

Fire Occurrence in Side Crashes Based on NASS/CDS

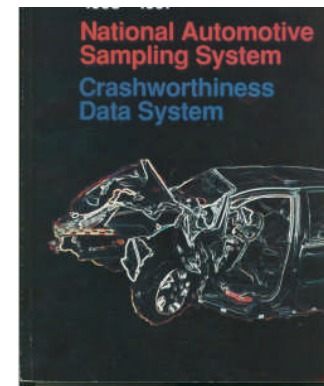
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Data Sources

The Fatality Analysis Reporting System (FARS) years 1979 to 2005

The National Automotive Sampling System - Crashworthiness Data System (NASS/CDS) 1997-2006



Definitions

FARS Fires – Any vehicle in the FARS file where there was both a fatality and a fire.

FARS MHV (Most Harmful Event) Fires – The FARS cases where fire was the most harmful event that occurred to the vehicle. The MHV does not necessarily apply to the people in the vehicle. Therefore, one can not assume that the most harmful event for a vehicle was the cause of the death or injury for any specific individual within the vehicle.

NASS Major Fire – Any NASS case where fire enters the occupant compartment

A Major Fire in NASS



Presentation Outline – Fires in Side Crashes

- n Overview of Fires in FARS
 - ▬ Side crashes relative to other crash modes

- n NASS/CDS Data on Side Crashes with Major Fires

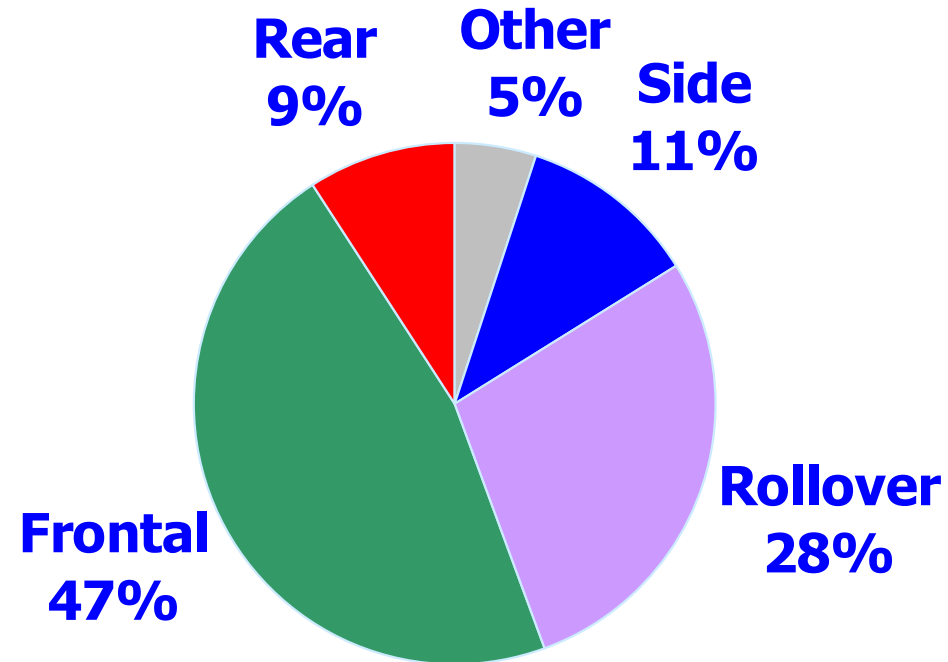
- n Examination of Eight Cases in NASS where Fire may have contributed to the Fatality

- n Conclusions



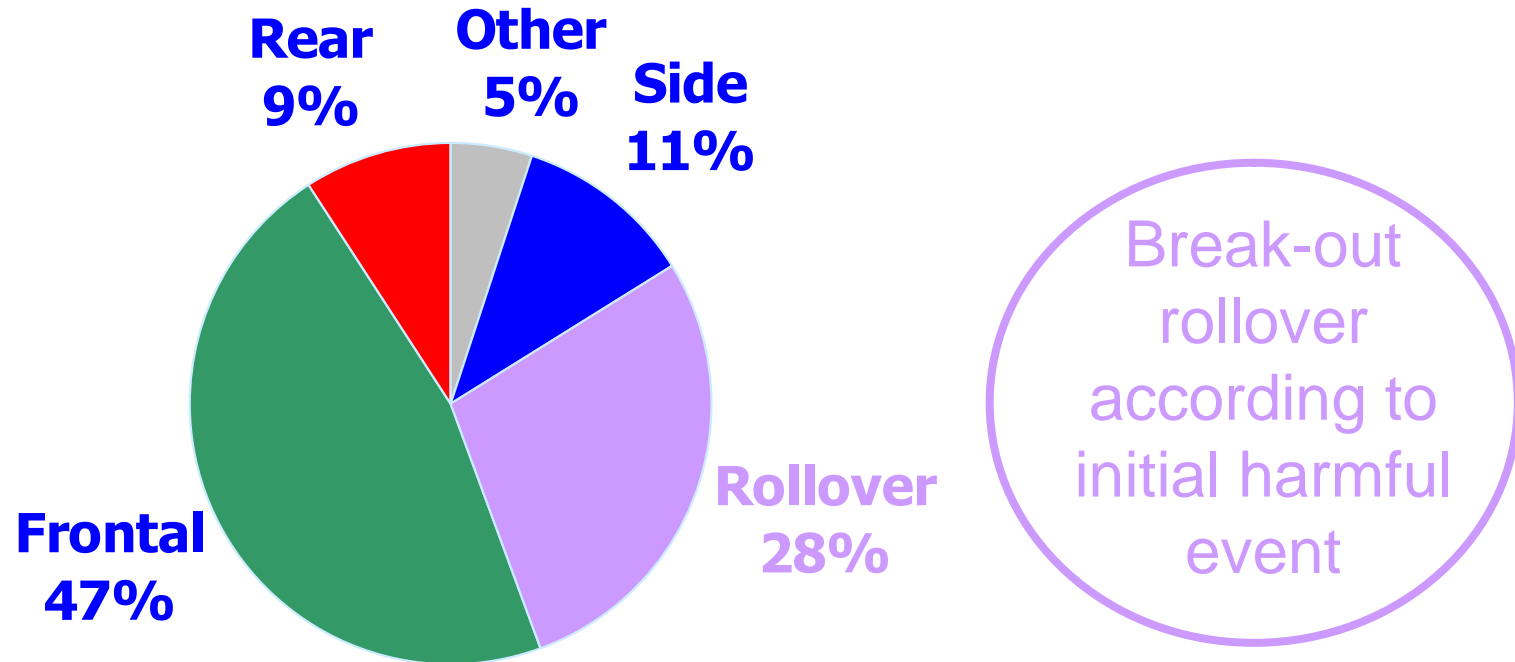
Distribution of Fatalities with Fire MHV by Crash Direction

FARS 2001-2005



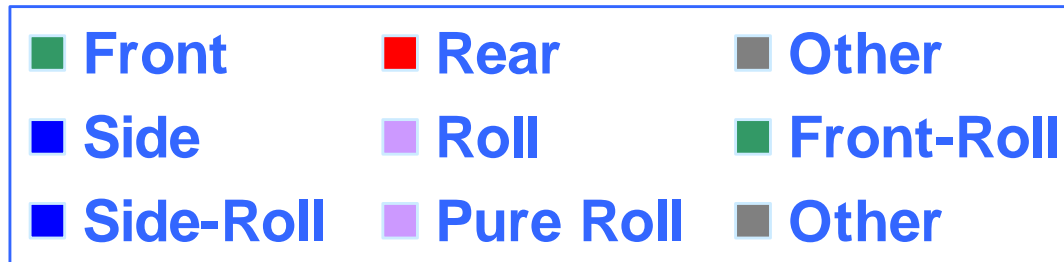
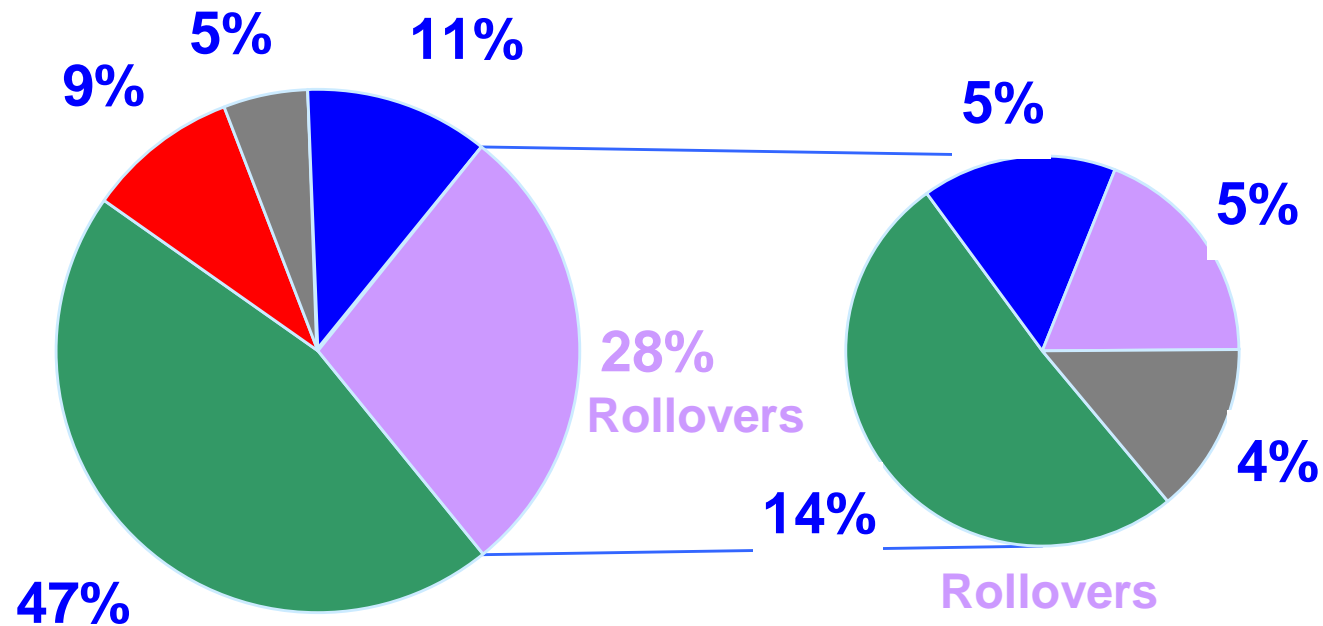
Distribution of Fatalities with Fire MHV by Crash Direction

FARS 2001-2005



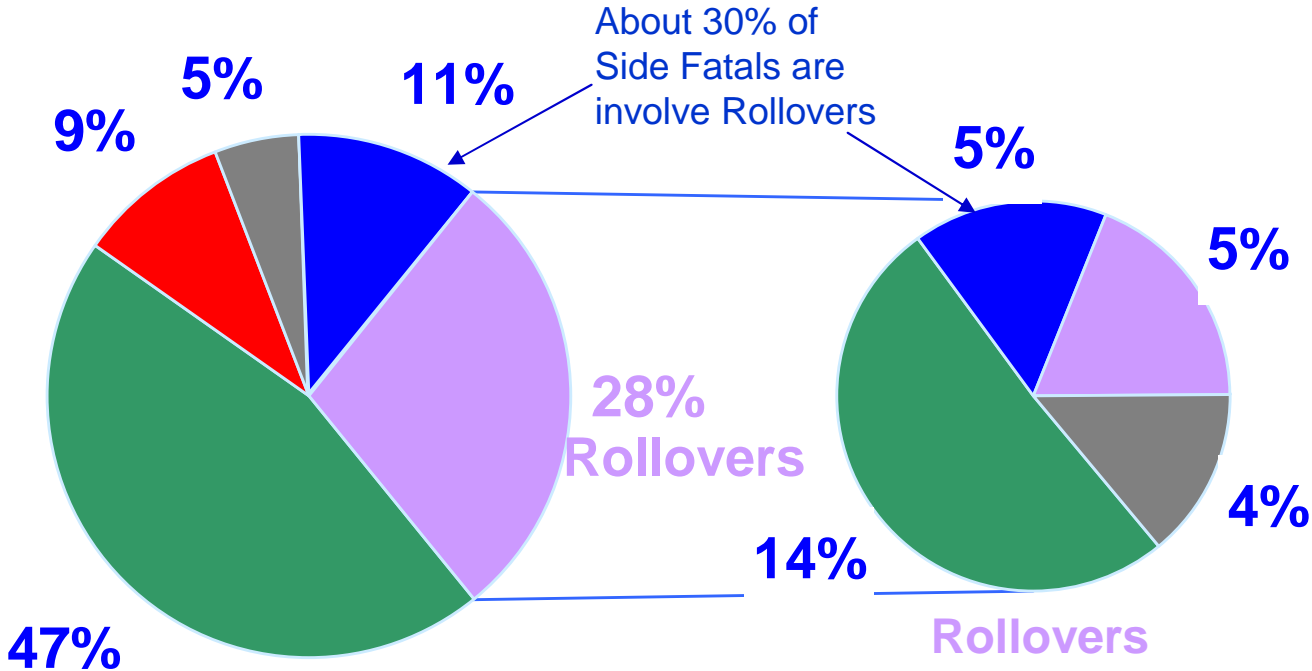
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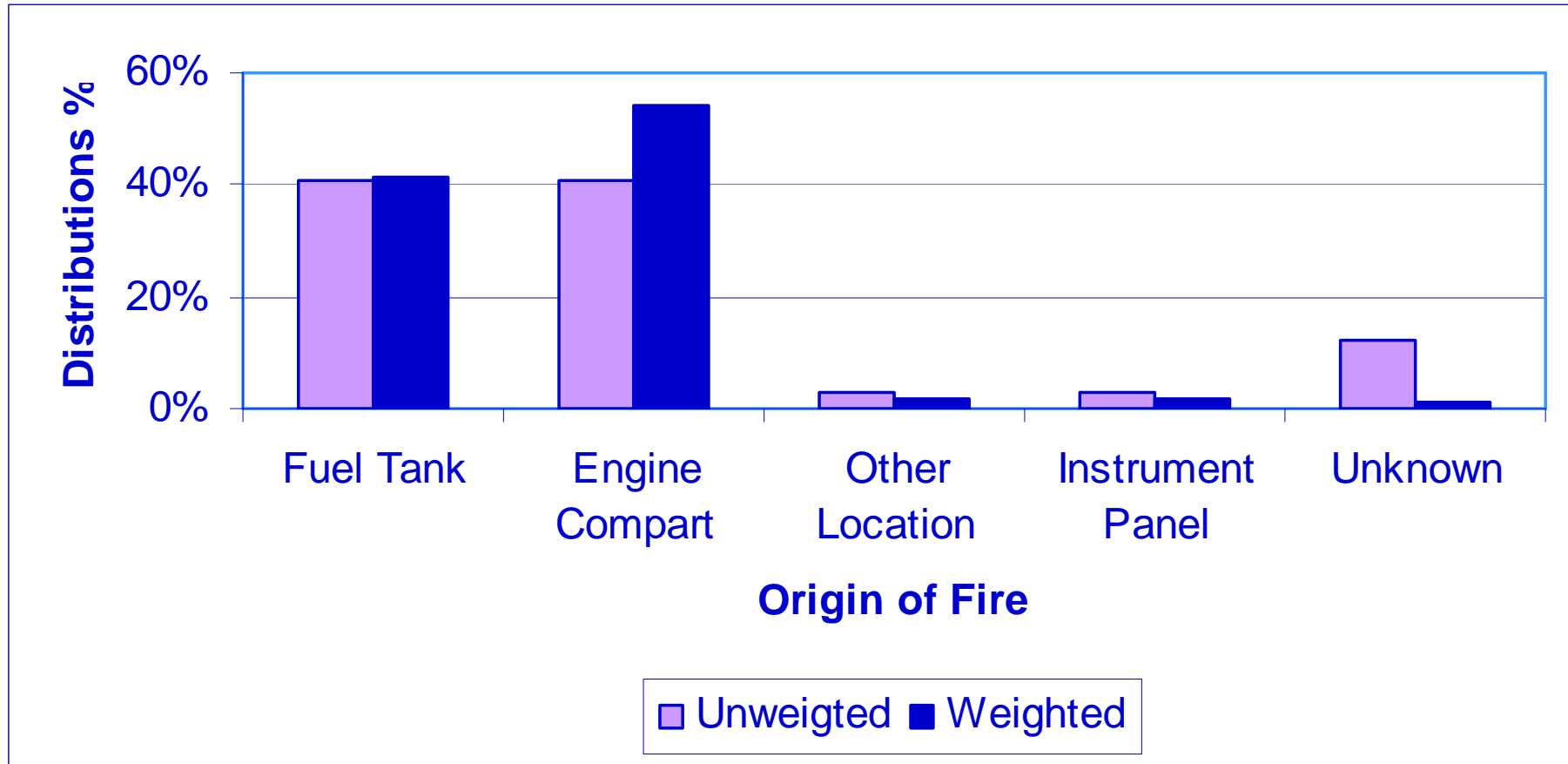


NASS/CDS Data on Frontal Crashes with Major Fires and Fires with Fatalities

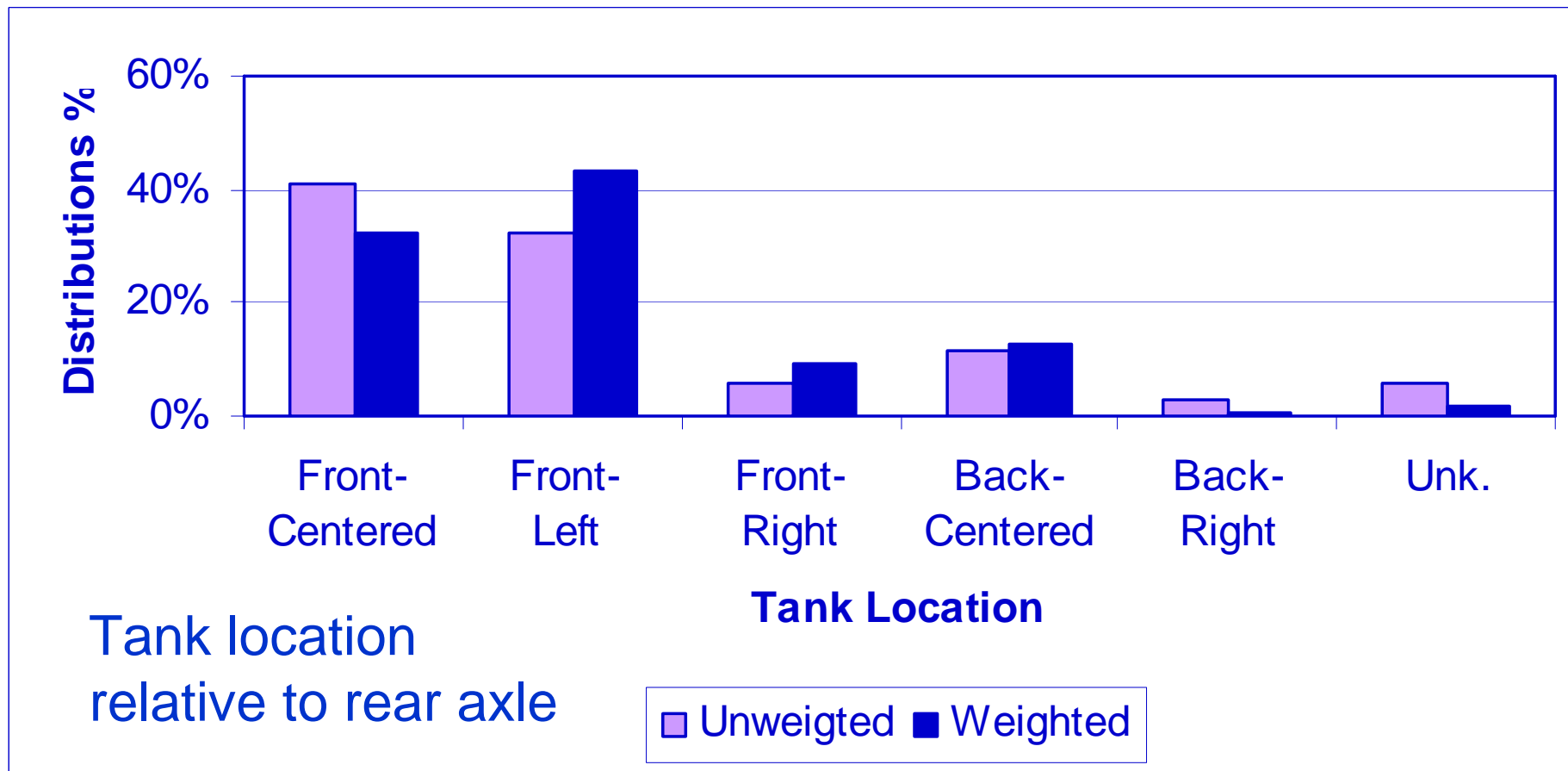
The National Automotive Sampling System/Crashworthiness Data System (NASS/CDS) 1997-2006 –

- ≡ Vehicles less than 10 years old
- ≡ 34 vehicles with side impact and major fires
- ≡ When weighted expands to 3,216 vehicles
- ≡ Small numbers – requires comparison of weighted and unweighted data to confirm trends

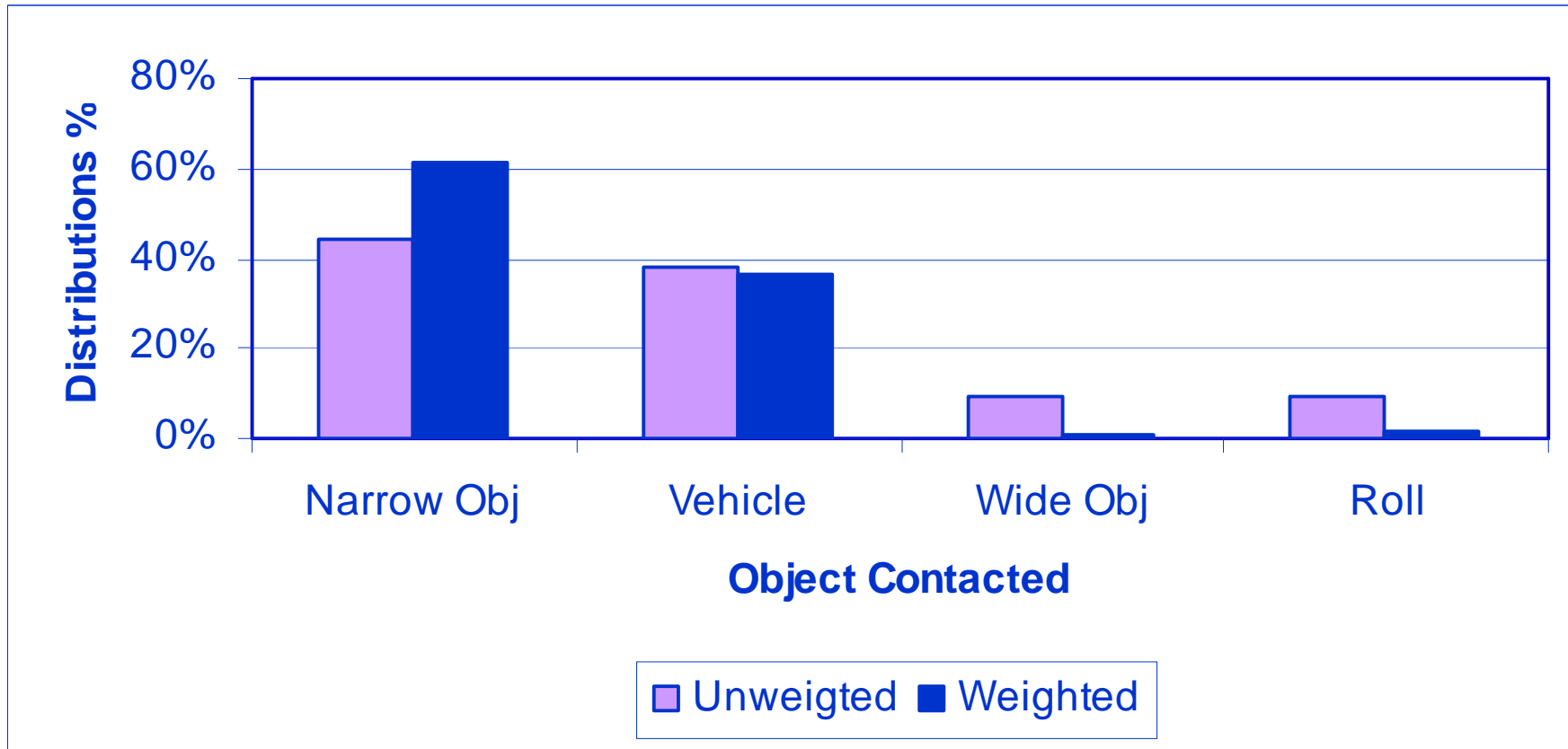
Distribution of Major Fires - Side Impacts Vehicles <10 Years Old by Fire Origin



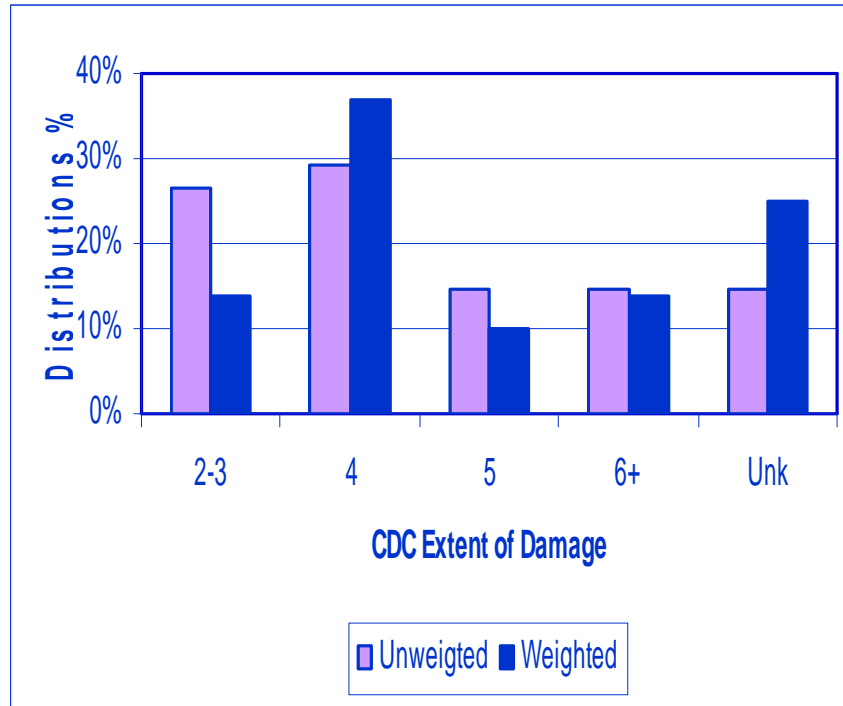
Fuel Tank Location in Major Fires – Side Impacts Vehicles <10 Years Old



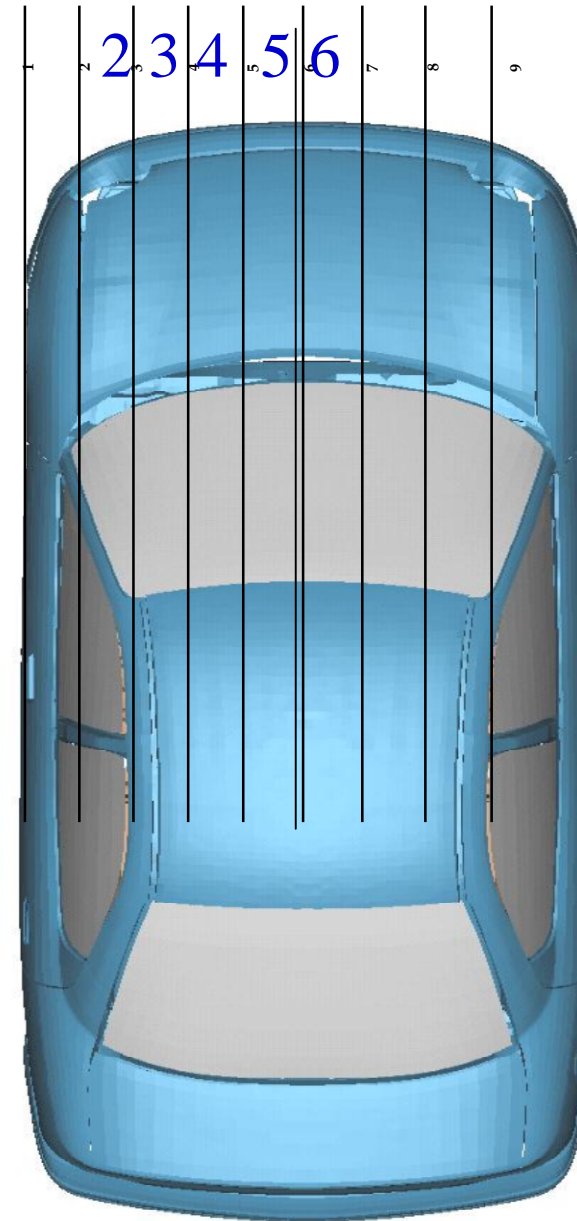
1st Object Contacted - Major Fires in Side Crashes– Vehicles Less than 10 Years Old



CDC Extent of Damage



**Major Fires in Side Crashes—
Vehicles Less than 10 Years Old**



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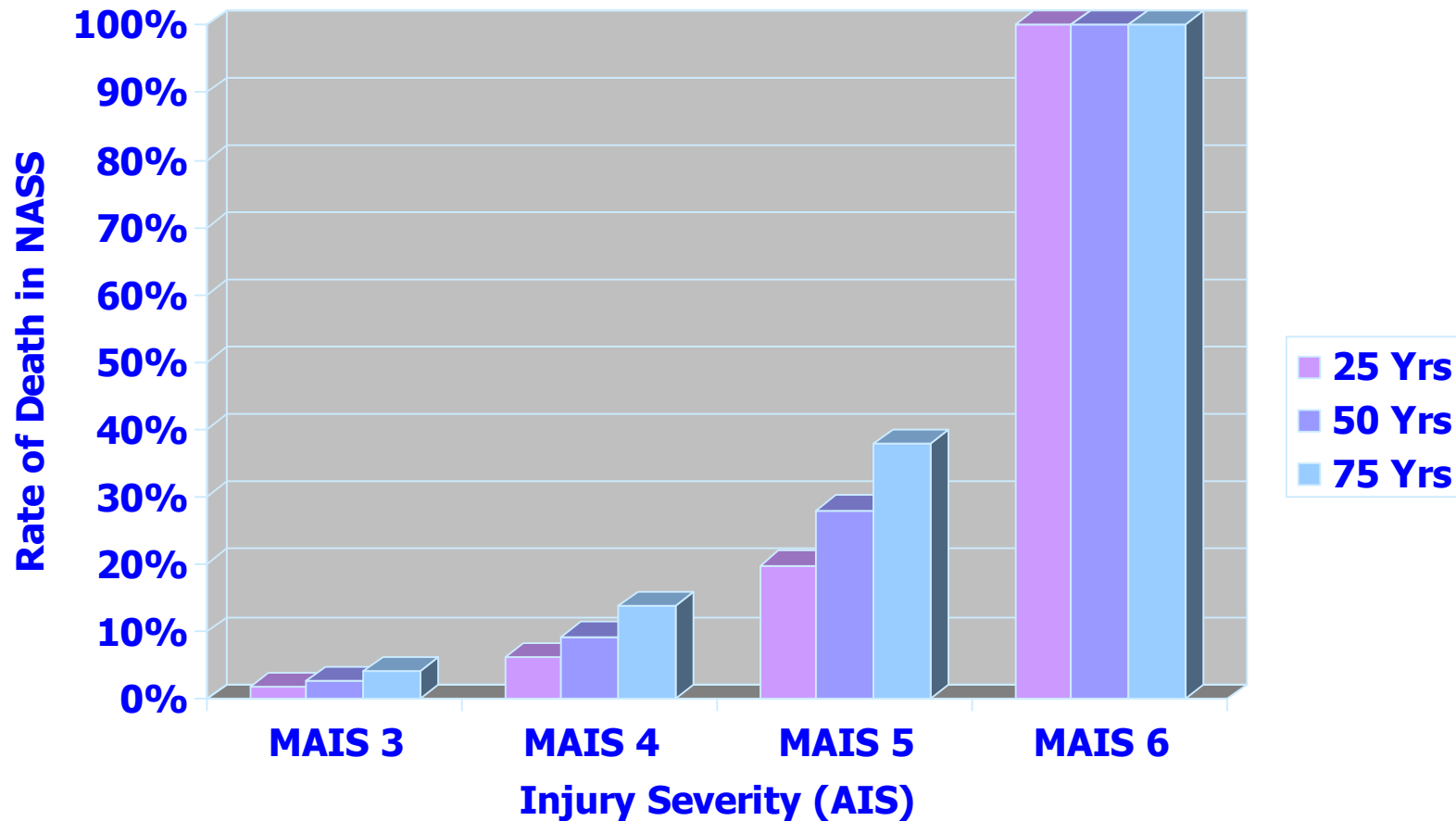
Data Set Involving Fatalities

- ≡ 34 vehicles with major fires
- ≡ 19 with fatalities
- ≡ 8 with AIS 6 attributed to fire - and crash injuries as follows:
 - In most cases MAIS 3 or 4
 - One case MAIS 5
- ≡ Injury assessment based on NASS coding
- ≡ Damage coding based on side impact damage not rollovers

Side Crashes with Fires and Fatalities

Fire Origin	Objects Contacted	Damage	Comments
Engine Compartment	Narrow Object	Severe	Impact near front wheels
Fuel tank	Narrow Object	Severe	Hydroplaned; Impact at occupant compartment
Fuel tank	Narrow Object	Severe	Impact at occupant compartment
Fuel tank	Narrow Object	Severe	Barrier sideswipe+ pole impact
Fuel tank	Roll + Vehicle + ¼ Roll	Very Severe	Occupant compartment impact
Fuel tank	1 Vehicle + 2 Narrow Objects	Severe	Impact near rear fuel tank
Fuel tank	Traffic Barrier/Light Pole + Rollover	Moderate	Rollover followed impact
Fuel tank	Impact Attenuator + Rollover	Moderate	Fuel system damage during rollover

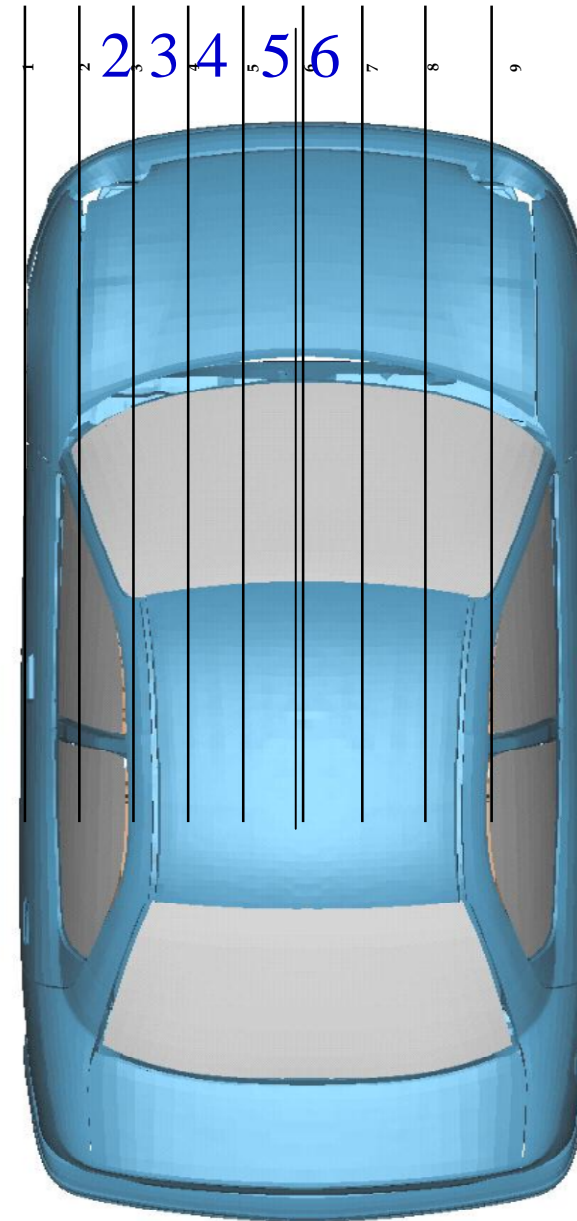
MAIS Rate of Death for 3 Age Groups



Definitions

CDC – Extent of Damage
CDC 5 ~ 1/2 vehicle width

CMAIS – Max AIS from
crash injuries



Side Impact with Engine Compartment Fire – Narrow Object Impact



Case 1998 49 95



CDC-4 Damage Profile

Side Impacts with Fuel Tank Fires



Narrow Object Impacts



Sideswipe + Narrow Object

Side Impacts with Fuel Tank Fires



1 vehicle impact +
2 narrow impacts

Impact near rear
fuel tank

Side Impacts with Fuel Tank Fires



Rollover + Vehicle front-to-side impact + $\frac{1}{4}$ Rollover
Driver would probably have died from crash injuries

Side Impacts with Fuel Tank Fires



Side Impacts Followed by Rollovers

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Conclusions

Data from NASS/CDS 1997-2006 – Vehicles less than 10 years old; Side Impacts with Major Fires

- ≡ 34 vehicles
- ≡ 19 with fatalities
- ≡ 8 with fatalities possibly fire related
- ≡ 34 vehicles expand to 3,216 when weighted

Conclusions – Fire Origin

Fuel Tank- 40% unweighted; 41% weighted

Engine Comp- 40% unweighted; 54% weighted

Conclusions – Side Impact Fires

Narrow objects are most frequently impacted –
60% (weighted data)

Most side impacts with major fire incur damage
of CDC 4+

Entrapment rate was:

- ≡ 32% unweighted
- ≡ 35% weighted

Conclusions – Fire Cases with Fatalities

FROM FARS DATA:

Side Impacts represent 16% of the fatalities
with fire as MHE

About 30% of these cases also involve rollovers

FROM NASS DATA:

Rollovers were observed in 3 of 8 NASS cases
with fire related fatalities

Side impacts without rollovers generally involve
severe side damage; CDC 4+ (NASS)

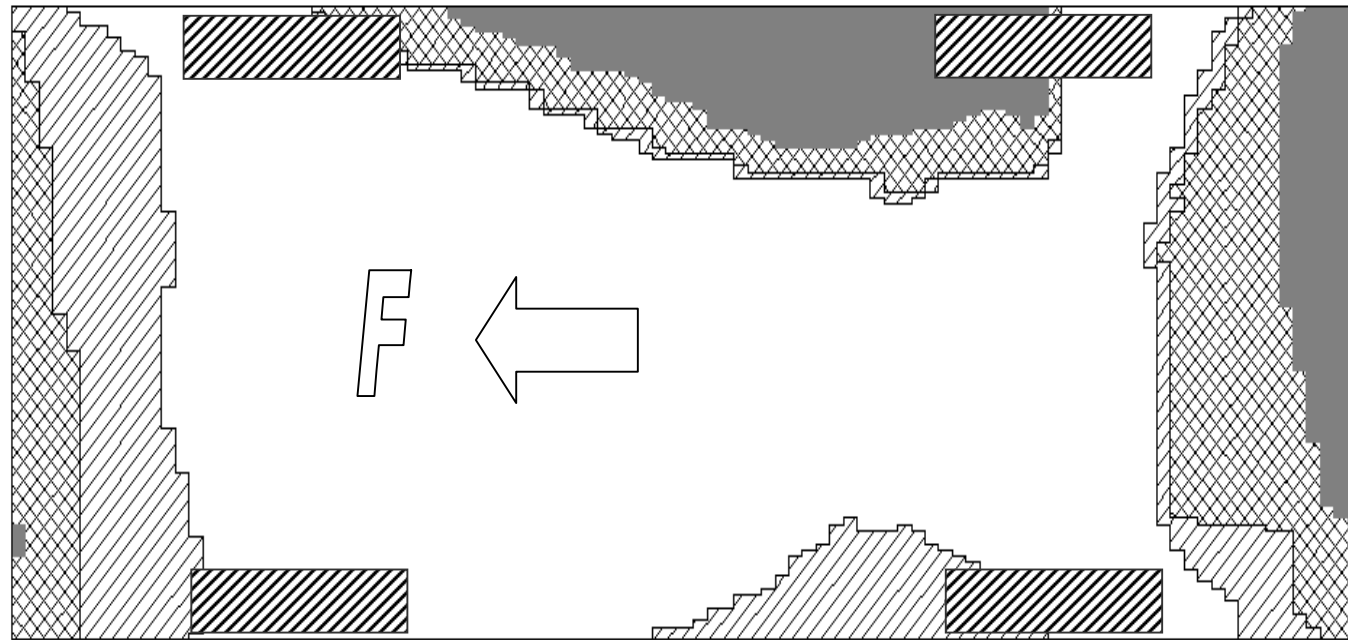
Conclusions- Major Threats; Fires in Side Impacts






Impacts with narrow objects with CDC 4 and above.

Rollovers following the side impact.

Damage Patterns where Fuel Leakage Occurred

Drivers Only, Fuel Leak Involved Crashes (% of all impacts)



% Crashes  1%  5%  10%  25%  50%

Frequency that damage occurs in a given location

From Paper SAE 2006-01- 0789 by G. Bahouth



The End

Questions?