
SCI Analysis

**NHTSA
R&D**

**National Center for Statistics and Analysis
Special Crash Investigations**



SCI DATA

Introduction



- **This material is based in crash investigations conducted by NHTSA's Special Crash Investigation (SCI)**
- **In-depth crash investigations cases were conducted where the air bag was suspected of causing an injury and/or fatality**

Preliminary

Confirmed v. Unconfirmed



- SCI selects cases for investigation based on **alleged** air bag related injury and/or fatality.
 - **These cases are commonly referred to as UNCONFIRMED.**
- When an investigation is complete, and if the case shows the vehicle air bag was related to an injury and/or fatality, it is considered **CONFIRMED.**
 - **Other cases are dropped from the air bag related injury and/or fatality file.**

Preliminary

Fatal Confirmed and Unconfirmed Combined SCI Data



- **CAUTION** - Analysis of these data could produce **erroneous results** if the Unconfirmed cases are dropped as a result of the research

Preliminary

Some SCI Injury Cases are Not Sampled Scientifically



- SCI researches all cases related to air bag induced injuries - both fatal and non-fatal
- Fatal cases selection based on field reports
 - To insure NHTSA has located all such cases, it analyzes its FARS data base for additional cases
- Non-fatal cases are also selected on field reports.
 - Non-fatal crashes provide valuable engineering information regarding occupant - air bag interactions
 - But, no method exists to insure all cases are selected
 - Hence, non-fatal cases should not be used to make comparative analyses between vehicles

Preliminary

*All "Air Bag Related
Fatalities and Serious
Injuries" Case Data*

All "Air Bag Related Fatalities and Serious Injuries" Case Data



- **ANALYSES USING THESE DATA COULD BE FLAWED**
- Public data as of 4/1/99
- These data include all SCI cases, including:
 - Fatal
 - Non-fatal
 - Confirmed
 - Unconfirmed

Preliminary

All Air Bag Related Fatalities and Serious Injuries



4/1/99 Confirmed and Unconfirmed

Page 1 of 2

Model Year	CARAVAN	Taurus	VOYAGER	ESCORT	METRO	CAMRY	COROLLA	ACCENT	ASPIRE	CONTOUR	COROLLA	CONTINENTAL	FORD	EXPLORE	CROWN VICTORIA	NETA	JALANT	WINSTARY	CENSTURY	CAMARO	SUNFIRE	MUSTANG	PROBE	GRANDAM	GRANDPRIX	CUTLASS	SABLE	FIREBIRD	ECLIPSE	MIRAGE	MITSUBISHI	XJ	SENTRA	SONATA	NEON		
1988																																					
1989																																					
1990		4										1																						1			
1991		4									2			1														1				1					
1992		2									2	2																									
1993		1					2				1								1																		
1994	6	1	6			5	1	4	2	4	1		1	1					1	1	1	2	1	1	1	1	1					1	1				
1995	5		4	7	5	1	3	4	2	4				1	2		2	1	2		1	1	1		1					2	1		1		2	1	
1996	4	2	1	3	2		1	1	1	2				1		2		1	1	1					1	1							1				
1997	1		1	1	3	4		2				1	3	2			1	1		1	1															1	
1998	1															1																					
1999																							1														
TOTAL	17	14	12	11	10	10	7	7	7	6	6	4	4	4	4	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Preliminary

All Air Bag Related Fatalities and Serious Injuries (216)



4/1/99 Combined (Confirmed and Unconfirmed)

	Fatal	Nonfatal	Total
<u>Confirmed</u>			
<i>Drivers</i>	52	5	57
<i>Adult Passengers</i>	6	3	9
<i>Children Not in RFCSS</i>	58	17	75
<i>Children in RFCSS</i>	<u>16</u>	<u>9</u>	<u>25</u>
Total	132	34	166
<u>Unconfirmed</u>			
<i>Drivers</i>	13	4	17
<i>Adult Passengers</i>	3	1	4
<i>Children Not in RFCSS</i>	21	6	27
<i>Children in RFCSS</i>	<u>1</u>	<u>1</u>	<u>2</u>
Total	38	12	50

Preliminary

All Air Bag Related Fatalities and Serious Injuries (216)



4/1/99 Combined (Confirmed and Unconfirmed)

	Fatal	Nonfatal	Total
<i>Drivers</i>	65	9	74
<i>All Passengers</i>	105	37	142
<i>Adult</i>	9	4	13
<i>Children Not in RFCSS</i>	79	23	102
<i>Children in RFCSS</i>	17	10	27

Preliminary

All Air Bag Related Fatalities and Serious Injuries



4/1/99 Combined (Confirmed and Unconfirmed)

Occupant Type by Body Type					
	AUTOMOBILE	MINIVAN	PICKUP	UTILITY VEHICLE	TOTAL
CHILDREN	74	24	2	2	102
DAB	66	4	2	2	74
PAB ADULT	7	5		1	13
RFCSS	22	2	1	2	27
TOTAL	169	35	5	7	216

Preliminary

All SCI Fatal Confirmed Cases



- These data provide the source for **accurate analyses**
- Based solely on Confirmed Fatal Crashes

Preliminary

All Confirmed Air Bag Related Fatalities



5/1/99 Confirmed

Fatal Occupants By Vehicle Type

	AUTOMOBILE	MINIVAN	PICKUP	UTILITY VEHICLE	TOTALS
Drivers	48	2	1	2	53
Adult Passengers	4	2			6
Children (Not in RFCSS)	46	11	1	1	59
RFCSS	13	1	1	2	17
TOTALS	111	16	3	5	135

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All Confirmed *Passenger-side* Fatal Cases



- Includes Only Confirmed Cases
- **Accurate** data set for making comparative analysis

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Passenger-side Confirmed Air Bag Related Fatalities



5/1/99 Confirmed

All Fatal Passengers by Manufacturer and Body Type

	CHRYSLER	FORD	GM	HYUNDAI	ISUZU	JAGUAR	MAZDA	MITSUBISHI	SUBARU	TOYOTA	VOLKSWAGEN	VOLVO	TOTALS
AUTOMOBILE	4	19	15	7		1	2	3	1	8	2	1	63
MINIVAN	13							1					14
PICKUP	1	1											2
UTILITY VEHICLE		2			1								3
TOTALS	18	22	15	7	1	1	2	4	1	8	2	1	82

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*All Minivan Air Bag
Related Investigations*

Minivan Unconfirmed and Confirmed Combined Air Bag Related Investigations



- All minivans Investigations
- Investigation cases include:
 - Fatal Confirmed cases
 - Fatal Unconfirmed cases
 - Fatal and Serious Injury
 - Driver and Passenger-side occupants
 - Child Safety Seats
 - Seated on lap

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Minivan Air Bag Related Fatalities and Serious Injuries



4/1/99 Combined (Confirmed and Unconfirmed)

Minivan Occupant Type by Vehicle Model					
	CHILDREN	DAB	PAB ADULT	RFCSS	TOTAL
CARAVAN	12	2	1	2	17
EXPO MINIVAN			1		1
QUEST	1				1
SAFARI	1				1
VOYAGER	9	1	2		12
WINDSTAR	1	1	1		3
TOTAL	24	4	5	2	35

Preliminary

Minivan Air Bag Related Fatalities and Serious Injuries



4/1/99 Combined(Confirmed and Unconfirmed)

Minivan Occupant Type by Vehicle Model						
		CHILDREN	DAB	PAB ADULT	RFCSS	TOTAL
CONFIRMED	CARAVAN	10		1	2	13
	EXPO MINIVAN			1		1
	VOYAGER	6	1	1		8
	WINDSTAR		1	1		2
	SUBTOTAL	16	2	4	2	24
UNCONFIRMED	CARAVAN	2	2			4
	QUEST	1				1
	SAFARI	1				1
	VOYAGER	3		1		4
	WINDSTAR	1				1
	SUBTOTAL	8	2	1	0	11
	TOTAL	24	4	5	2	35

Preliminary

Minivan Air Bag Related Fatalities and Serious Injuries



4/1/99 Combined (Confirmed and Unconfirmed)

Minivan Vehicle Model by Occupant Type by Restraint Use									
		NOT PROPERLY SECURED IN BOOSTER SEAT	USED LAP BELT ONLY	NOT BELTED	NO - ON LAP OF PASSENGER	TBD	BELTED	PROPERLY SECURED IN RFCSS	TOTAL
CARAVAN	CHILDREN	1	1	5	1		4		12
	DAB			1			1		2
	PAB ADULT						1		1
	RFCS							2	2
EXPO MINIVAN	PAB ADULT			1					1
QUEST	CHILDREN			1					1
SAFARI	CHILDREN				1				1
VOYAGER	CHILDREN		2	6		1			9
	DAB			1					1
	PAB ADULT						2		2
WINDSTAR	CHILDREN				1				1
	DAB			1					1
	PAB ADULT						1		1
	TOTAL	1	3	16	3	1	9	2	35

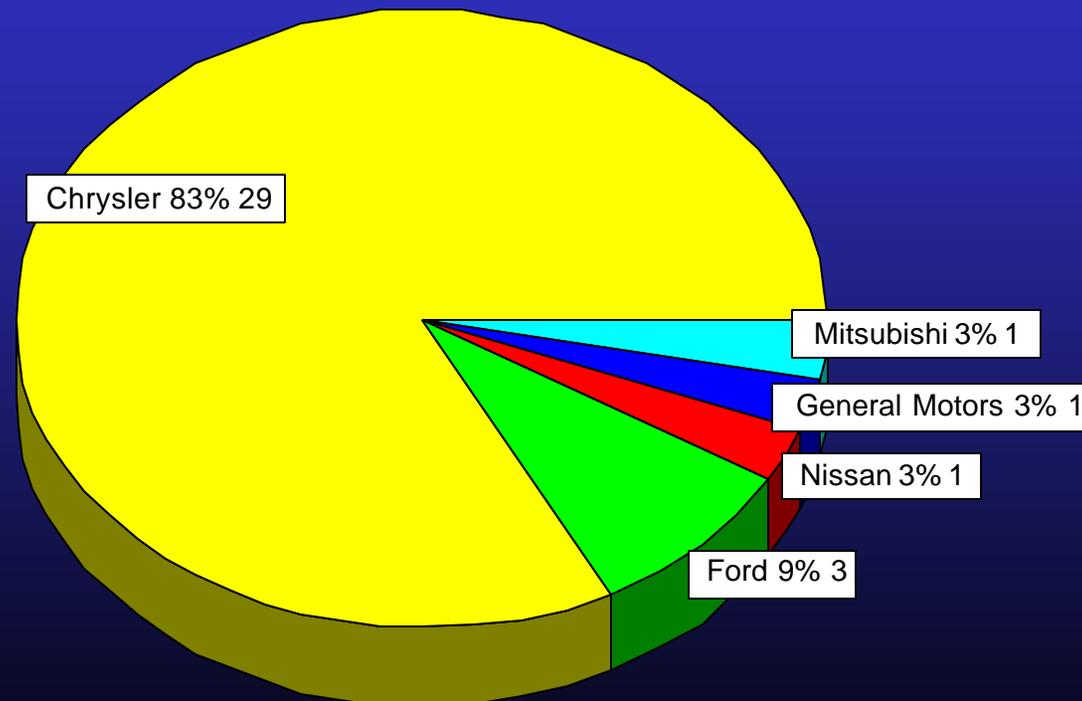
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Minivan Air Bag Related Fatalities and Serious Injuries



4/1/99 Combined (Confirmed and Unconfirmed)

Vehicles By Manufacturers (35)



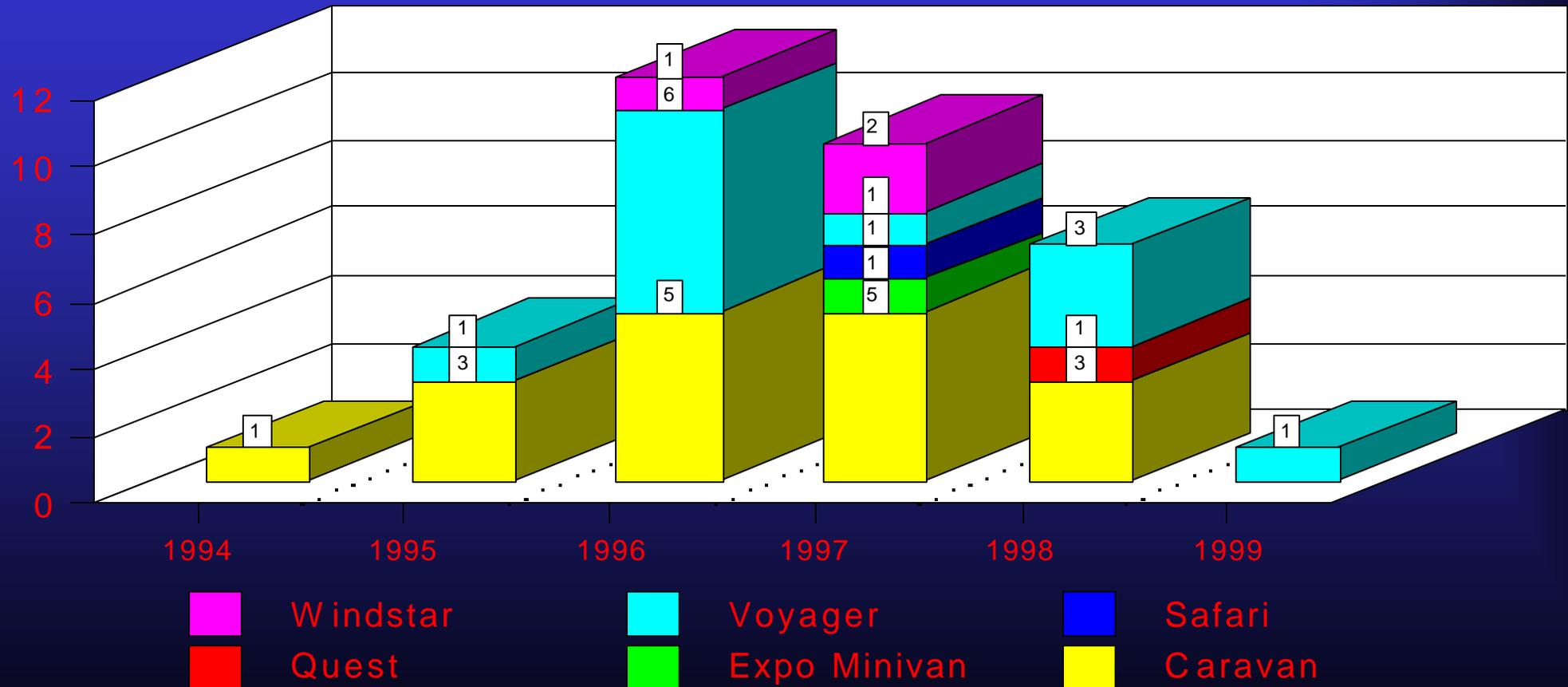
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Minivan Air Bag Related Fatalities and Serious Injuries



4/1/99 Combined (Confirmed and Unconfirmed) (35)

Vehicle Models by Year of Crash



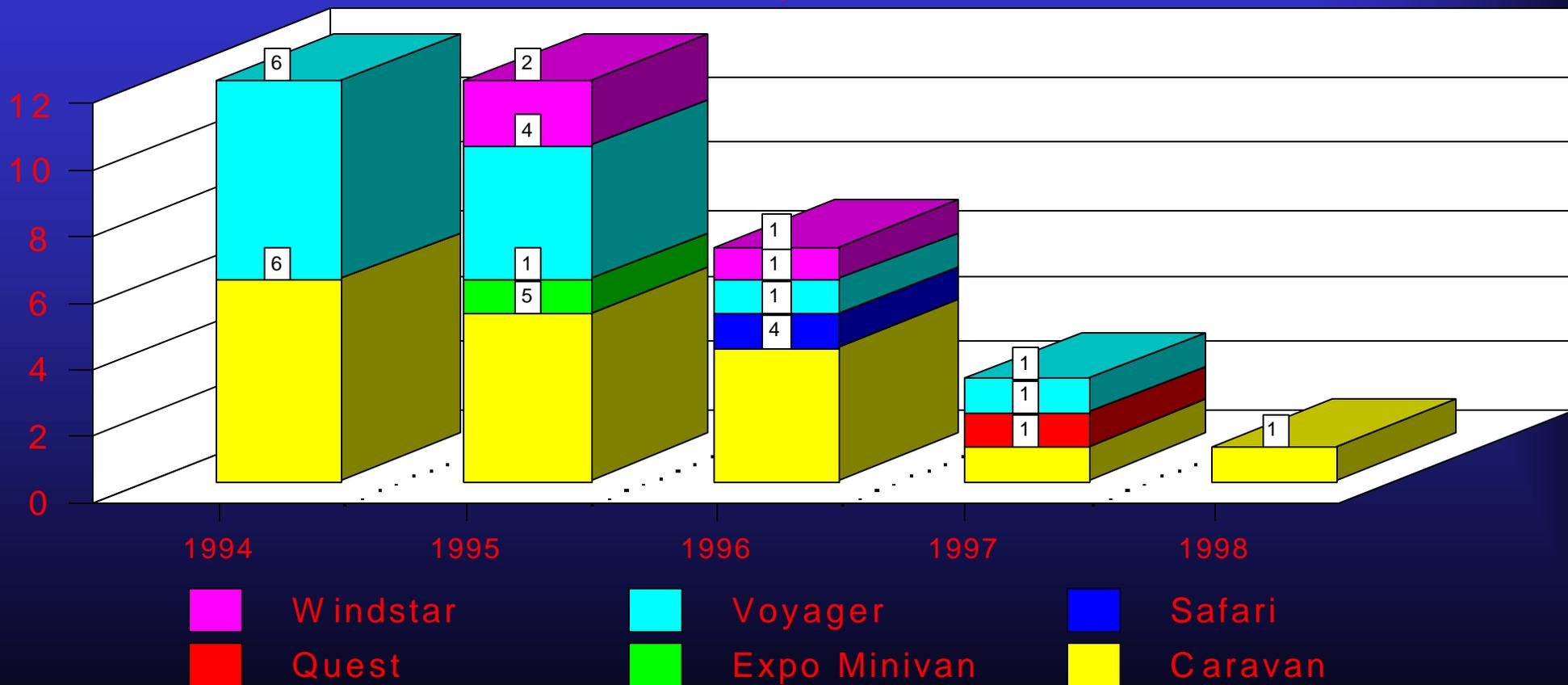
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Minivan Air Bag Related Fatalities and Serious Injuries



4/1/99 Combined (Confirmed and Unconfirmed) (35)

Vehicle Models by Vehicle Model Year

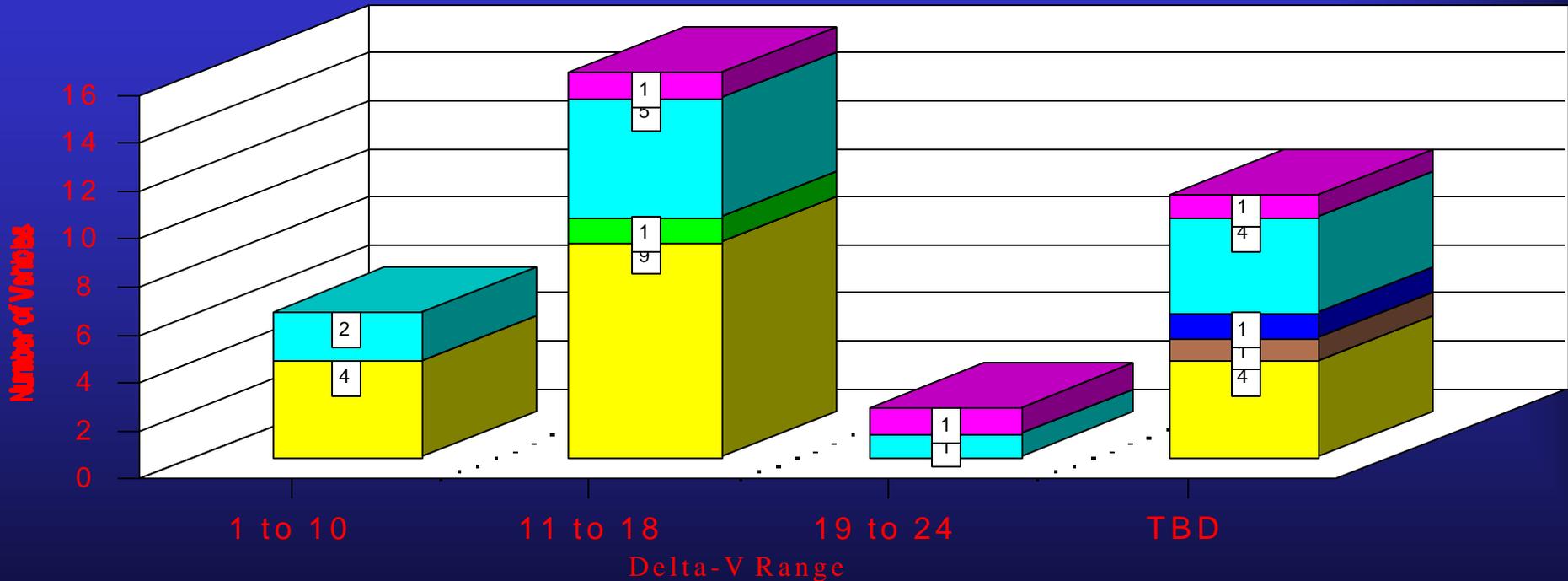


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Minivan Air Bag Related Fatalities and Serious Injuries



4/1/99 Combined (Confirmed and Unconfirmed) (35)
 Vehicle Models by Delta-V Range



- Windstar
- Voyager
- Safari
- Quest
- Expo Minivan
- Caravan

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ANALYSIS OF SCI DATA

*Overall Analysis by Driver
and Passenger side Air Bags*

Overall Rate of Air Bag Related Fatalities



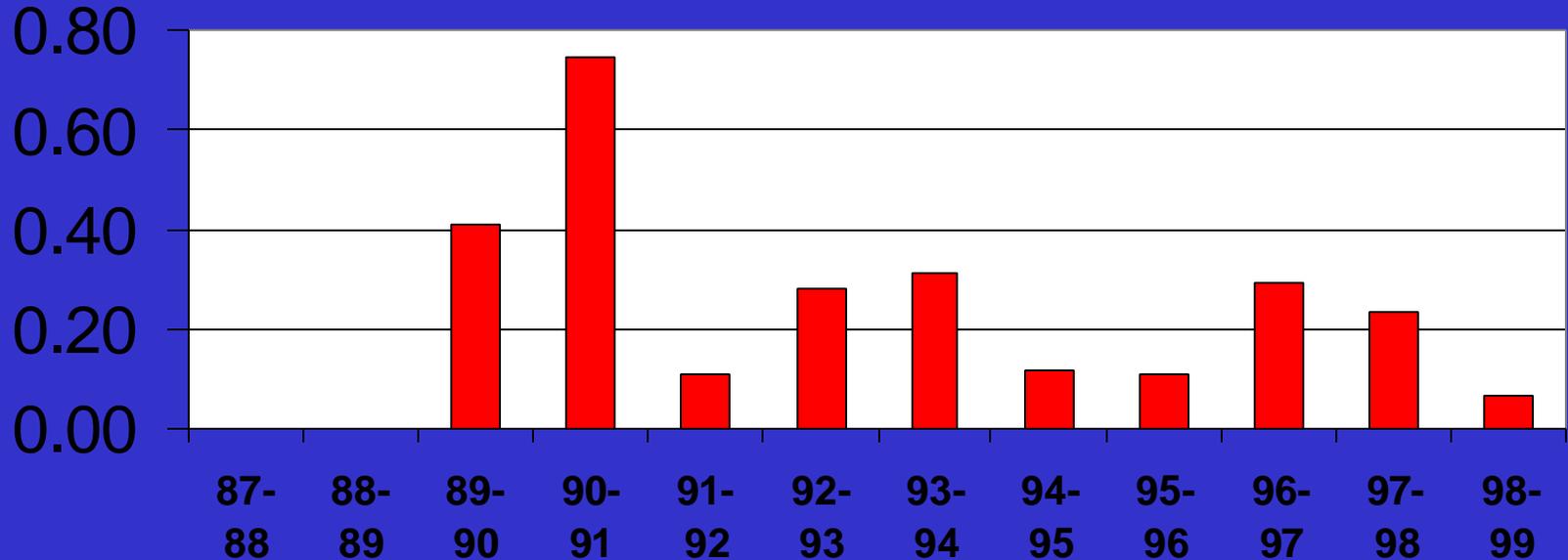
- **Position of Air Bag**
 - **Driver's Side**
 - **Passenger's Side**
- **Year analysis**
 - **Crash Year**
 - Year interval - September 1 through August 31
 - **Model Year**

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Fatality Rate by Year (Sept-Aug)

Drivers

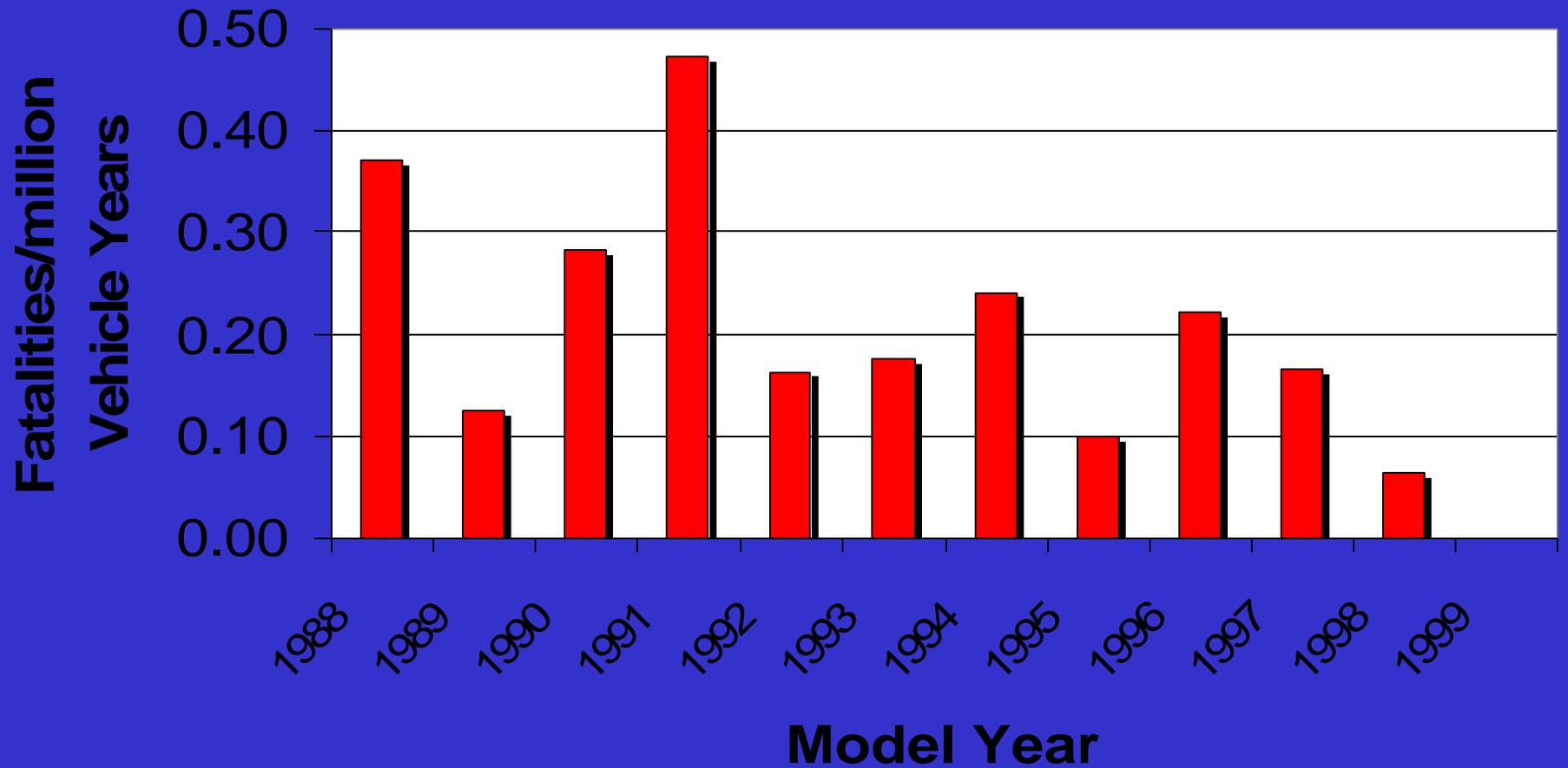
Fatalities/
million
vehicle years



12 Month Period

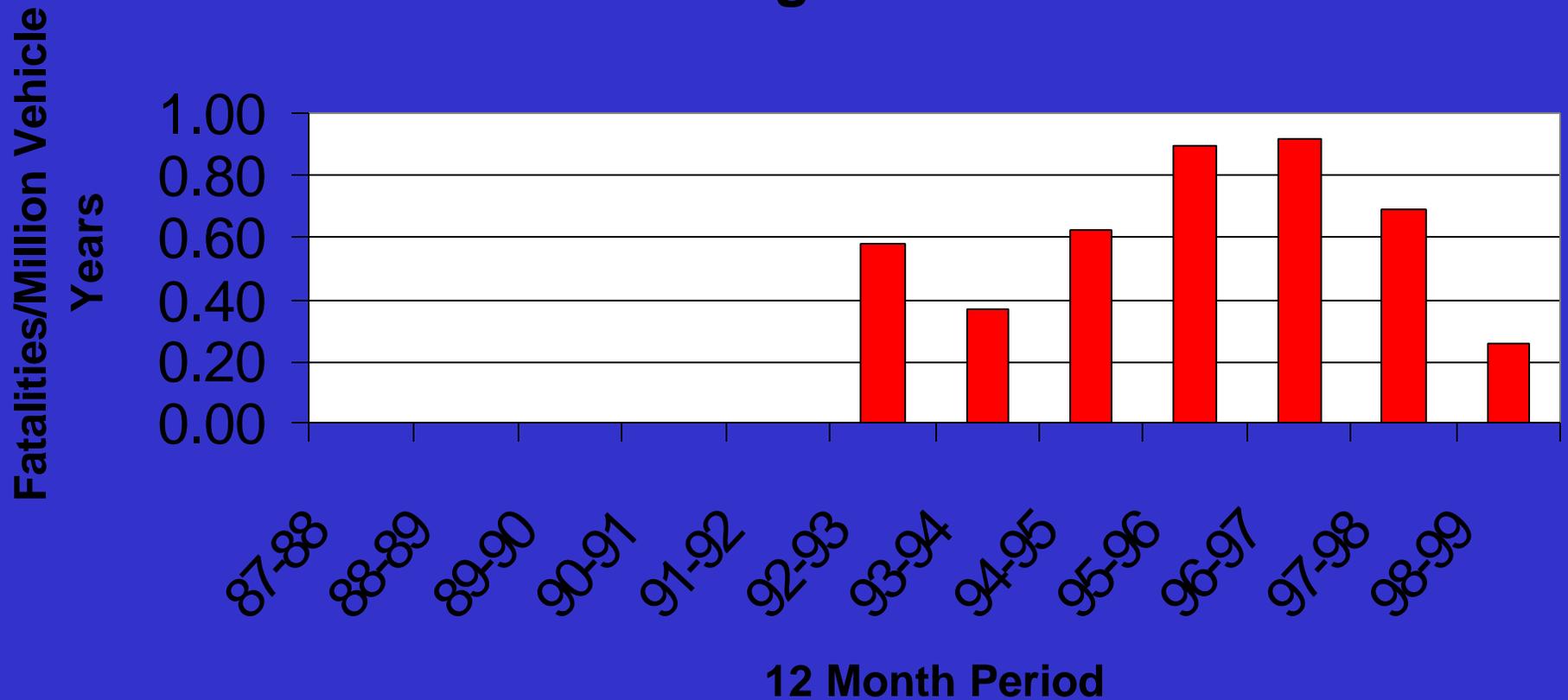
Fatality Rate by Model Year

Drivers Side



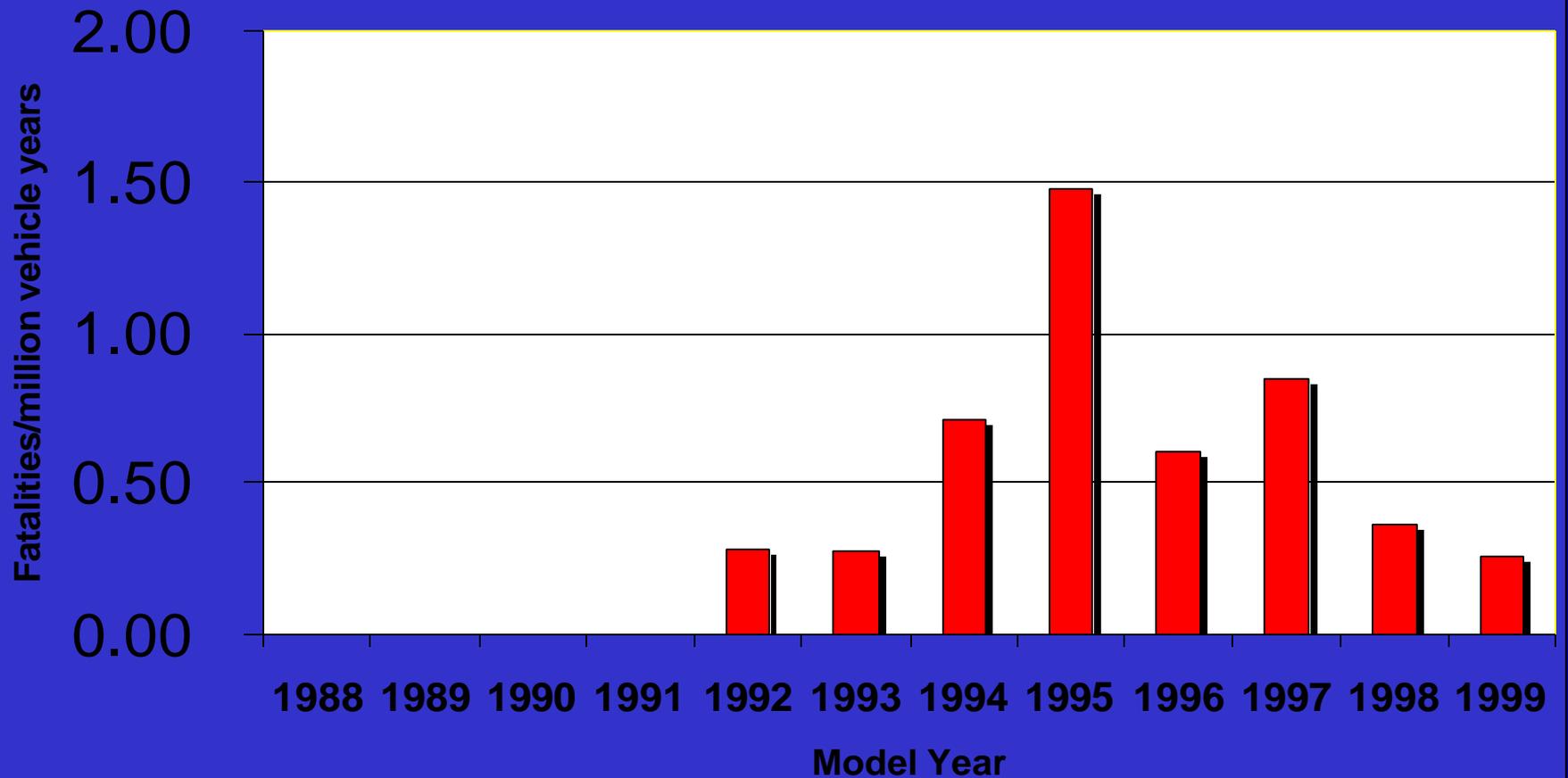
Fatality Rate by Year (Sept-Aug)

Passenger Side



Fatality Rate by Model Year

Passenger Side



*Passenger Side
Make/Model
Analysis of SCI Data*

All Make/Model Analysis, Normalized for Vehicle Years



- Considers Each Make/Model with at Least 2 SCI Cases on Passenger Side
 - Total Confirmed and Unconfirmed
- Number of Cases normalized for numbers of vehicles on the road and number of years in use
- Rate Data is # SCI Cases per million Registered Vehicle Years of Exposure; or:

$$\text{Rate} = \frac{\# \text{ SCI cases}}{\text{million registered vehicle years}}$$

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All Make/Model Analysis, Normalized for Right Front Occupancy



- Accounts for the number of young occupants in the right front seat exposed to crashes
- Since most fatalities are age 13 and less, this age group was used for adjusting for occupancy rates
- Rate Data is # SCI Cases per million Registered Vehicle Years Adjusted for Right Front Seat Occupancy (<13 YO) rate.

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Vehicle Occupancy Rates



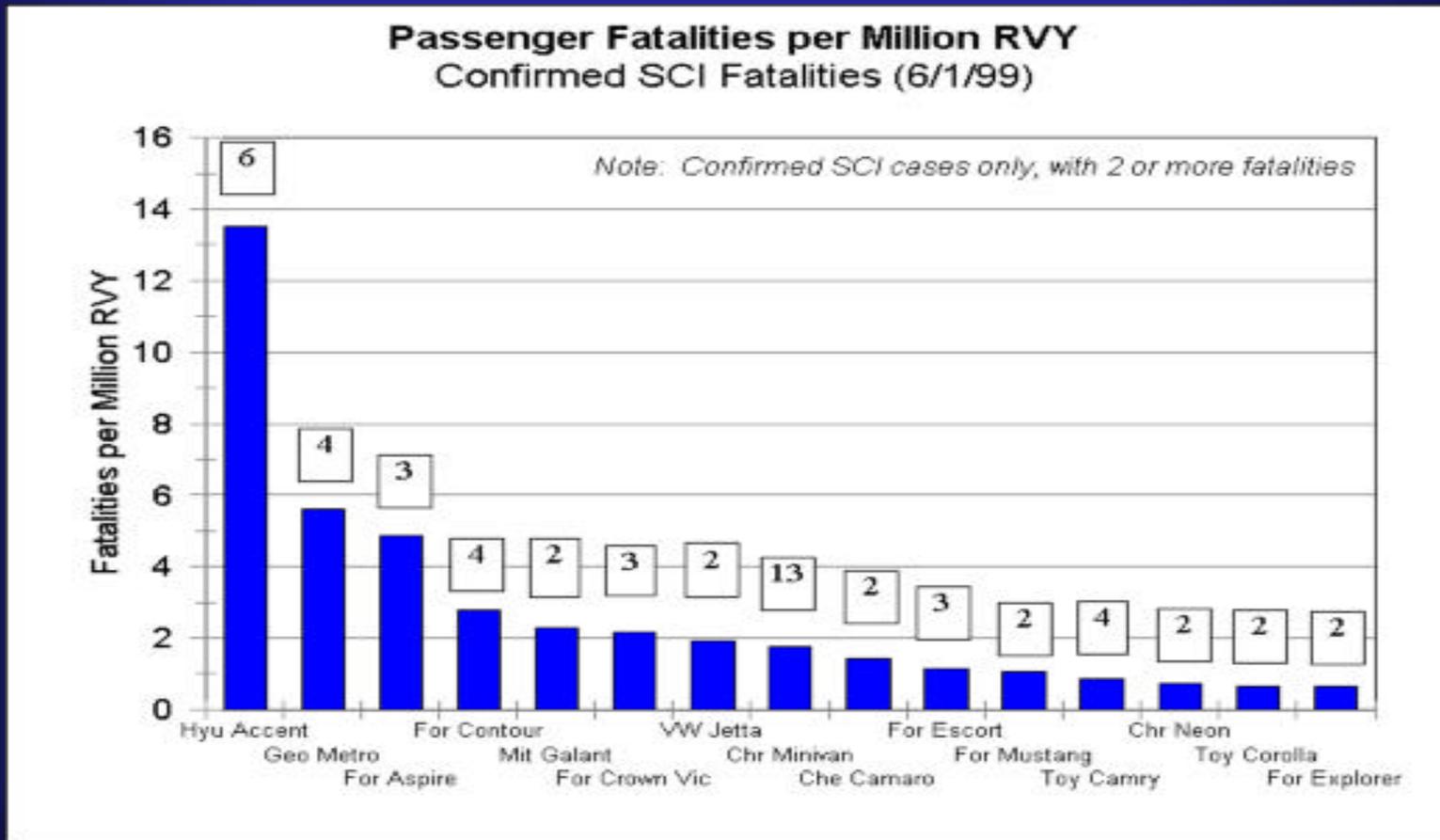
Right Front Passenger Occupancy Rate - Based on FL, MD, & PA

Model Year 1994 & Later	Passenger Air Bag			Ratio to Passenger Cars	
	Total	< 13	13+	< 13	13+
Chrysler Minivans	34%	7%	27%	2.4	1.2
Non-Chrysler Minivans	33%	7%	26%	2.5	1.1
Passenger Cars	26%	3%	23%	1.0	1.0
Utilities	26%	4%	23%	1.2	1.0
Pickups	19%	2%	16%	0.8	0.7
Standard Vans	23%	3%	20%	1.1	0.9

Minivan is 2.4 times as likely to have an occupant under 13 in right front passenger seat when compared to an automobile.

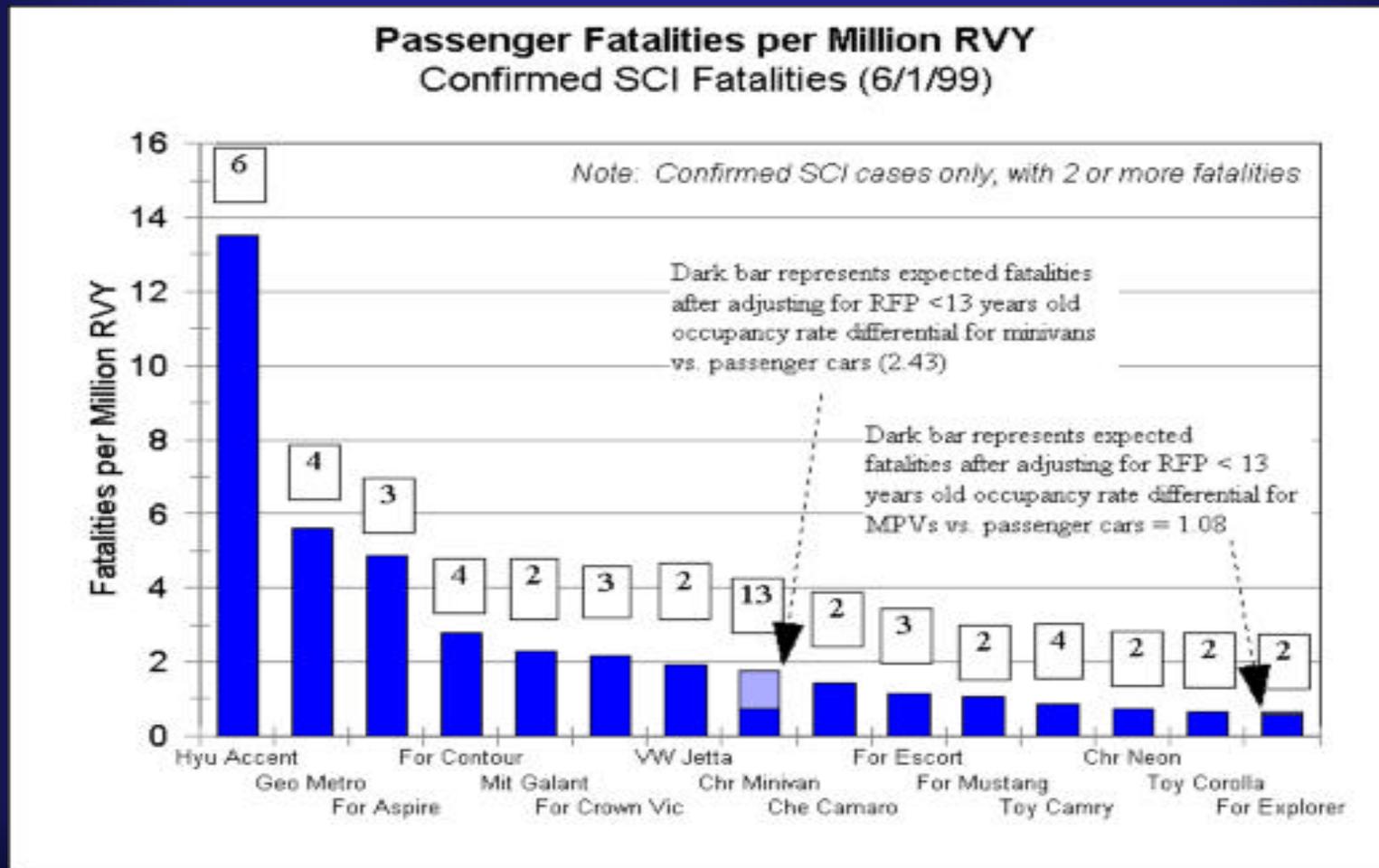
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Confirmed Fatalities per RVY, All Vehicle Types



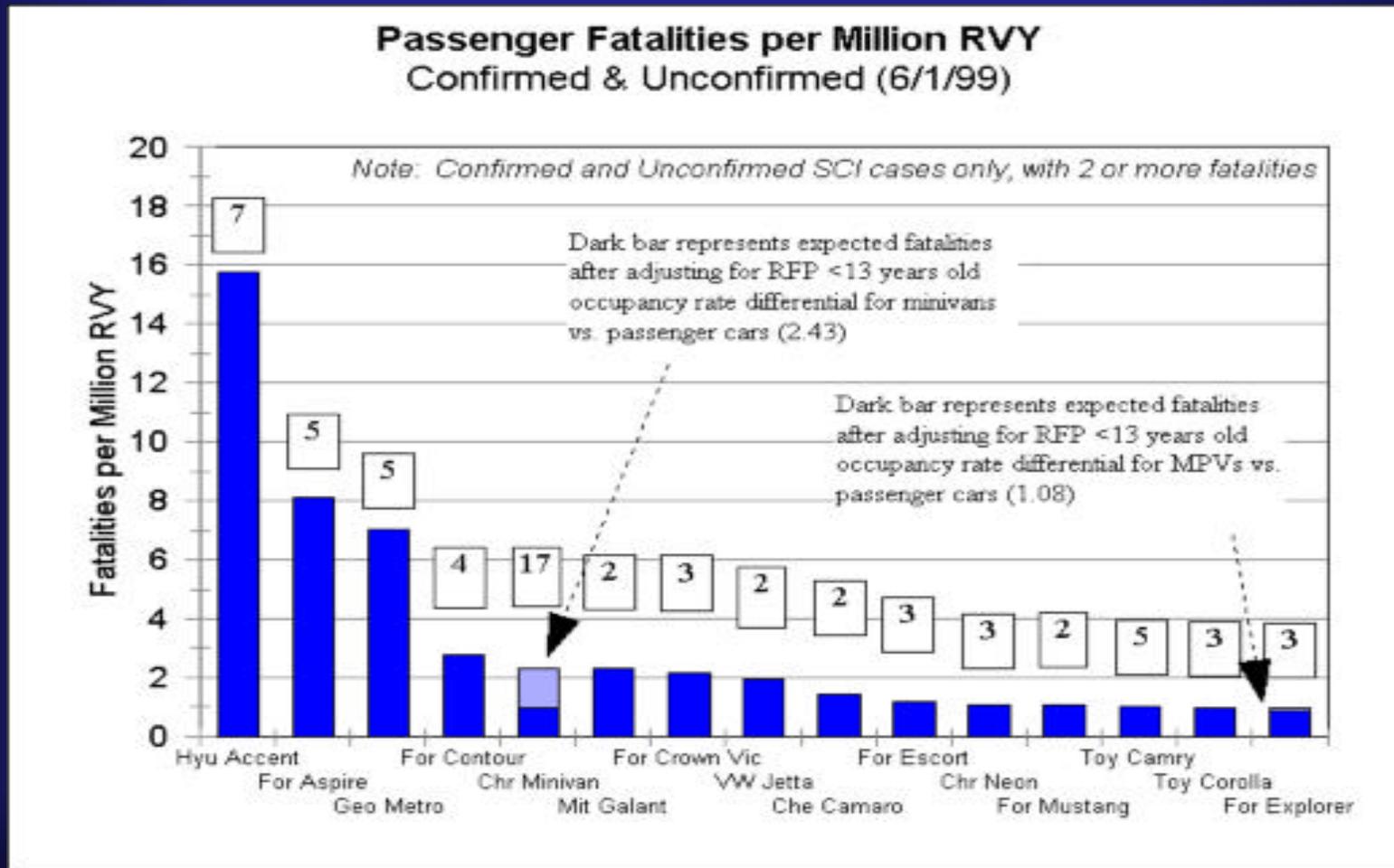
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Confirmed Fatalities per RVY Adjusted for Occupancy, All Vehicle Types



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Confirmed and Unconfirmed Fatalities per RVY Adjusted for Occupancy, All Vehicle Types



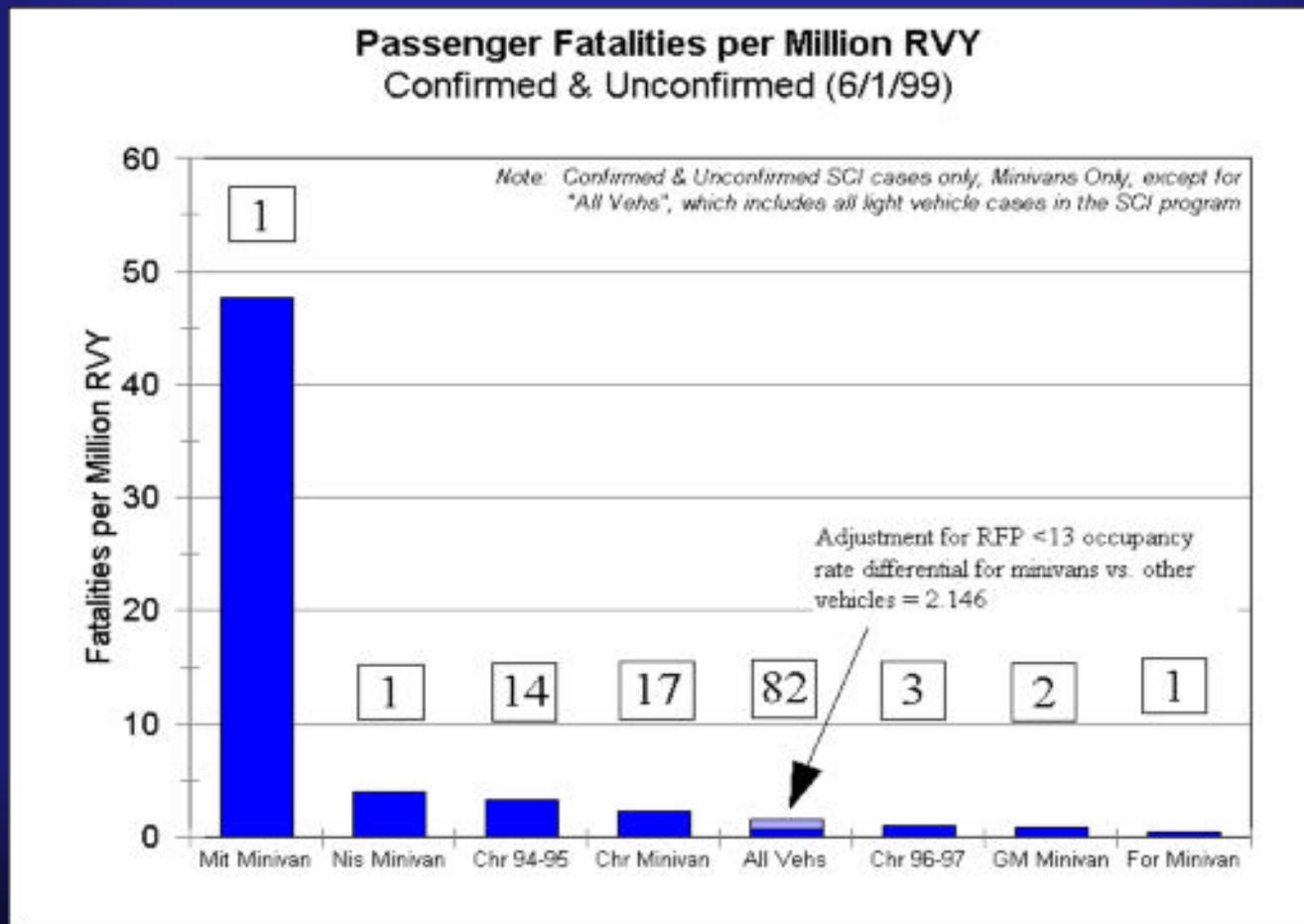
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*Minivan Analysis of
SCI Data*

SCI Minivan Data Evaluation On Fatalities Related to Passenger Air Bags



6/1/99 Combined (Confirmed and Unconfirmed)

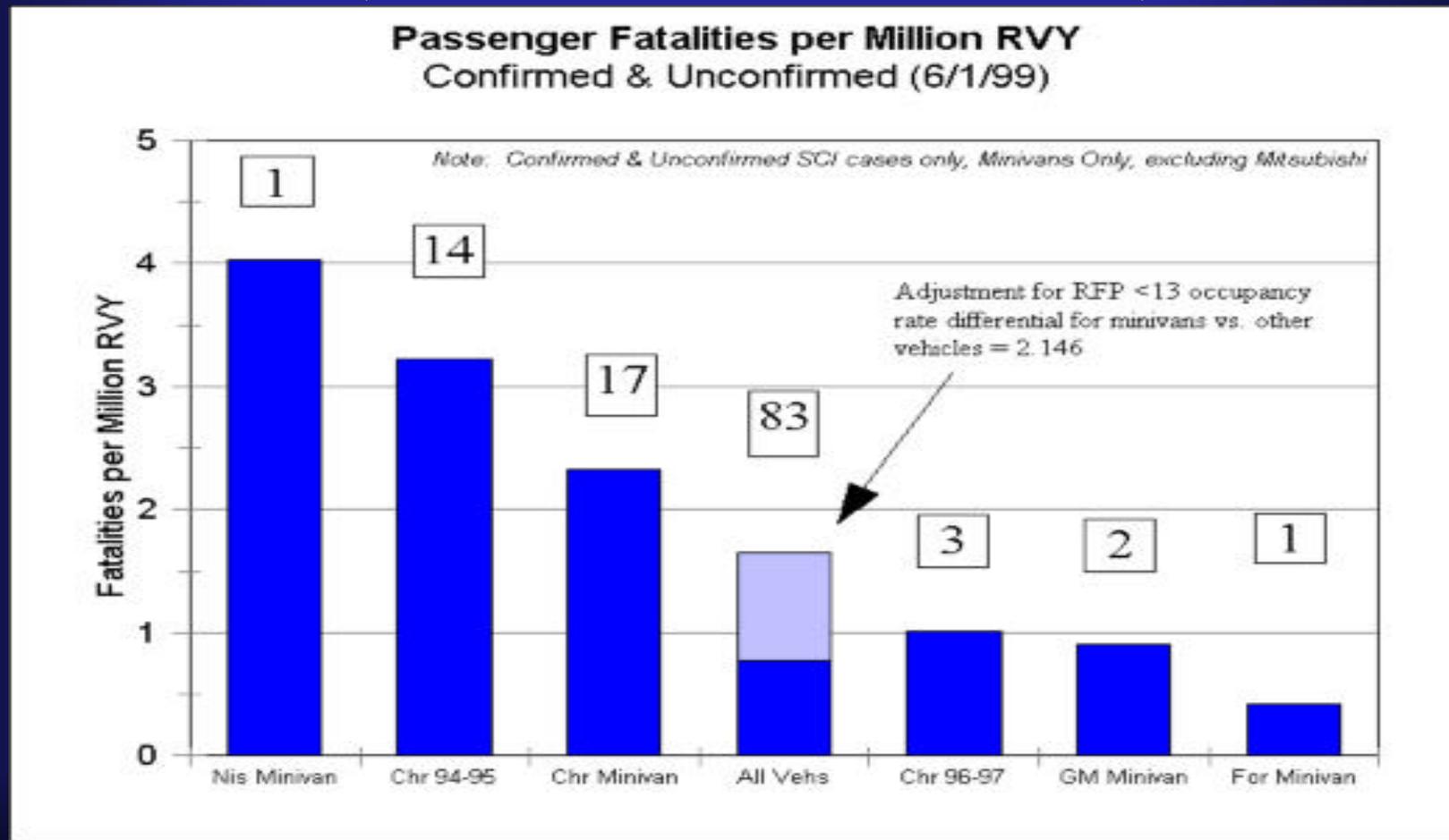


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SCI Minivan Data Evaluation On Fatalities Related to Passenger Air Bags, MIT removed



6/1/99 Combined (Confirmed and Unconfirmed)



Preliminary

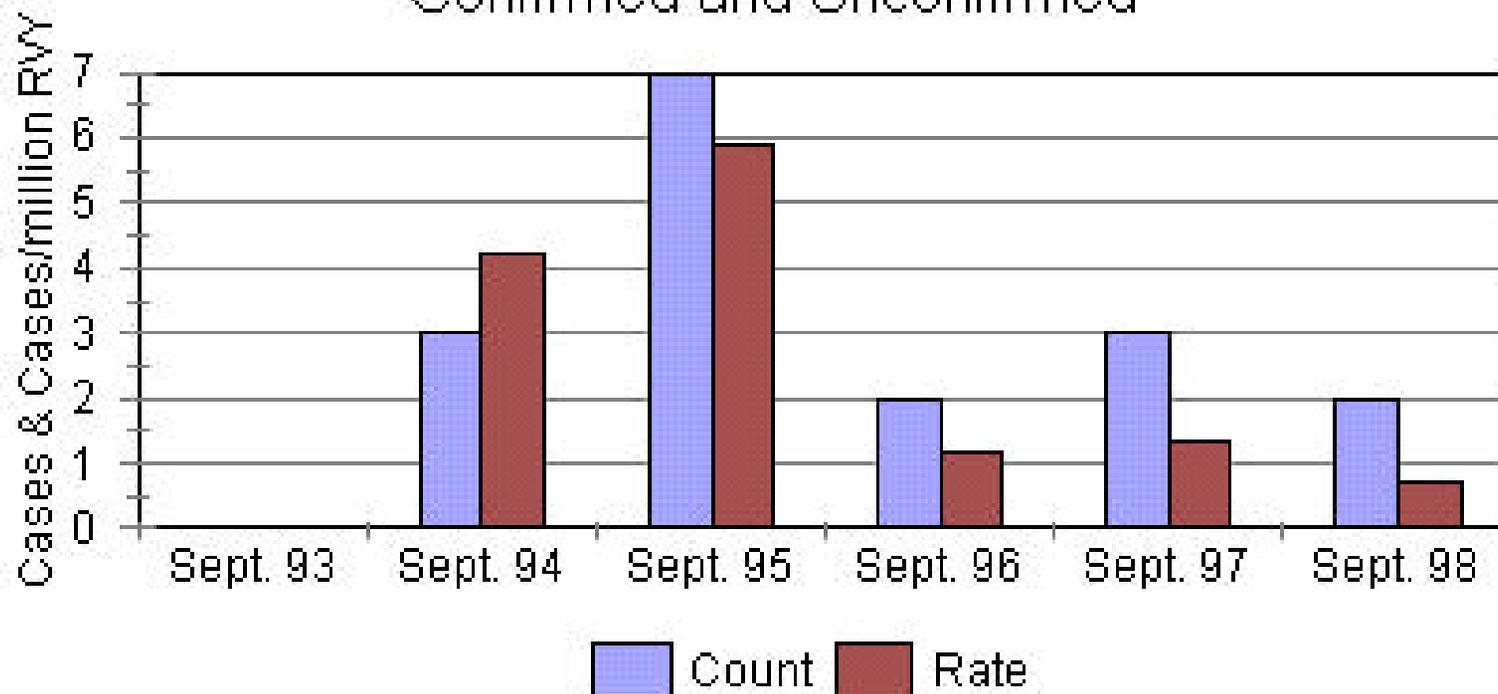
SCI Minivan Data Evaluation On Fatalities Related to Passenger Air Bags



6/1/99 Combined (Confirmed and Unconfirmed)

Chrysler Minivan Crash Dates

Confirmed and Unconfirmed



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Analysis of Minivan Crash Characteristics



- **FARS Data used to Determine Similarity of Minivans in Fatal Crashes**
- **State Data used to determine Age Distribution and Injury Rates**

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FARS Air Bag Effectiveness for Minivans



<u>Air Bag Equipped</u>	<u>Driver Fatalities</u>	<u>Passenger Fatalities</u>	<u>Driver Fatalities</u>	<u>Passenger Fatalities</u>
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Chrysler Minivans

None	151	194		
Driver AB	44	53	44	53
Dual AB			50	37
Estimated Effectiveness	Driver Air Bags -7%		Passenger Air Bags 39%	

Non-Chrysler Minivan

None	30	45		
Driver AB	12	19	12	19
Dual AB			7	10
Estimated Effectiveness	Driver Air Bags 5%		Passenger Air Bags 10%	

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Findings



- None of the Effectiveness estimates is statistically significant, due to small sample sizes
- From this quick check analysis, it appears that the Chrysler passenger air bag is effective in reducing fatalities (in potentially fatal crashes)

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Minivan Passenger Occupant Age Distribution



	Passenger Air Bag		No Passenger Air Bag	
	<u>0-12 years old</u>	<u>13+ years old</u>	<u>0-12 years old</u>	<u>13+ years old</u>

Model Year Prior to 1994

Chrysler			24.38%	75.62%
Non-Chrysler			23.93%	76.07%

Model Year 1994 and later

Chrysler	21.13%	78.87%		
Non-Chrysler	21.80%	78.20%	23.12%	76.88%

**Minivan Front-Right-Seat Occupancy Rates by Age Group -
Florida, Pennsylvania and Maryland, 1994-97**

Preliminary

Minivan Passenger Injury Rates, by Age



	Passenger Air Bag		No Passenger Air Bag	
	<u>0-12 years old</u>	<u>13+ years old</u>	<u>0-12 years old</u>	<u>13+ years old</u>
<u>Model Year Prior to 1994</u>				
Chrysler			26.96%	38.15%
Non-Chrysler			24.23%	36.37%
<u>Model Year 1994 and later</u>				
Chrysler	29.15%	35.67%		
Non-Chrysler	31.44%	35.05%	25.12%	32.81%

Front-Right Seat Passenger Injury Rates (K+A Injuries) by Age Group
Florida, Pennsylvania and Maryland, 1994-97

Preliminary

Findings



- **Based on the raw state data injury rates per involved occupant, children under 13 years old have lower A-injury rates than persons 13+ years old.**
- **As in the fatality data, children appear to derive little benefit from the presence of passenger air bags – the injury rate for children increased with the introduction of passenger air bags for both Chrysler and non-Chrysler minivans (although the increase for Chrysler was smaller).**

Preliminary