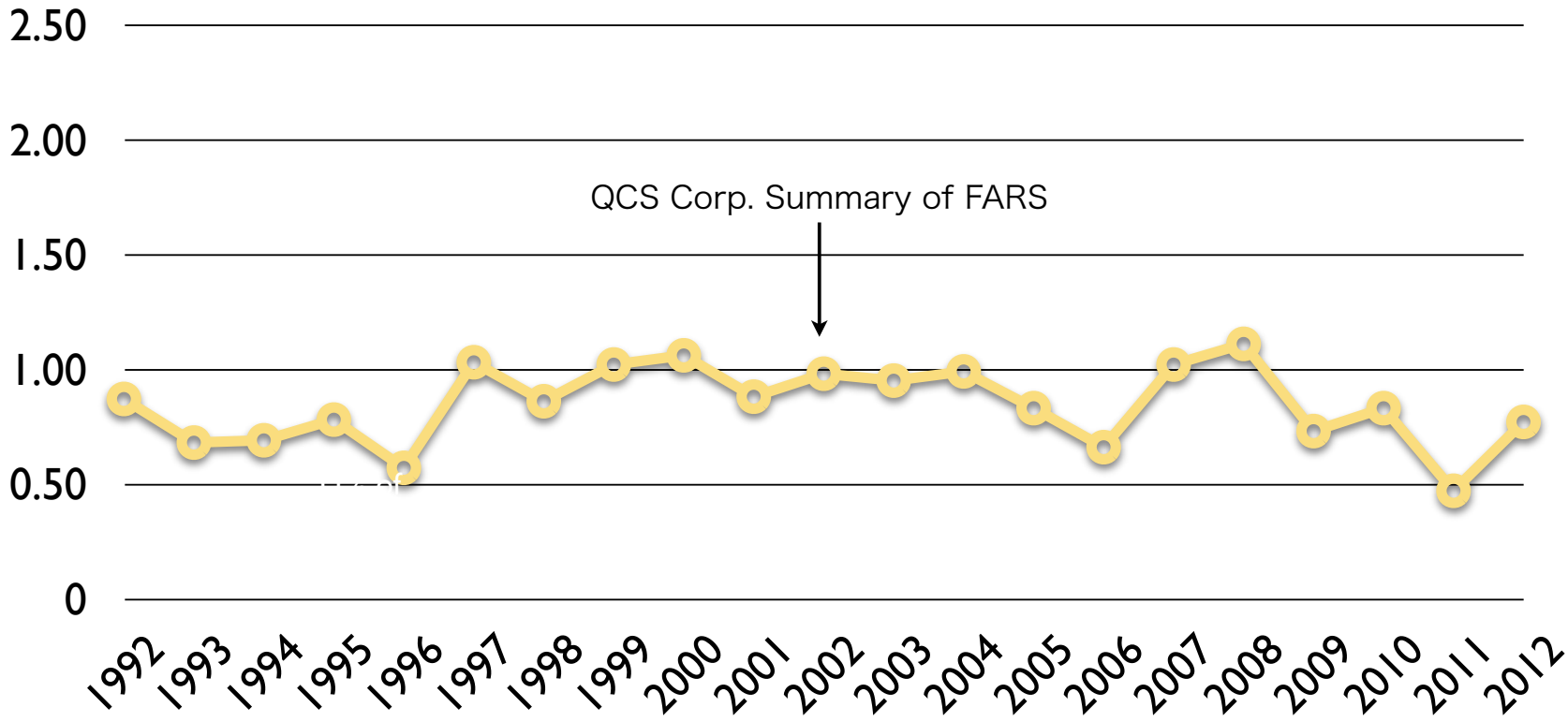
Percentage of Light Passenger Vehicles with Occupant Fatality That Have Tire-related Issues by Calendar Year 1992-2012 (Using Methodology Unchanged Since 1996) 2 or Fewer Estimated Years in Service (= CY - MY)



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Note: Vehicle type classified from police-reported body type.
Source: QCS Corp. summary of FARS

CDS/FARS Matching (2010-2012):

Matching Key Fields:
1) First 10 characters of the Vehicle Identification Number (VIN)
2) Driver Zip Code
3) Calendar Year
4) Month
5) Day of Week
6) State in which crash occurred

CDS "General Vehicle" records with an occupant fatality (VTREAT =1): 373
Records in which matching key fields are unique: 373

FARS vehicle records with an occupant fatality: 76,504
Records in which matching key fields are unique: 76,489
CDS and FARS records joined by key fields: 326 (87% match rate for the CDS records)

None of the 326 CDS cases record the critical pre-crash event associated with tires
In 4 matched cases, FARS records "possible pre-existing defects or maintenance conditions that may have contributed to the crash"

Review of these 4 cases shows:

2010-45-2-1: A rollover with a debeaded tire
2010-49-22-1: 2 flat tires and degraded roadway surface
2010-45-45-1: 1 flat tire
2011-49-102-1: 2 flat, debeaded tires

QCS CORP

Source: QCS Corp. summary of NASS/CDS and FARS, 2010-2012

CDS/FARS Matching (1992-2009):

Matching Key Fields:
1) First 10 characters of the Vehicle Identification Number (VIN)
2) Driver Zip Code
3) Calendar Year
4) Month
5) Day of Week
6) State in which crash occurred

CDS "General Vehicle" records with an occupant fatality (VTREAT =1): 7,208
Records in which matching key fields are unique: 7,208

FARS vehicle records with an occupant fatality: 1,007,069
Records in which matching key fields are unique: 1,000,080
CDS and FARS records joined by key fields: 5030 (70% match rate for the CDS records)

33 CDS cases record the critical pre-crash event associated with tires (PREEVENT=1);
of these 33, FARS does not record a tire issue in 4 cases.

75 FARS cases record a tire issue;
of these 75 cases, CDS does not record PREEVENT=1 in 46 cases;
of these 46 cases, half are departures from the roadway or travel lane.

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Source: QCS Corp. summary of NASS/CDS and FARS, 1992-2009

FARS is a Vital Tool for Surveillance of Tire-related Crash Fatalities

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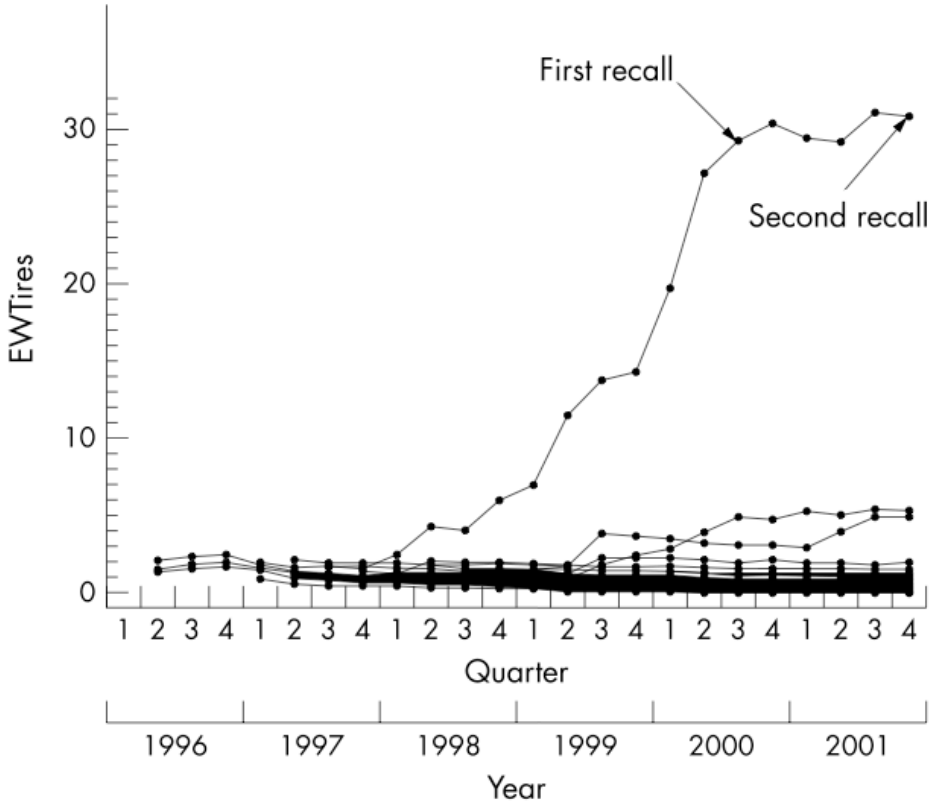
Early Warning Surveillance Statistic for Tires – MY 1996 Ford Explorer 4-door, 4x2s Compared to Other MY 1996 Fleets Based on FARS Data



EWTires by quarter for 50 vehicle fleets of model year 1996.

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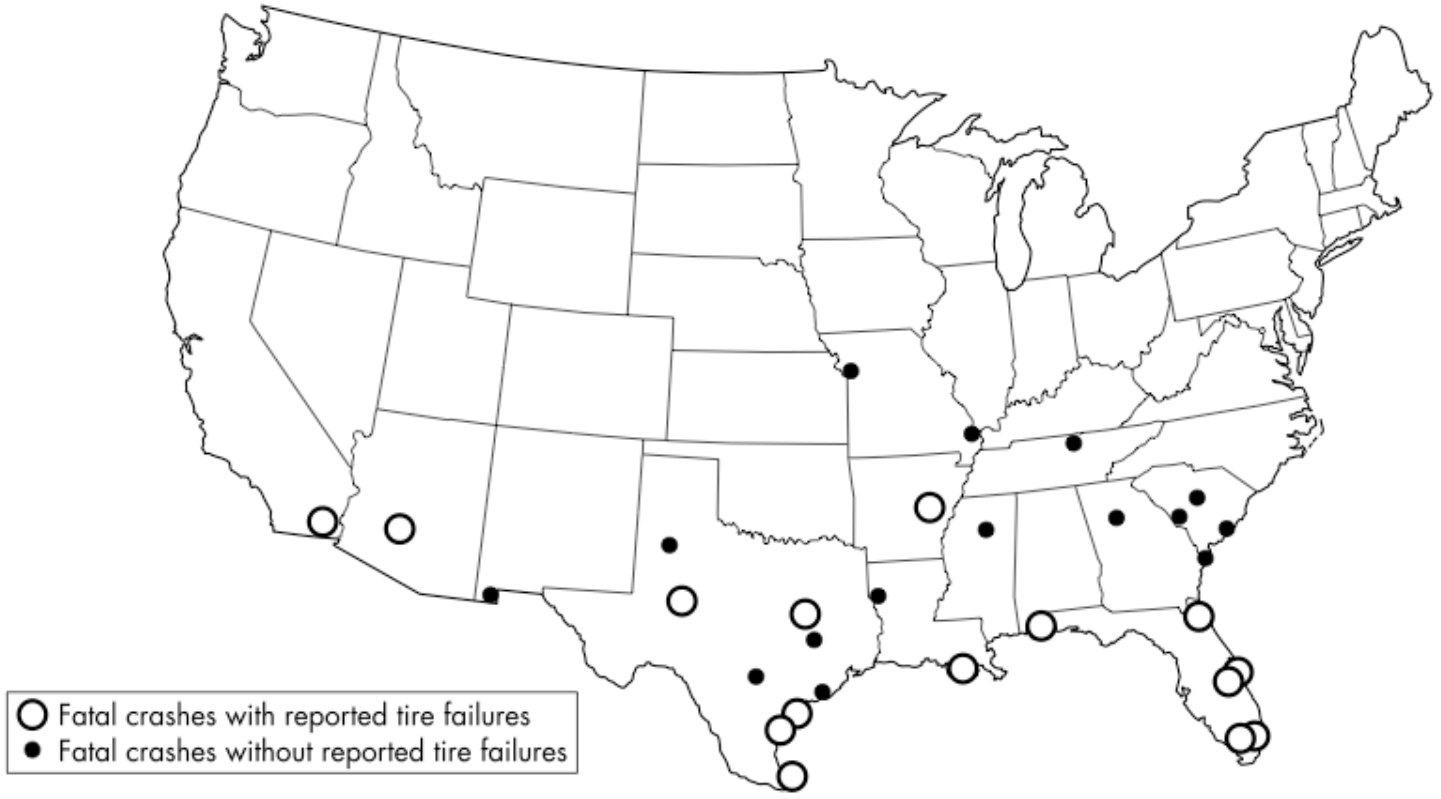
Source: R. A. Whitfield and Alice K. Whitfield, "Improving Surveillance for Injuries Associated with Potential Motor Vehicle Safety Defects." Injury Prevention, April 2004, 10:88-92.

Fatal, Single Vehicle Crashes of MY 1996 Ford Explorer 4-door, 4x2s Originally Equipped with Non-recalled Goodyear Tires through Calendar Year 1999

QCS CORP

Source: R. A. Whitfield and Alice K. Whitfield, "Improving Surveillance for Injuries Associated with Potential Motor Vehicle Safety Defects." Injury Prevention, April 2004, 10:88-92.

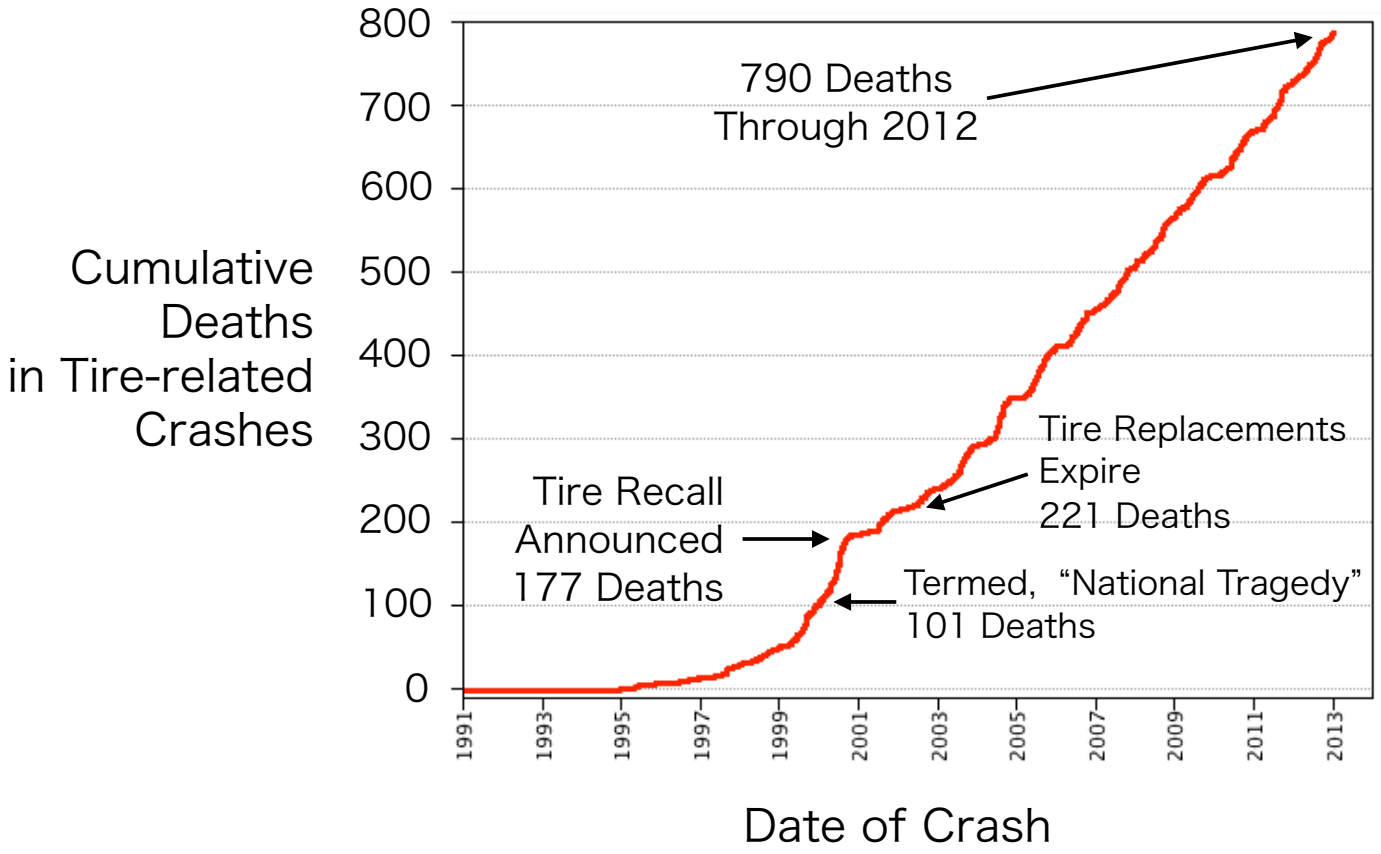
Fatal, Single Vehicle Crashes of MY 1996 Ford Explorer 4-door, 4x2s Originally Equipped with Recalled Firestone Tires through Calendar Year 1999



QCS CORP

Source: R. A. Whitfield and Alice K. Whitfield, "Improving Surveillance for Injuries Associated with Potential Motor Vehicle Safety Defects." Injury Prevention, April 2004, 10:88-92.

FARS Shows That Tire Recalls Slowed Tire-related Fatalities in Ford Explorer Crashes – <u>But Only Temporarily</u>



Source: QCS Corp. summary of FARS, 1991-2012

<u>Note</u>: Ford Explorers include MY 1991-2001 Ford Explorers, MY 2001-2003 Ford Explorer Sports, MY 1997-2001 Mercury Mountaineers and MY 1991-1994 Mazda Navajos

Recommendations: FARS

Utilize FARS data when appropriate to quantify deaths and injuries in tire-related crashes

Commit resources to surveillance of vehicle- and tire-related defects based on FARS data

Provide on-line, public access to underlying police accident reports for FARS cases with narrative crash accounts

Recommendations: Data Reporting

Revise the Model Minimum Uniform Crash Criteria used in accident reports to require “yes/no” checklists itemized by component – including tires – for pre-existing motor vehicle defects or maintenance conditions that may have contributed to a crash

Require the reporting of Tire Identification Numbers in accident reports and associated databases for tires noted to have a defect or condition that may have contributed to a crash

Revise the structure of Tire Identification Numbers to include a check digit

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Recommendations: Data Analysts

Consider all casualties in tire-related crashes in appropriate statistical analyses, not just casualties in the specific vehicles with pre-existing tire defects or maintenance conditions

Consider the value of data about complete populations (e.g., FARS and state data) as well as sample data based on large sampling fractions

Report sample error estimates and confidence intervals where reasonable and appropriate to important conclusions

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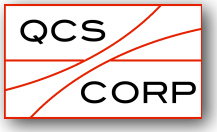
Recommendations:
Database Administrators

Provide links between databases for shared cases or claims – with appropriate safeguards for personally identifying information

Recognize tire failure modes beyond “blow-outs” and “flats” in documentation and training for police and accident report coders



Recommendations: TREAD EWR System

Revise TREAD Early Warning Reporting regulations to allow greater detail in component failure modes

Implement a coding system which links the category of the allegedly failing component with a separate code denoting the type of failure that is alleged.

Require the reporting of individual claims rather than summary counts where appropriate

Remove prohibitions against public access to Early Warning Reporting information

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Recommendations:
Surveillance for Tire Defects

Start with FARS

Use proven statistical surveillance techniques to rank order potential problems

Alert consumers to potential problems

Monitor and raise recall completion rates

Monitor the effectiveness of recall remedies

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Recommendations: Rulemaking

Perform additional analyses to replicate and understand the increase in fatal, tire-related passenger vehicle crashes and casualties despite FMVSS NO. 139 and mandatory TPMS

Reconsider FMVSS tire aging rulemaking based on accurate casualty counts of tire-related deaths and injuries in U.S. motor vehicles

QCS CORP

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410-923-2411

Useful URLs:

This expanded presentation:

http://quality-control.us/NTSB_QCS_Corp_Expanded_41222.pdf

Condensed presentation:

http://quality-control.us/NTSB_QCS_Corp_41208.pdf

Our website:
http://quality-control.us

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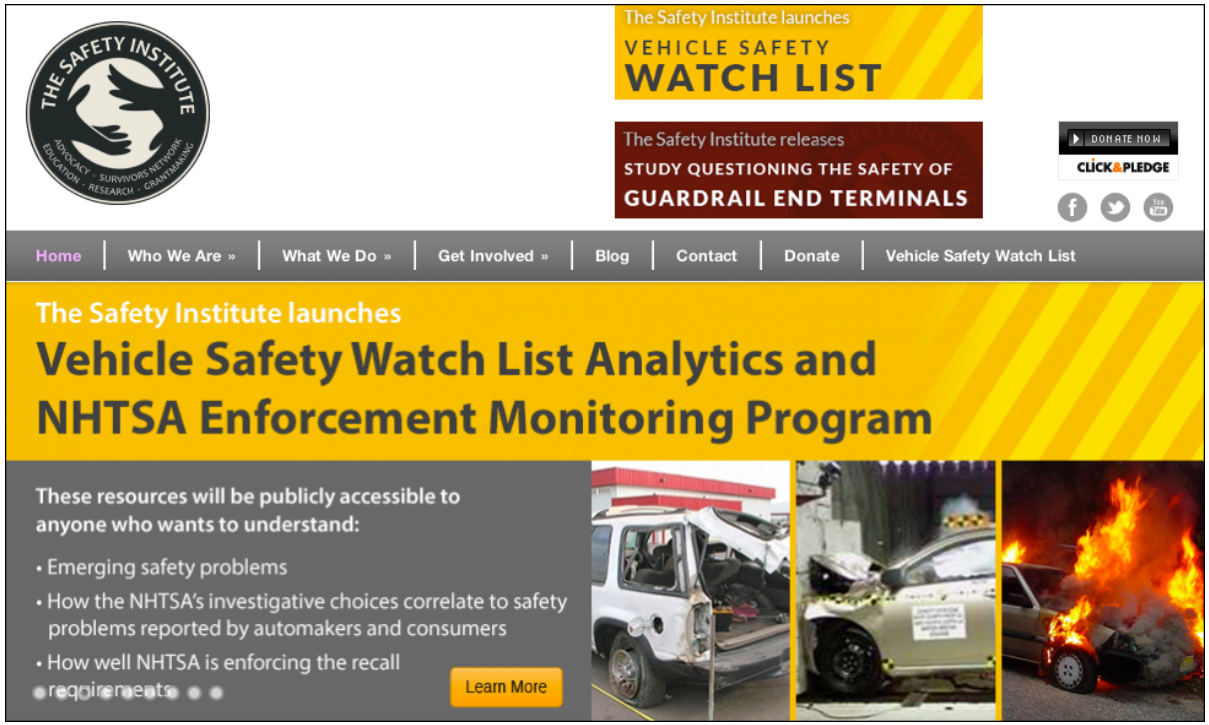

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Thank You