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Appendix A - Kinetic Energy Calculations

KE Calculations Data

KJ INFORMATION FOR KINETIC ENERGY CALCULATION

Incident Name	Model (struck vehicle)	Model Year (struck vehicle)	VIN (struck vehicle)	Make, Model, MY of Bullet Vehicle	Bullet Vehicle VIN	Number of Occupants Bullet Vehicle	Bullet Vehicle Impact Speed	Target Vehicle Impact Speed	Relative Impact Velocity	Closing Speed LOW	Closing Speed HIGH	Bullet Curb Weight	Kinetic Energy LOW	Kinetic Energy HIGH	Kinetic Energy MID	Range	
													30	4000	120,303		FMVSS 301 (30 mph)
													50	3015	251,885		FMVSS 301 (50 mph)
[redacted]	KJ	2006	1J4GL48K16 [redacted]	2006 Freightliner tractor/trailer	1FUJBBCK86 [redacted]	1	65-75 mph	0-10 mph	In excess of 55 mph	55	75	29000	2,931,553	5,451,235	4,191,394	1,259,841	11/3/06, PA
[redacted]	KJ	2004	1J4GK48K04 [redacted]	1996 Ford F-150 pickup	2FTEF15Y0T [redacted]	1	In excess of 50 mph	0 mph	In excess of 50 mph	50	50	4050	338,853	338,853	338,843	0	10/31/06, LA
[redacted]	KJ	2004	1J4GL48K54 [redacted]	1997 Plymouth Neon	Not noted [redacted]	1	35-40 mph	0 mph	35-40 mph	35	40	2385	97,633	127,521	112,577	14,944	9/30/05, NY
[redacted]	KJ	2004	1J4GL48K14 [redacted]	2003 Kenworth tractor/trailer	1XKADU9X3 [redacted]	1	55-63 mph	15 mph	45-50 mph	40	48	29000	1,550,573	2,232,826	1,891,700	341,126	4/4/09, CO
[redacted]	KJ	2006	1J4GL58K66 [redacted]	1996 Honda Civic	1HGEJ6224T [redacted]	1	In excess of 35 mph	0 mph	Likely 35 mph or greater	35	35	2257	92,394	92,394	92,394	0	11/11/06, GA
[redacted]	KJ	2005	1J4GL48K65 [redacted]	2003 Ford Expedition	1FMPU18L03 [redacted]	1	30-35 mph	0-10 mph	Two impacts, per PAR 1. Expedition	20	35	5674	75,844	232,274	154,059	78,215	3/30/10, VA
[redacted]	KJ	2004	1J4GK48K84 [redacted]	1997 Nissan Altima	1N4BU31D2V [redacted]	1	In excess of 60 mph	5 mph	In excess of 50 mph	50	55	2893	241,692	292,448	267,070	25,378	5/6/07, CA
[redacted]	KJ	2003	1J4GL38K63 [redacted]	1995 Nissan passenger car	1N4AB41D8S [redacted]	1	65 mph	50 mph	Approx. 15 mph or greater	15	15	2310	17,369	17,369	17,369	0	7/11/05, FL
[redacted]	KJ	2007	1J4GL48K [redacted]	2006 Ford Explorer	1FMEU73 [redacted]	5	60 mph	0	60 mph	60	60	4620	555,800	555,800	555,800	0	FARS # 420704

WJ INFORMATION FOR KINETIC ENERGY CALCULATION

Incident Name	Model (struck vehicle)	Model Year (struck vehicle)	VIN (struck vehicle)	Make, Model, MY of Bullet Vehicle	Bullet Vehicle VIN	Number of Occupants Bullet Vehicle	Bullet Vehicle Impact Speed	Target Vehicle Impact Speed	Relative Impact Velocity	Closing Speed	Bullet Curb Weight	Kinetic Energy	
										30	4000	120,303	FMVSS 301 (30 mph)
										50	3015	251,885	FMVSS 301 (50 mph)
2	WJ	2000	1J4G248S8Y	1997 Ford F-250 pickup	2FTHX25H	1	In excess of 50 mph	0 mph	In excess of 50 mph	50	5278	440,944	10/17/00, GA
4	WJ	2001	1J4GW48S3	2005 Ford Freestyle	1FMDK021	2	65 mph	0 mph	65 mph	65	3951	557,838	7/3/07, WI
5	WJ	2000	1J4G248S2Y	1992 Chevrolet flatbed wrecker	1G8G6W1	3 15,000 lbs approximate weight	In excess of 60 mph	0 mph	In excess of 60 mph	60	15000	1,804,547	4/28/06, TX
6	WJ	1999	1J4GW58S2	1997 Dodge Dakota pickup	1B7GL23Y	1	Unknown	Unknown	Unknown	65.8	3767	545,032	3/6/12, GA
7	WJ	2004	1J4GX48S94	2000 Orion bus	1VH2B1E2	20,000 lbs approximate vehicle weight	60-65 mph	0-5 mph	In excess of 50 mph	50	20000	1,670,877	7/10/09, TX
8	WJ	2004	1J4GW48SX	2003 Chrysler Sebring	1C3EL46X	1	50 mph or greater	0 mph	50 mph or greater	50	3388	283,046	10/1/09, TX
1	WJ	2004	1J4GW4858	2002 Ford F-150 pickup truck	1FTRW073	4	79 mph	0 mph	79 mph	79	4636	966,879	FARS Case # 62897
1	WJ	2000	1J4GW48S7	2000 Volvo tractor/trailer	4V4M22GF	1	65 mph	0 mph	65 mph	65	28000	3,953,294	FARS Case # 420293

ZJ INFORMATION FOR KINETIC ENERGY CALCULATION

Incident Name	Model (struck vehicle)	Model Year (struck vehicle)	VIN (struck vehicle)	Make, Model, MY of Bullet Vehicle	Bullet Vehicle VIN	Number of Occupants Bullet Vehicle	Bullet Vehicle Impact Speed	Target Vehicle Impact Speed	Relative Impact Velocity	Closing Speed LOW	Closing Speed HIGH	Bullet Curb Weight	Kinetic Energy LOW	Kinetic Energy HIGH	Kinetic Energy MID	Range	
													30	4000	120,303		FMVSS 301 (30 mph)
													50	3015	251,885		FMVSS 301 (50 mph)
[redacted]	ZJ	1993	1J4GZ78S1P[redacted]	1995 Ford F-150 pickup	1FTDF15Y0SN[redacted]	1	60-65 mph	0-5 mph	60-65 mph	60	65	4030	484,822	568,992	526,907	42,085	10/16/07, IL
	ZJ	1997	1J4GZ58S3V	1986 Toyota MR-2	Not noted	2	Approx. 60 mph	0 mph	Approx. 60 mph	60	60	2310	277,900	277,900	277,900	0	9/1/99, NY
	ZJ	1993	1J4GZ58S4P	2000 Hyundai Accent	KMH6045044	1	In excess of 50 mph	0 mph	In excess of 50 mph	50	50	2097	175,191	175,191	175,191	0	11/29/00, GA
	ZJ	1995	1J4GZ58Y0S	Toyota pickup truck (model and MY unknown)	unkn	unknown	In excess of 40-45 mph	0 mph	In excess of 40-45 mph	40	45	2565	137,146	173,575	155,360	18,215	10/14/96, PA
	ZJ	1997	1J4FX58SXV	2002 Mercury Mountaineer	4M2ZU66E22	1	Approx. 65 mph	0 mph	Approx. 65 mph	60	65	4374	526,206	617,561	571,883	45,678	11/16/11, FL
	ZJ	1997	1J4GZ58S3V	1994 Toyota full-size pickup	4TAYN1303R	2	50-70 mph	0 mph	In excess of 50 mph; as high as 70 mph	50	70	4050	338,353	663,171	500,762	162,409	12/27/00, FL
	ZJ	1996	1J4GZ78SXT	1993 Cadillac Deville	1G6KS5253R8	1	55 mph	20 mph	In excess of 35-40 mph	35	40	3598	147,289	192,378	169,834	22,544	8/3/00, MD
	ZJ	1993	1J4GZ78YXP	1997 Ford Taurus	1FALP52U0VA	1	55-60 mph	5-10 mph	Approx. 50 mph	50	50	3293	275,110	275,110	275,110	0	8/30/02, CA
	ZJ	1996	1J4FX58S9T	1998 Ford Explorer	1FMYU22X7W	1	50-60 mph	0-10 mph	45-60 mph	45	60	3302	223,448	397,241	310,344	86,896	10/9/99, FL
	ZJ	1993	1J4GZ58S6P	2001 Chevrolet Lumina	2G1WL52J211	1	Approx. 65 mph	0 mph	65 mph	65	65	3330	470,160	470,160	470,160	0	2/12/06, TX
	ZJ	1996	1J4GZ58S9T	2004 Toyota Sienna minivan	5TDZA22C344	1	70 mph	0-10 mph	In excess of 60 mph	60	60	4356	524,040	524,040	524,040	0	2/24/07, NJ
	ZJ	1998	1J4FX58S9W	2005 Dodge Caravan	1D4GP25B75B	1	60 mph	5-10 mph	50-60 mph	50	60	3854	321,978	463,648	392,813	70,835	3/1/07, AL
	ZJ	1998	1J4FX48S7W	1991 Ford F-250 pickup	2FTEF25N8M	1	In excess of 55 mph	0 mph	In excess of 55 mph	55	55	4110	415,472	415,472	415,472	0	10/27/99, CA
	ZJ	1996	1J4FX58S3T	1998 Isuzu Rodeo	4SZCK58D6W	1	In excess of 50 mph	0 mph	In excess of 50 mph; as high as 67 mph	50	67	3920	327,492	588,044	457,768	130,276	7/12/99, FL
	ZJ	1994	1J4GZ58Y5R	1993 Mercedes Benz 500S	WDBGA51E5P	1	60 mph	0 mph	60 mph	60	60	4928	592,854	592,854	592,854	0	7/20/01, CA
	ZJ	1998	1J4GZ58S5W	2007 Peterbilt tractor/ trailer	1XP5DB9X07N	1	65 mph	0 mph	In excess of 55-60 mph	55	60	28000	2,830,465	3,368,487	3,099,476	269,011	10/5/12, VA
	ZJ	1995	1J4FX78S2S	1991 Lincoln Town Car	1LNCM81W0	1	45-55 mph	0 mph	45-55 mph	45	55	4026	272,441	406,980	339,711	67,269	10/6/01, FL
	ZJ	1994	1J4GZ58Y7R	2006 Big Dog motorcycle	Not noted	1	In excess of 50 mph	0 mph	In excess of 50 mph	50	50	700	58,481	58,481	58,481	0	8/9/06, CA
	ZJ	1993	1J4GZ58S2P	2006 Peterbilt Tractor/Trailer	KMHDN45D73	1	55 mph or greater	0 mph	55 mph or greater	55	55	29000	2,931,553	2,931,553	2,931,553	0	FARS Case # 360655
	ZJ	1995	1J4GZ58S2P	1996 Motor Coach Industries Bus	1M8SDMPA1T	At least 7	65 mph	0 mph	65 mph	65	65	20000	2,823,781	2,823,781	2,823,781	0	FARS Case # 60339
	ZJ	1995	Unk	1996 Ford U-Haul Truck	Unkn	1	70 mph	0 mph	70 mph	70	70	5000	818,730	818,730	818,730	0	FARS Case # 280793
	ZJ	1993	1J4GZ78Y8	1997 Mercury Marquis	2MELM74W	2	Vehicles travelling in opposite directions	Vehicles travelling in opposite directions	75 + mph (combined speeds of vehicles)	75	75	3788	345,965	345,965	345,965	0	FARS Case #560022
	ZJ	1998	1J4FX78S3W	2001 Volvo tractor-trailer	4V5SC8UF2[redacted]	1	48 mph	10 mph	38 mph	38	38	29000	1,399,393	1,399,393	1,399,393	0	FARS Case # 450360

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Appendix A - Kinetic Energy Calculations

Kinetic Energy Calculations

Impact Kinetic Energy Comparison

Contents

- Kinetic impact energy was calculated for several incidents using the following equation:

$$E = \frac{1}{2} m v_c^2$$

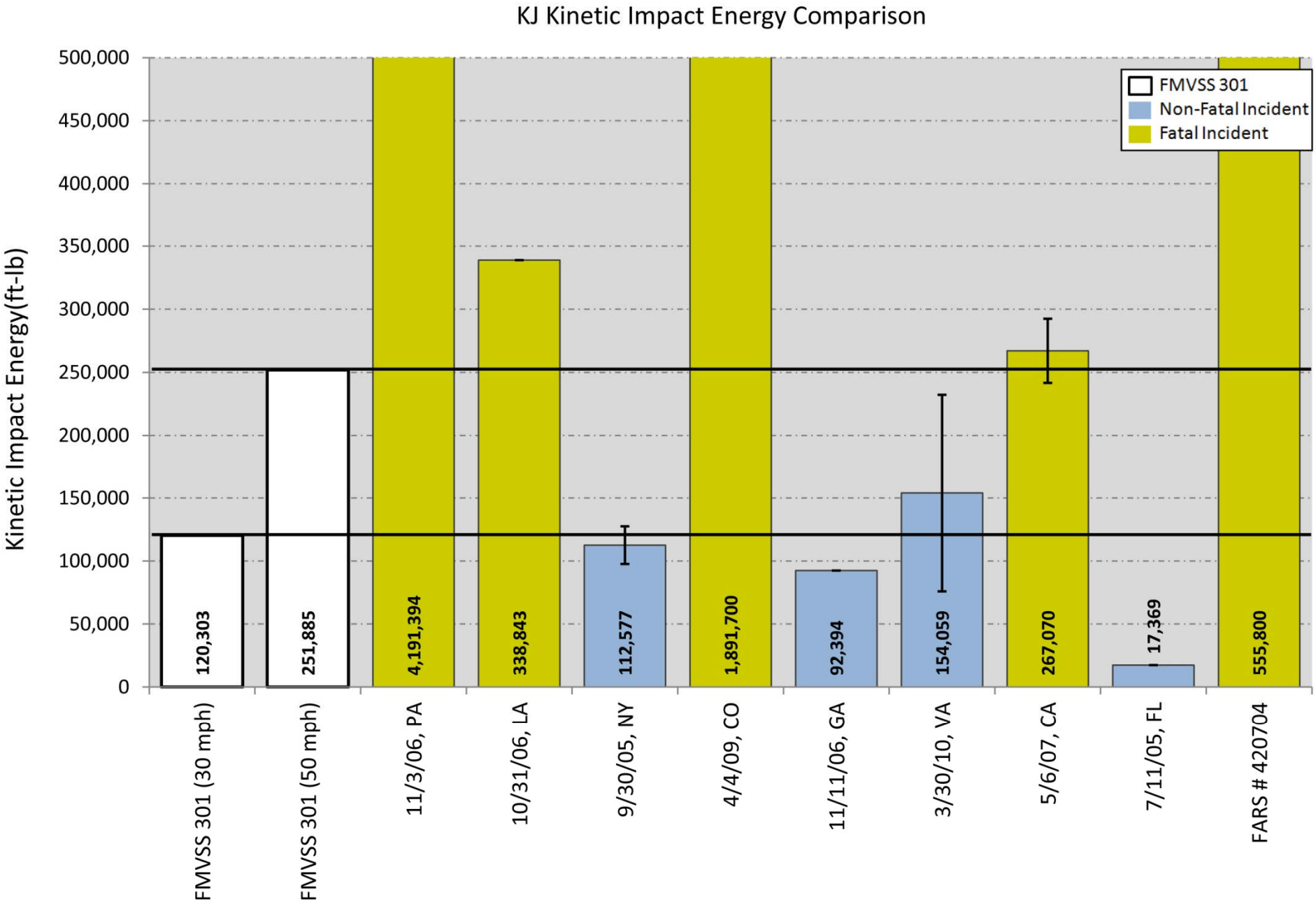
  In this equation, *m* is the mass of the bullet (impacting) vehicle and v_c is the relative closing speed of the of the bullet vehicle. If the subject vehicle was stopped when it is impacted at the rear by a vehicle traveling 60 mph, the relative closing speed was 60 mph. If the subject vehicle was traveling 10 mph when it is struck by a bullet vehicle traveling 70 mph, the relative closing speed was also 60 mph.

- The kinetic impact energy of the 30 mph and 50 mph FMVSS 301 rear impact tests were calculated for comparison.

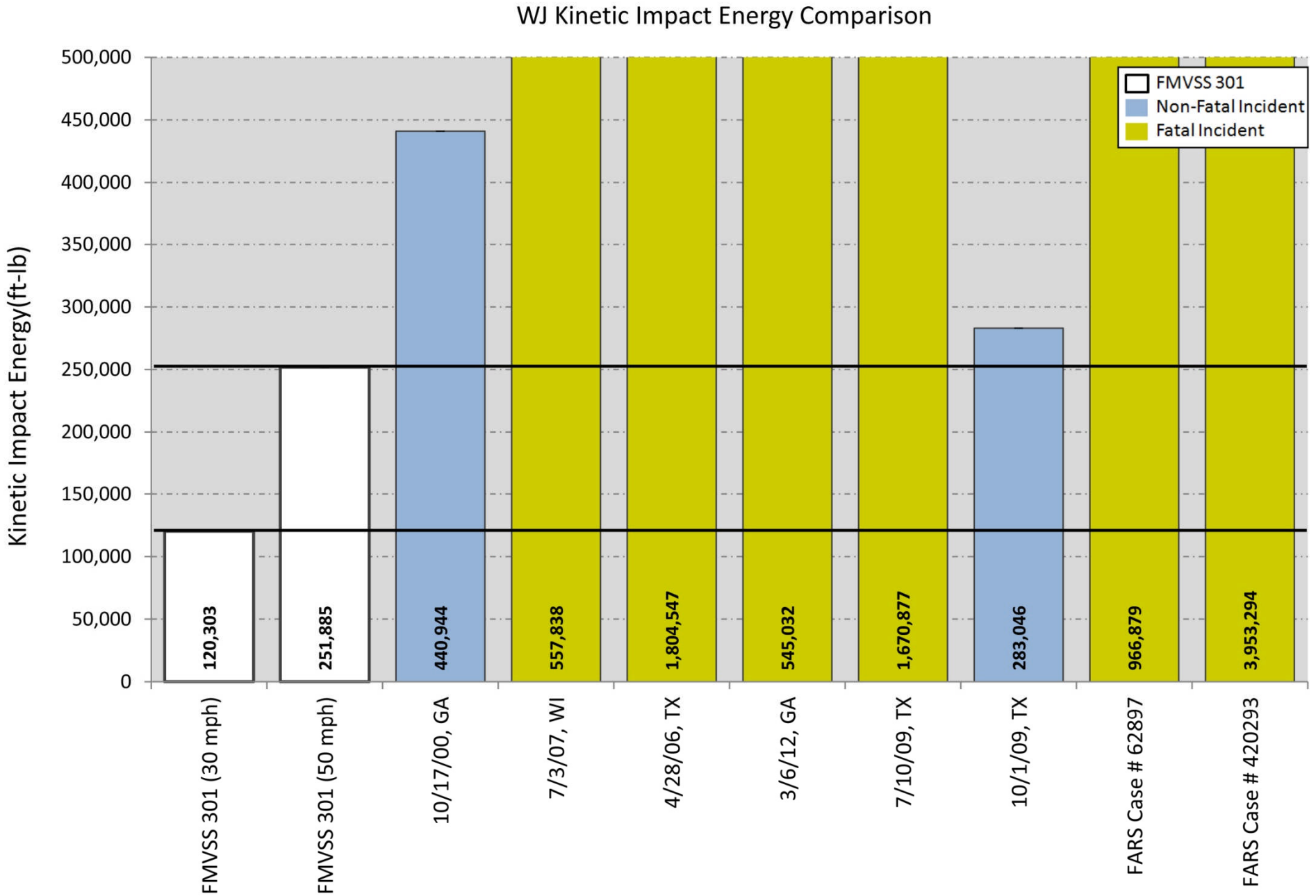
- When possible, incident vehicle identification number (VIN) was used to determine vehicle curb weight. The weight of cargo and occupants were not included in the energy calculations. When VIN data was unavailable, curb weight was obtained from online sources or from similar vehicles.

- When a range of impact speeds was given, a range of kinetic impact energies was calculated. In the charts, the columns represent the mid range kinetic impact energy. The range is depicted with error bars.

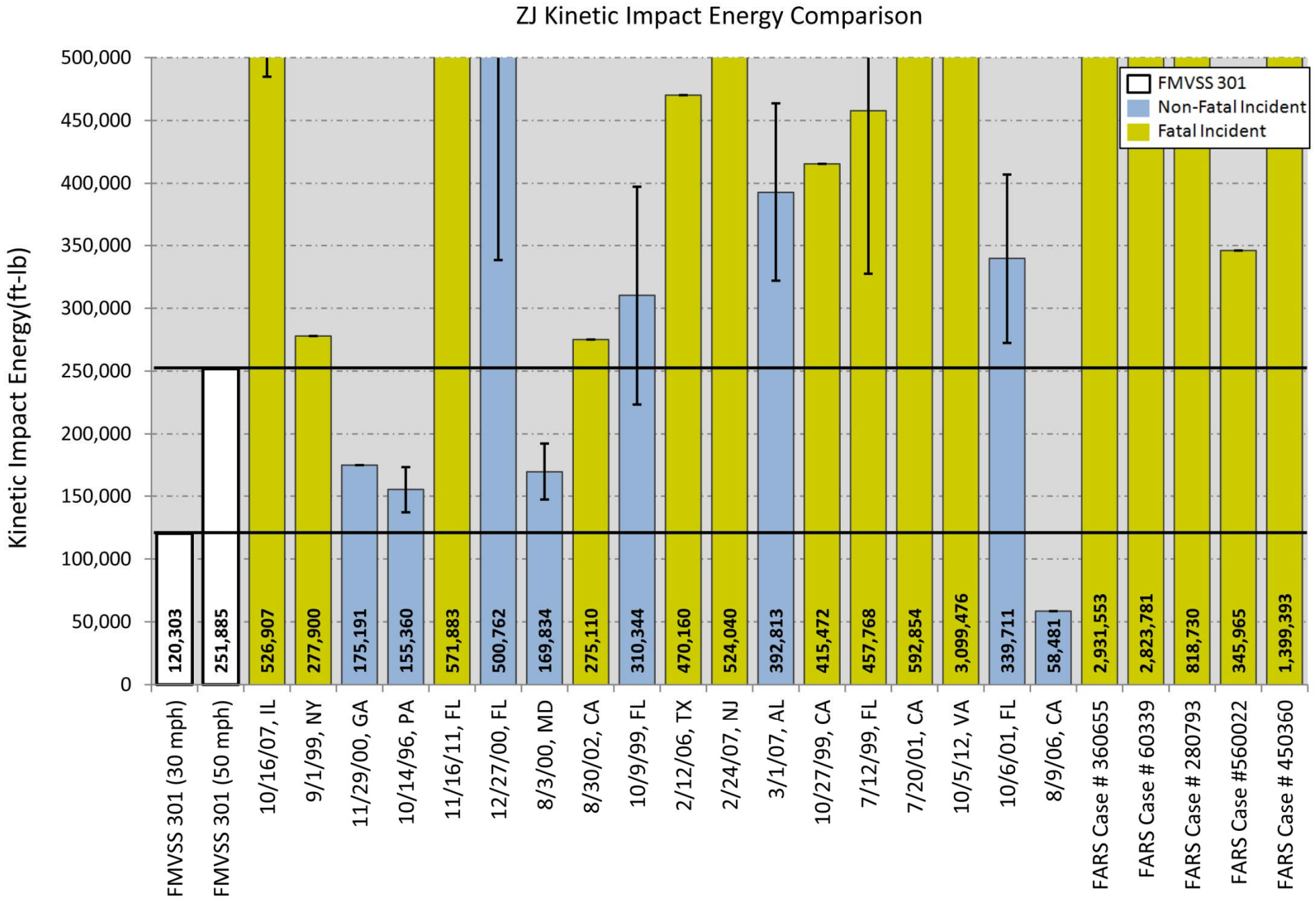
- Incidents with insufficient data to calculate kinetic impact energy were not included in the comparison. The specific number of incidents with insufficient data for each vehicle platform is displayed on each chart.



12 Incidents had insufficient data to calculate kinetic impact energy and were not included



5 Incidents had insufficient data to calculate kinetic impact energy and were not included



12 Incidents had insufficient data to calculate kinetic impact energy and were not included

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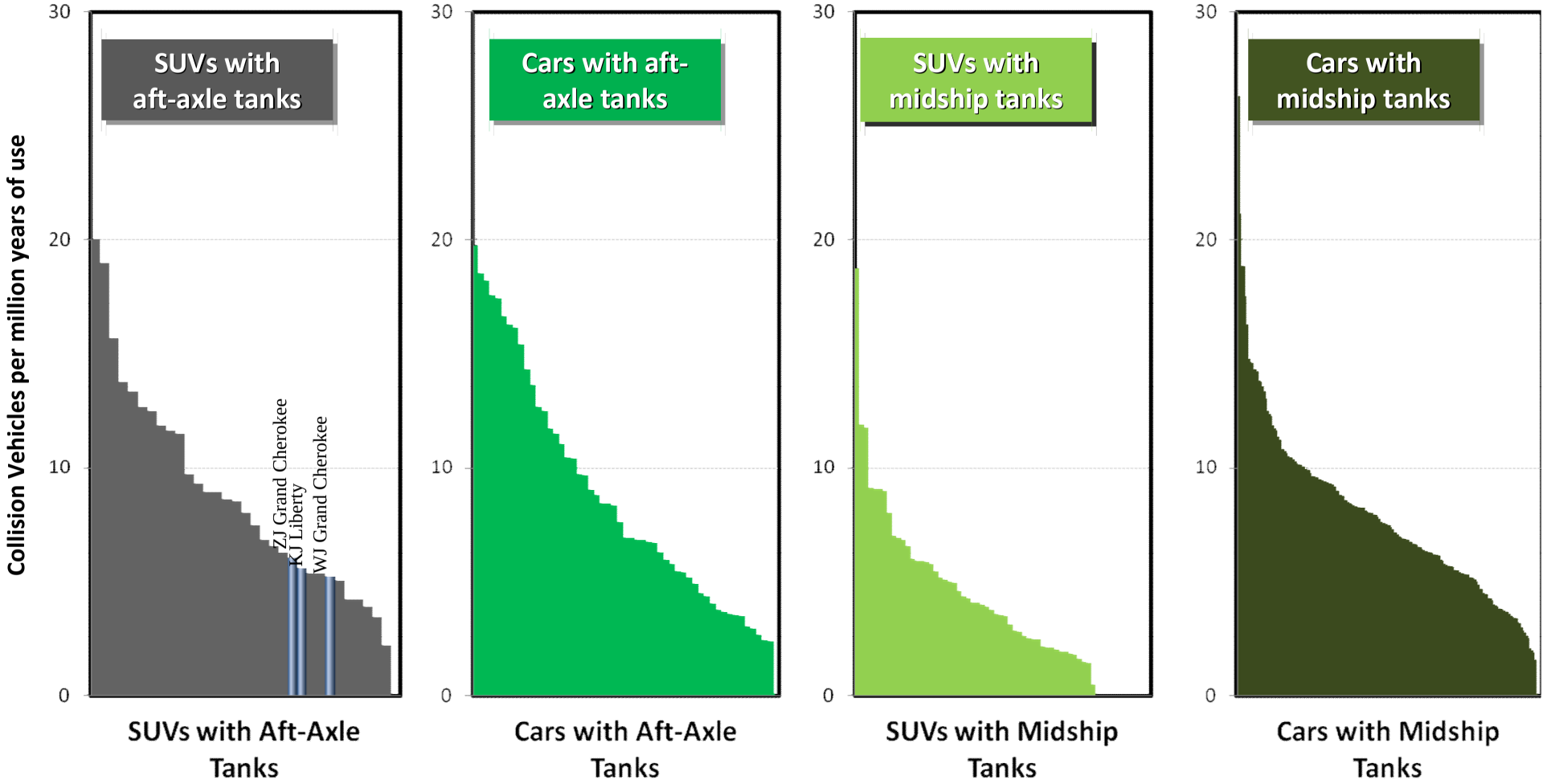
Appendix B

Collisions By Vehicle Groups and Tank Locations

Rates of Rear Fatal Collisions

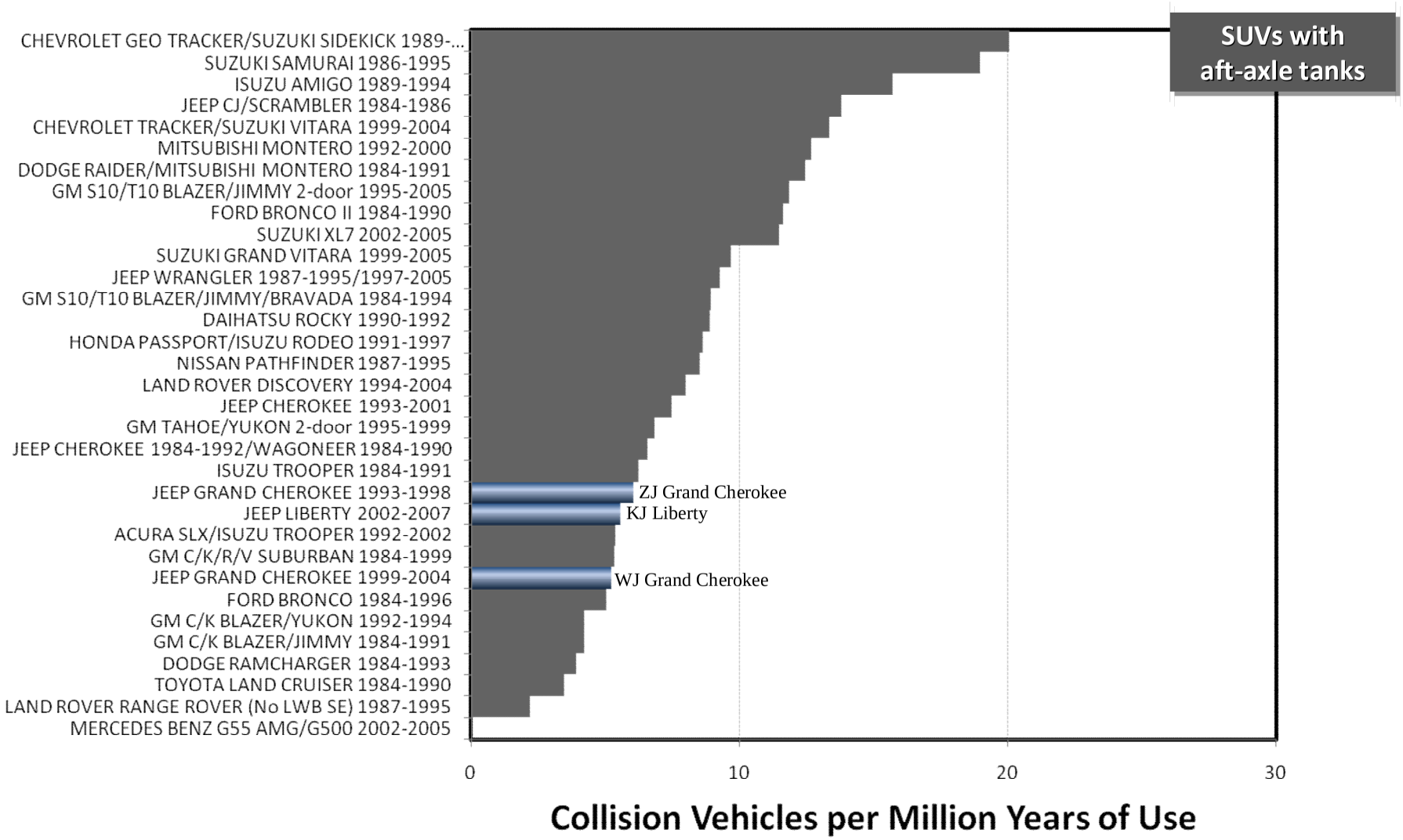
Vehicles involved in a rear collision with occupant fatality, per million years of use



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004, and KJ Liberty 2002-2007. Other vehicles are model years 1984-2005. FARS data 1984-2011. Registration data from RL Polk. Rear collision includes either initial or principal impact to clock points 5, 6, or 7. Includes collision vehicles with an occupant fatality.

Rates of Rear Fatal Collisions

Vehicles involved in a rear collision with occupant fatality, per million years of use



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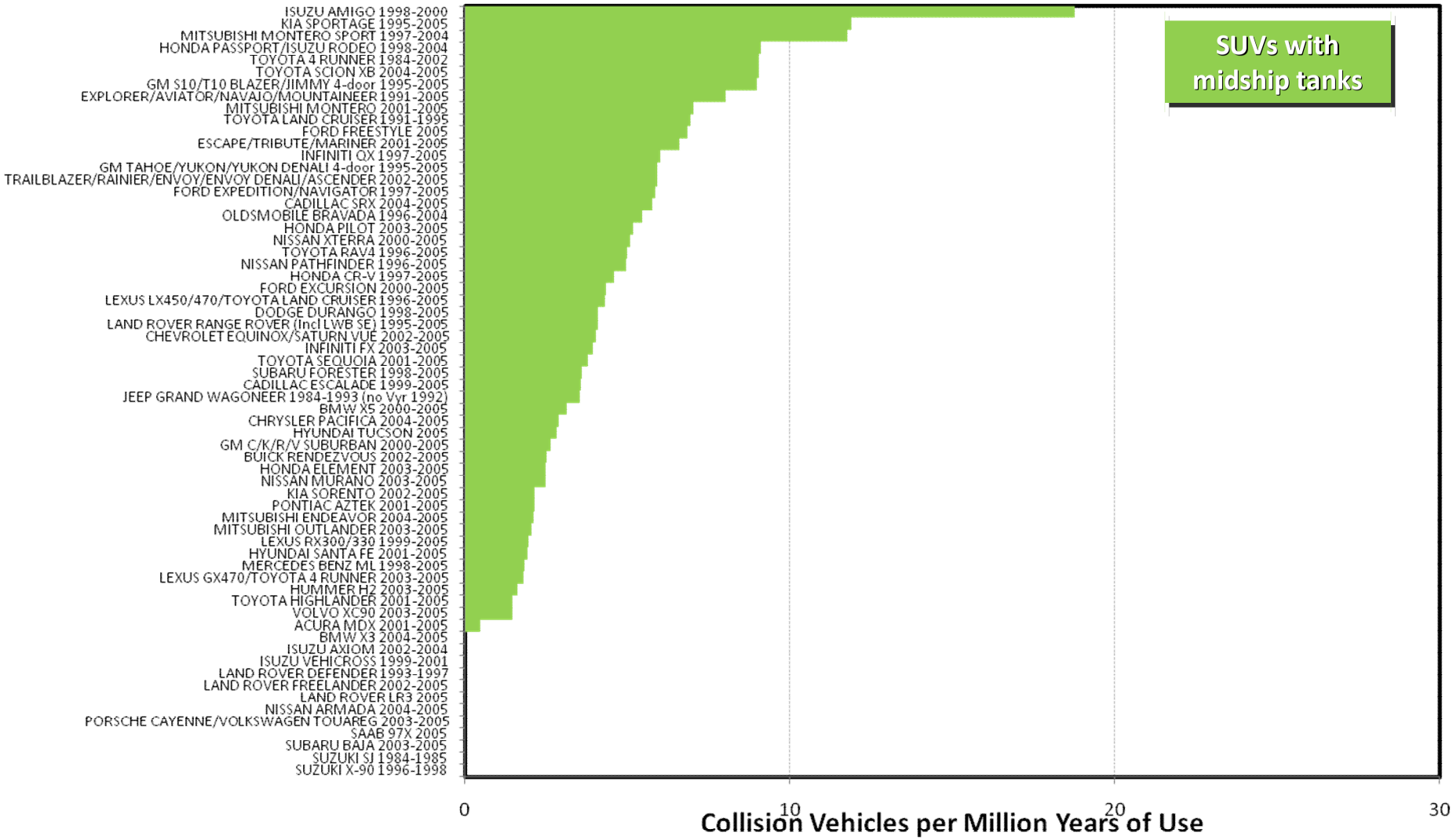
Rates of Rear Fatal Collisions

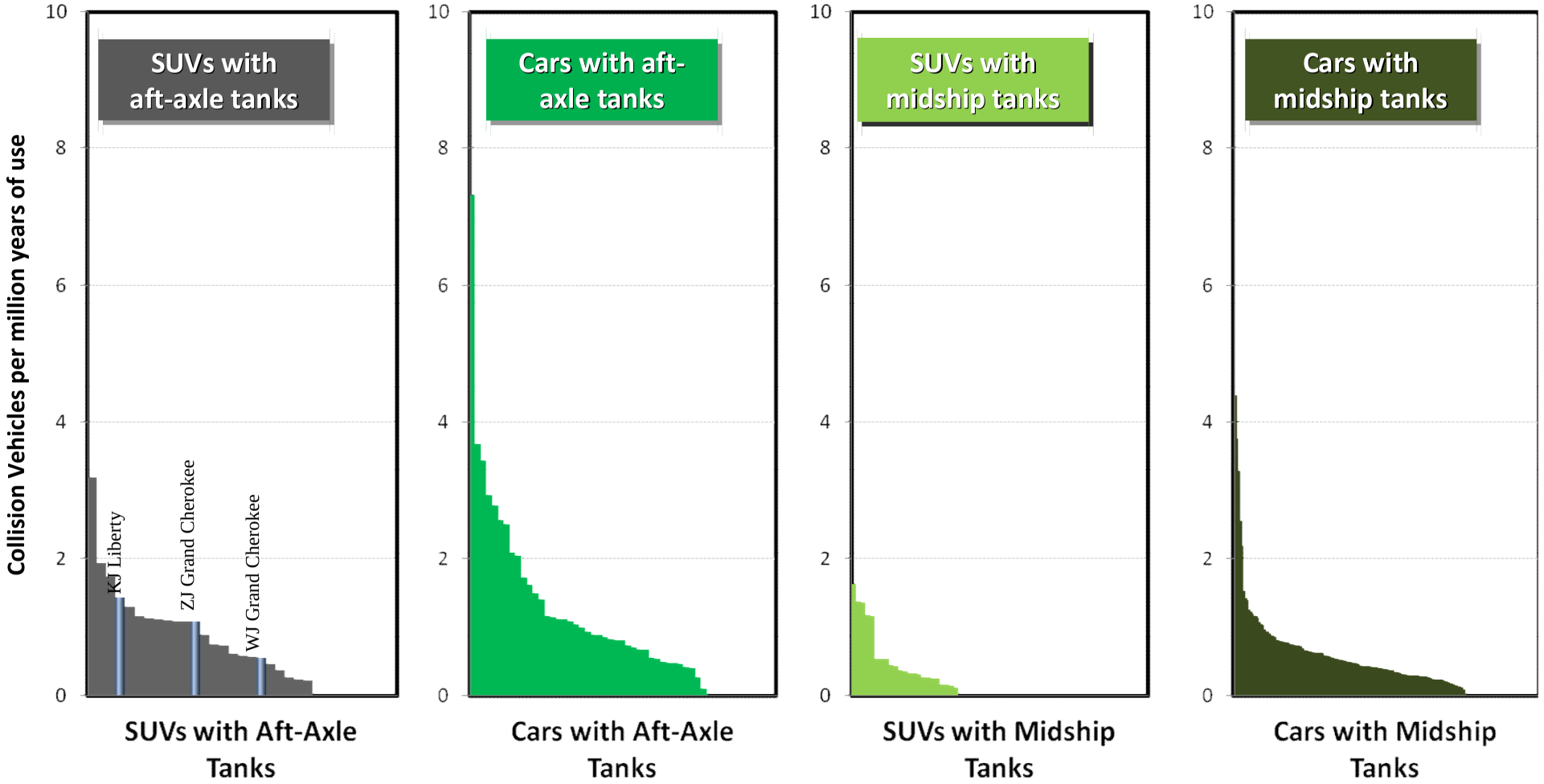
Vehicles involved in a rear collision with occupant fatality, per million years of use



Notes: Each bar represents a different model of vehicle. Vehicles are model years 1984-2005. FARS data 1984-2011. Registration data from RL Polk. Rear collision includes either initial or principal impact to clock points 5, 6, or 7. Includes collision vehicles with an occupant fatality.

Rates of Rear Fatal Collisions with Fire

Vehicles involved in a rear collision with occupant fatality and fire, per million years of use



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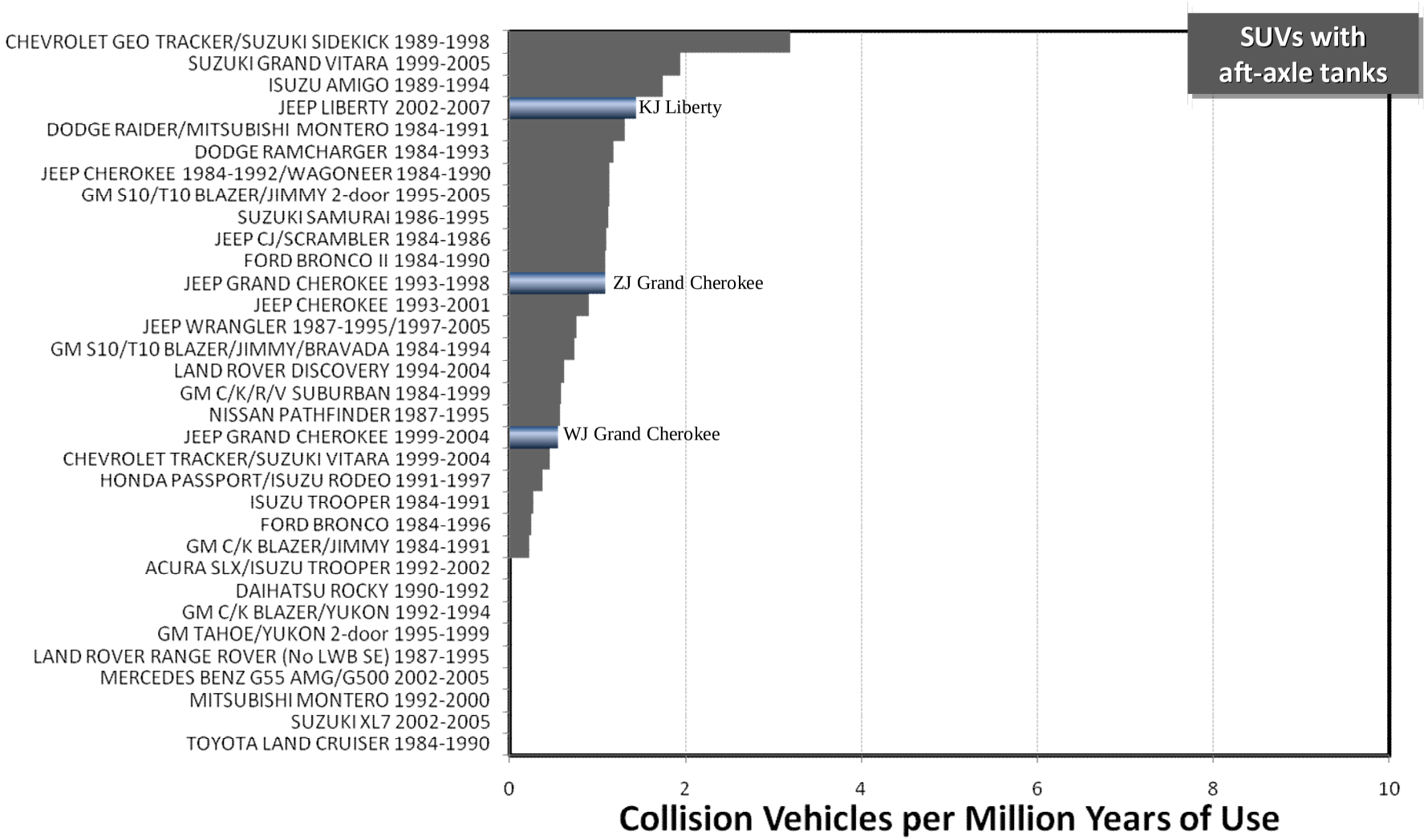
Rates of Rear Fatal Collisions with Fire

Vehicles involved in a rear collision with occupant fatality and fire, per million years of use



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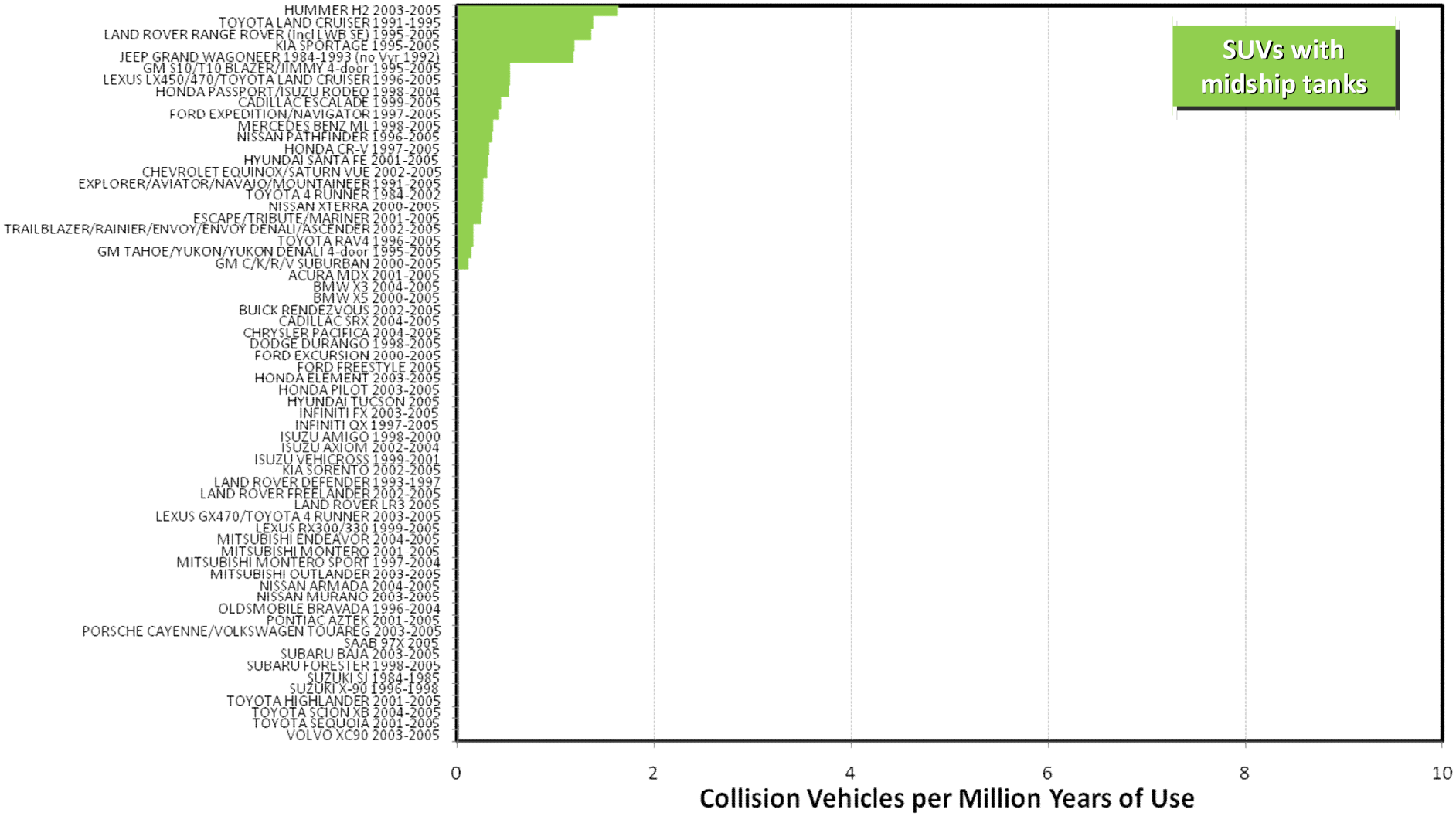
Rates of Rear Fatal Collisions with Fire

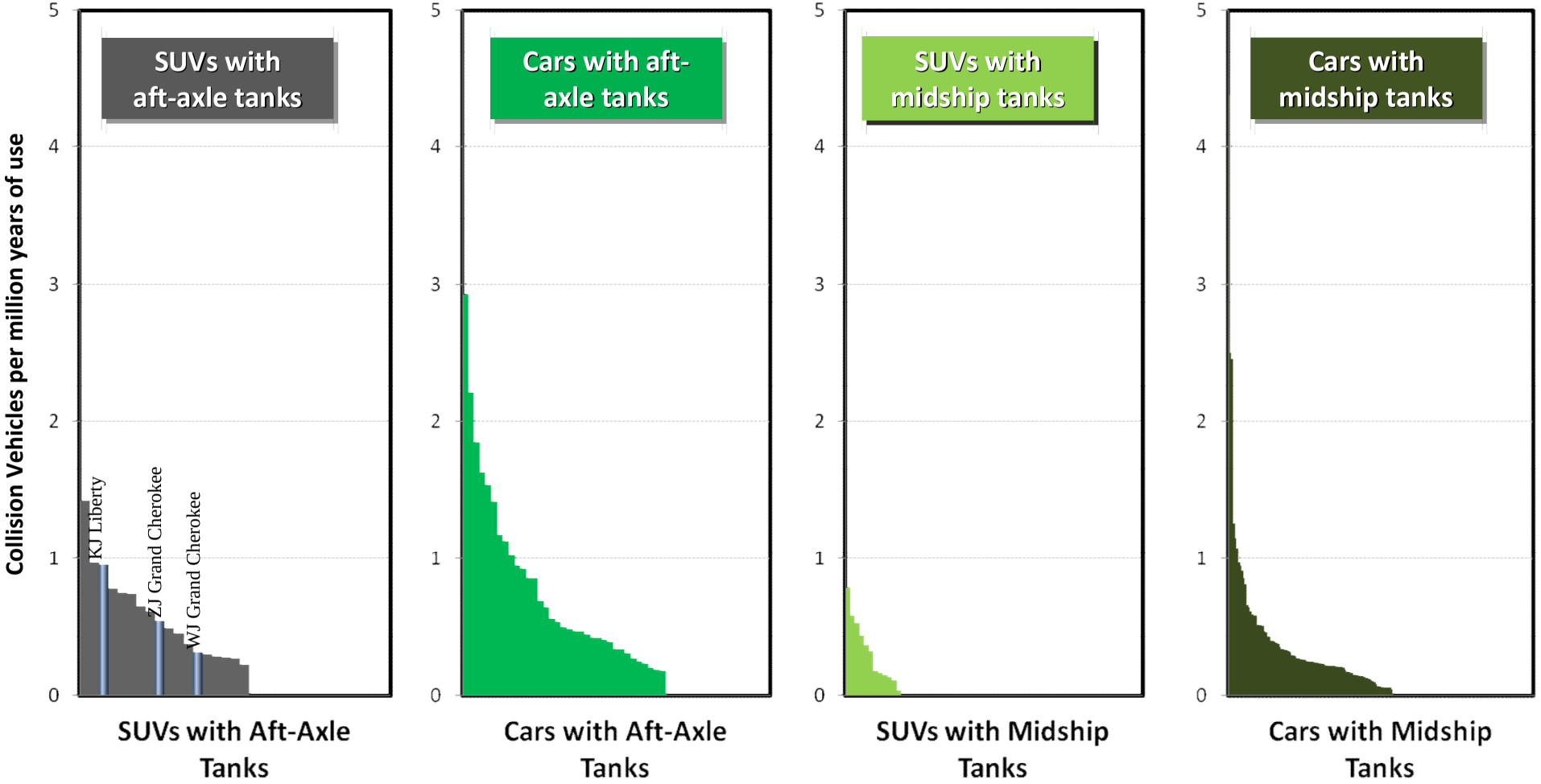
Vehicles involved in a rear collision with occupant fatality and fire, per million years of use



Notes: Each bar represents a different model of vehicle. Vehicles are model years 1984-2005. FARS data 1984-2011. Registration data from RL Polk. Rear collision includes either initial or principal impact to clock points 5, 6, or 7. Includes vehicles with an occupant fatality where the vehicle experienced a post-collision fire.

Rates of Rear Fatal Collisions with MHE Fire

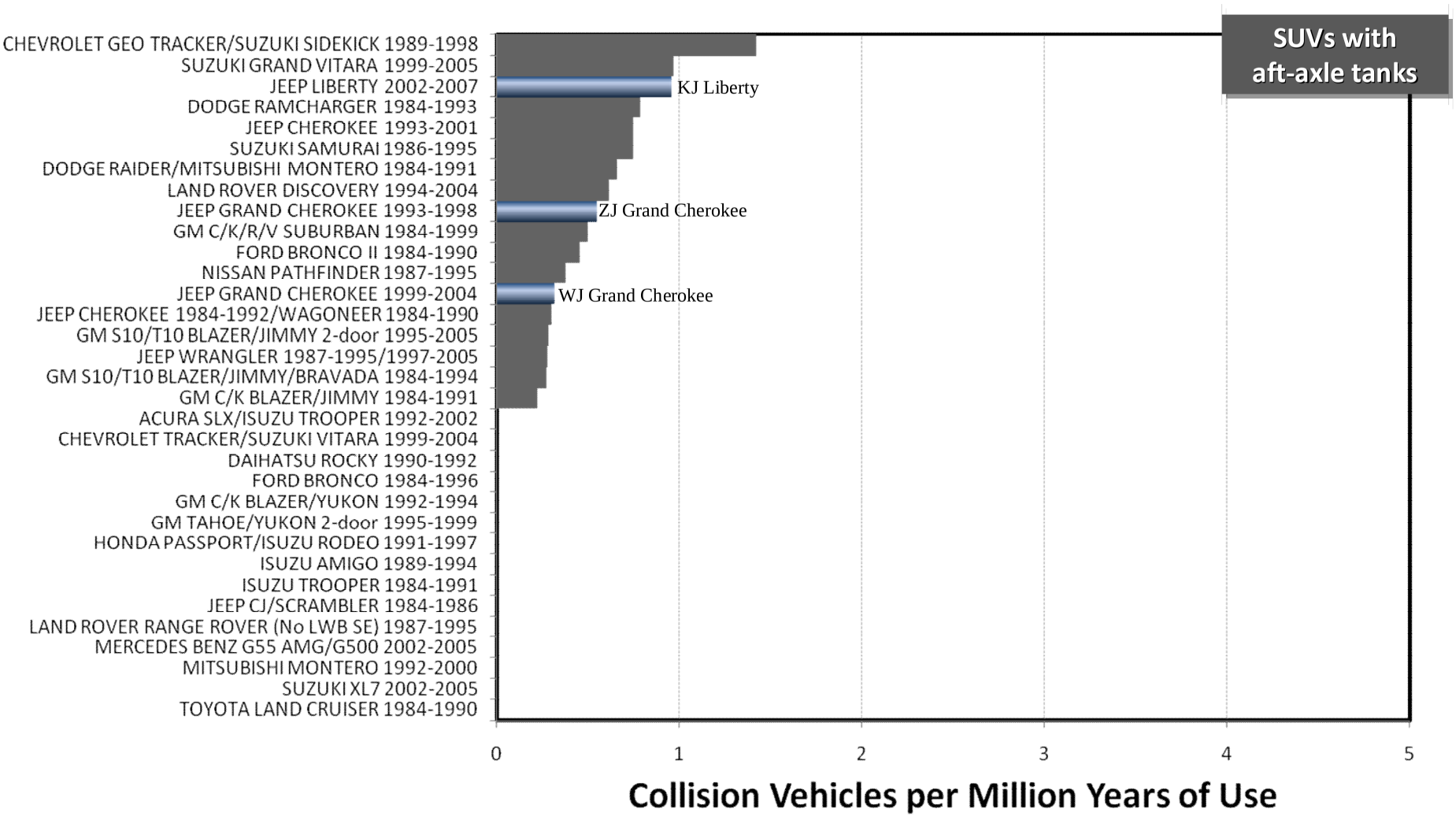
Vehicles involved in a rear collision with occupant fatality and most harmful event fire, per million years of use



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004, and KJ Liberty 2002-2007. Other vehicles are model years 1984-2005. FARS data 1984-2011. Registration data from RL Polk. Rear collision includes either initial or principal impact to clock points 5, 6, or 7. Includes vehicles with an occupant fatality where the vehicle experienced a post-collision fire as the most harmful event.

Rates of Rear Fatal Collisions with MHE Fire

Vehicles involved in a rear collision with occupant fatality and most harmful event fire, per million years of use



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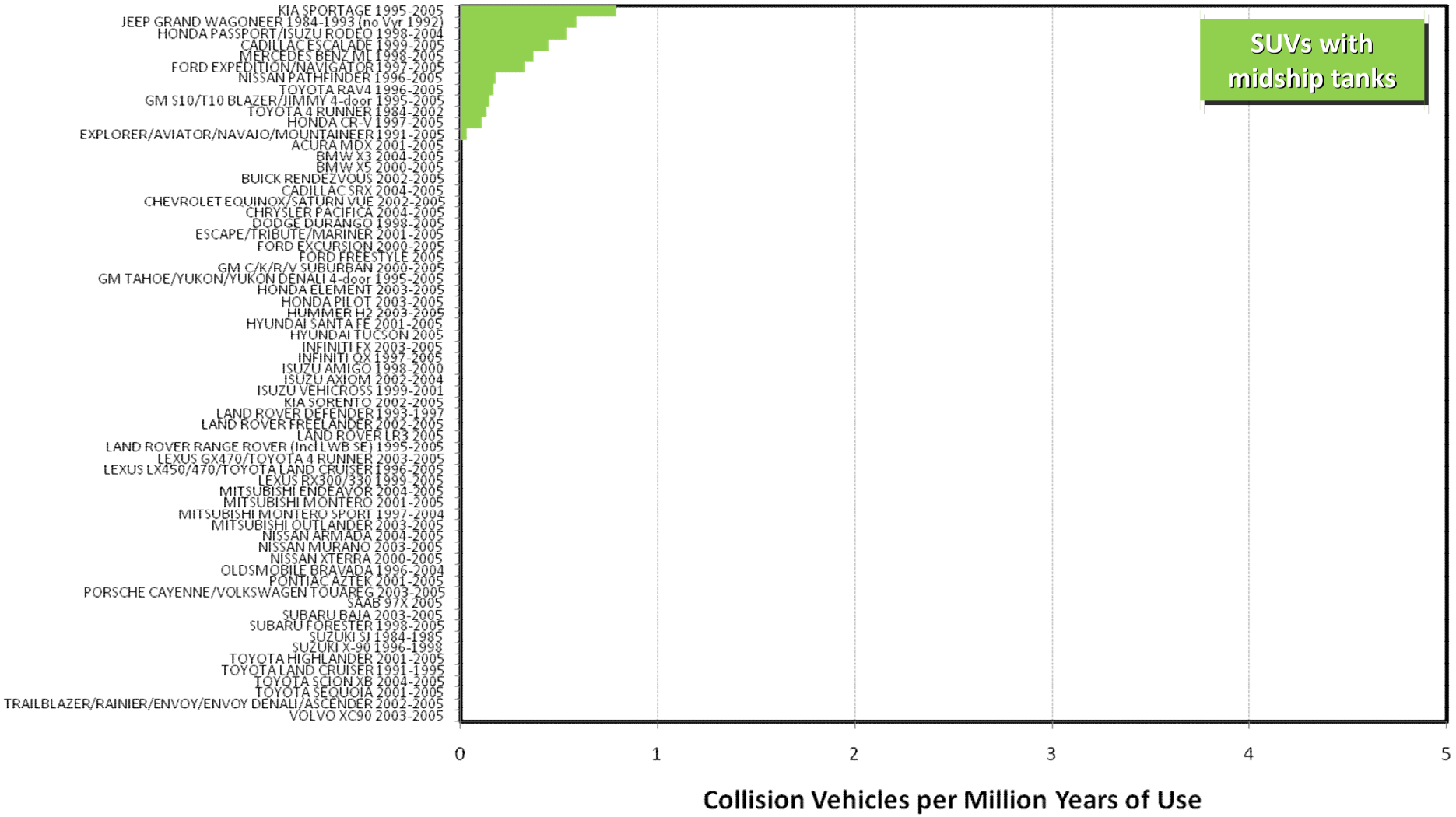
Rates of Rear Fatal Collisions with MHE Fire

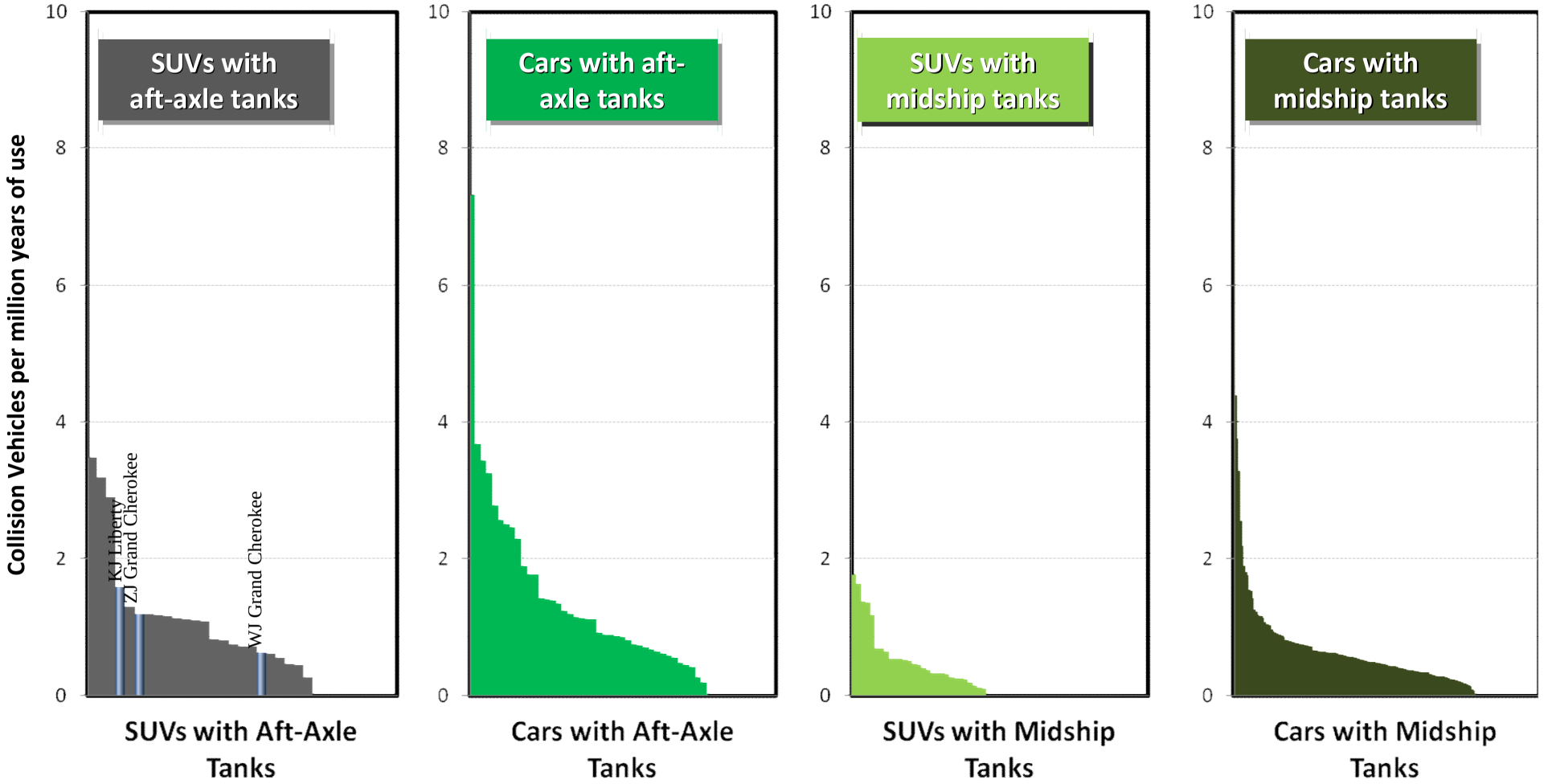
Vehicles involved in a rear collision with occupant fatality and most harmful event fire, per million years of use



Notes: Each bar represents a different model of vehicle. Vehicles are model years 1984-2005. FARS data 1984-2011. Registration data from RL Polk. Rear collision includes either initial or principal impact to clock points 5, 6, or 7. Includes vehicles with an occupant fatality where the vehicle experienced a post-collision fire as the most harmful event.

Rates of Rear Collisions with Fire

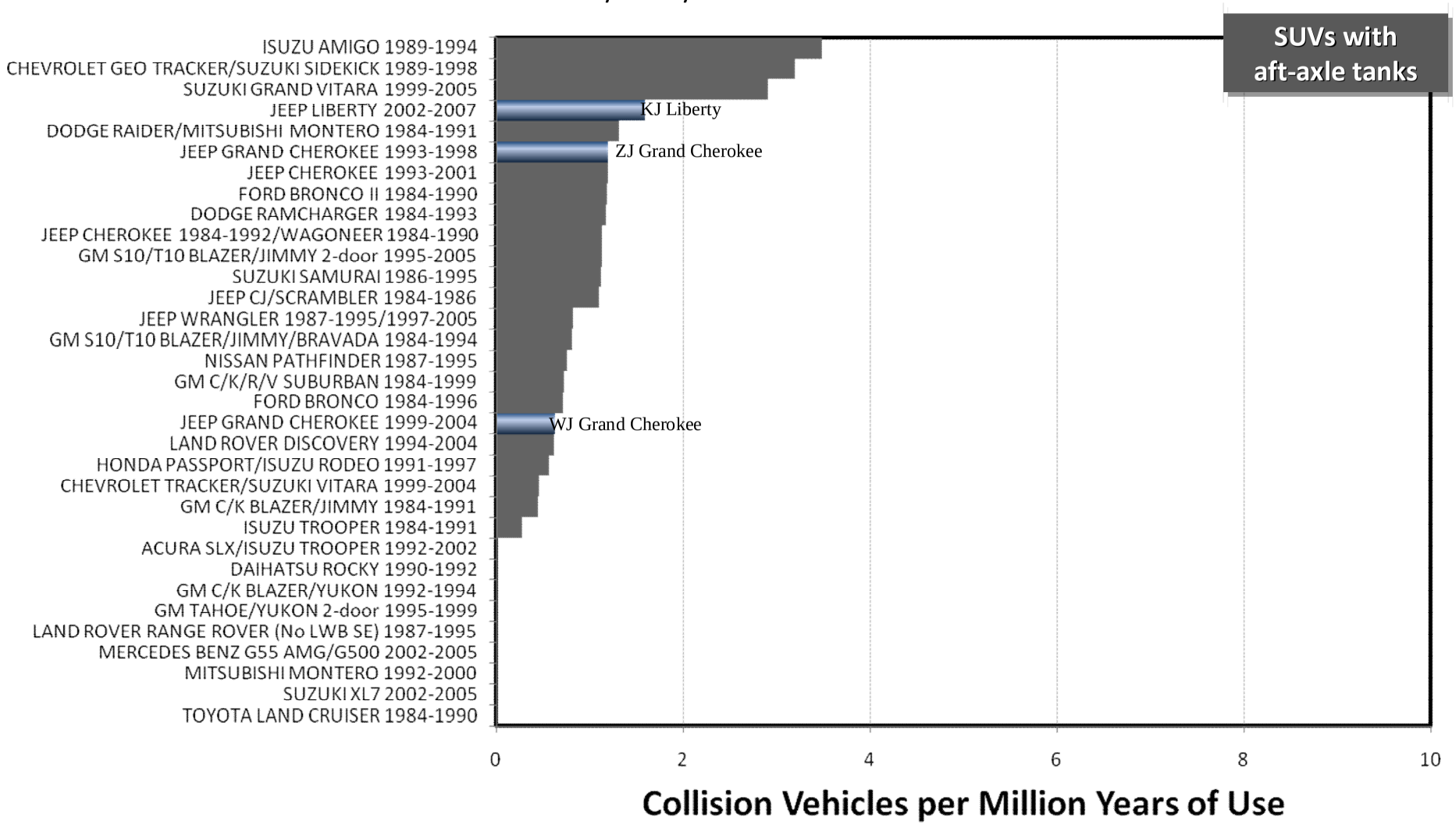
Vehicles involved in a rear collision with post-collision fire, per million years of use
Fatality in any vehicle in the crash



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004, and KJ Liberty 2002-2007. Other vehicles are model years 1984-2005. FARS data 1984-2011. Registration data from RL Polk. Rear collision includes either initial or principal impact to clock points 5, 6, or 7. Includes vehicles where the vehicle experienced a post-collision fire. Fatality in any vehicle in the crash.

Rates of Rear Collisions with Fire

Vehicles involved in a rear collision with post-collision fire, per million years of use
Fatality in any vehicle in the crash



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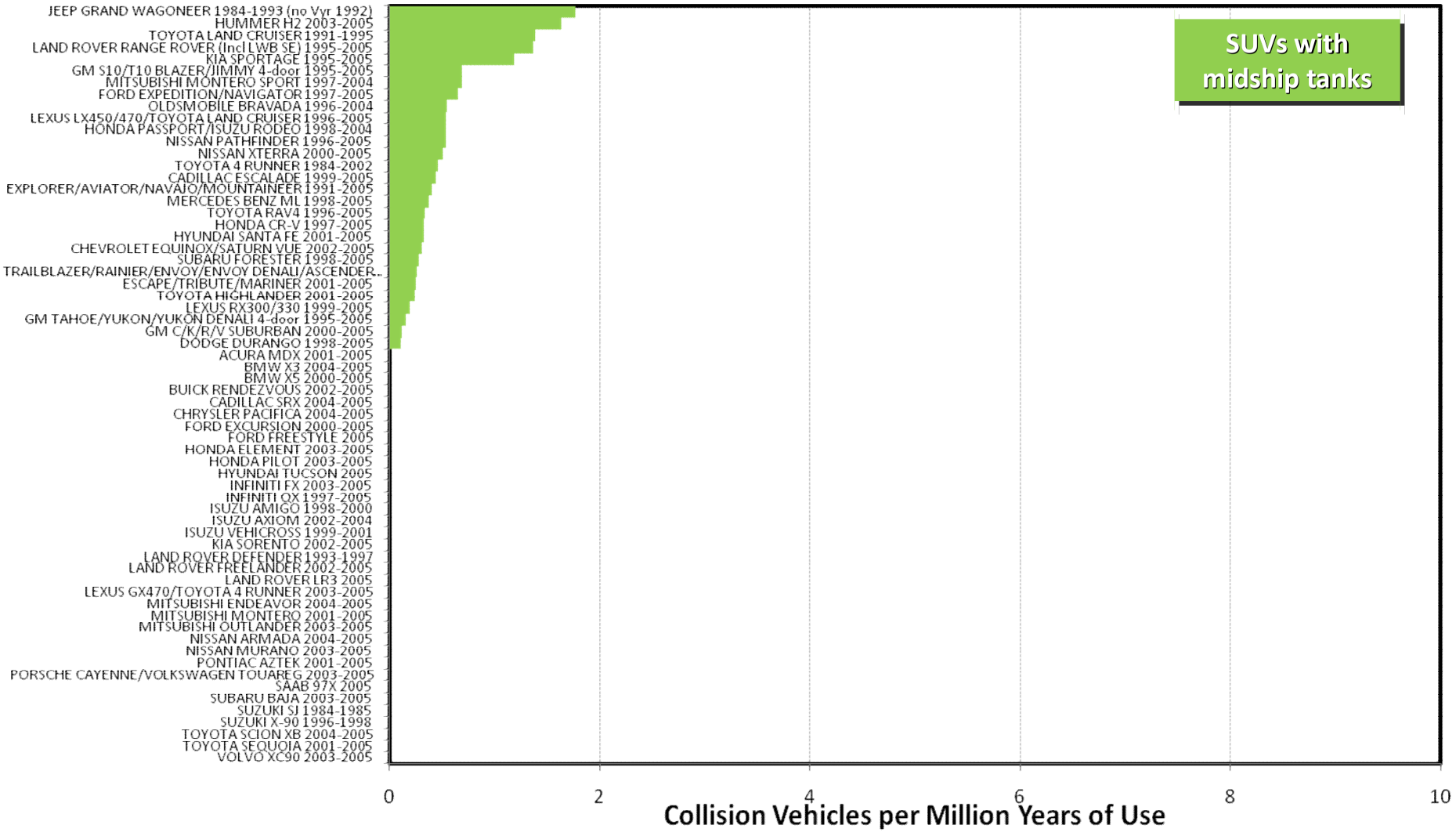
Rates of Rear Collisions with Fire

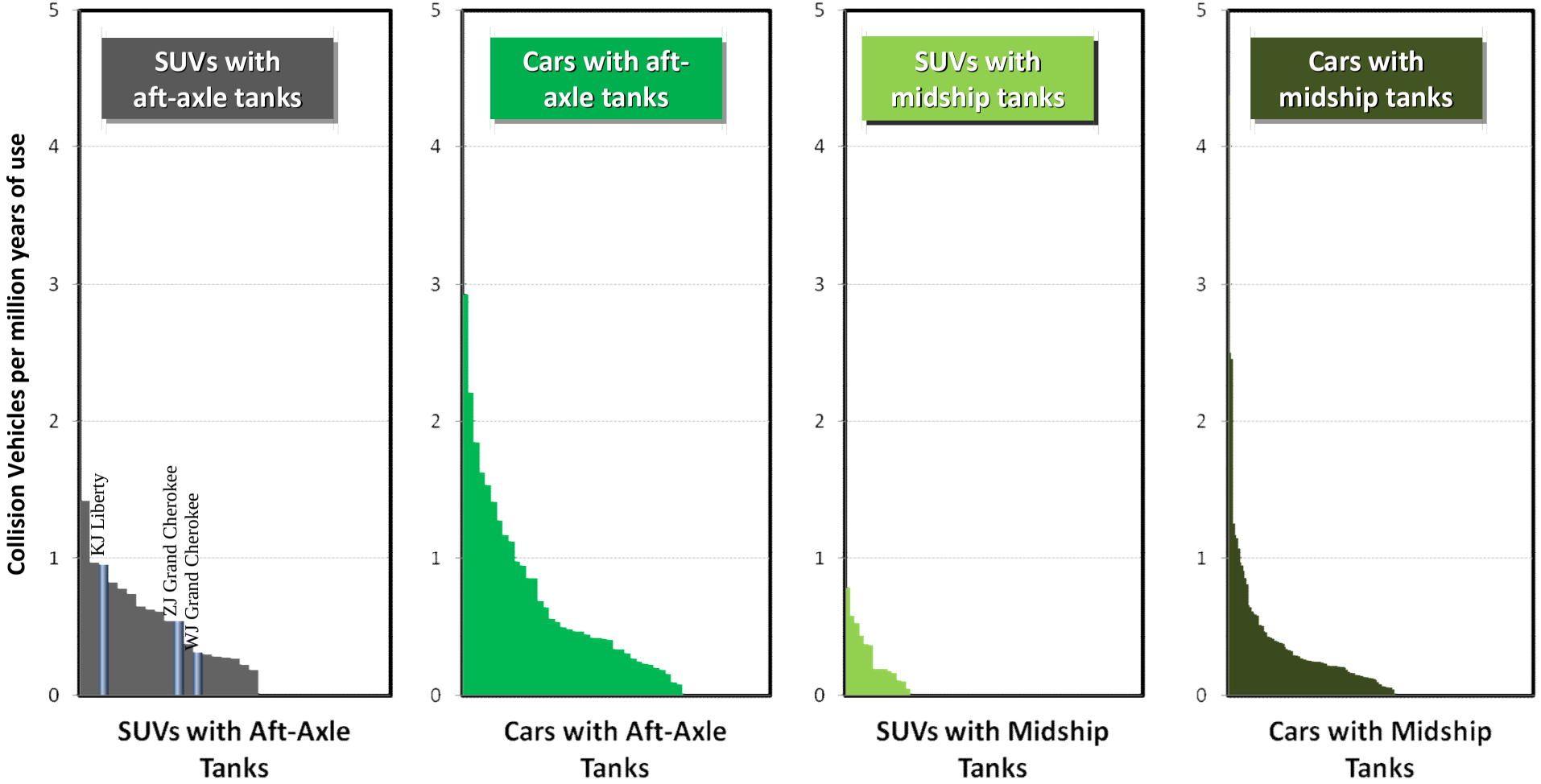
Vehicles involved in a rear collision with post-collision fire, per million years of use
Fatality in any vehicle in the crash



Notes: Each bar represents a different model of vehicle. Vehicles are model years 1984-2005. FARS data 1984-2011. Registration data from RL Polk. Rear collision includes either initial or principal impact to clock points 5, 6, or 7. Includes vehicles where the vehicle experienced a post-collision fire. Fatality in any vehicle in the crash.

Rates of Rear Collisions with MHE Fire

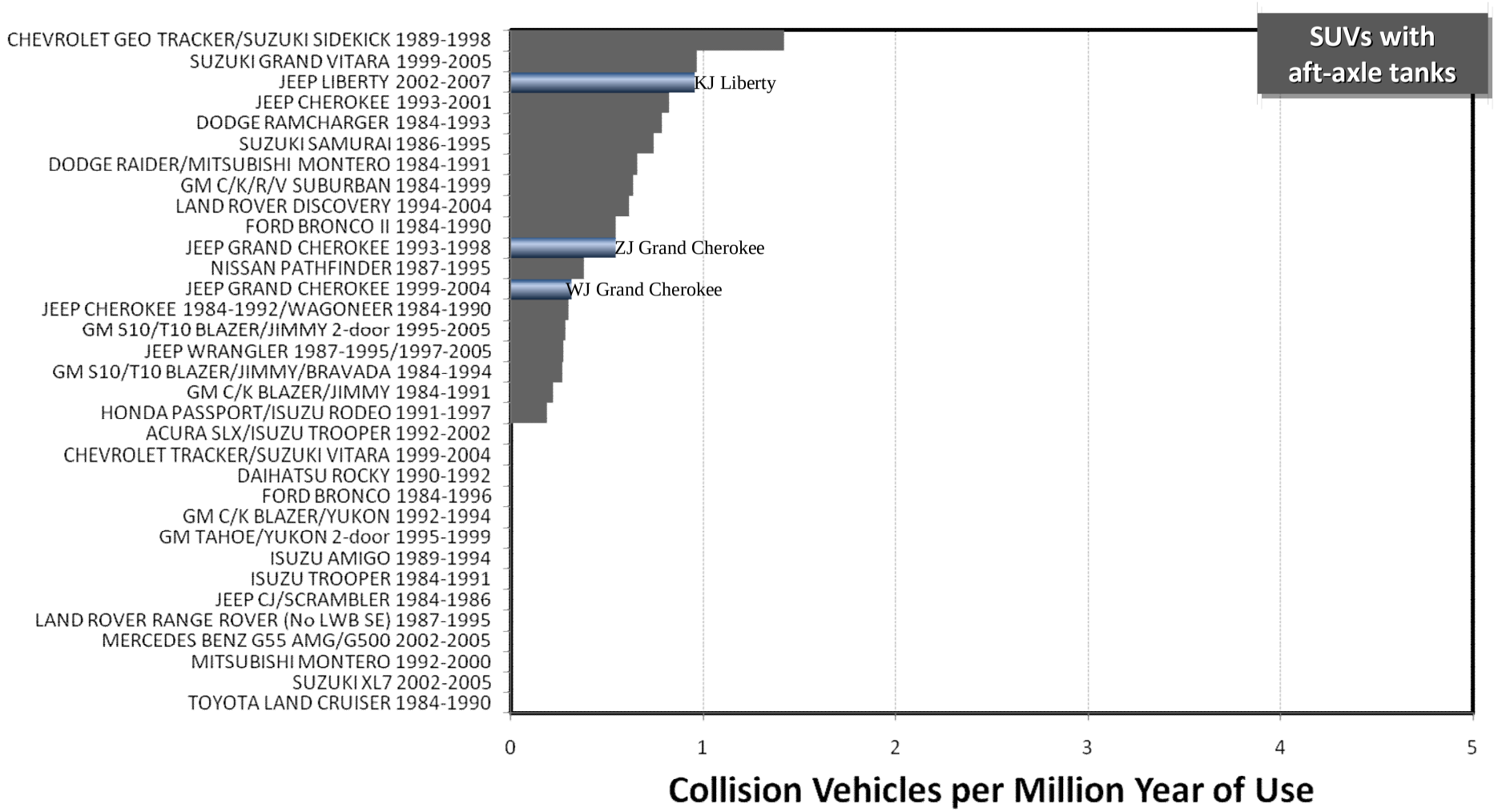
Vehicles involved in a rear collision with fire as MHE, per million years of use
Fatality in any vehicle in the crash



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004, and KJ Liberty 2002-2007. Other vehicles are model years 1984-2005. FARS data 1984-2011. Registration data from RL Polk. Rear collision includes either initial or principal impact to clock points 5, 6, or 7. Includes vehicles where the vehicle experienced a post-collision fire as the most harmful event. Fatality in any vehicle in the crash.

Rates of Rear Collisions with MHE Fire

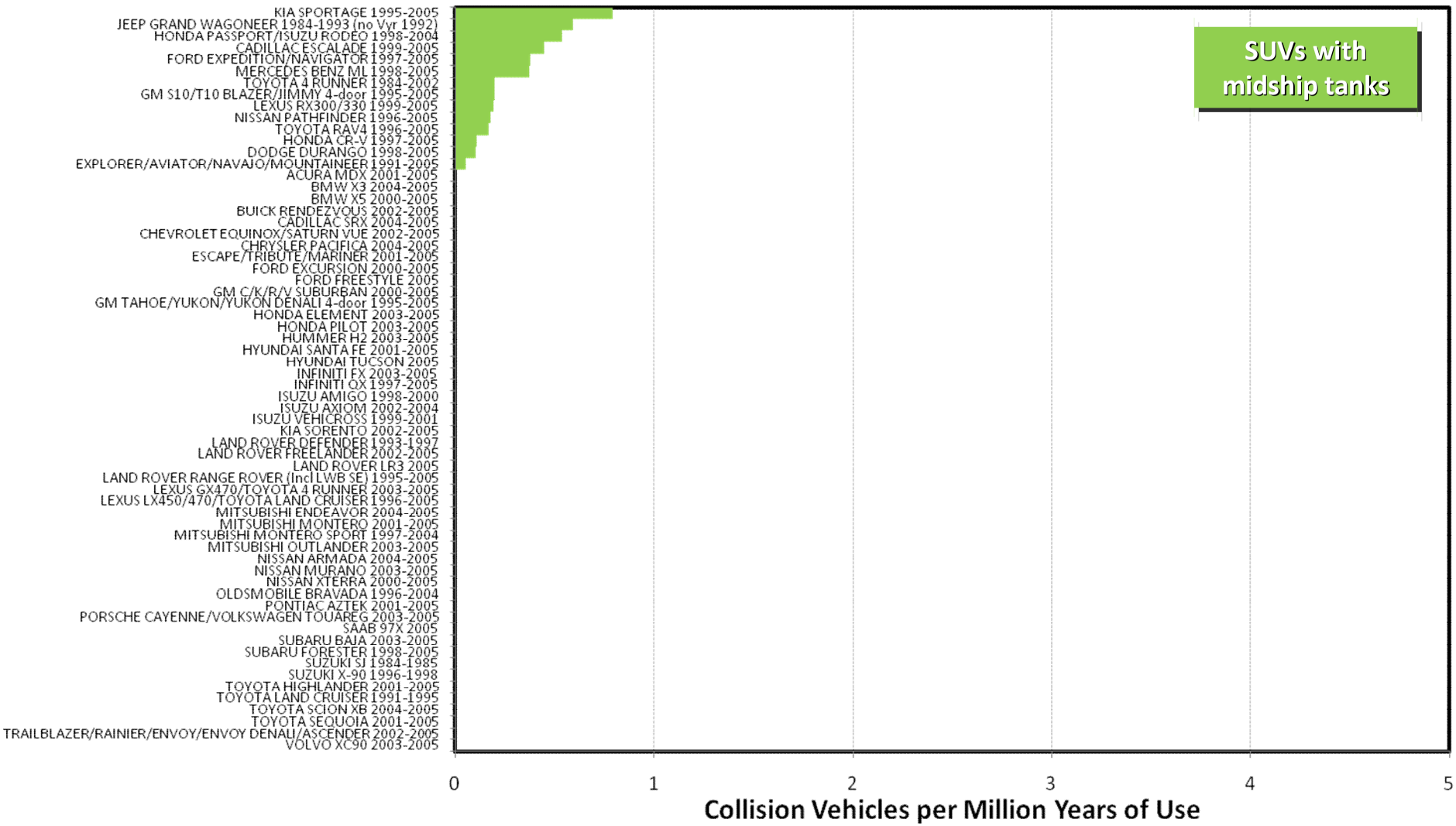
Vehicles involved in a rear collision with fire as MHE, per million years of use
Fatality in any vehicle in the crash



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004, and KJ Liberty 2002-2007. Other vehicles are model years 1984-2005. FARS data 1984-2011. Registration data from RL Polk. Rear collision includes either initial or principal impact to clock points 5, 6, or 7. Includes vehicles where the vehicle experienced a post-collision fire as the most harmful event. Fatality in any vehicle in the crash.

Rates of Rear Collisions with MHE Fire

Vehicles involved in a rear collision with fire as MHE, per million years of use
Fatality in any vehicle in the crash



Notes: Each bar represents a different model of vehicle. Vehicles are model years 1984-2005. FARS data 1984-2011. Registration data from RL Polk. Rear collision includes either initial or principal impact to clock points 5, 6, or 7. Includes vehicles where the vehicle experienced a post-collision fire as the most harmful event. Fatality in any vehicle in the crash.

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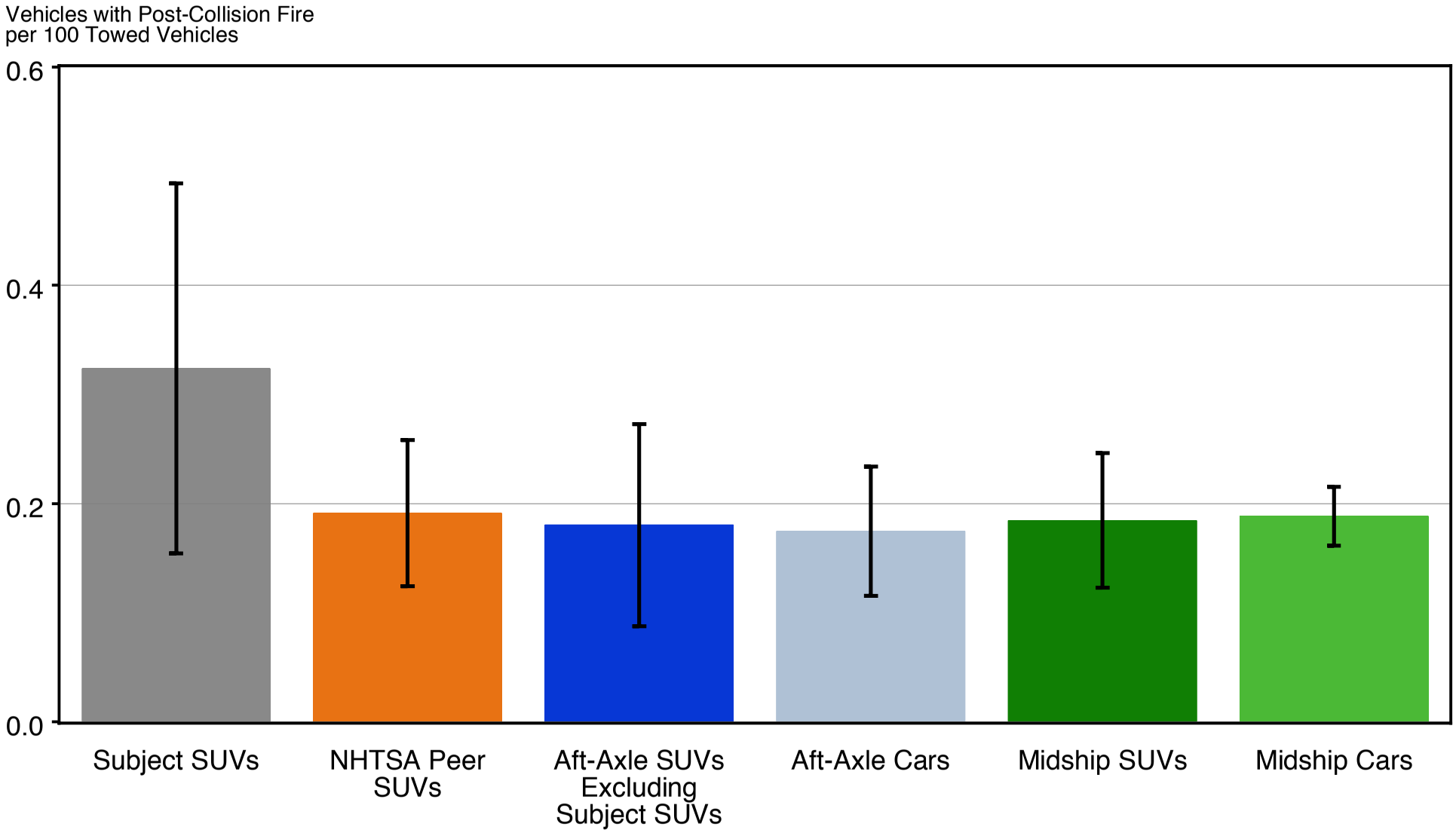
Appendix C

FARS and NASS Analysis Updates

NASS GES and CDS

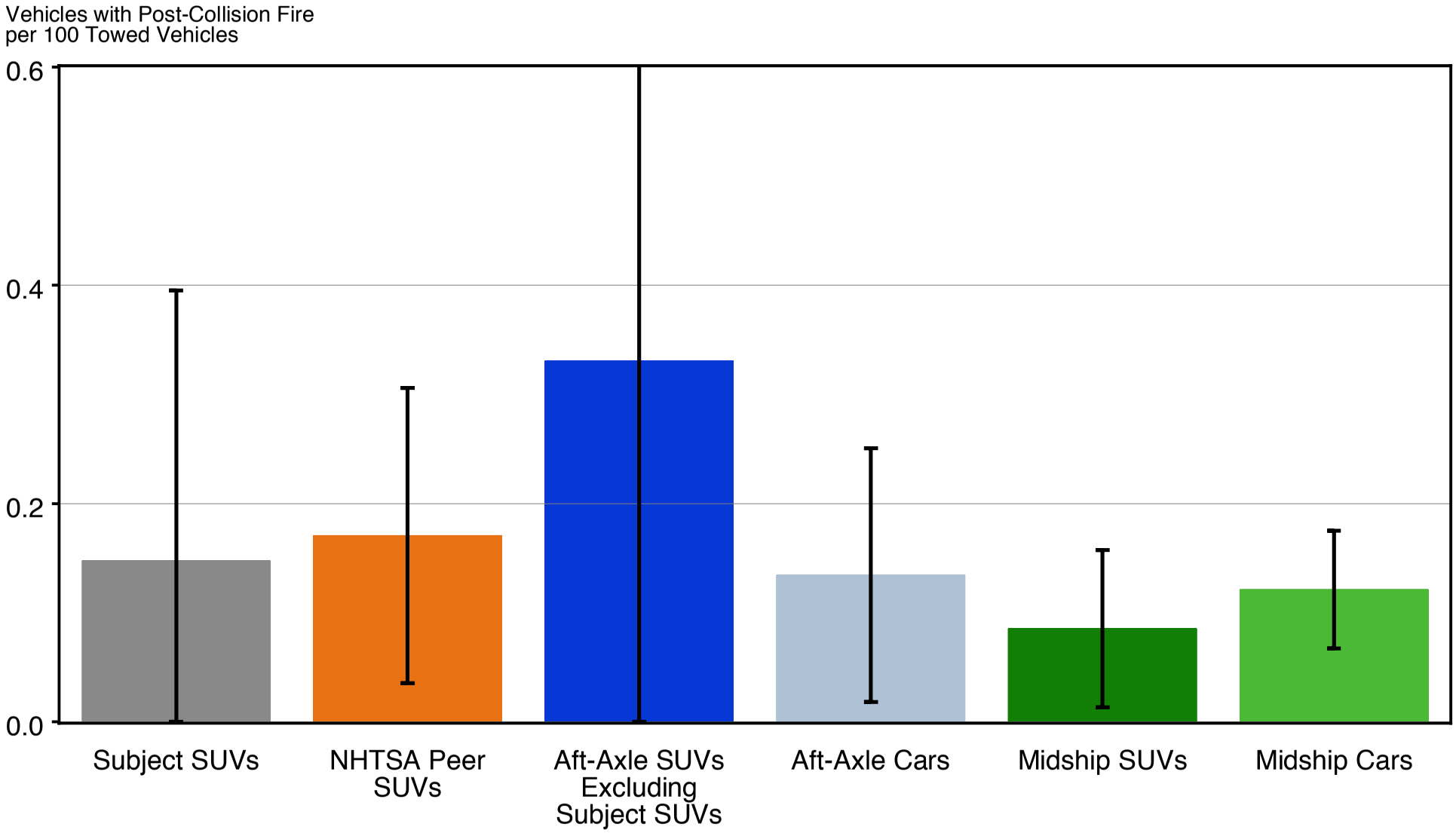
NASS GES

Rates of Post-Collision Fire
Utility Vehicles and Cars Towed Due to Damage



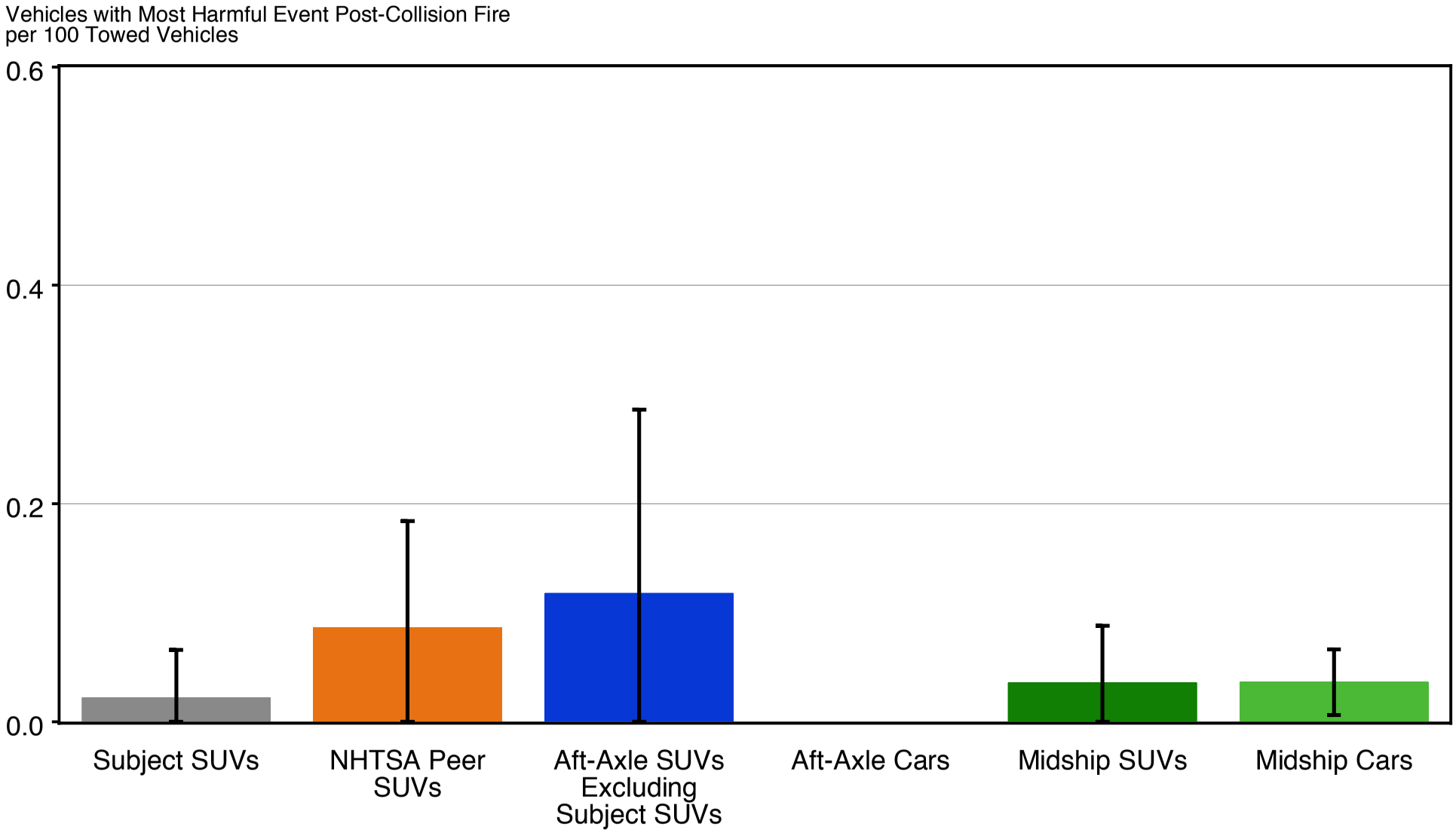
Source: NASS GES 1992-2011.
Subject SUVs are the model-year 1993-2004 Jeep Grand Cherokee and 2002-2007 Jeep Liberty.
Other groups are model-year 1993-2007 cars and SUVs labeled with tank location "Mid Ship" or "Aft Axle" in "Fuel Tank Location Information NHTSA 12-10-12."
NHTSA peers are defined in Table 1.
Vehicle models identified by VIN.

Rates of Post-Collision Fire in Rear Impacts
Utility Vehicles and Cars Towed Due to Damage



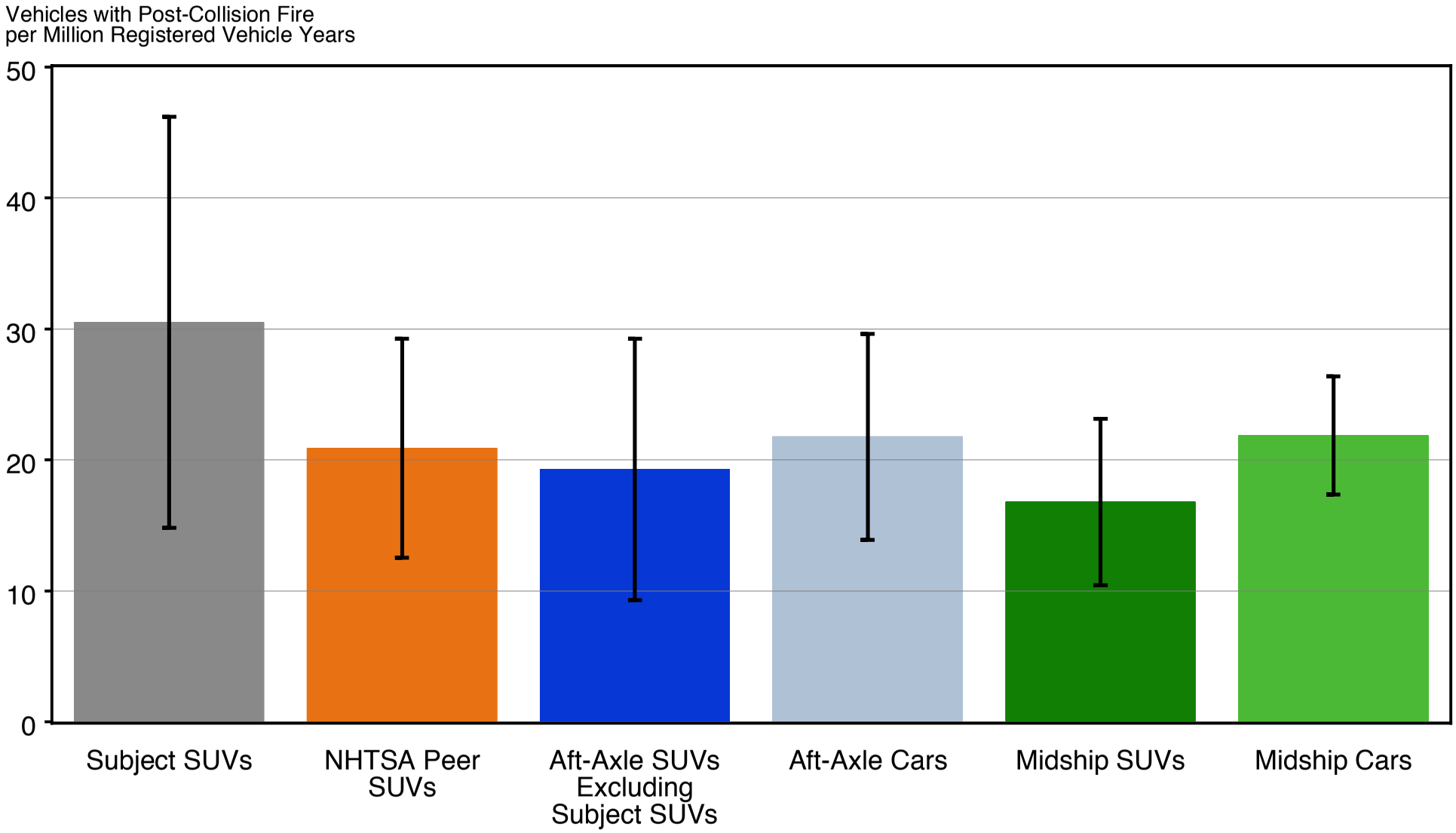
Source: NASS GES 1992-2011.
Subject SUVs are the model-year 1993-2004 Jeep Grand Cherokee and 2002-2007 Jeep Liberty.
Other groups are model-year 1993-2007 cars and SUVs labeled with tank location "Mid Ship" or "Aft Axle" in "Fuel Tank Location Information NHTSA 12-10-12."
NHTSA peers are defined in Table 1.
Vehicle models identified by VIN.

Rates of Most Harmful Event Post-Collision Fire in Rear Impacts
Utility Vehicles and Cars Towed Due to Damage



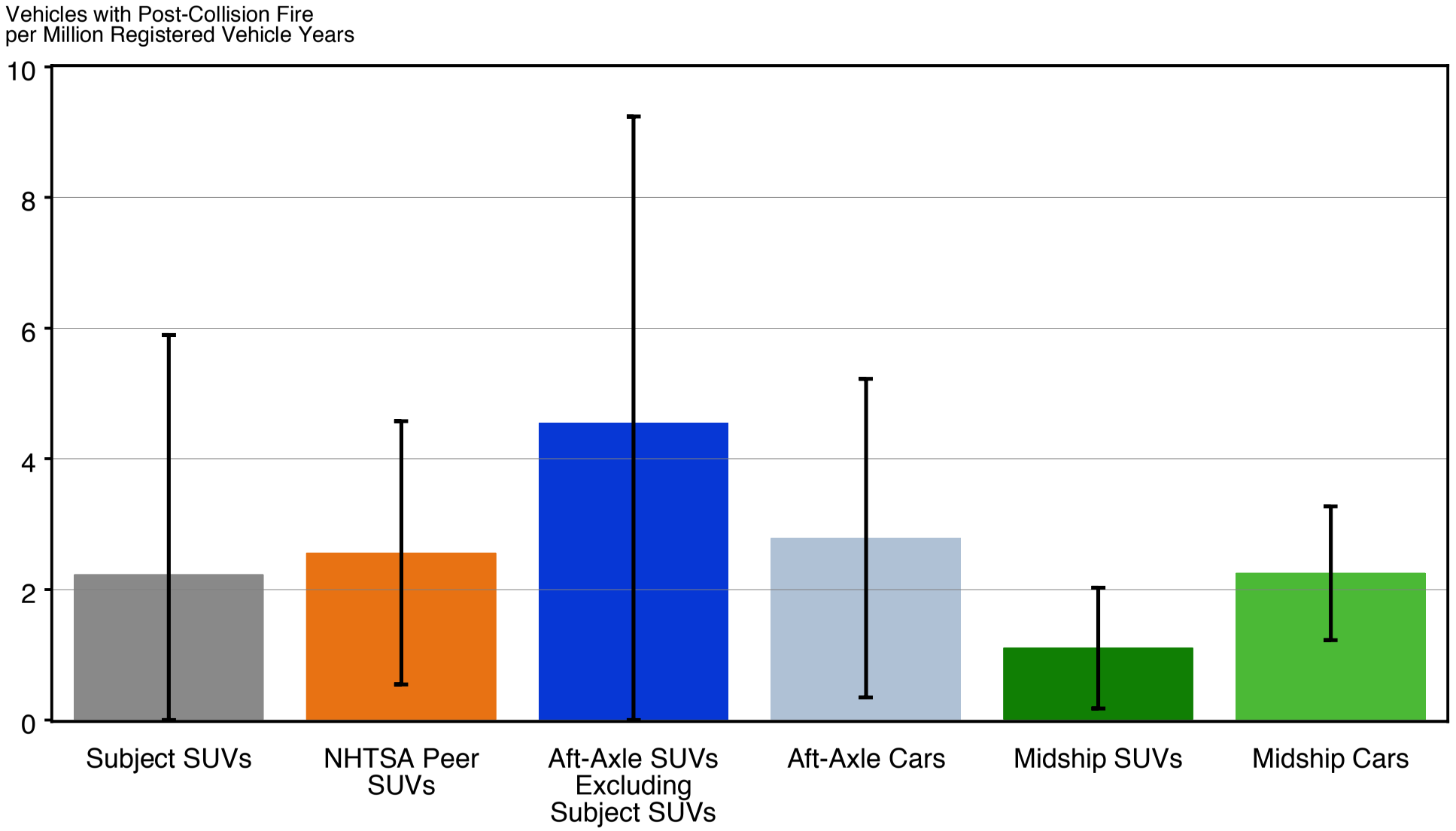
Source: NASS GES 1992-2011.
Subject SUVs are the model-year 1993-2004 Jeep Grand Cherokee and 2002-2007 Jeep Liberty.
Other groups are model-year 1993-2007 cars and SUVs labeled with tank location "Mid Ship" or "Aft Axle" in "Fuel Tank Location Information NHTSA 12-10-12."
NHTSA peers are defined in Table 1.
Vehicle models identified by VIN.

Rates of Post-Collision Fire
Utility Vehicles and Cars Towed Due to Damage



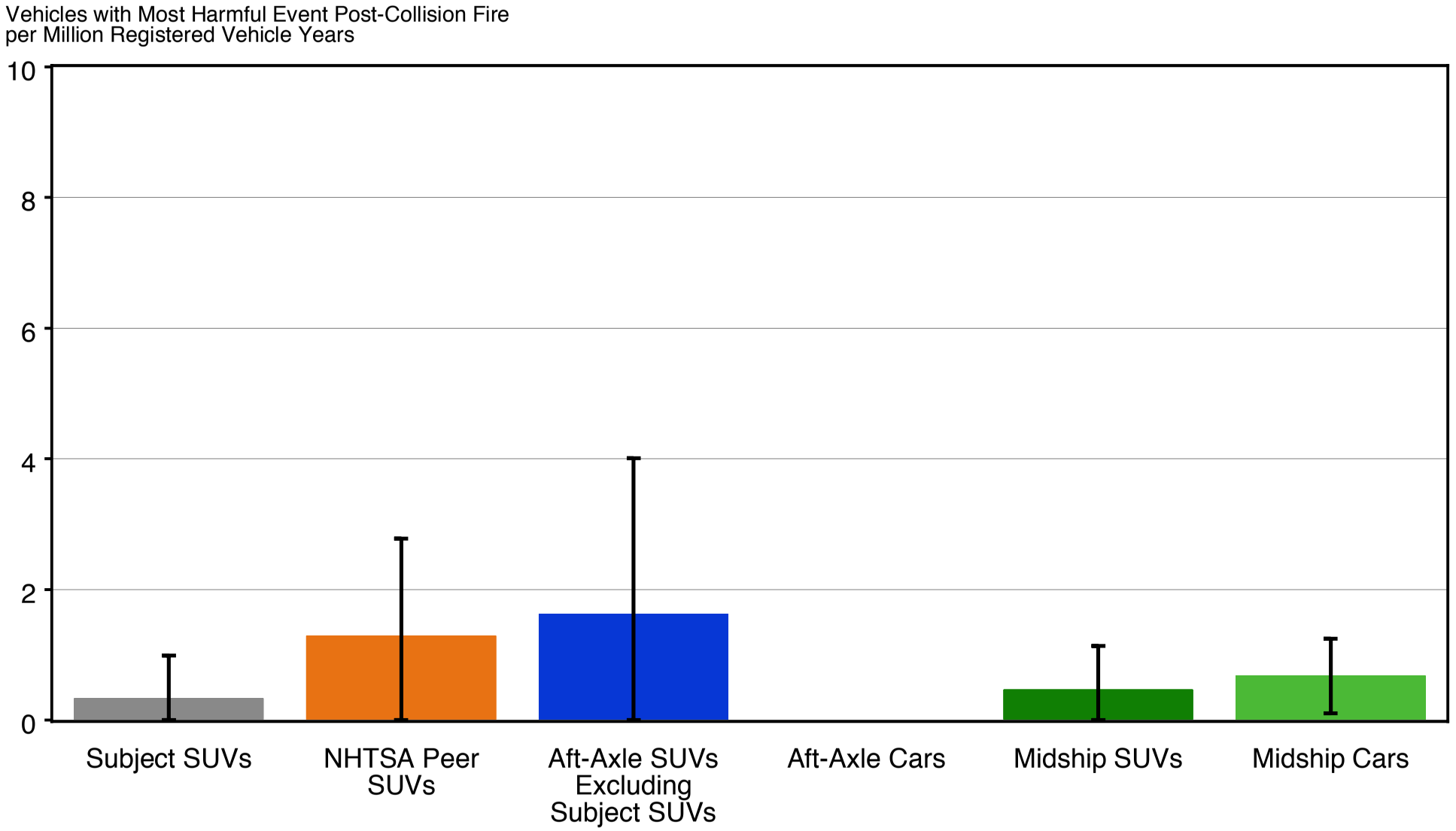
Sources: NASS GES 1993-2011 and Polk NVPP 1993-2011.
Subject SUVs are the model-year 1993-2004 Jeep Grand Cherokee and 2002-2007 Jeep Liberty.
Other groups are model-year 1993-2007 cars and SUVs labeled with tank location "Mid Ship" or "Aft Axle" in "Fuel Tank Location Information NHTSA 12-10-12."
NHTSA peers are defined in Table 1.
Vehicle models identified by VIN.

Rates of Post-Collision Fire in Rear Impacts
Utility Vehicles and Cars Towed Due to Damage



Sources: NASS GES 1993-2011 and Polk NVPP 1993-2011.
Subject SUVs are the model-year 1993-2004 Jeep Grand Cherokee and 2002-2007 Jeep Liberty.
Other groups are model-year 1993-2007 cars and SUVs labeled with tank location "Mid Ship" or "Aft Axle" in "Fuel Tank Location Information NHTSA 12-10-12."
NHTSA peers are defined in Table 1.
Vehicle models identified by VIN.

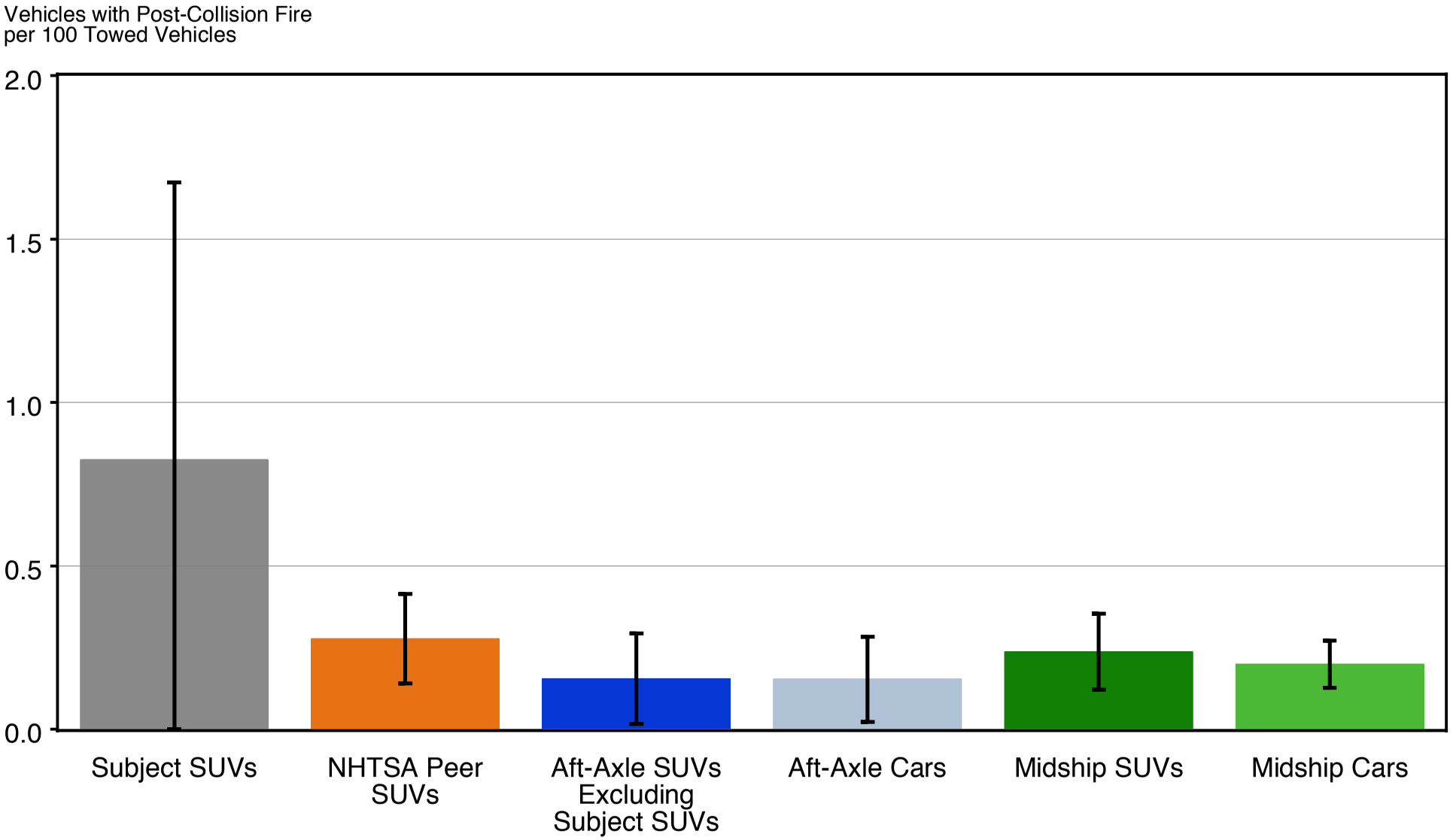
Rates of Most Harmful Event Post-Collision Fire in Rear Impacts
Utility Vehicles and Cars Towed Due to Damage



Sources: NASS GES 1993-2011 and Polk NVPP 1993-2011.
Subject SUVs are the model-year 1993-2004 Jeep Grand Cherokee and 2002-2007 Jeep Liberty.
Other groups are model-year 1993-2007 cars and SUVs labeled with tank location "Mid Ship" or "Aft Axle" in "Fuel Tank Location Information NHTSA 12-10-12."
NHTSA peers are defined in Table 1.
Vehicle models identified by VIN.

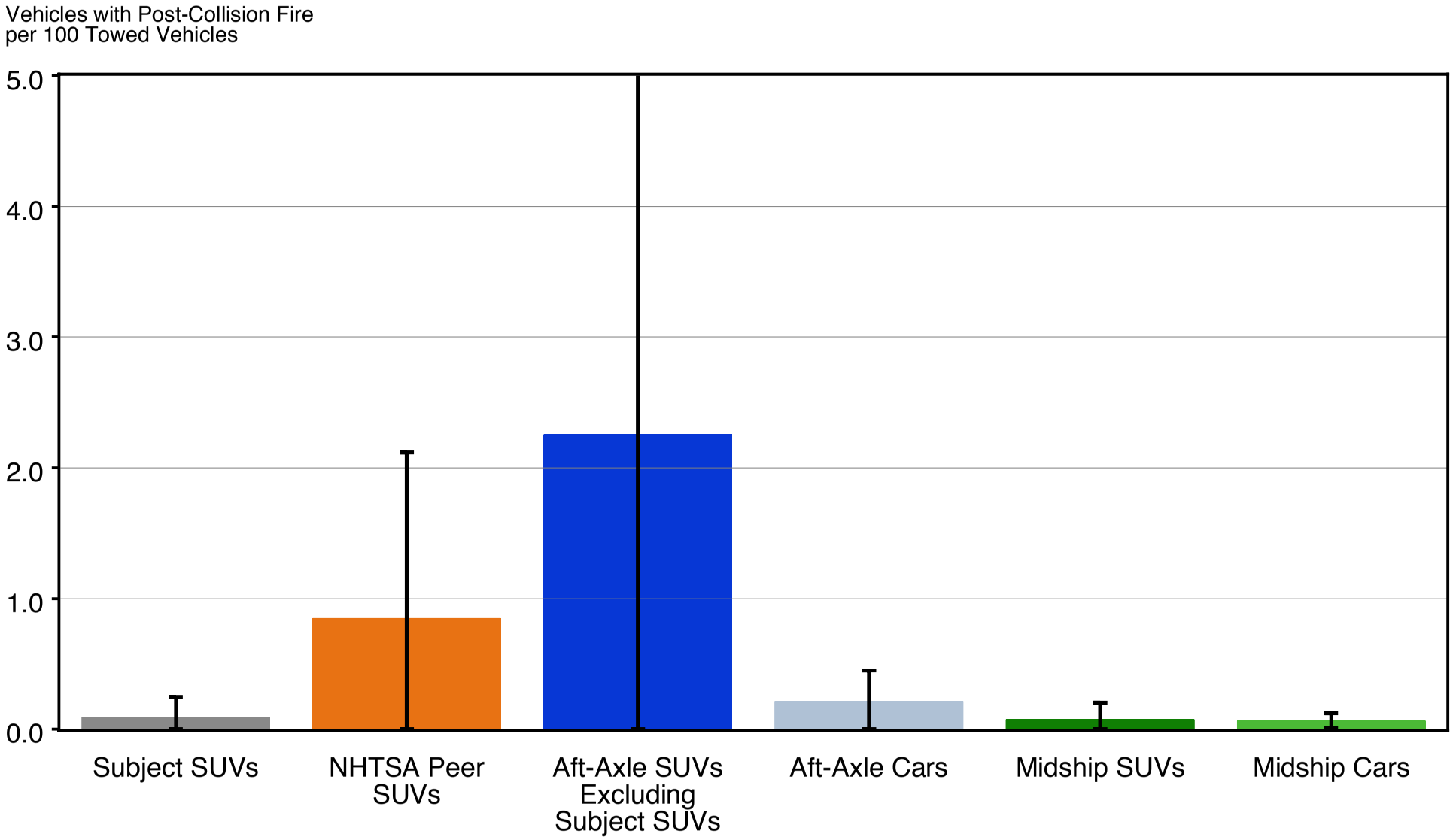
NASS CDS

Rates of Post-Collision Fire
Utility Vehicles and Cars Towed Due to Damage



Source: NASS CDS 1992-2011.
Subject SUVs are the model-year 1993-2004 Jeep Grand Cherokee and 2002-2007 Jeep Liberty.
Other groups are model-year 1993-2007 cars and SUVs labeled with tank location "Mid Ship" or "Aft Axle" in "Fuel Tank Location Information NHTSA 12-10-12."
NHTSA peers are defined in Table 1.
Vehicle models identified by VIN.

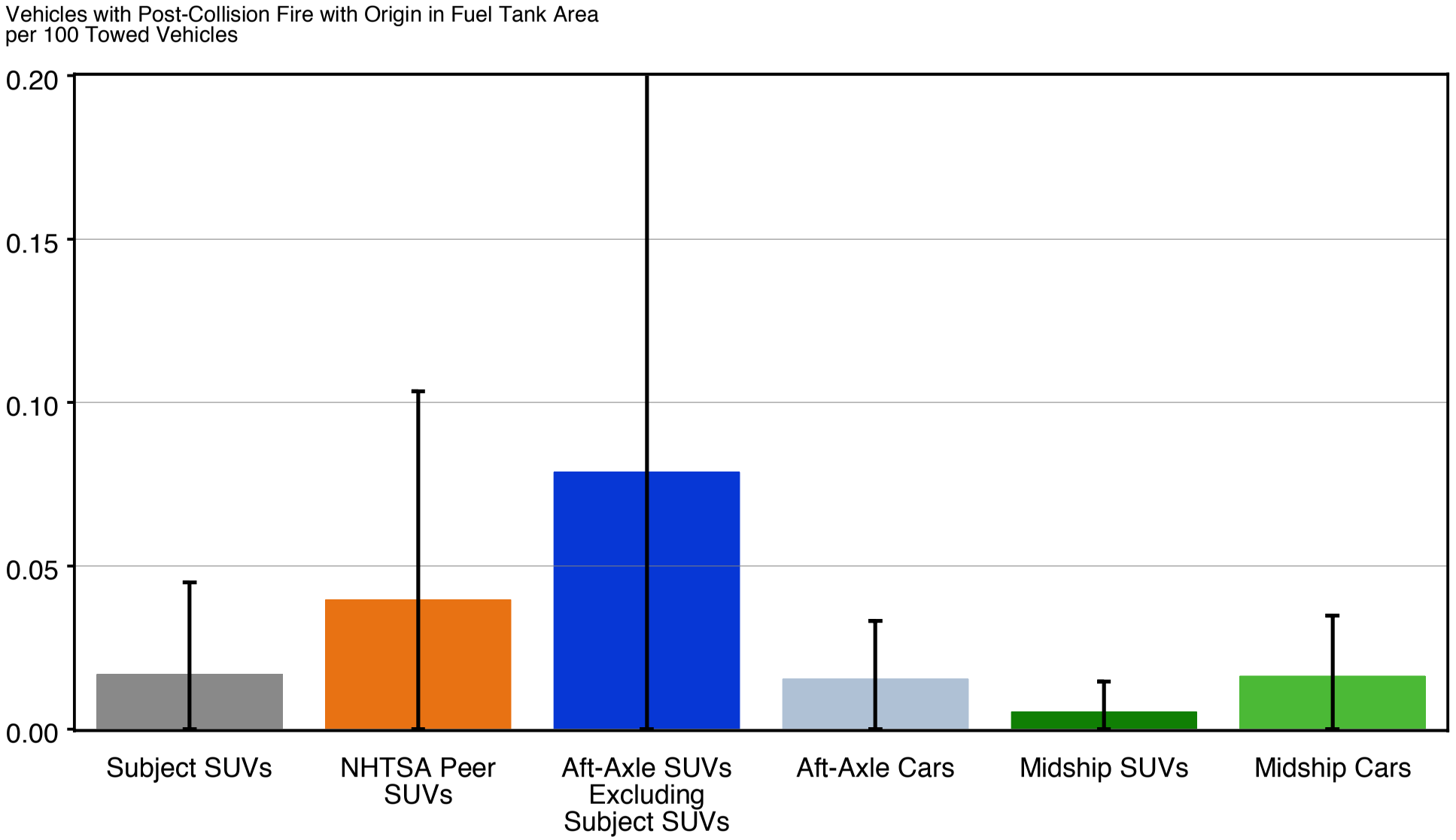
Rates of Post-Collision Fire in Rear Impacts
Utility Vehicles and Cars Towed Due to Damage



Source: NASS CDS 1992-2011.
Subject SUVs are the model-year 1993-2004 Jeep Grand Cherokee and 2002-2007 Jeep Liberty.
Other groups are model-year 1993-2007 cars and SUVs labeled with tank location "Mid Ship" or "Aft Axle" in "Fuel Tank Location Information NHTSA 12-10-12."
NHTSA peers are defined in Table 1.
Vehicle models identified by VIN. "Rear Impact" is defined as the Highest Deformation Location (variable: GAD1) equal to "Back."

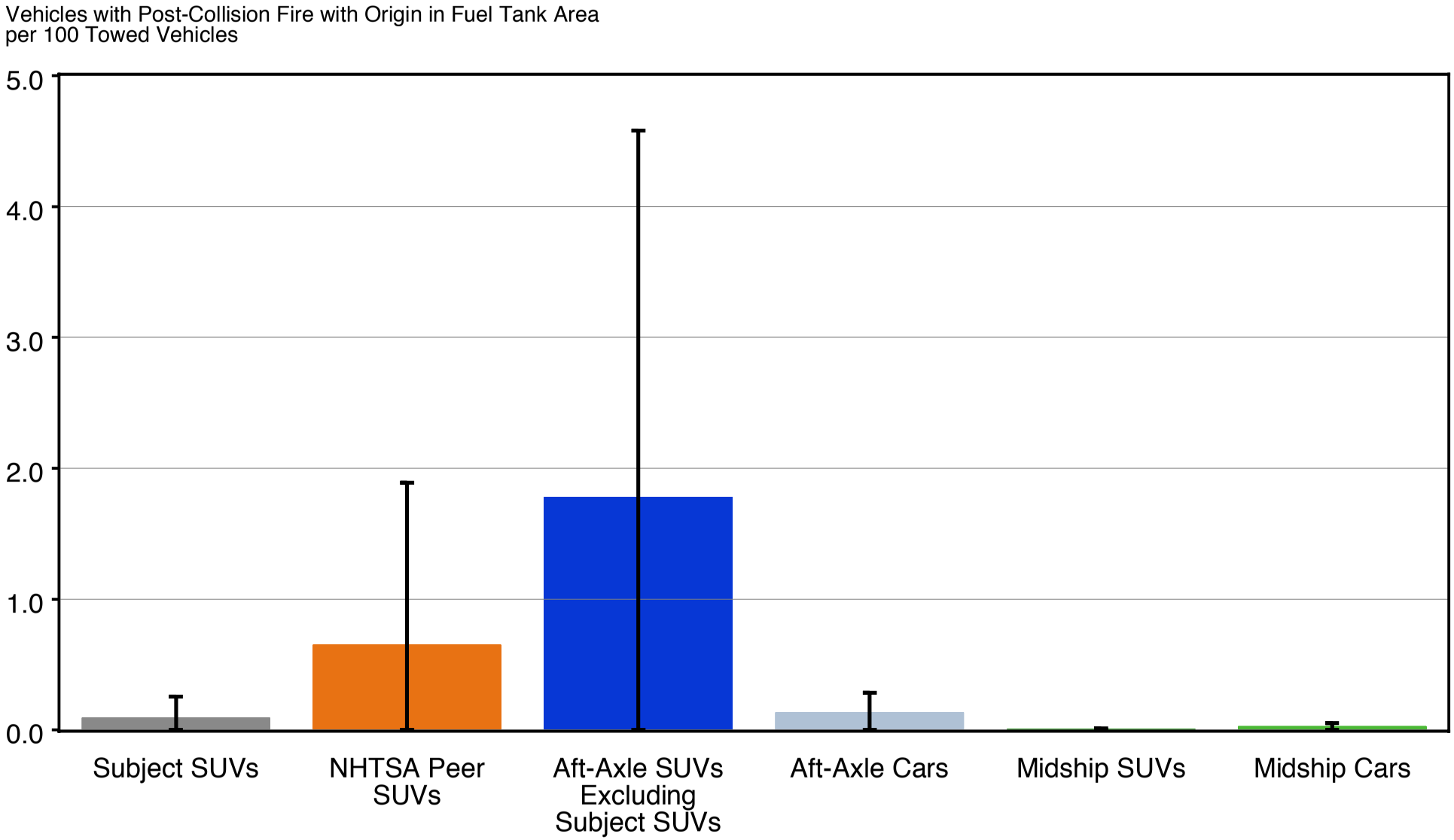
Rates of Post-Collision Fire with Origin in Fuel Tank Area

Utility Vehicles and Cars Towed Due to Damage



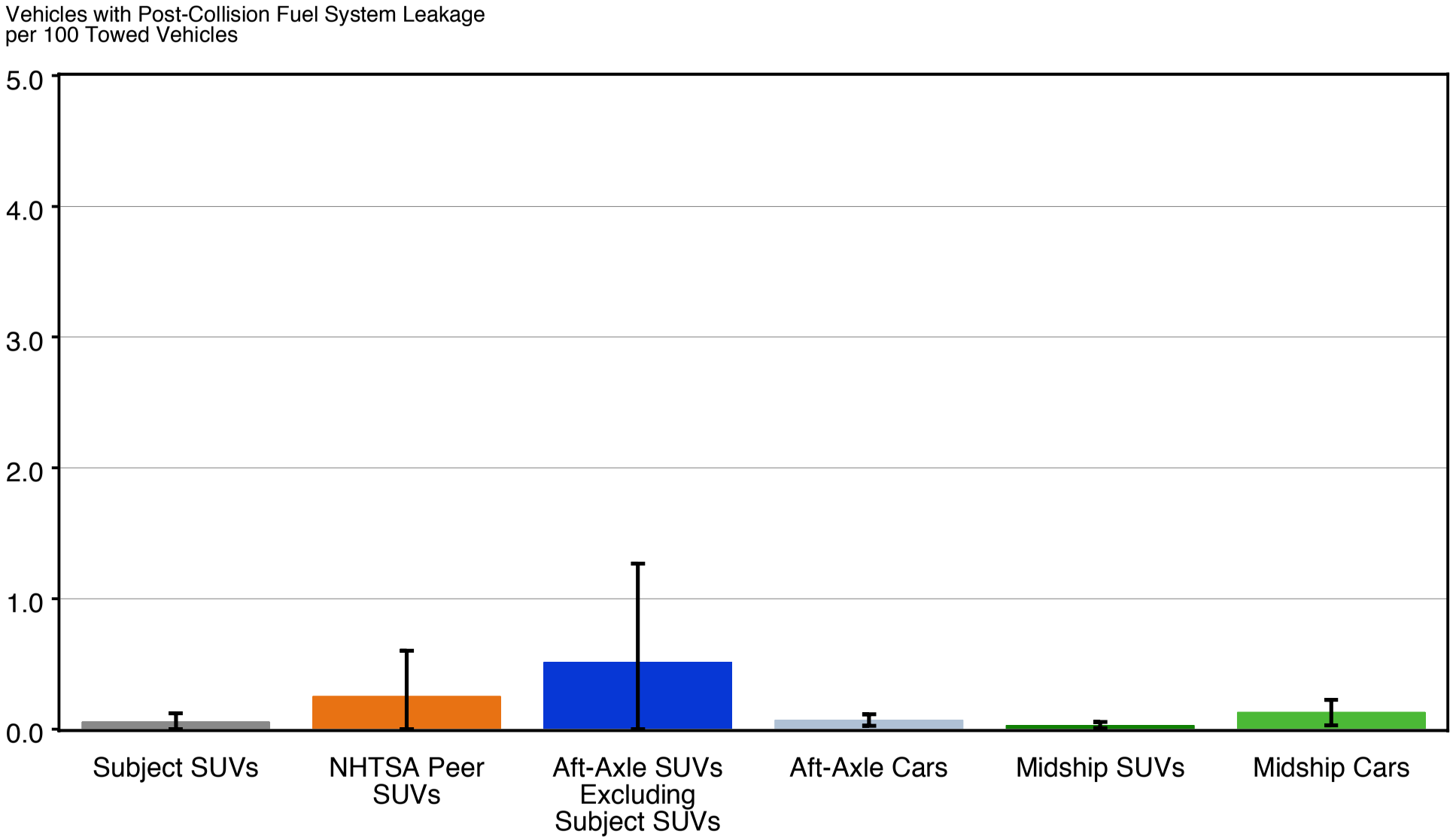
Source: NASS CDS 1992-2011.
Subject SUVs are the model-year 1993-2004 Jeep Grand Cherokee and 2002-2007 Jeep Liberty.
Other groups are model-year 1993-2007 cars and SUVs labeled with tank location "Mid Ship" or "Aft Axle" in "Fuel Tank Location Information NHTSA 12-10-12."
NHTSA peers are defined in Table 1.
Vehicle models identified by VIN.

Rates of Post-Collision Fire with Origin in Fuel Tank Area in Rear Impacts
Utility Vehicles and Cars Towed Due to Damage



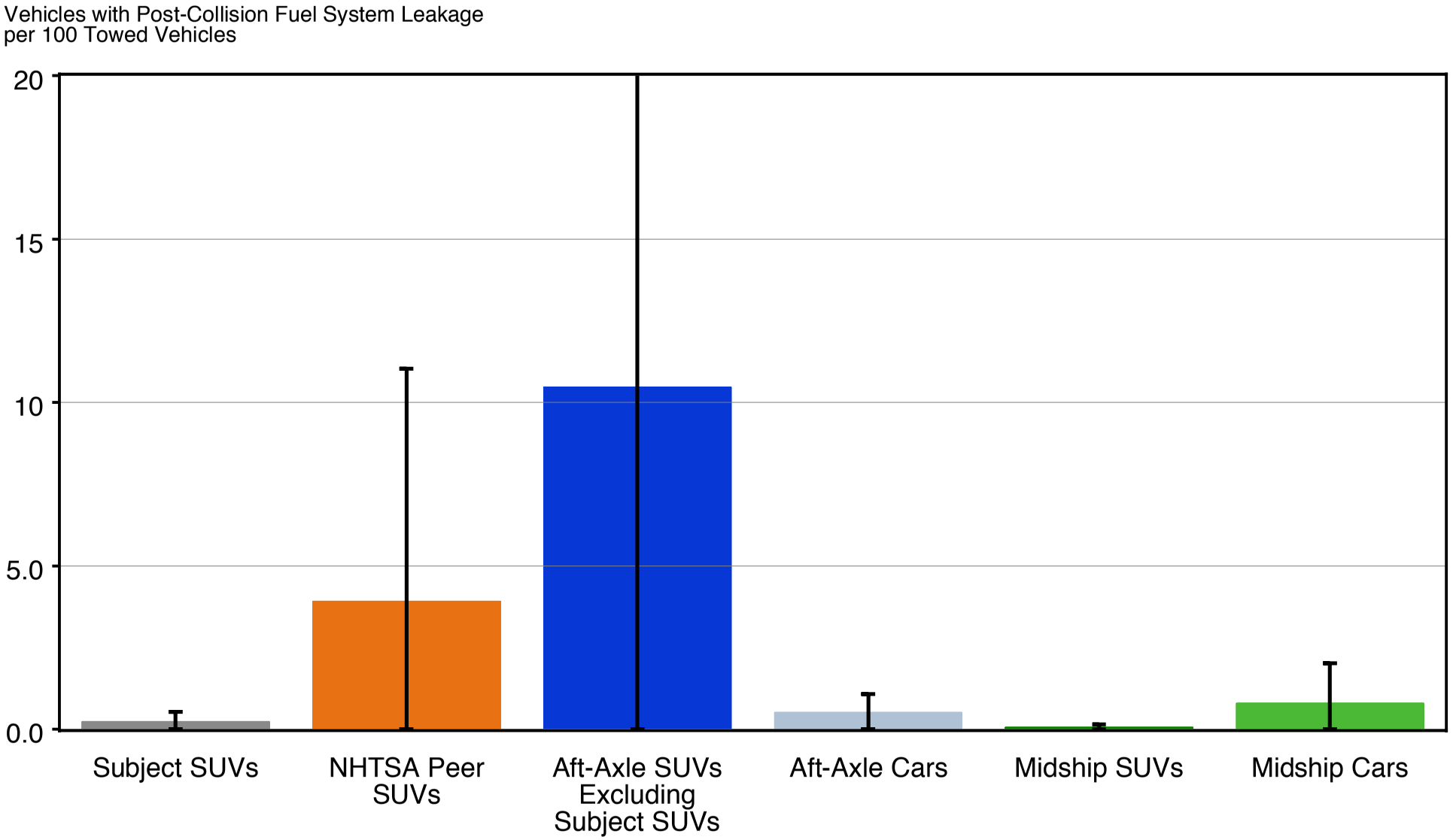
Source: NASS CDS 1992-2011.
Subject SUVs are the model-year 1993-2004 Jeep Grand Cherokee and 2002-2007 Jeep Liberty.
Other groups are model-year 1993-2007 cars and SUVs labeled with tank location "Mid Ship" or "Aft Axle" in "Fuel Tank Location Information NHTSA 12-10-12."
NHTSA peers are defined in Table 1.
Vehicle models identified by VIN. "Rear Impact" is defined as the Highest Deformation Location (variable: GAD1) equal to "Back."

Rates of Post-Collision Fuel System Leakage
Utility Vehicles and Cars Towed Due to Damage



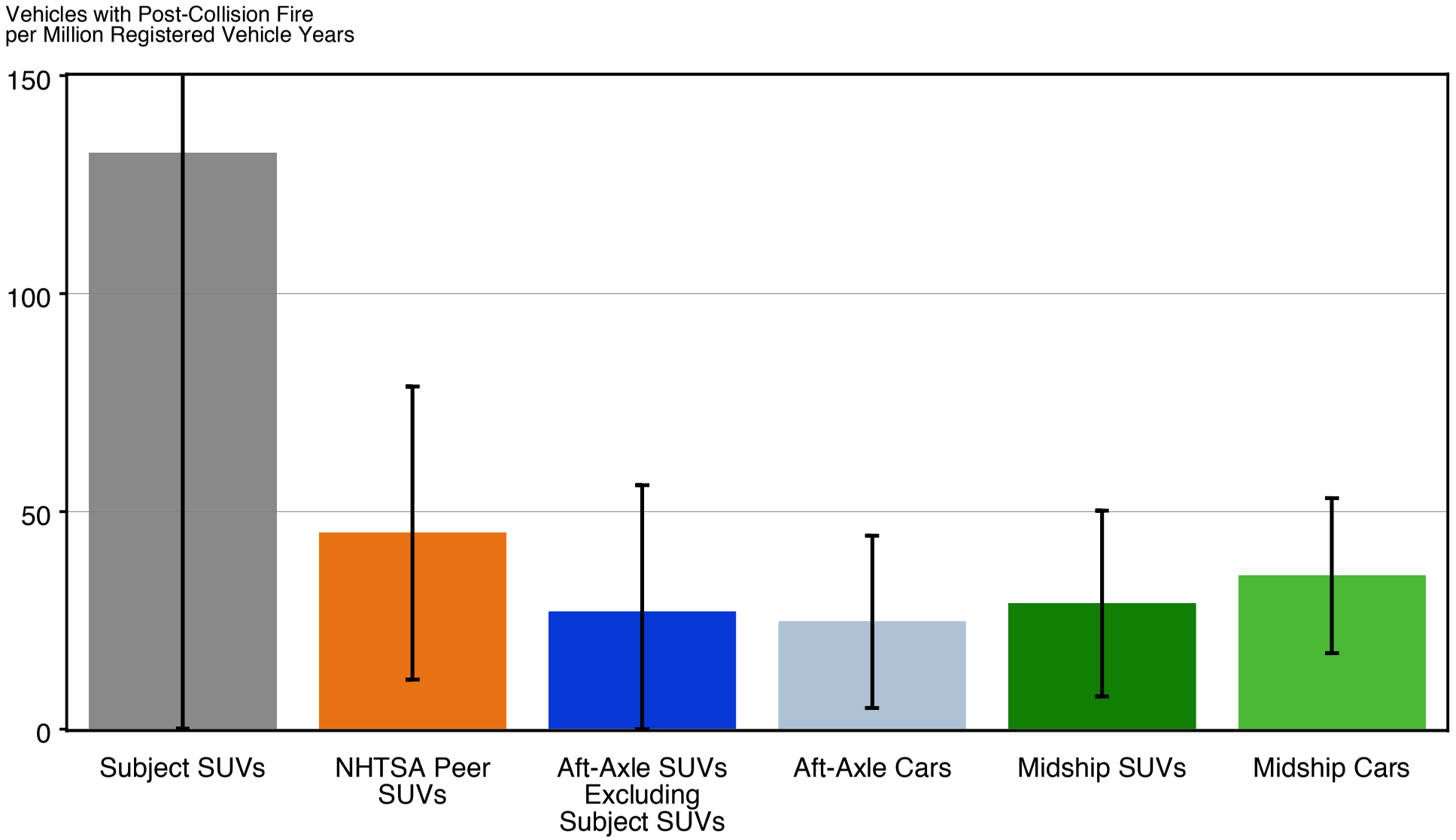
Source: NASS CDS 1994-2011.
Subject SUVs are the model-year 1993-2004 Jeep Grand Cherokee and 2002-2007 Jeep Liberty.
Other groups are model-year 1993-2007 cars and SUVs labeled with tank location "Mid Ship" or "Aft Axle" in "Fuel Tank Location Information NHTSA 12-10-12."
NHTSA peers are defined in Table 1.
Vehicle models identified by VIN.

Rates of Post-Collision Fuel System Leakage in Rear Impacts
Utility Vehicles and Cars Towed Due to Damage



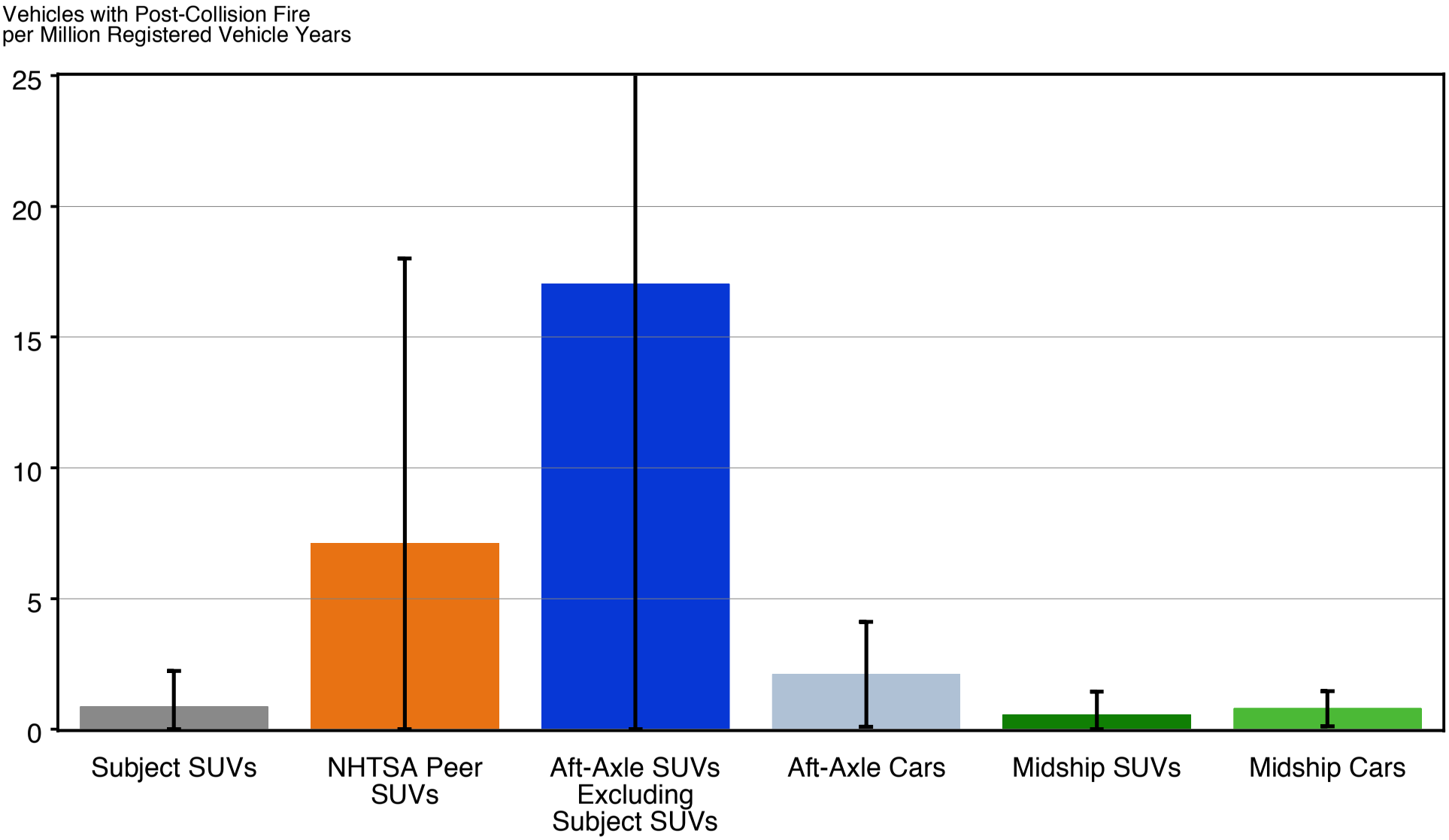
Source: NASS CDS 1994-2011.
Subject SUVs are the model-year 1993-2004 Jeep Grand Cherokee and 2002-2007 Jeep Liberty.
Other groups are model-year 1993-2007 cars and SUVs labeled with tank location "Mid Ship" or "Aft Axle" in "Fuel Tank Location Information NHTSA 12-10-12."
NHTSA peers are defined in Table 1.
Vehicle models identified by VIN. "Rear Impact" is defined as the Highest Deformation Location (variable: GAD1) equal to "Back."

Rates of Post-Collision Fire
Utility Vehicles and Cars Towed Due to Damage



Sources: NASS CDS 1993-2011 and Polk NVPP 1993-2011.
Subject SUVs are the model-year 1993-2004 Jeep Grand Cherokee and 2002-2007 Jeep Liberty.
Other groups are model-year 1993-2007 cars and SUVs labeled with tank location "Mid Ship" or "Aft Axle" in "Fuel Tank Location Information NHTSA 12-10-12."
NHTSA peers are defined in Table 1.
Vehicle models identified by VIN.

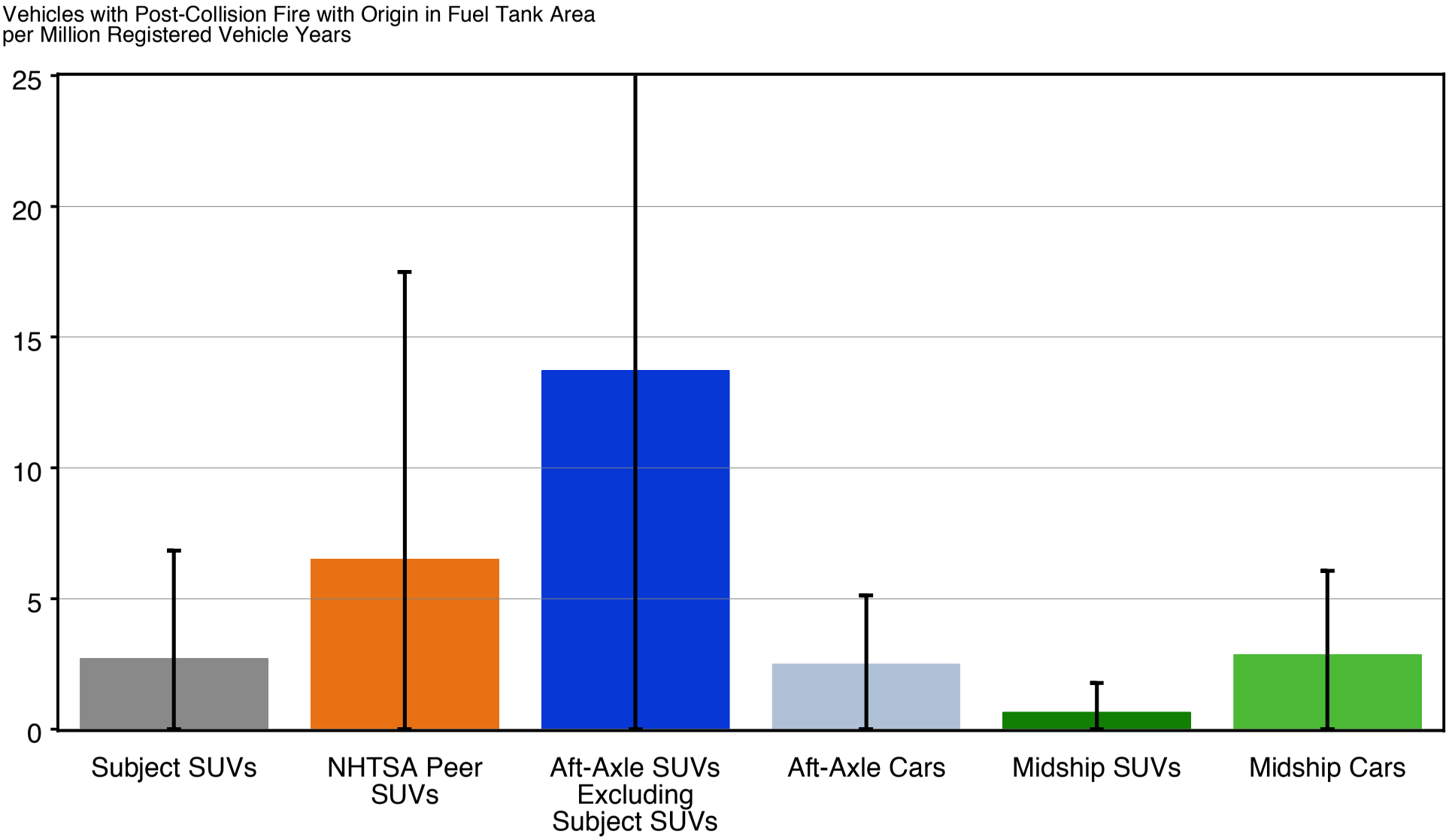
Rates of Post-Collision Fire in Rear Impacts
Utility Vehicles and Cars Towed Due to Damage



Sources: NASS CDS 1993-2011 and Polk NVPP 1993-2011.
Subject SUVs are the model-year 1993-2004 Jeep Grand Cherokee and 2002-2007 Jeep Liberty.
Other groups are model-year 1993-2007 cars and SUVs labeled with tank location "Mid Ship" or "Aft Axle" in "Fuel Tank Location Information NHTSA 12-10-12."
NHTSA peers are defined in Table 1.
Vehicle models identified by VIN. "Rear Impact" is defined as the Highest Deformation Location (variable: GAD1) equal to "Back."

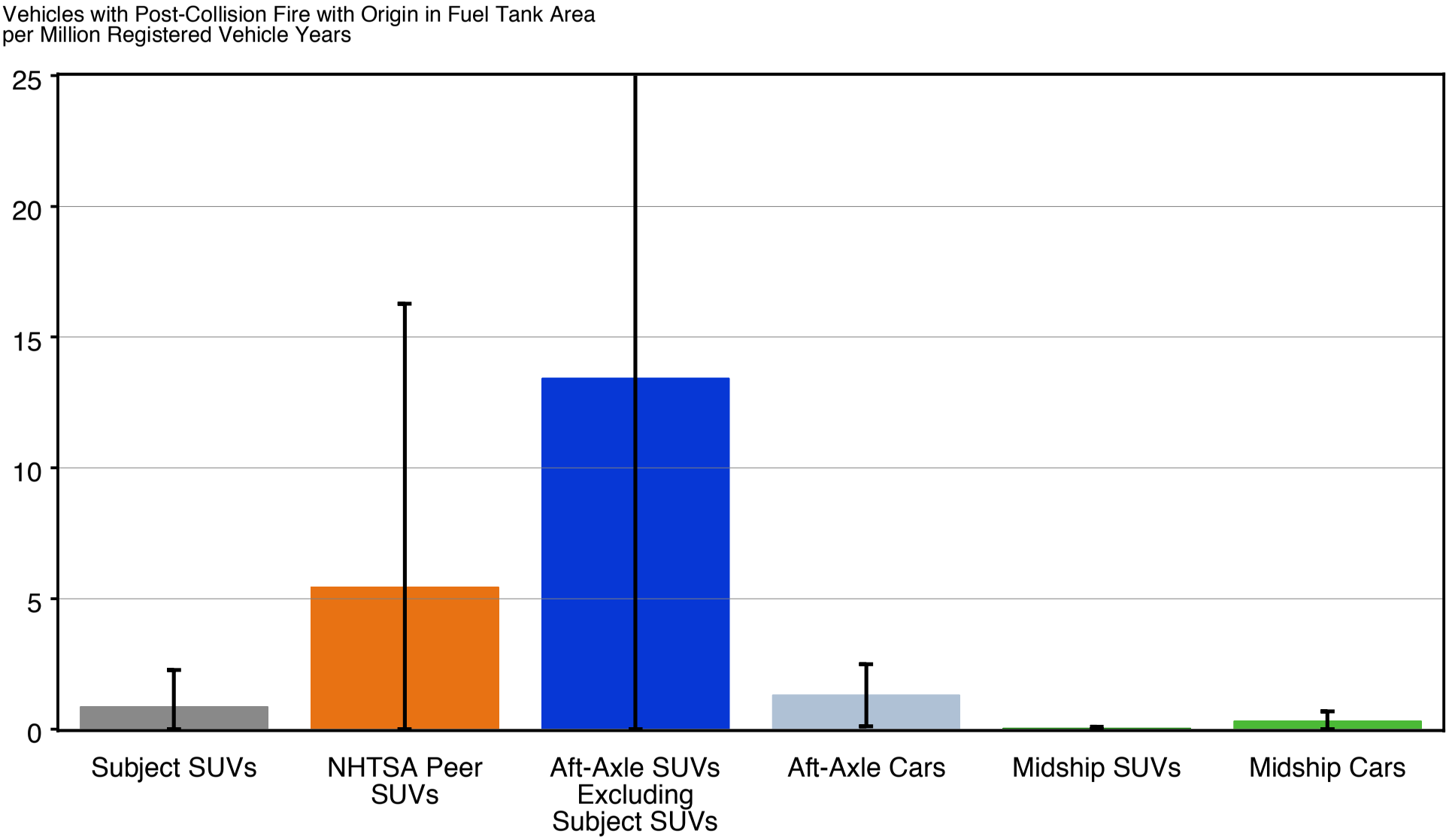
Rates of Post-Collision Fire with Origin in Fuel Tank Area

Utility Vehicles and Cars Towed Due to Damage



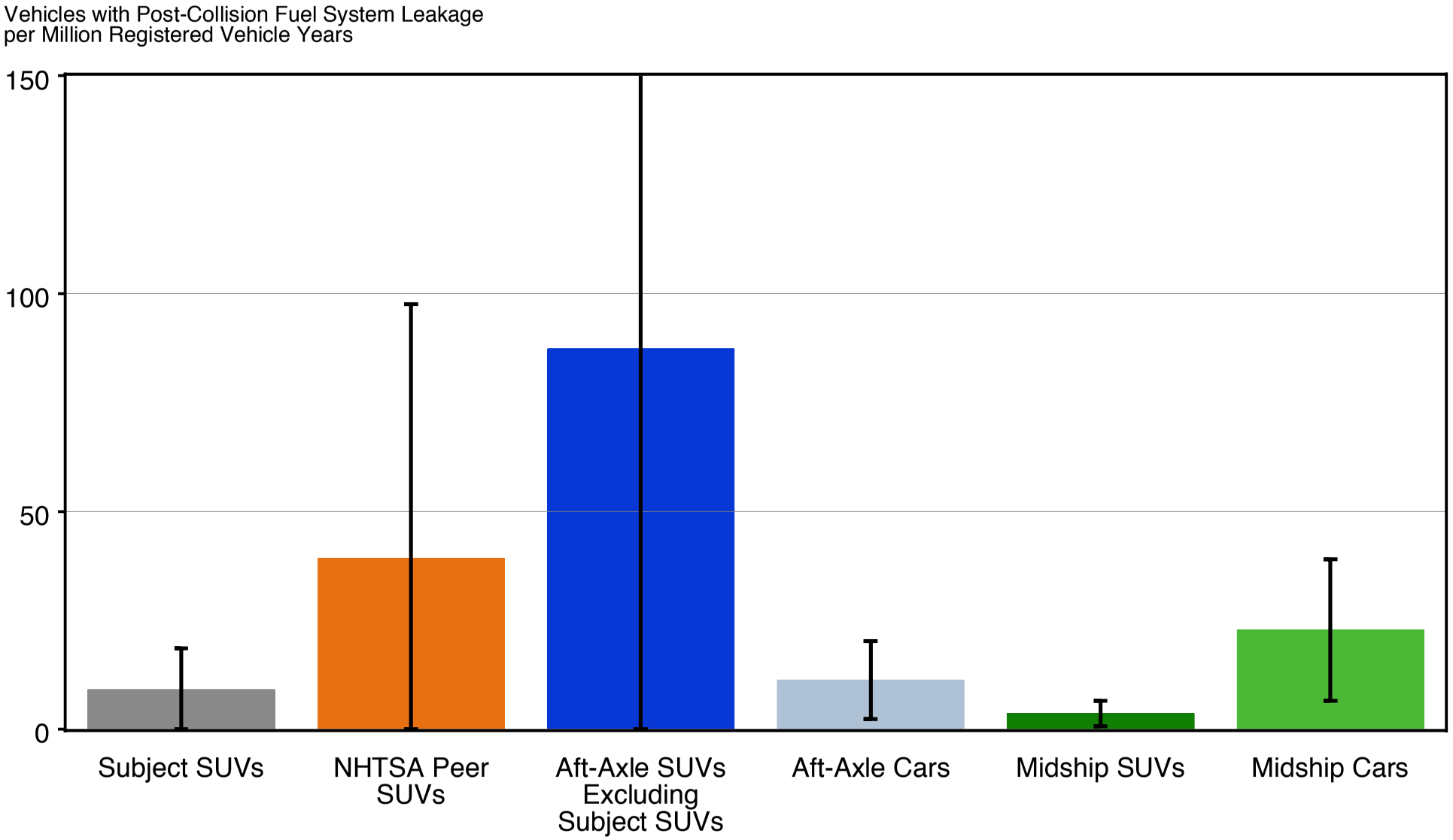
Sources: NASS CDS 1993-2011 and Polk NVPP 1993-2011.
Subject SUVs are the model-year 1993-2004 Jeep Grand Cherokee and 2002-2007 Jeep Liberty.
Other groups are model-year 1993-2007 cars and SUVs labeled with tank location "Mid Ship" or "Aft Axle" in "Fuel Tank Location Information NHTSA 12-10-12."
NHTSA peers are defined in Table 1.
Vehicle models identified by VIN.

Rates of Post-Collision Fire with Origin in Fuel Tank Area in Rear Impacts
Utility Vehicles and Cars Towed Due to Damage



Sources: NASS CDS 1993-2011 and Polk NVPP 1993-2011.
Subject SUVs are the model-year 1993-2004 Jeep Grand Cherokee and 2002-2007 Jeep Liberty.
Other groups are model-year 1993-2007 cars and SUVs labeled with tank location "Mid Ship" or "Aft Axle" in "Fuel Tank Location Information NHTSA 12-10-12."
NHTSA peers are defined in Table 1.
Vehicle models identified by VIN. "Rear Impact" is defined as the Highest Deformation Location (variable: GAD1) equal to "Back."

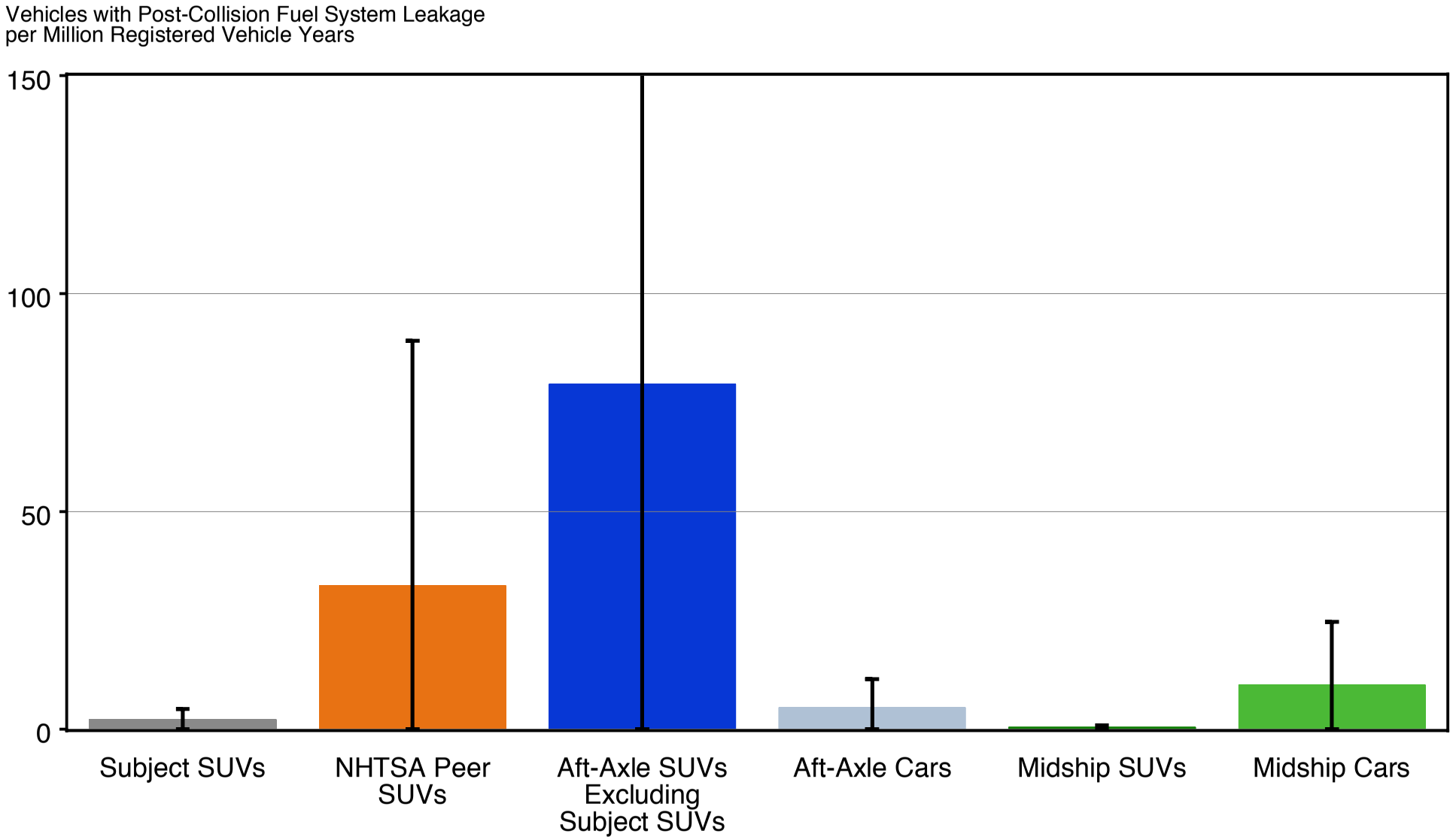
Rates of Post-Collision Fuel System Leakage
Utility Vehicles and Cars Towed Due to Damage



Sources: NASS CDS 1994-2011 and Polk NVPP 1994-2011.
Subject SUVs are the model-year 1993-2004 Jeep Grand Cherokee and 2002-2007 Jeep Liberty.
Other groups are model-year 1993-2007 cars and SUVs labeled with tank location "Mid Ship" or "Aft Axle" in "Fuel Tank Location Information NHTSA 12-10-12."
NHTSA peers are defined in Table 1.
Vehicle models identified by VIN.

Rates of Post-Collision Fuel System Leakage in Rear Impacts

Utility Vehicles and Cars Towed Due to Damage



Sources: NASS CDS 1994-2011 and Polk NVPP 1994-2011.
Subject SUVs are the model-year 1993-2004 Jeep Grand Cherokee and 2002-2007 Jeep Liberty.
Other groups are model-year 1993-2007 cars and SUVs labeled with tank location "Mid Ship" or "Aft Axle" in "Fuel Tank Location Information NHTSA 12-10-12."
NHTSA peers are defined in Table 1.
Vehicle models identified by VIN. "Rear Impact" is defined as the Highest Deformation Location (variable: GAD1) equal to "Back."

Table 1: List of NHTSA Peers

NHTSA Peers
Chevrolet Geo Tracker 1993-1998
Chevrolet Geo Tracker 1999-2006
Chevrolet S10/T10 Blazer 1993-2007
Chevrolet TrailBlazer 1993-2007
Ford Explorer 1993-2007
GMC Envoy 1993-2007
GMC S15/T15 Jimmy 1993-2007
GMC Typhoon 1993-2007
Honda Passport 1993-2004
Isuzu Amigo 1993-2004
Isuzu Rodeo 1993-2004
Isuzu Trooper 1993-2002
Jeep Wrangler 1993-1995,1997-2007
Mercury Mountaineer 1993-2007
Mitsubishi Montero 1993-2006
Mitsubishi Montero Sport 1993-2006
Nissan Pathfinder 1993-2007
Oldsmobile Bravada 1993-2007
Suzuki Grand Vitara 1999-2006
Suzuki Sidekick 1993-1998
Suzuki Vitara 1999-2006
Suzuki XL7 1999-2006
Toyota 4 Runner 1993-2007

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Appendix C

FARS and NASS Analysis Updates

Top 100 Vehicles by various categories - Initial Impact

Contents

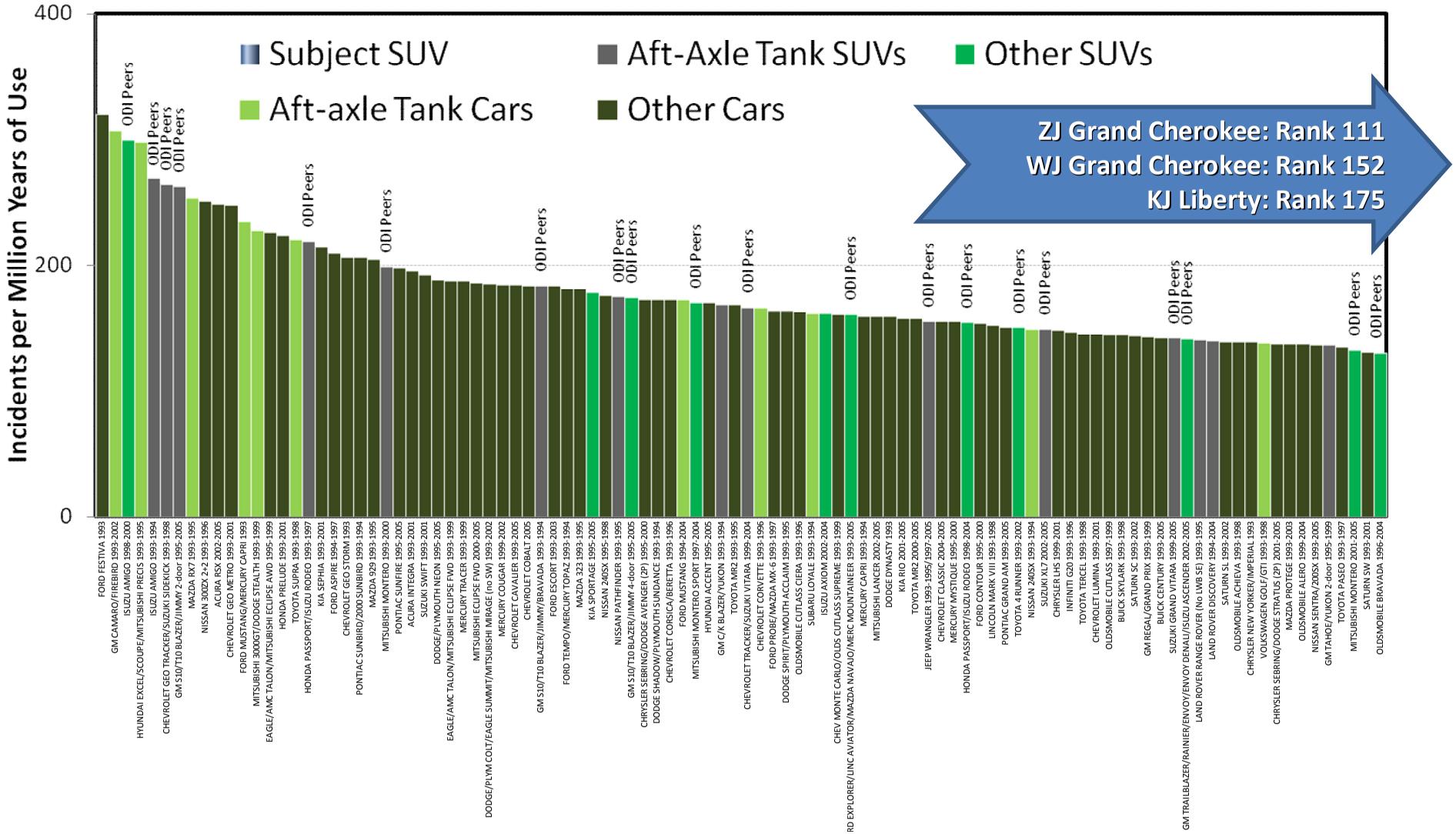
- Rates of various collision types for passenger cars and light trucks with model years 1993-2005 (2007 for Liberty)
- The 100 vehicles having the highest crash rates for each crash mode are plotted, and the ranking of the Subject SUVs noted if not in the top 100 list
- Uses FARS 1993-2011 data exactly as coded, so any incidents that might not be accurately coded have not been corrected

For this set of vehicles, the following slides are shown:

- Any impact with occupant fatality
- Initial impact to rear (excludes rollovers) with occupant fatality
- Any impact with fire, fatality in crash not necessarily in vehicle
- Initial Impact to rear (excludes rollover), fatality in crash not necessarily in vehicle
- Initial Impact to side (excludes rollover), fatality in crash not necessarily in vehicle
- Initial Impact to rear or side (excludes rollover), fatality in crash not necessarily in vehicle

Rates of Fatal Collisions

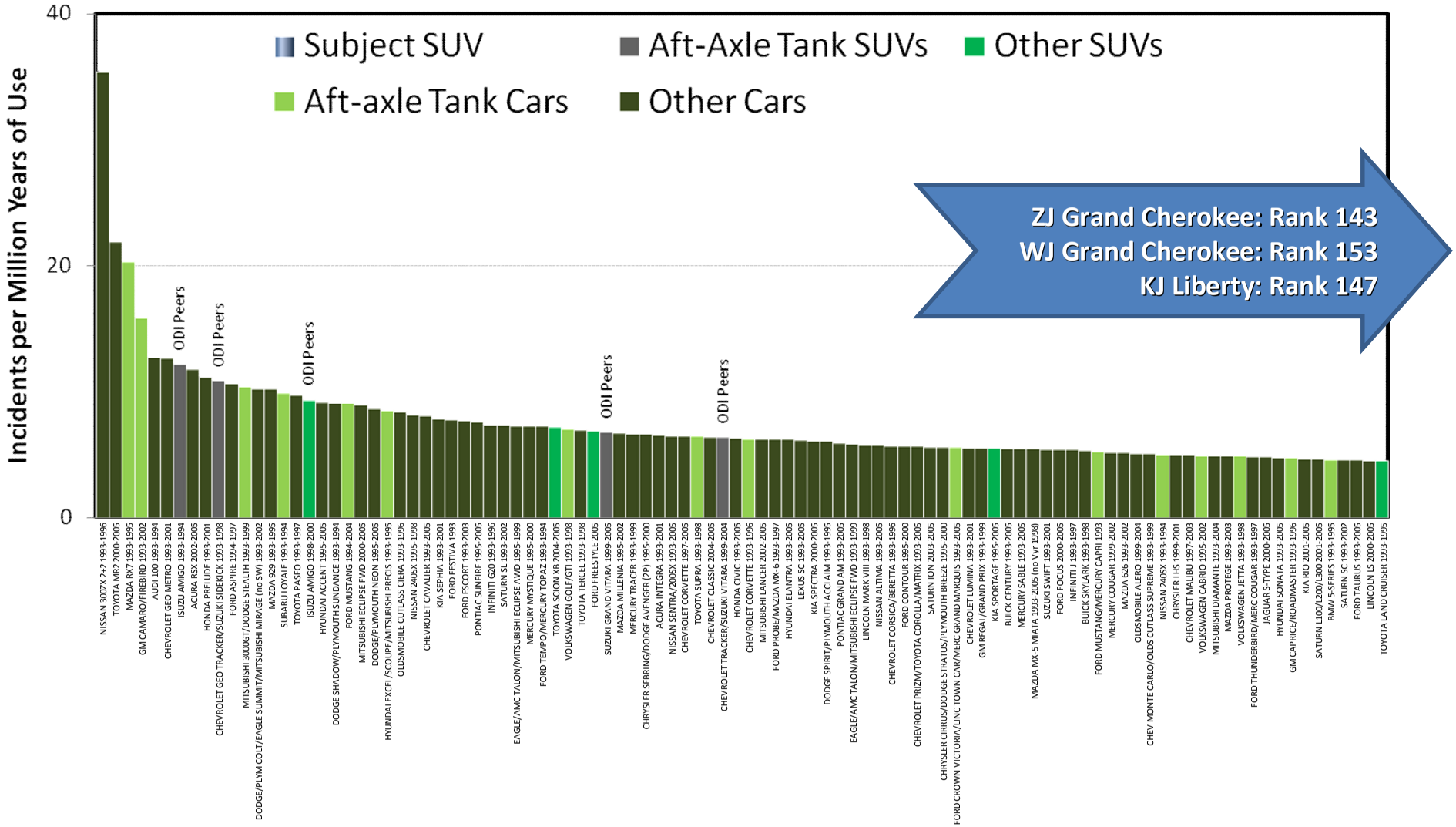
100 Vehicles Having the Highest Rates of Collisions With Occupant Fatality



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004 and KJ Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Included in the chart are the 100 passenger cars and SUVs having the highest rates of crashes with an occupant fatality. ODI list indicates vehicles identified by the NHTSA as peer vehicles.

Rates of Fatal Rear Collisions

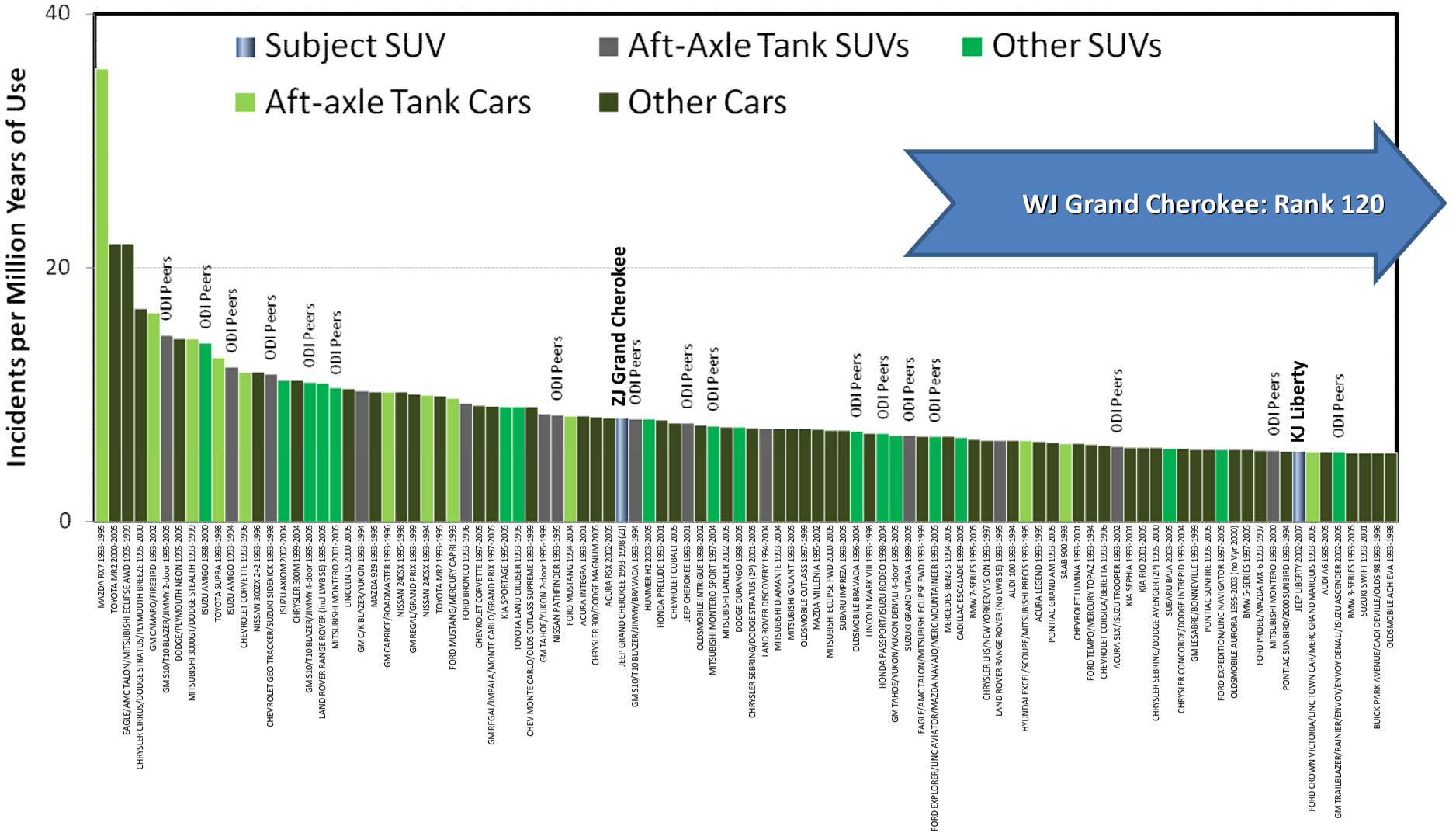
100 Vehicles Having the Highest Rates of Initial Impact to the Rear with Occupant Fatality



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004 and KJ Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Included in the chart are the 100 passenger cars and SUVs having the highest rates of non-rollover crashes with an occupant fatality and initial impact to the rear (clock points 5, 6, or 7). ODI list indicates vehicles identified by the NHTSA as peer vehicles.

Rates of Collisions Accompanied by Fire

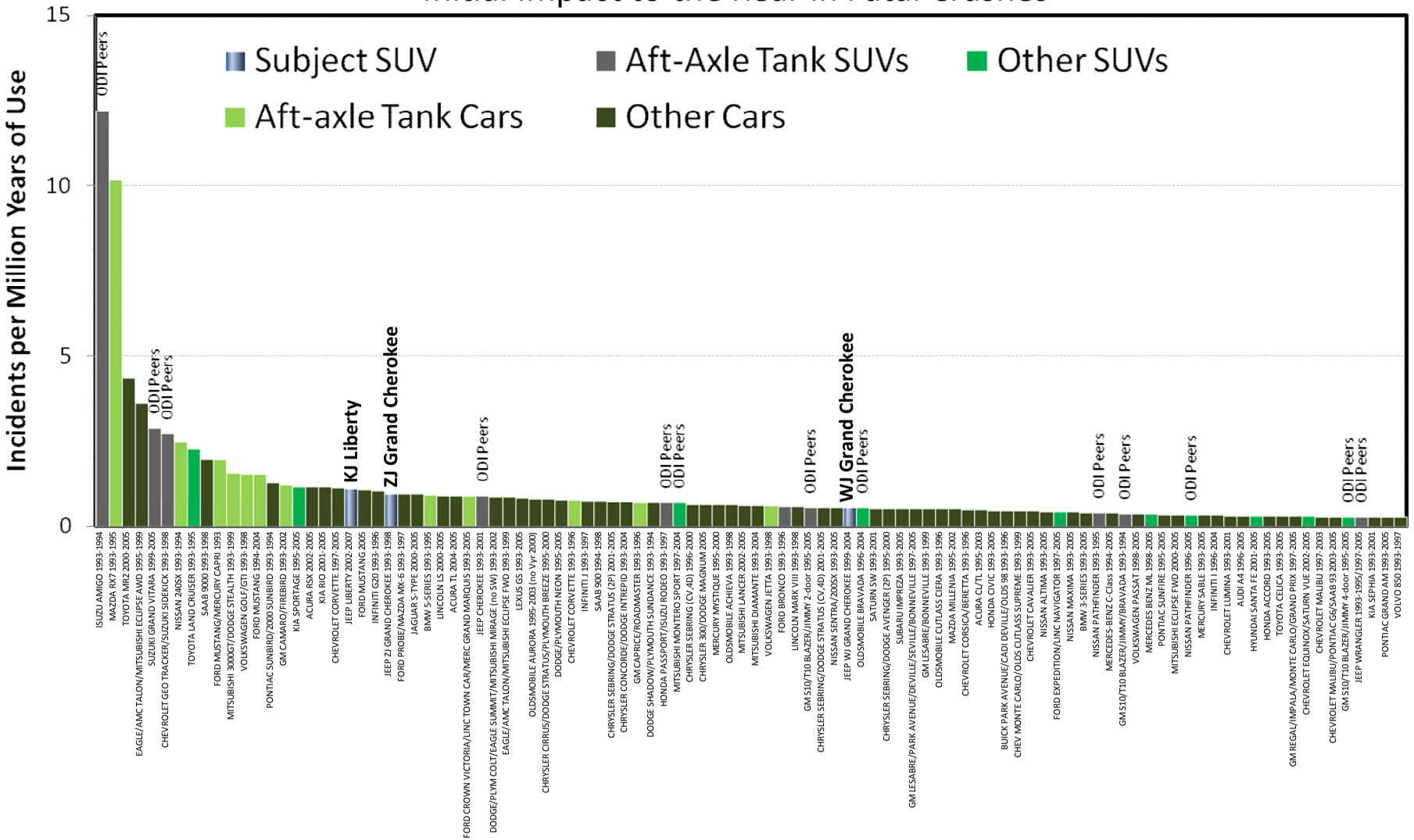
100 Vehicles Having the Highest Rates of Collisions With Fire in Fatal Crashes



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004 and KJ Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Included in the chart are the 100 passenger cars and SUVs having the highest rates of crashes with fire, where a fatality occurred in the crash but not necessarily in the vehicle analyzed. ODI list indicates vehicles identified by the NHTSA as peer vehicles.

Rates of Rear Collisions Accompanied by Fire

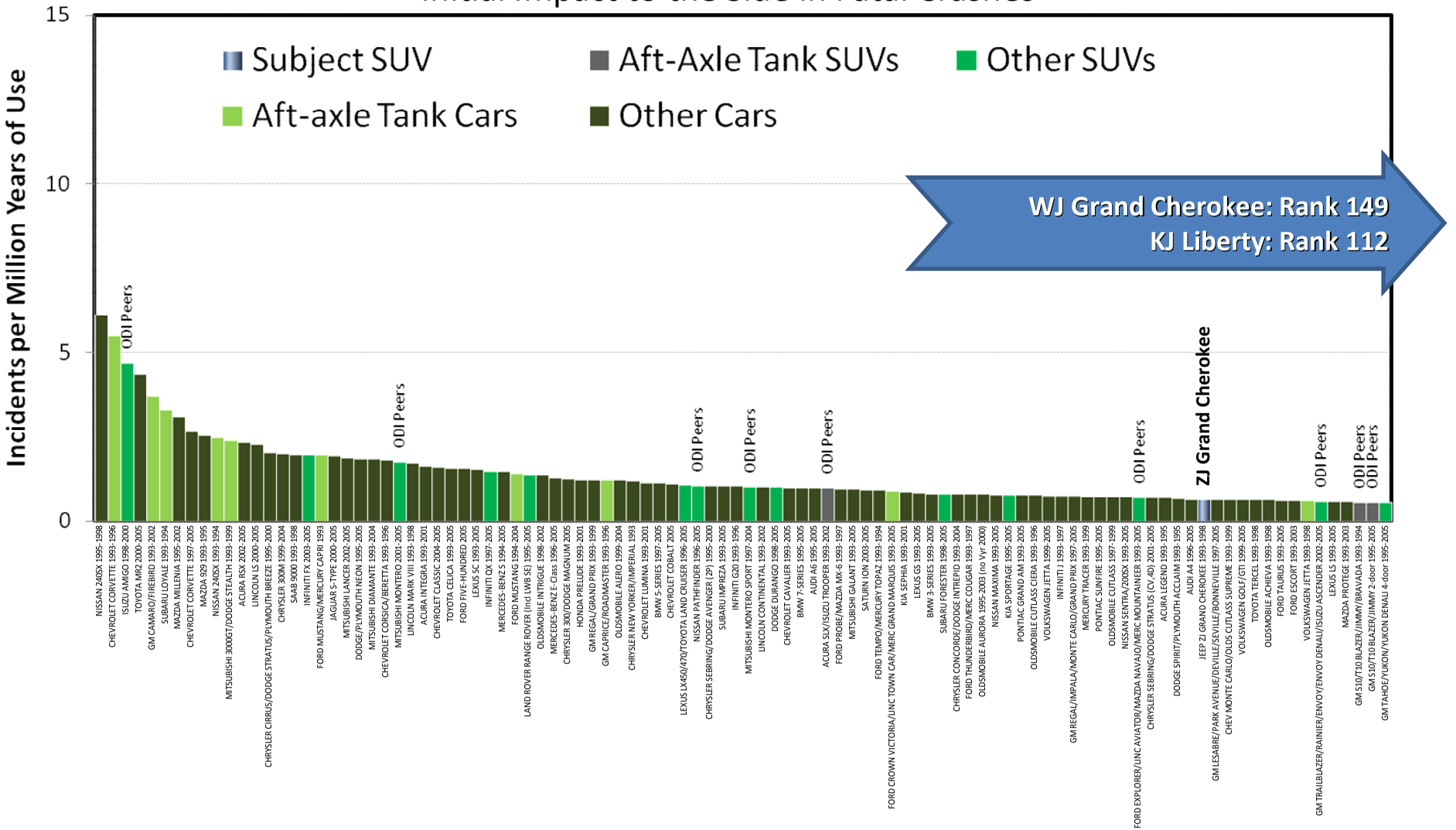
100 Vehicles Having the Highest Rates of Collisions With Fire and Initial Impact to the Rear in Fatal Crashes



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004 and KJ Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Included in the chart are the 100 passenger cars and SUVs having the highest rates of non-rollover crashes with fire and initial impact to the rear (clock points 5-7), where a fatality occurred in the crash but not necessarily in the vehicle analyzed. ODI list indicates vehicles identified by the NHTSA as peer vehicles.

Rates of Side Collisions Accompanied by Fire

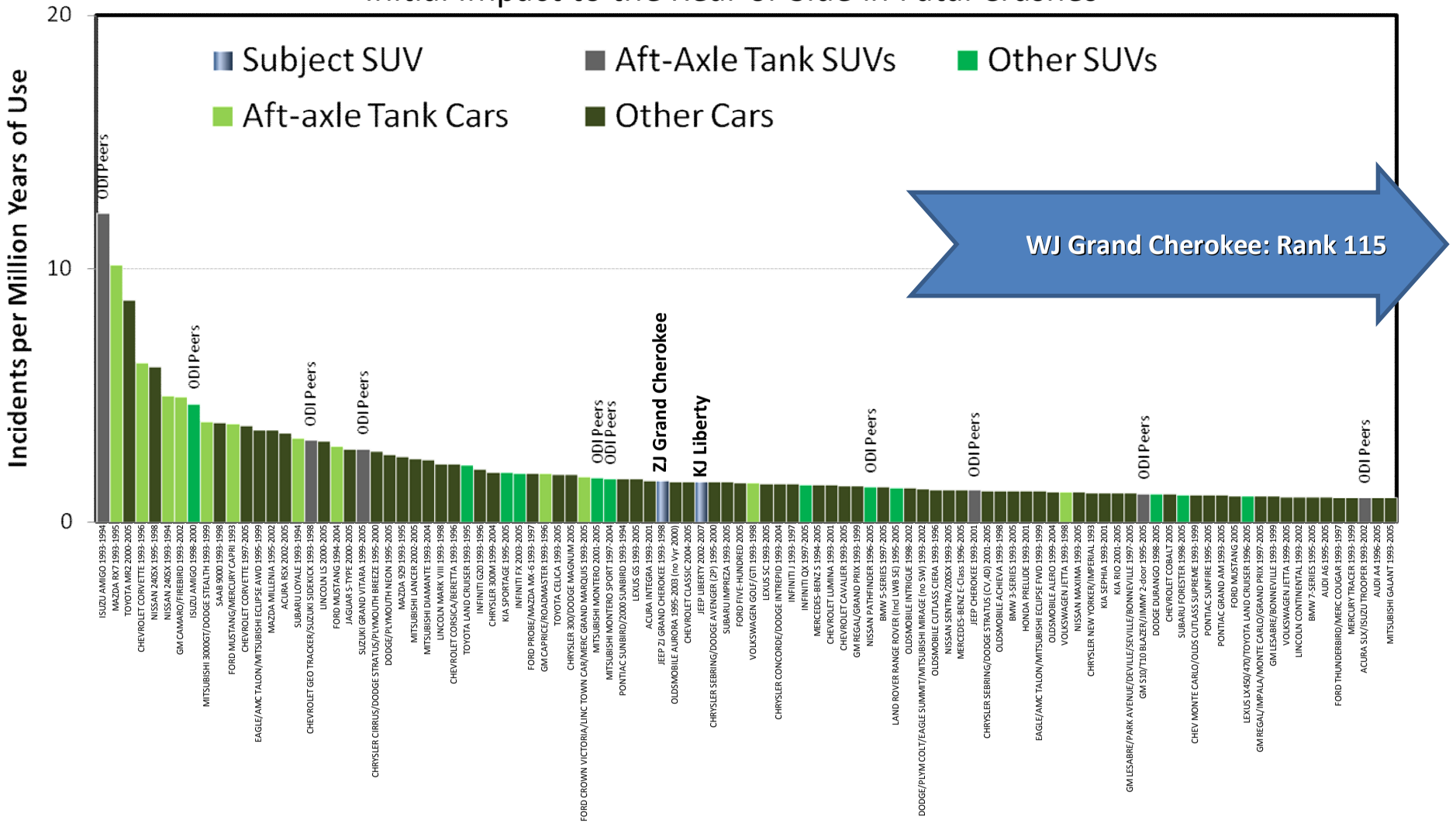
100 Vehicles Having the Highest Rates of Collisions With Fire and Initial Impact to the Side in Fatal Crashes



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004 and KJ Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Included in the chart are the 100 passenger cars and SUVs having the highest rates of non-rollover crashes with fire and initial impact to the side (clock points 2-4, 8-10), where a fatality occurred in the crash but not necessarily in the vehicle analyzed. ODI list indicates vehicles identified by the NHTSA as peer vehicles.

Rates of Rear or Side Collisions Accompanied by Fire

100 Vehicles Having the Highest Rates of Collisions With Fire and Initial Impact to the Rear or Side in Fatal Crashes



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004 and KJ Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Included in the chart are the 100 passenger cars and SUVs having the highest rates of non-rollover crashes with fire and initial impact to the rear or side (clock points 2-10), where a fatality occurred in the crash but not necessarily in the vehicle analyzed. ODI list indicates vehicles identified by the NHTSA as peer vehicles.

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Appendix C

FARS and NASS Analysis Updates

Top 100 Vehicles by various categories - Principal Impact

Contents

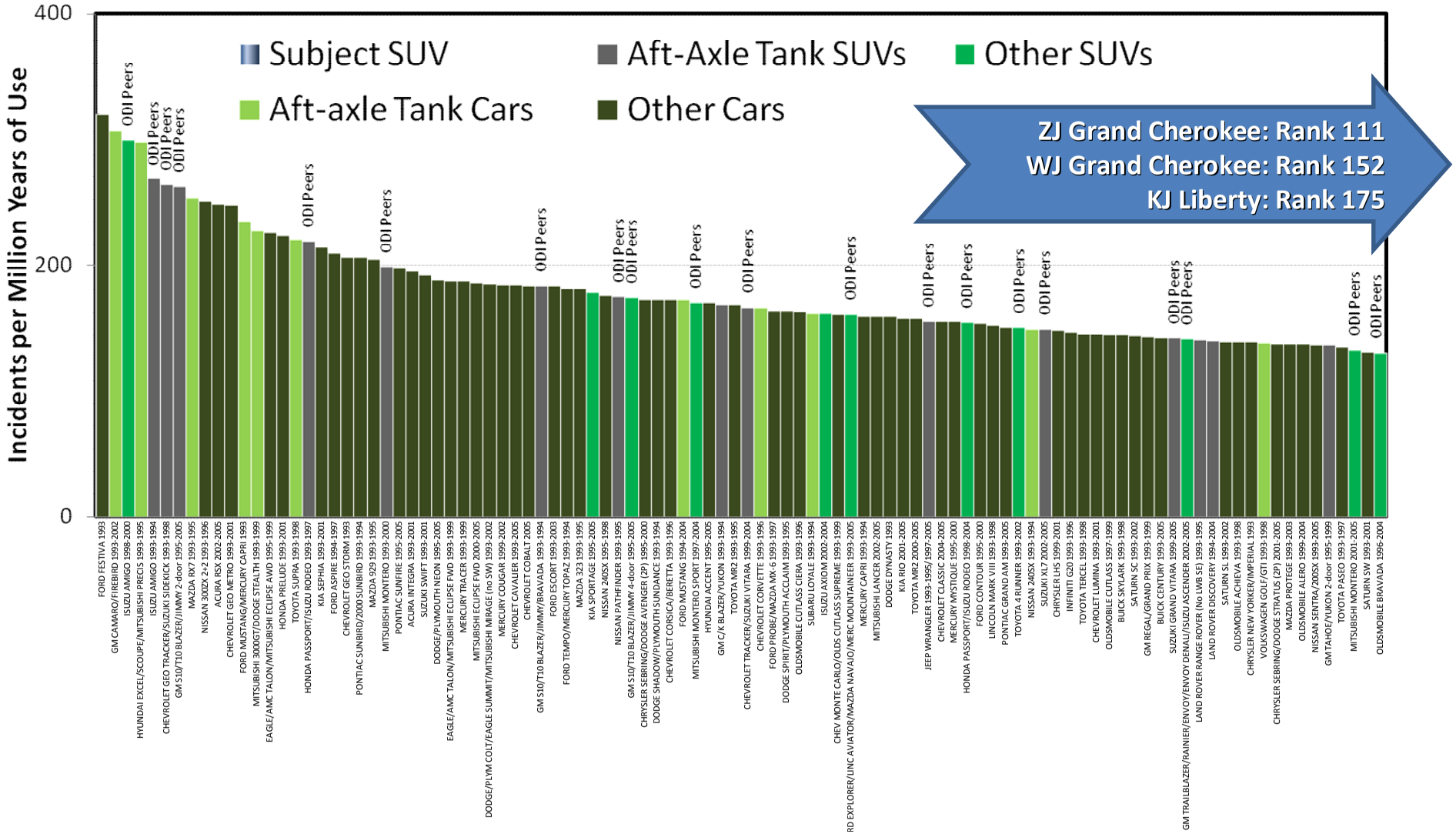
- Rates of various collision types for passenger cars and light trucks with model years 1993-2005 (2007 for Liberty)
- The 100 vehicles having the highest crash rates for each crash mode are plotted, and the ranking of the Subject SUVs noted if not in the top 100 list
- Uses FARS 1993-2011 data exactly as coded, so any incidents that might not be accurately coded have not been corrected

For this set of vehicles, the following slides are shown:

- Any impact with occupant fatality
- Principal impact to rear (excludes rollovers) with occupant fatality
- Any impact with fire, fatality in crash not necessarily in vehicle
- Principal Impact to rear (excludes rollover), fatality in crash not necessarily in vehicle
- Principal Impact to side (excludes rollover), fatality in crash not necessarily in vehicle
- Principal Impact to rear or side (excludes rollover), fatality in crash not necessarily in vehicle

Rates of Fatal Collisions

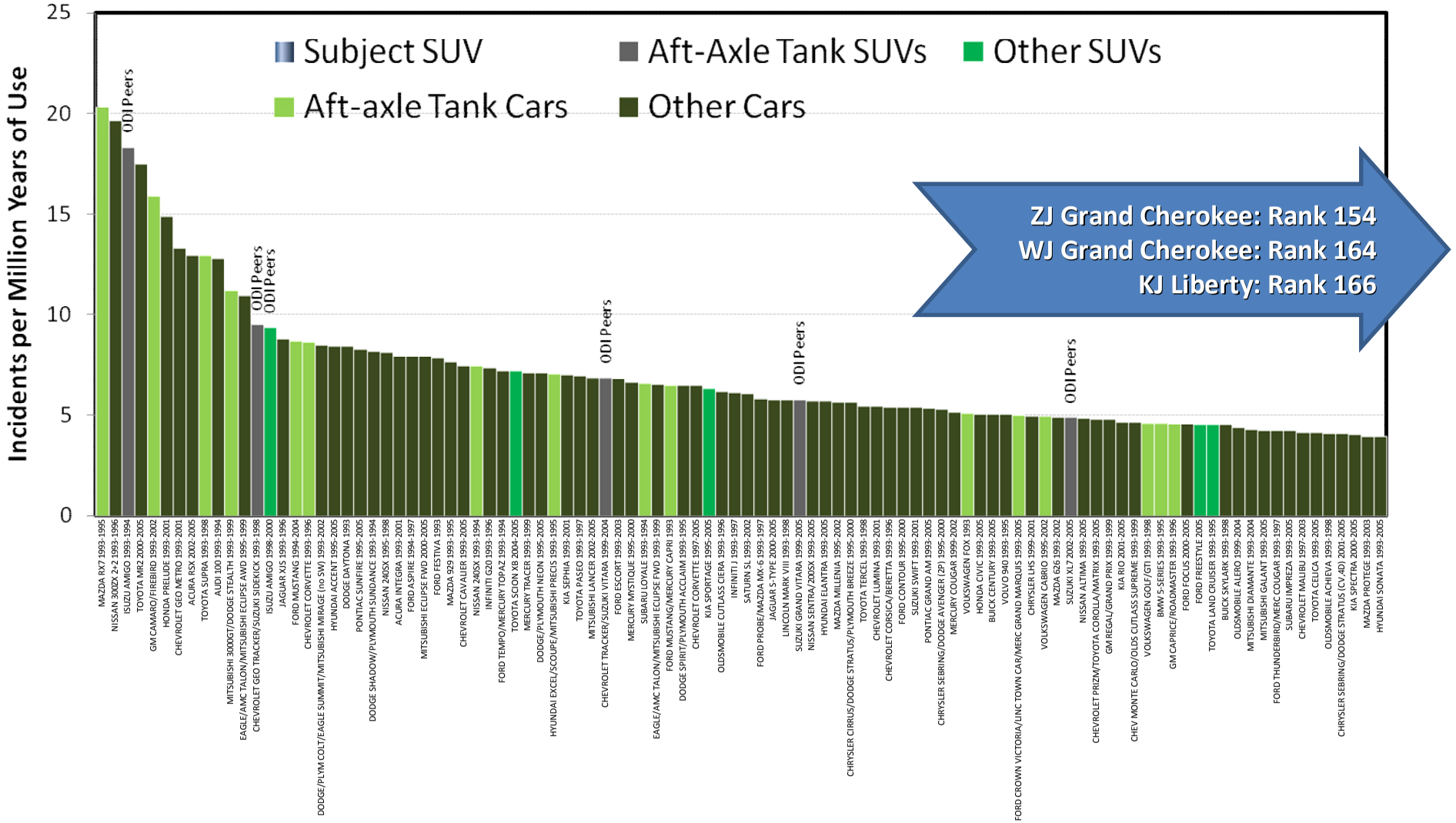
100 Vehicles Having the Highest Rates of Collisions With Occupant Fatality



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004 and KJ Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Included in the chart are the 100 passenger cars and SUVs having the highest rates of crashes with an occupant fatality. ODI list indicates vehicles identified by the NHTSA as peer vehicles.

Rates of Fatal Rear Collisions

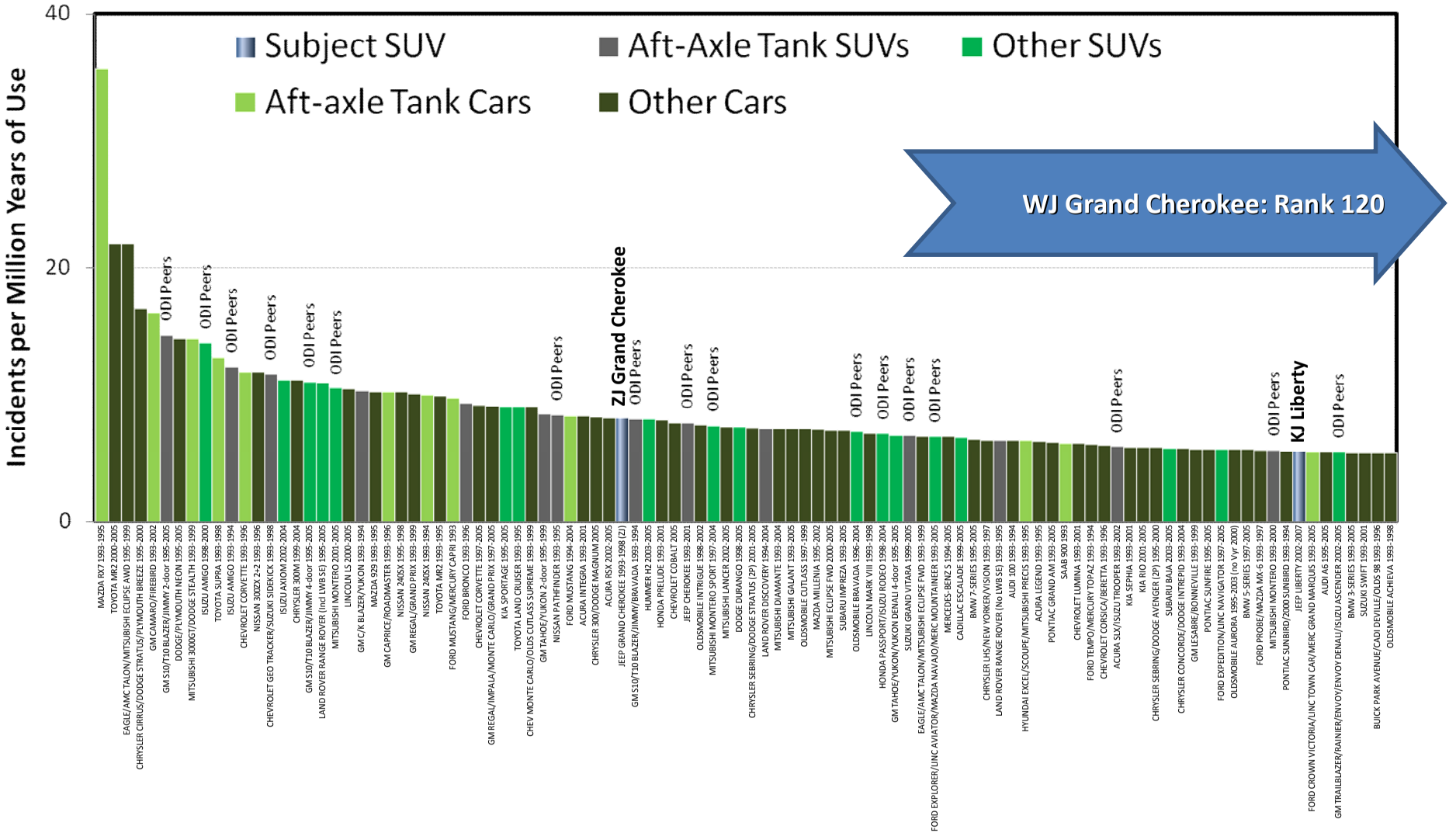
100 Vehicles Having the Highest Rates of Principal Impact to the Rear with Occupant Fatality



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004 and KJ Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Included in the chart are the 100 passenger cars and SUVs having the highest rates of non-rollover crashes with an occupant fatality and principal impact to the rear (clock points 5, 6, or 7). ODI list indicates vehicles identified by the NHTSA as peer vehicles.

Rates of Collisions Accompanied by Fire

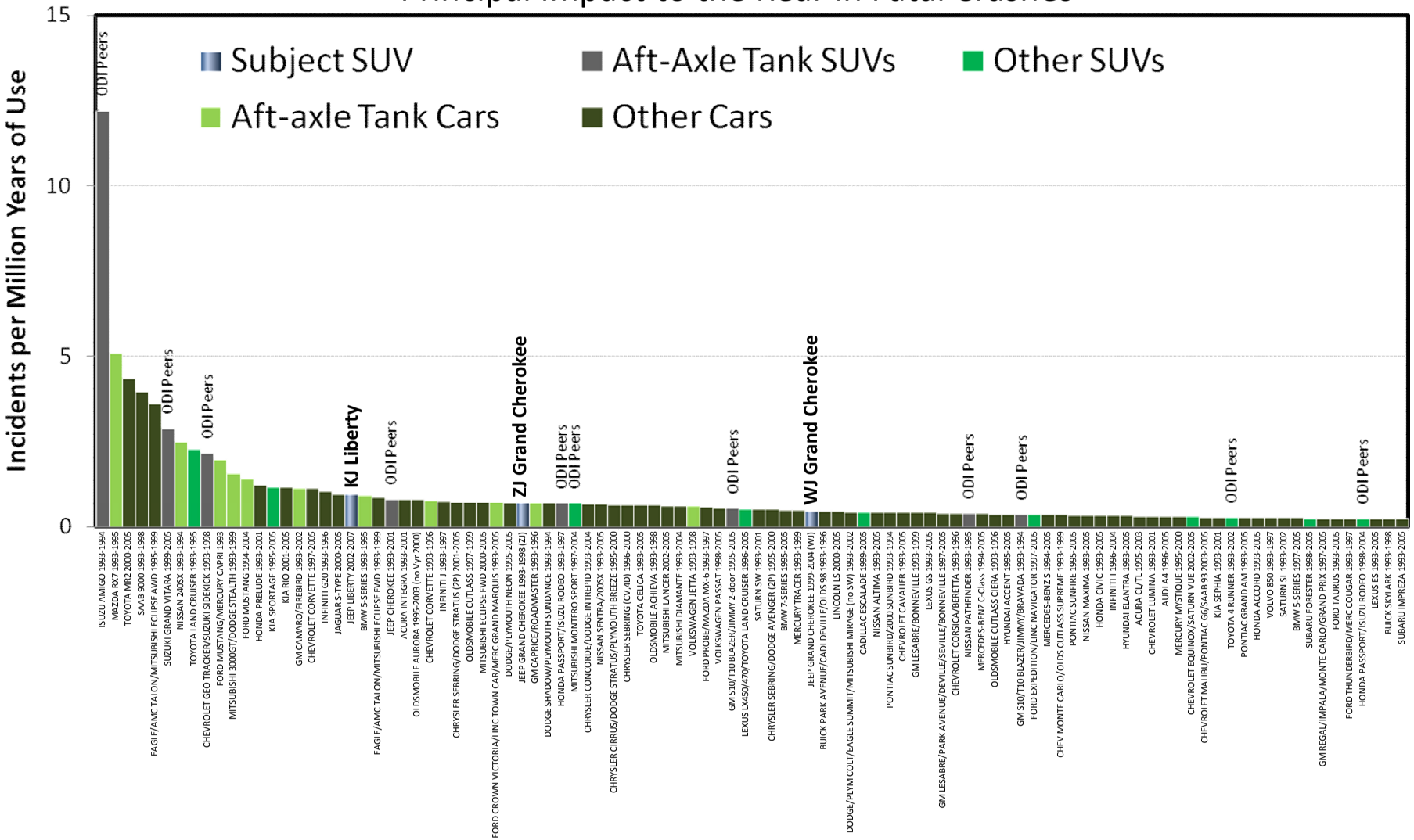
100 Vehicles Having the Highest Rates of Collisions With Fire in Fatal Crashes



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004 and KJ Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Included in the chart are the 100 passenger cars and SUVs having the highest rates of crashes with fire, where a fatality occurred in the crash but not necessarily in the vehicle analyzed. ODI list indicates vehicles identified by the NHTSA as peer vehicles.

Rates of Rear Collisions Accompanied by Fire

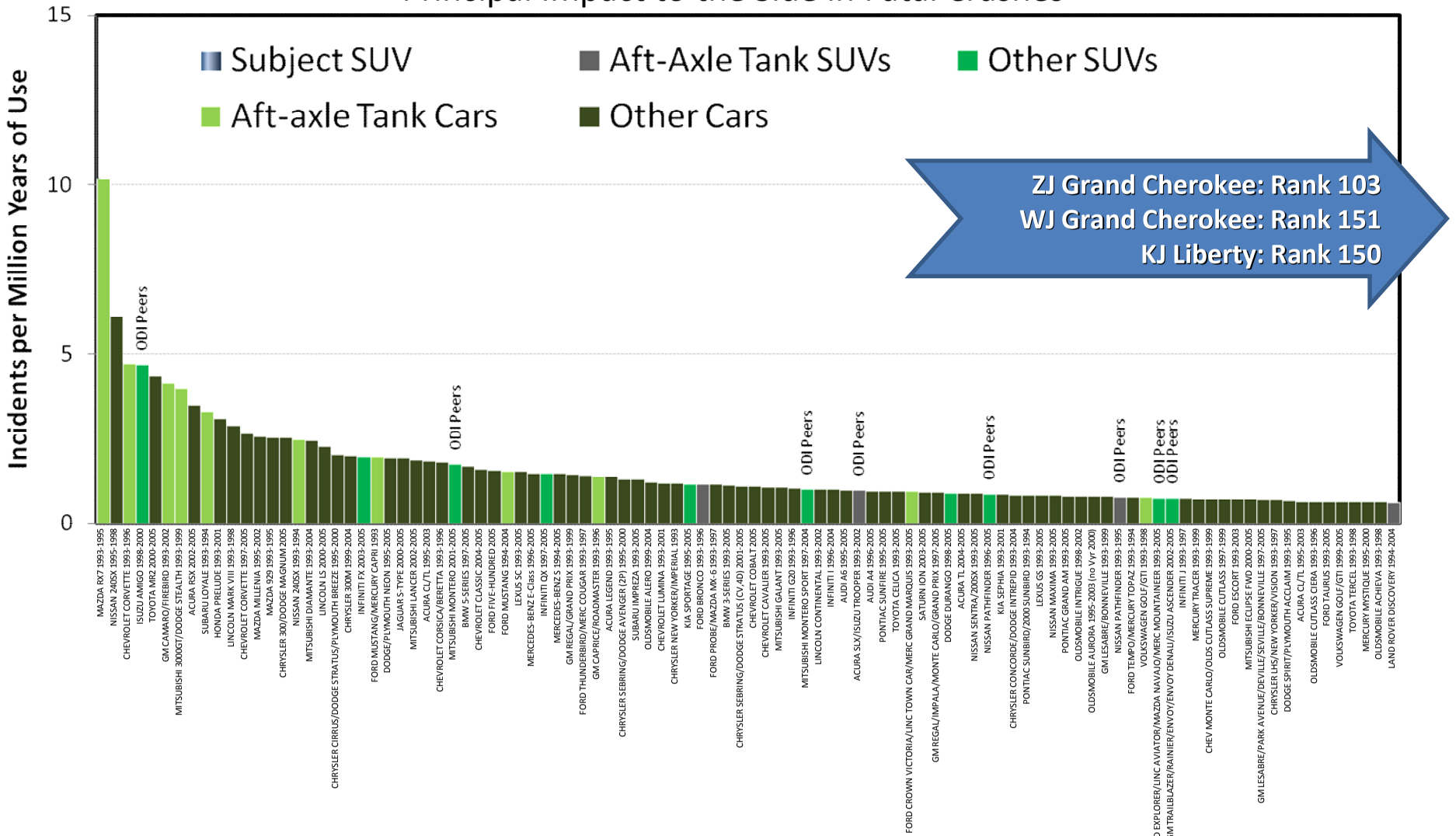
100 Vehicles Having the Highest Rates of Collisions With Fire and Principal Impact to the Rear in Fatal Crashes



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004 and KJ Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Included in the chart are the 100 passenger cars and SUVs having the highest rates of non-rollover crashes with fire and principal impact to the rear (clock points 5-7), where a fatality occurred in the crash but not necessarily in the vehicle analyzed. ODI list indicates vehicles identified by the NHTSA as peer vehicles.

Rates of Side Collisions Accompanied by Fire

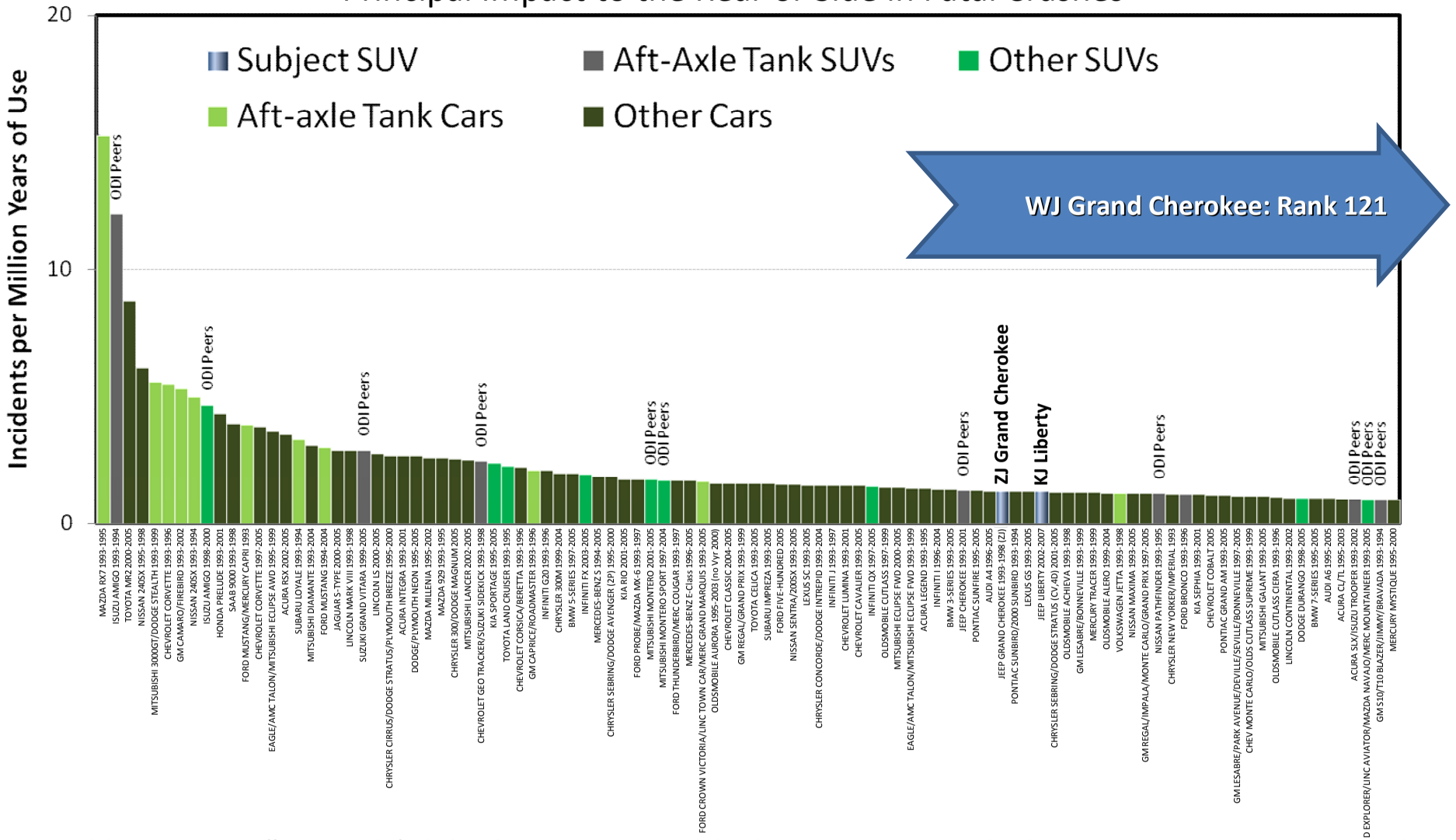
100 Vehicles Having the Highest Rates of Collisions With Fire and Principal Impact to the Side in Fatal Crashes



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004 and KJ Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Included in the chart are the 100 passenger cars and SUVs having the highest rates of non-rollover crashes with fire and principal impact to the side (clock points 2-4, 8-10), where a fatality occurred in the crash but not necessarily in the vehicle analyzed. ODI list indicates vehicles identified by the NHTSA as peer vehicles.

Rates of Rear or Side Collisions Accompanied by Fire

100 Vehicles Having the Highest Rates of Collisions With Fire and Principal Impact to the Rear or Side in Fatal Crashes



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004 and KJ Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Included in the chart are the 100 passenger cars and SUVs having the highest rates of non-rollover crashes with fire and principal impact to the rear or side (clock points 2-10), where a fatality occurred in the crash but not necessarily in the vehicle analyzed. ODI list indicates vehicles identified by the NHTSA as peer vehicles.

EA12-005

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Appendix C

FARS and NASS Analysis Updates

Updated Presentation - MY 93-05 FARS 92-2011

FARS Data Analysis

SUVs and Cars

Contents

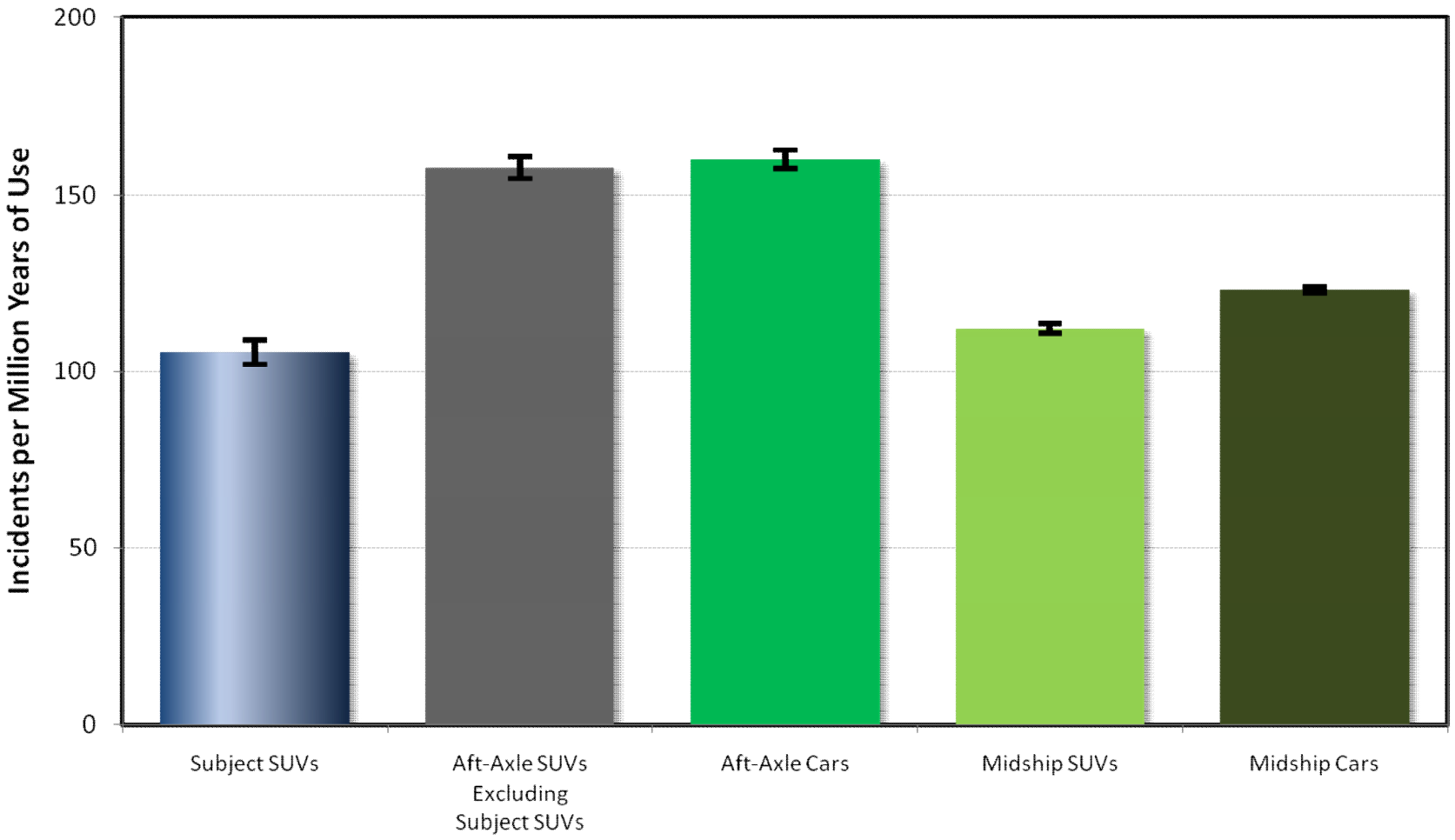
- Crash rates defined as collision vehicles per million years of use (million registered vehicle years), based on:
  - FARS data 1992-2011
  - Vehicles with at least 100,000 years of use.
  - RL Polk vehicle registration data
  - 95% confidence interval calculations about rates
- Average rates of crashes of different types, grouped by vehicle type, tank location and subject vehicle. Includes confidence intervals.
- Rates of fatal rear crashes accompanied by fire, rank-ordered by model (including confidence intervals)
  - 100 models having the highest rates
  - SUVs and Passenger Cars with aft-axle fuel tanks
  - SUVs with aft-axle or midship fuel tanks
  - SUVs with aft-axle fuel tanks

Grouped Rates of Crashes

- Rates grouped by vehicle type and tank location, shown with confidence intervals
  - SUV vs. Passenger car
  - Aft-Axle vs. Midship tank location
  - Subject SUVs
    - ZJ Grand Cherokee 1993-1998
    - WJ Grand Cherokee 1999-2004
    - KJ Liberty 2002-2007
  - Rates for SUVs with aft-axle tanks do not include Subject SUVs
  - Rates shown with confidence intervals
- Collision types
  - Fatal collisions
  - Fatal collisions with fire
  - Rear fatal collisions
  - Rear fatal collisions with fire
  - Rear fatal collisions with MHE fire

Rates of Fatal Collisions

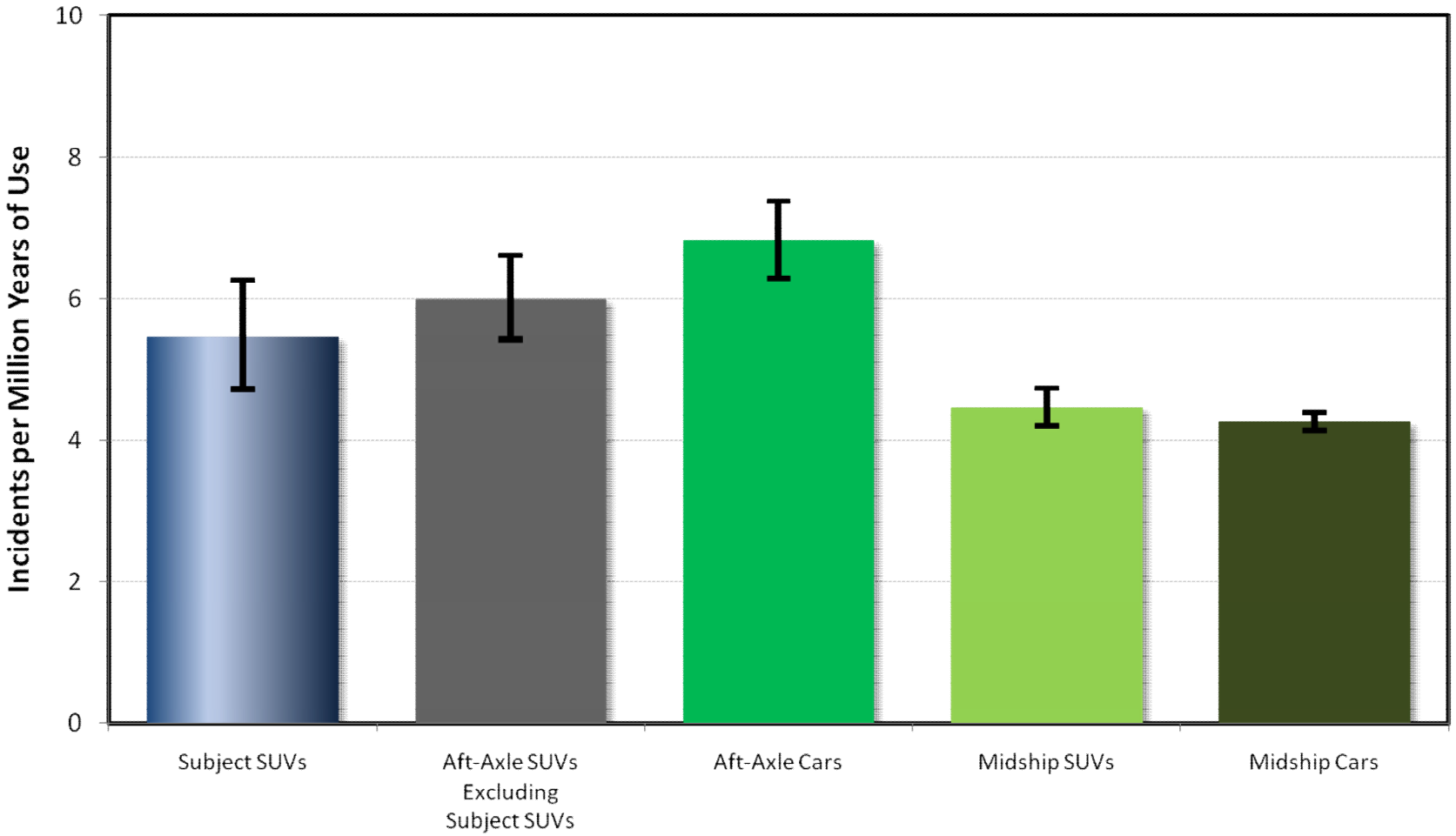
Vehicles involved in any collision with occupant fatality, per million years of use



Notes: Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004, and Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Includes collision vehicles with an occupant fatality. Rates are calculated as combined collision vehicles divided by combined million years of use. Vertical black lines are 95% confidence intervals.

Rates of Fatal Collisions with Fire

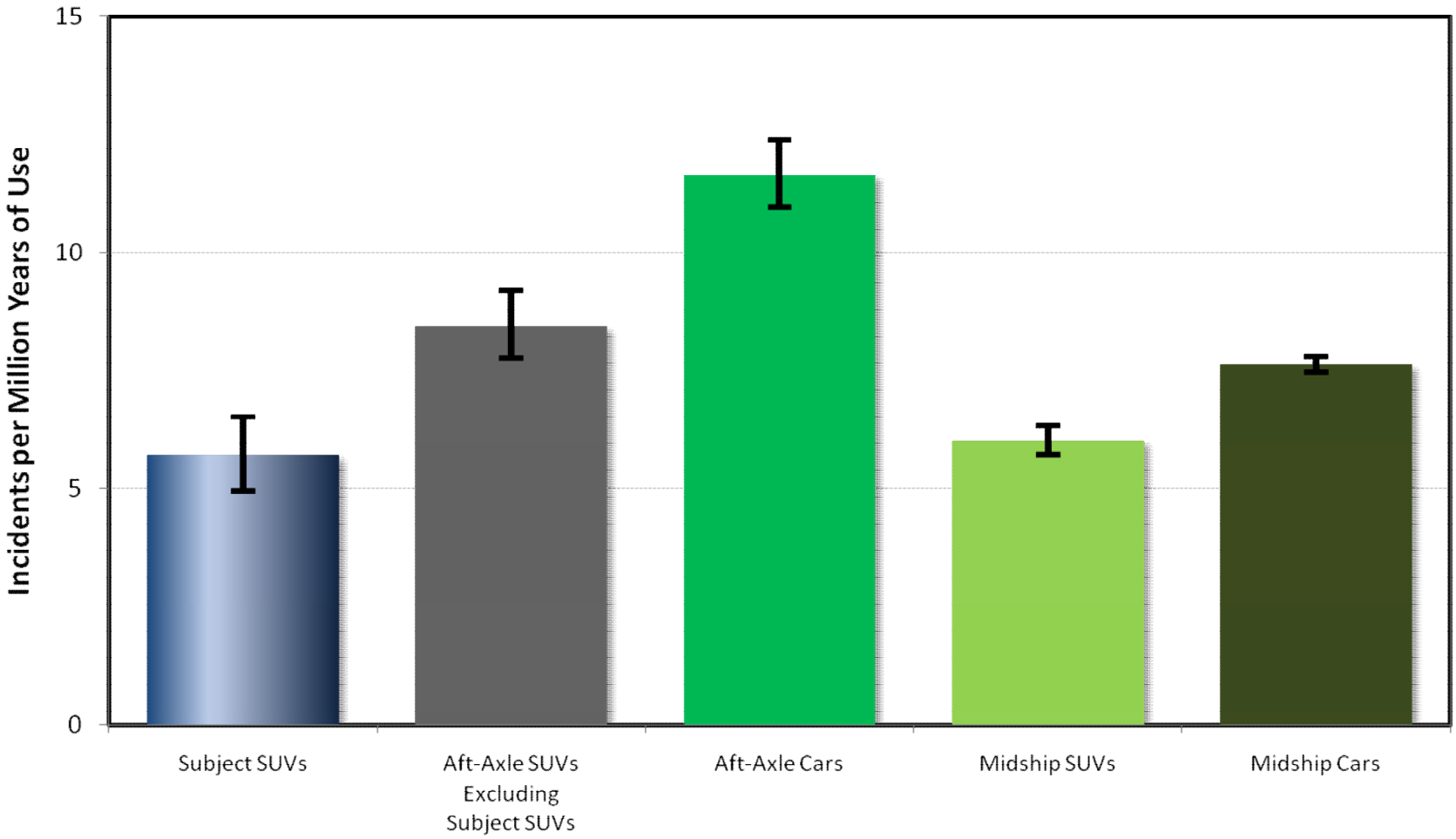
Vehicles involved in any collision with occupant fatality and post-collision fire, per million years of use



Notes: Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004, and Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Includes vehicles with an occupant fatality where the vehicle experienced a post-collision fire. Rates are calculated as combined collision vehicles divided by combined million years of use. Vertical black lines are 95% confidence intervals.

Rates of Fatal Rear Collisions

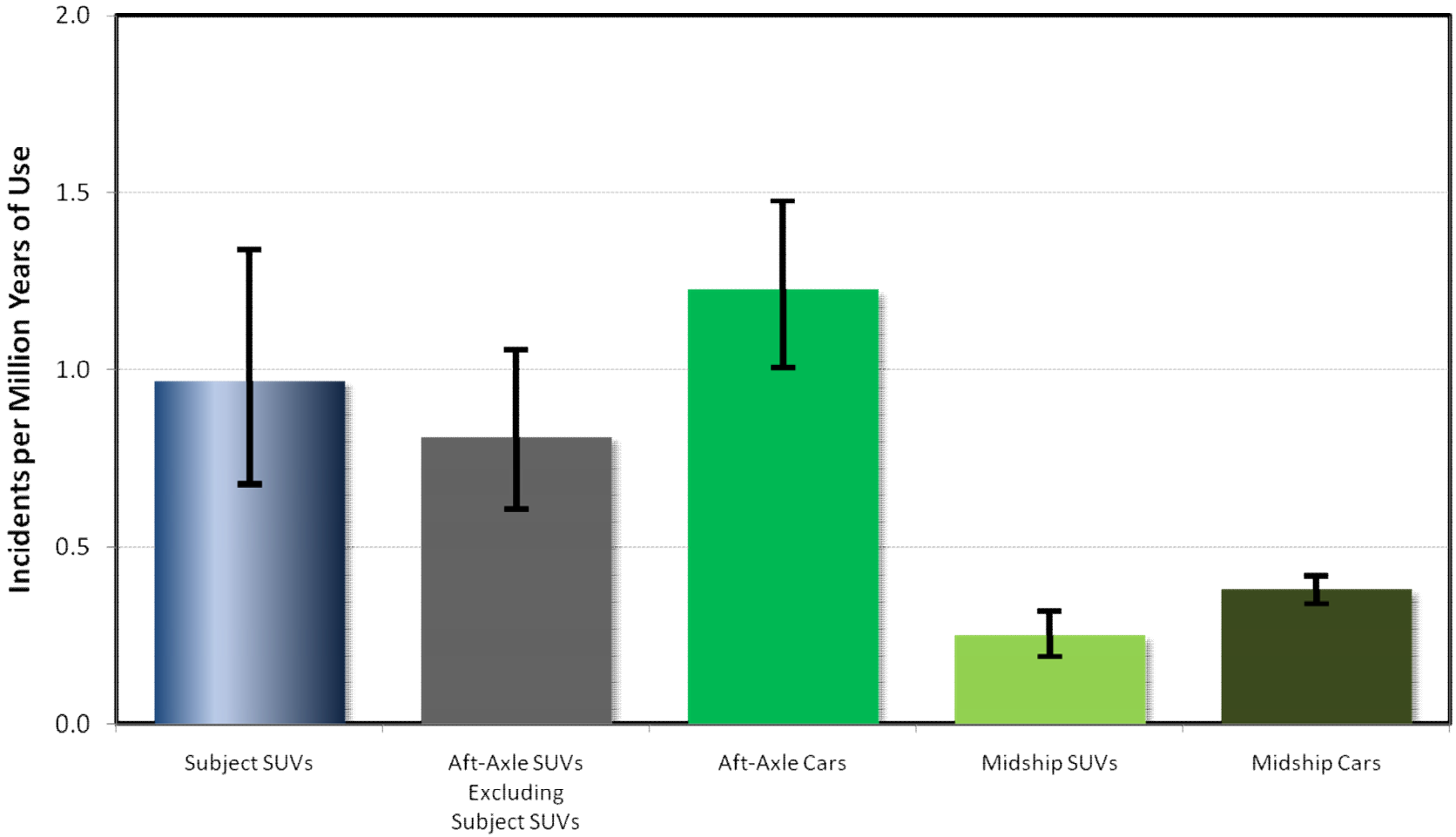
Vehicles involved in a rear collision with occupant fatality, per million years of use



Notes: Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004, and Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Includes vehicles involved in a rear collision with an occupant fatality. Rear collision includes either initial or principal impact at clock points 5, 6, or 7. Rates are calculated as combined collision vehicles divided by combined million years of use. Vertical black lines are 95% confidence intervals.

Rates of Fatal Rear Collisions with Fire

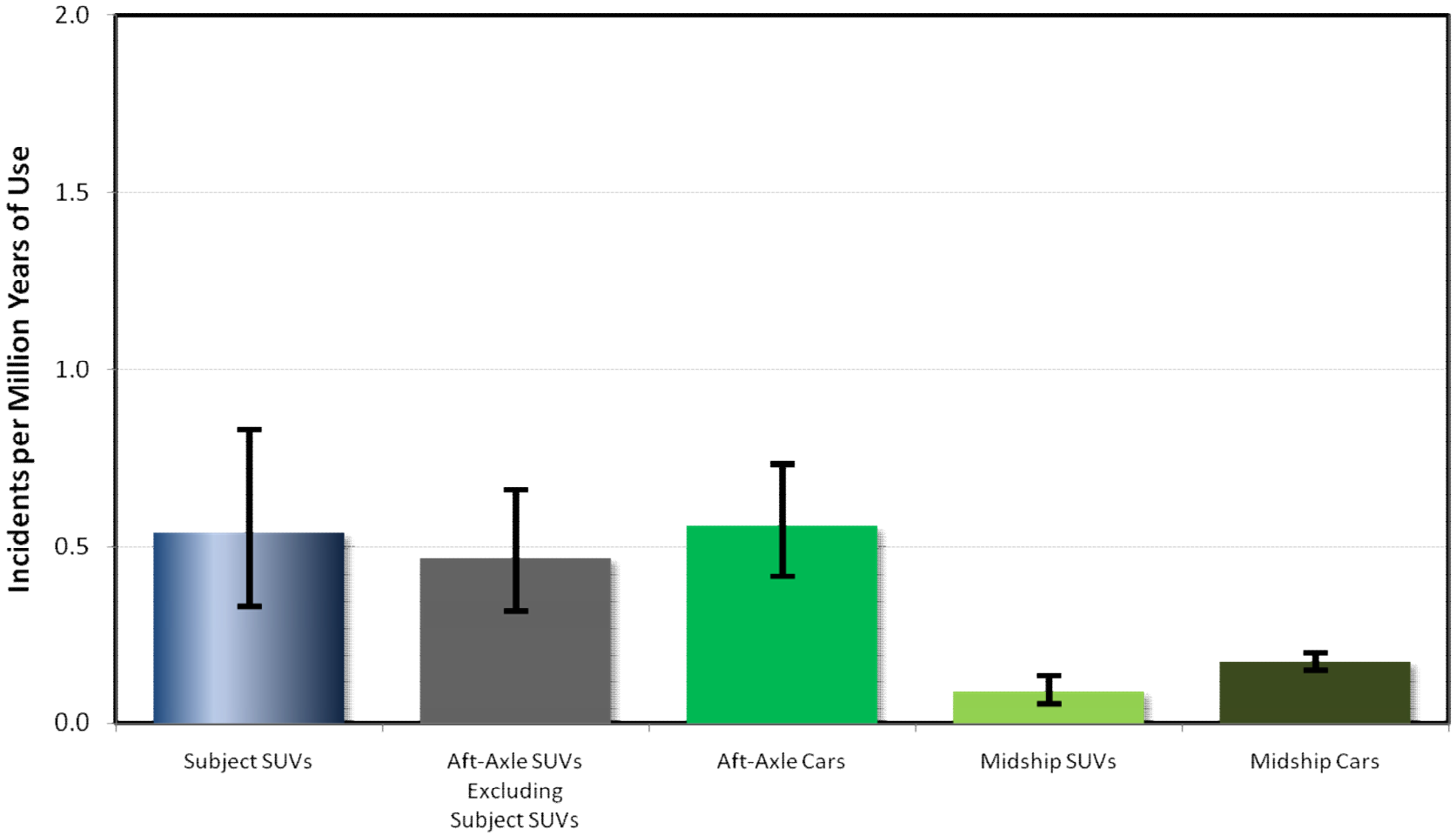
Vehicles involved in a rear collision with occupant fatality and fire, per million years of use



Notes: Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004, and Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Includes vehicles involved in a rear collision with an occupant fatality where the vehicle experienced a post-collision fire. Rear collision includes either initial or principal impact at clock points 5, 6, or 7. Rates are calculated as combined collision vehicles divided by combined million years of use. Vertical black lines are 95% confidence intervals.

Rates of Fatal Rear Collisions with MHE Fire

Vehicles involved in a rear collision with occupant fatality and fire as most harmful event, per million years of use



Notes: Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004, and Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Includes vehicles involved in a rear collision with an occupant fatality where the vehicle experienced a post-collision fire as the most harmful event. Rear collision includes either initial or principal impact at clock points 5, 6, or 7. Rates are calculated as combined collision vehicles divided by combined million years of use. Vertical black lines are 95% confidence intervals.

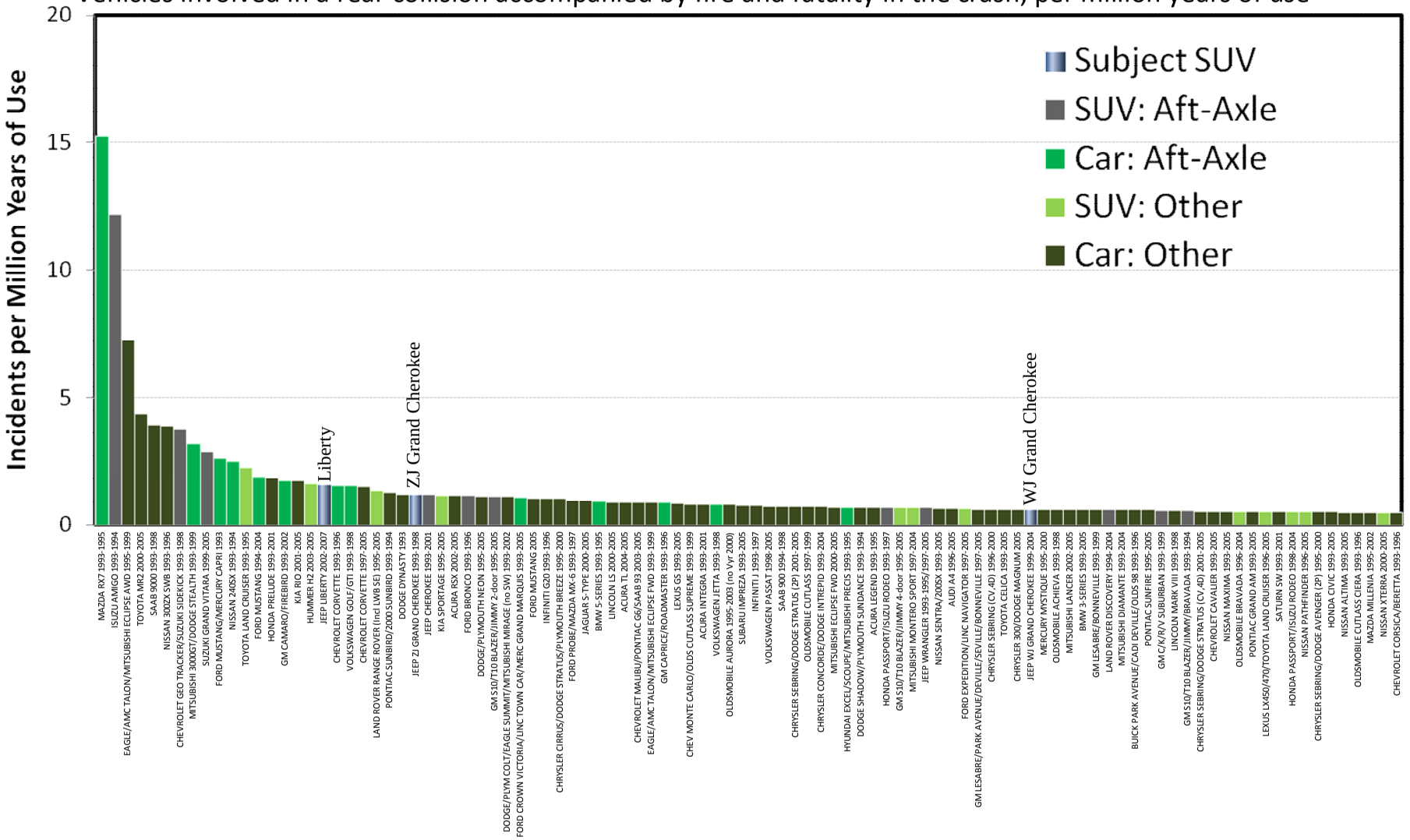
Rear Collisions with Fire

Rank Ordered by Model

- 100 Vehicles having the highest rates of rear collisions accompanied by fire with fatality in the crash
    - Independent of tank location or vehicle type
    - With confidence intervals
    - Fatality in any vehicle in the crash
    - Sorted by rate
    - With confidence intervals
- SUVs and Passenger Cars with aft-axle tanks
    - Sorted by rate
    - With confidence intervals
- SUVs with aft-axle or other tank locations
    - Sorted by rate
    - With confidence intervals
- SUVs with aft-axle tanks
    - Sorted by rate
    - With confidence intervals

100 SUVs and Passenger Cars Having the Highest Rates of Rear Collisions With Fire, by Tank Location

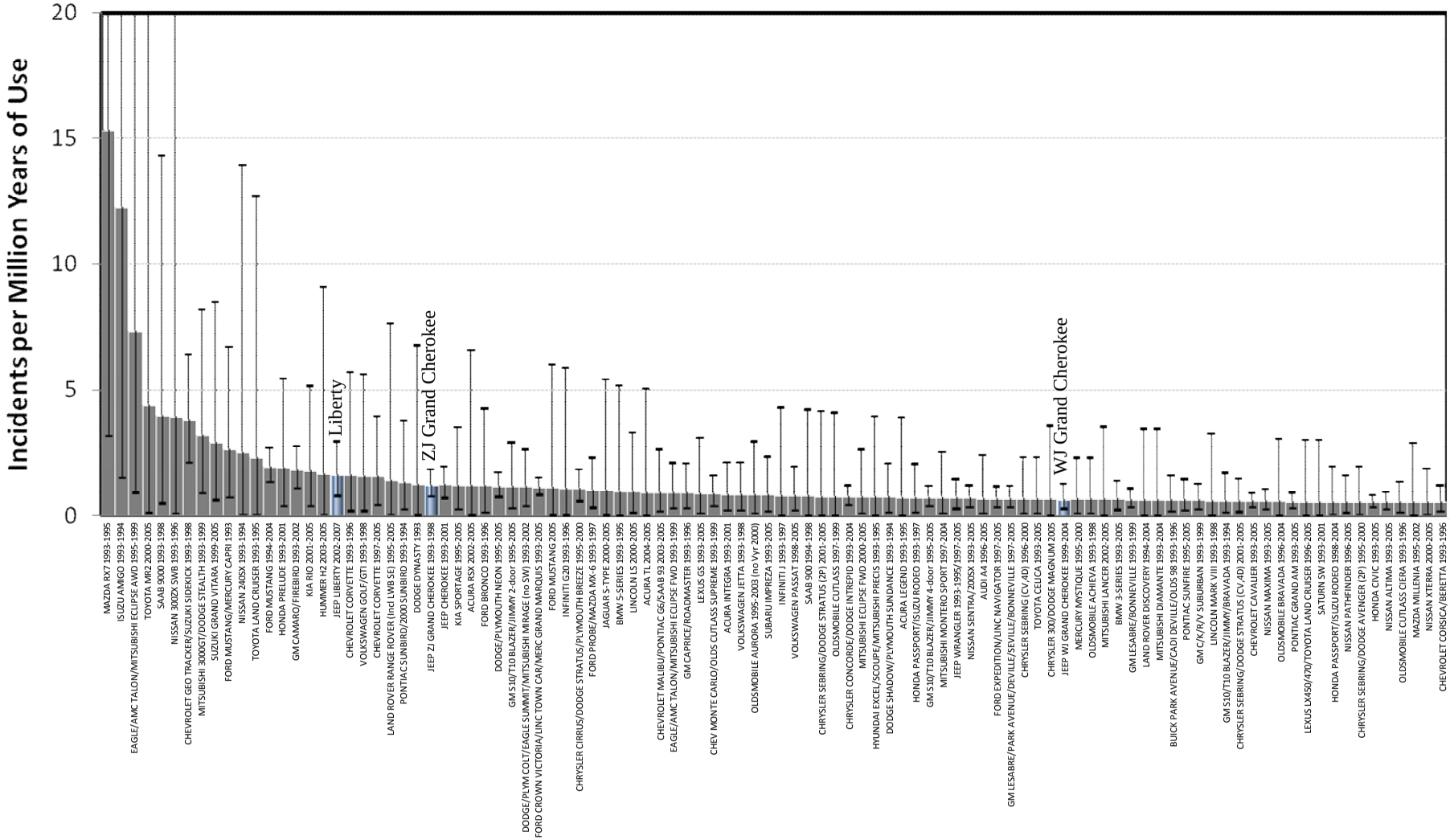
Vehicles involved in a rear collision accompanied by fire and fatality in the crash, per million years of use



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004, and Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Rear collision includes either initial or principal impact to clock points 5, 6, or 7. Includes collisions where the vehicle experienced a post-collision fire. Fatality in any vehicle in the crash.

100 SUVs and Passenger Cars Having the Highest Rates of Rear Collisions With Fire, with Confidence Intervals

Vehicles involved in a rear collision accompanied by fire and fatality in the crash, per million years of use



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004, and Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Rear collision includes either initial or principal impact to clock points 5, 6, or 7. Includes collisions where the vehicle experienced a post-collision fire. Fatality in any vehicle in the crash. Vertical lines are 95% confidence intervals about the rates.

Conclusions

Comparison of Rates of Rear Collisions with Fire in Fatal Crashes by Model, Vehicle Type and Tank Location

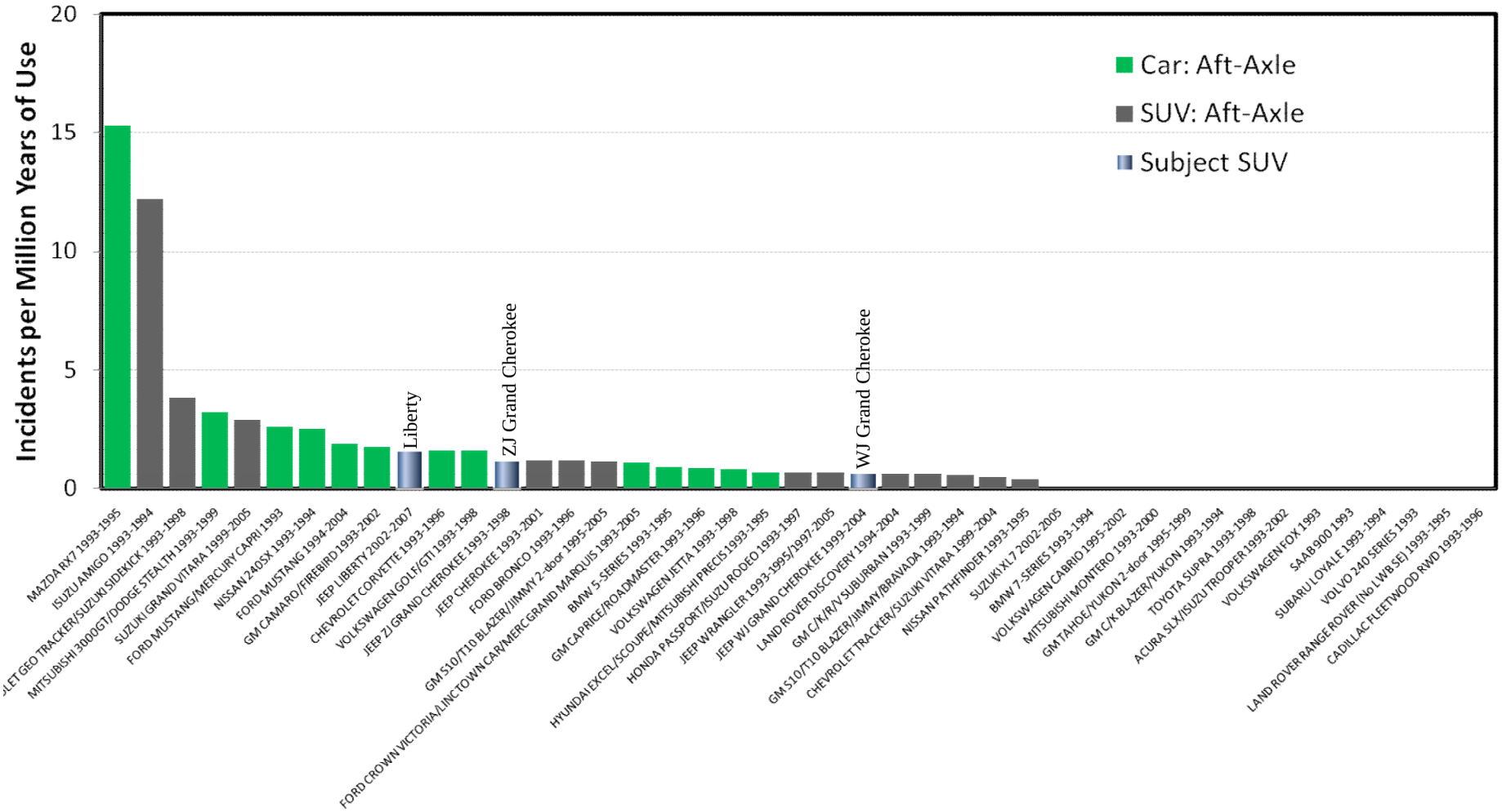
- The 100 SUV and passenger car models having the highest rates of rear collisions accompanied by fire in fatal crashes include vehicles with aft-axle tanks, as well as vehicles with midship tanks. Many such models have rates that are higher than the Subject SUVs.

- The Subject SUVs have rates of rear collisions accompanied by fire in fatal crashes that are <u>not</u> statistically significantly* different from most or all of the other 97 models in the list of 100 vehicle models having the highest rates.

* Statistical significance between rates is calculated by comparing the 95% confidence intervals about those rates. If the 95% confidence intervals for two rates overlap, then the difference in these rates is not considered statistically significant.

SUVs and Passenger Cars with Aft-Axle Tanks
Rates of Rear Collisions With Fire

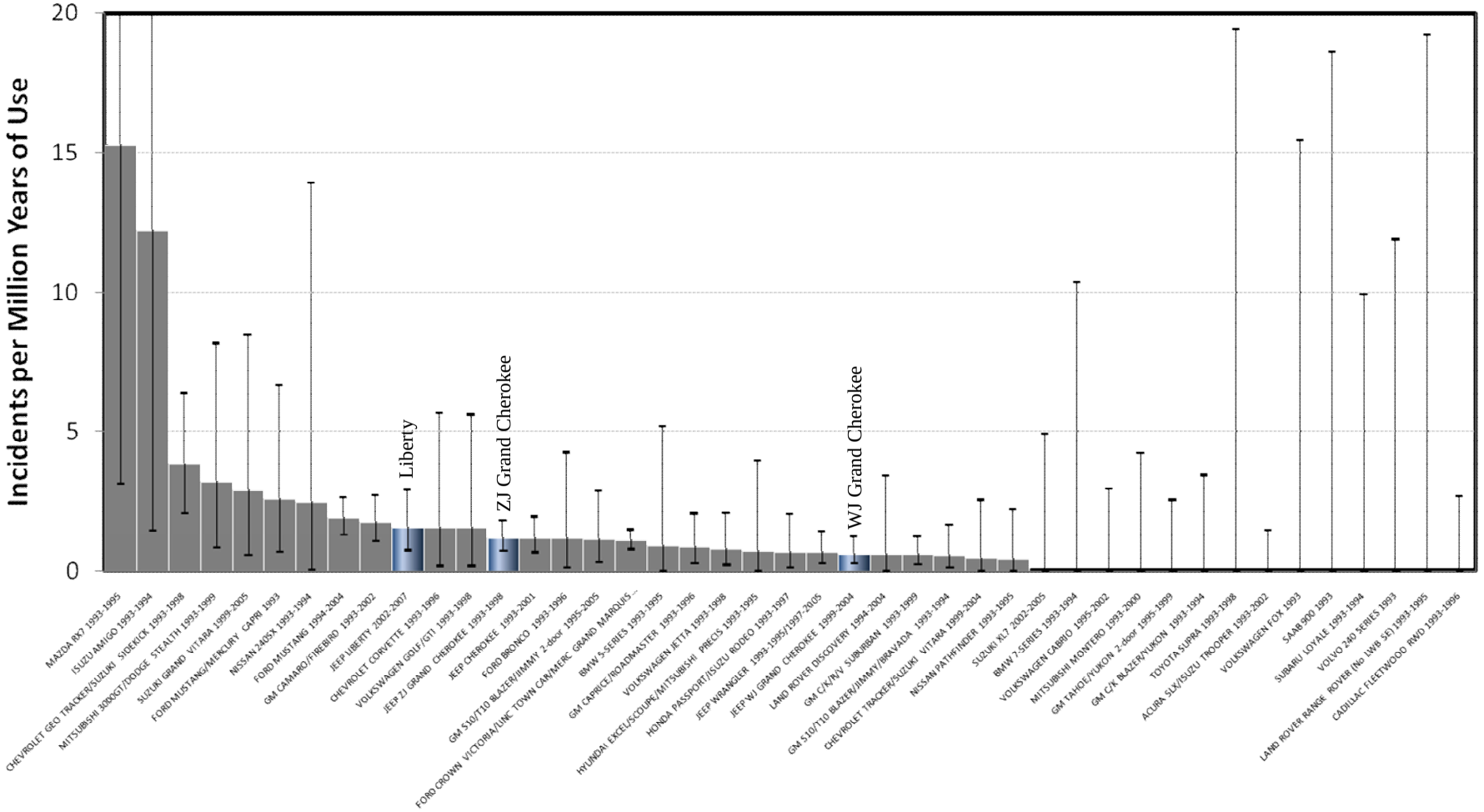
Vehicles involved in a rear collision accompanied by fire and fatality in the crash, per million years of use



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004, and Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Rear collision includes either initial or principal impact to clock points 5, 6, or 7. Includes collisions where the vehicle experienced a post-collision fire. Fatality in any vehicle in the crash.

SUVs and Passenger Cars with Aft-Axle Tanks
Rates of Rear Fatal Collisions With Fire, With Confidence Intervals

Vehicles involved in a rear collision accompanied by fire and fatality in the crash, per million years of use



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004, and Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Rear collision includes either initial or principal impact to clock points 5, 6, or 7. Includes collisions where the vehicle experienced a post-collision fire. Fatality in any vehicle in the crash. Vertical lines are 95% confidence intervals about the rates.

Conclusions

Comparison of Rates of Rear Collisions in Fatal Crashes With Fire by Model and Vehicle Type: Vehicles with Aft-Axle Tanks

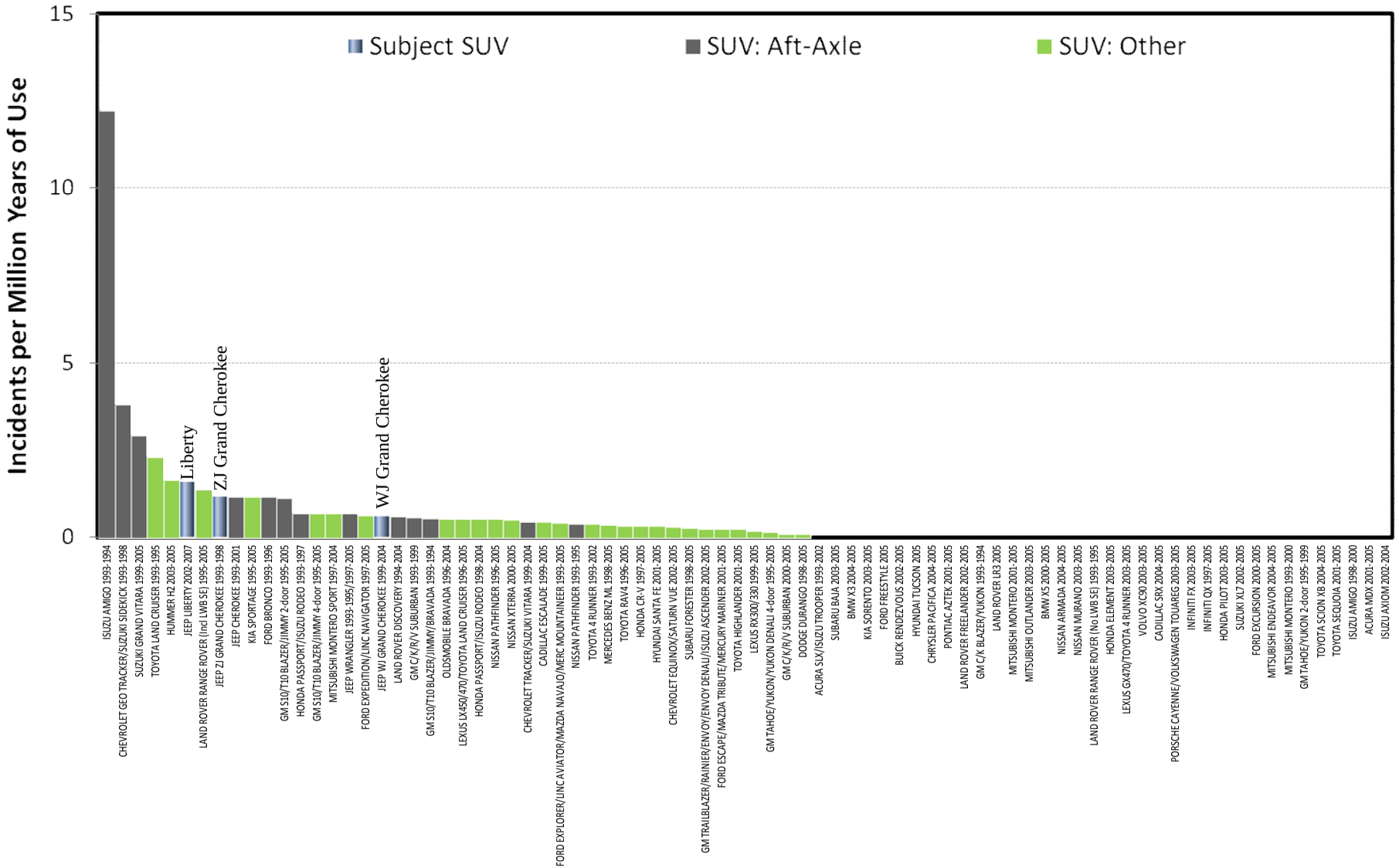
- This FARS analysis confirms that there are other SUVs and passenger cars with aft-axle fuel tanks that have higher rates of rear collisions accompanied by fire with fatality in the crash than the Subject SUVs.

- The Subject SUVs have rates of rear collisions accompanied by fire with fatality in the crash that are <u>not</u> statistically significantly* different from most or all of the SUVs or passenger cars with aft-axle tanks.

* Statistical significance between rates is calculated by comparing the 95% confidence intervals about those rates. If the 95% confidence intervals for two rates overlap, then the difference in these rates is not considered statistically significant.

SUVs: Rates of Rear Collisions With Fire, by Tank Location

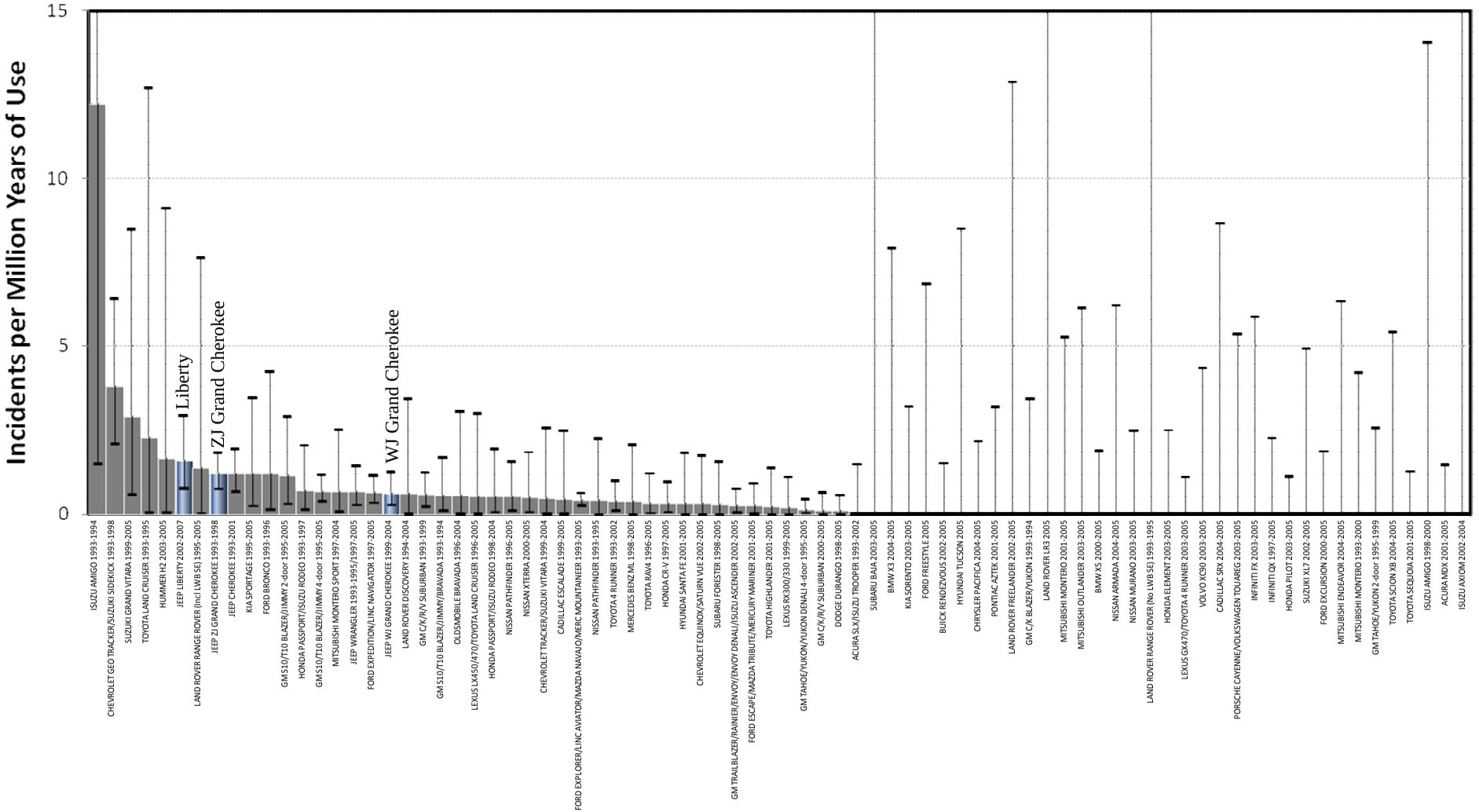
Vehicles involved in a rear collision accompanied by fire and fatality in collision, per million years of use



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004, and Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Rear collision includes either initial or principal impact to clock points 5, 6, or 7. Includes collisions where the vehicle experienced a post-collision fire. Fatality in any vehicle in the crash.

SUVs : Rates of Rear Collisions With Fire, With Confidence Intervals

Vehicles involved in a rear collision accompanied by fire and fatality in the crash, per million years of use



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004, and Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Rear collision includes either initial or principal impact to clock points 5, 6, or 7. Includes collisions where the vehicle experienced a post-collision fire. Fatality in any vehicle in the crash. Vertical lines are 95% confidence intervals about the rates.

Conclusions

Comparison of Rates of Rear Collisions with Fire and Fatality in the Crash
SUVs Only

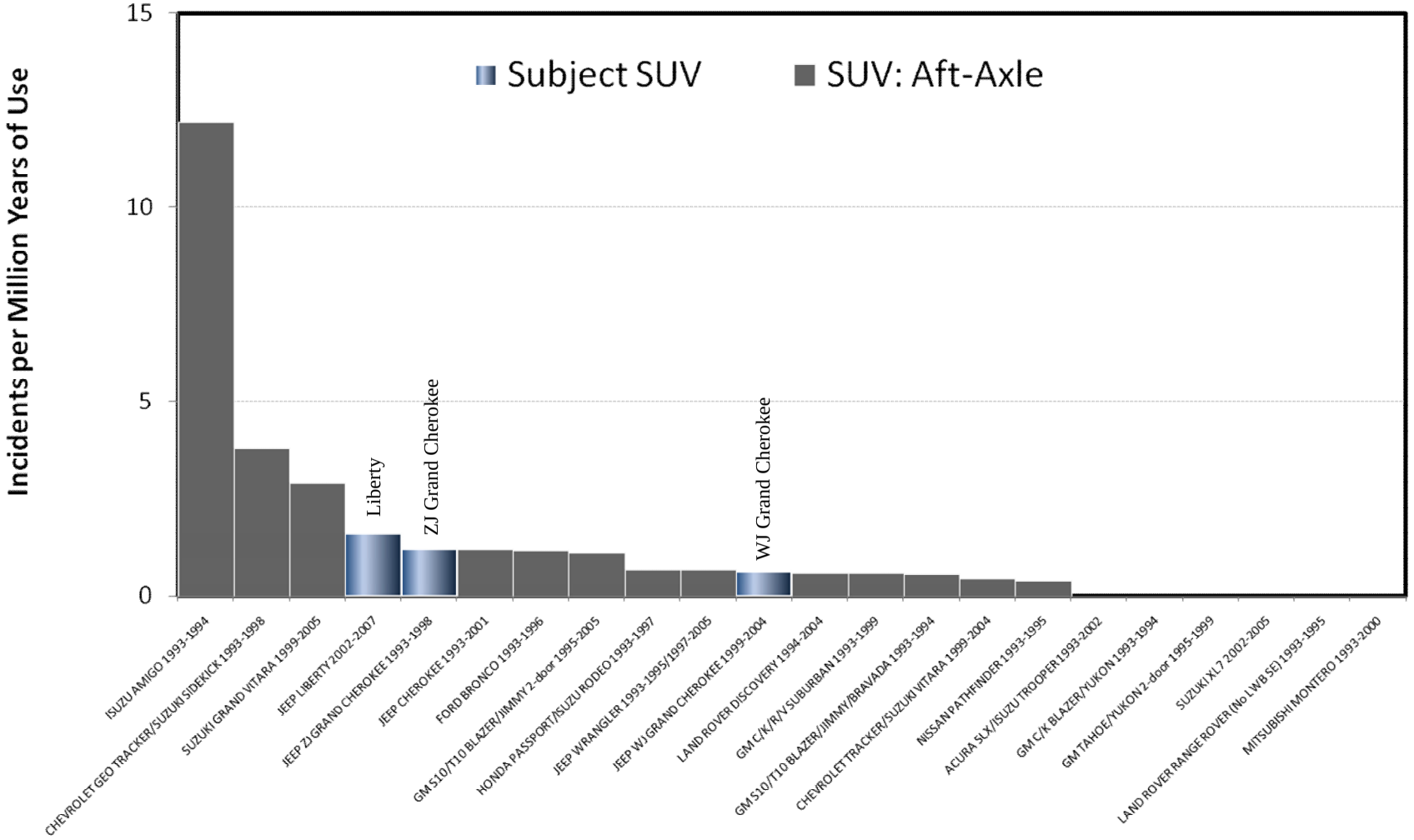
- This FARS analysis confirms that there are other SUVs that have higher rates of rear collisions accompanied by fire and fatality in the crash than the Subject SUVs.

- The Subject SUVs have rates of rear collisions accompanied by fire with fatality in the crash that are not statistically significantly* different from most or all of the other SUVs.

* Statistical significance between rates is calculated by comparing the 95% confidence intervals about those rates. If the 95% confidence intervals for two rates overlap, then the difference in these rates is not considered statistically significant.

SUVs with Aft-Axle Tanks
Rates of Rear Collisions With Fire

SUVs involved in a rear collision accompanied by fire with a fatality in the crash, per million years of use

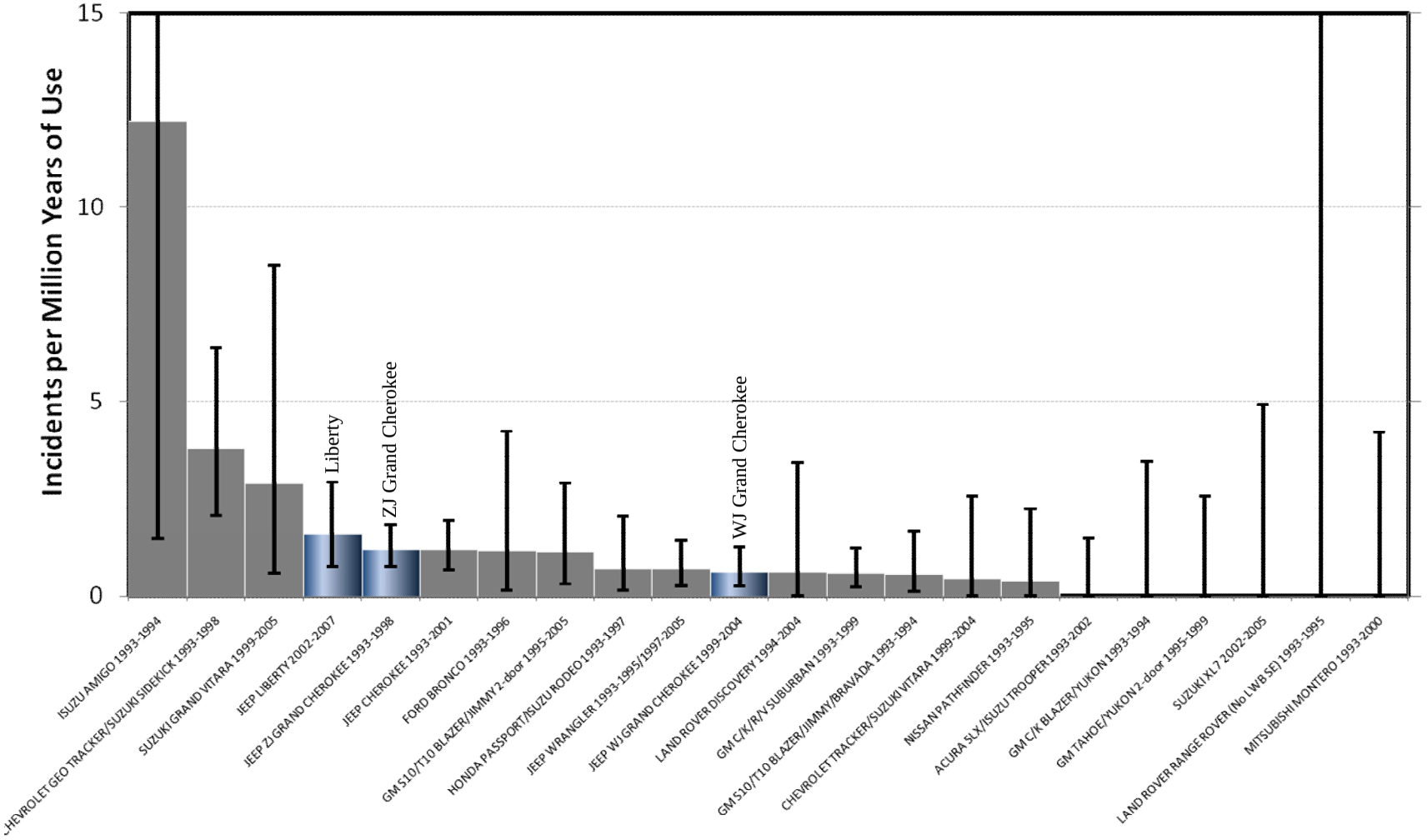


Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004, and Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Rear collision includes either initial or principal impact to clock points 5, 6, or 7. Includes collisions where the vehicle experienced a post-collision fire. Fatality in any vehicle in the crash.

SUVs with Aft-Axle Tanks

Rates of Rear Collisions With Fire, With Confidence Intervals

SUVs involved in a rear collision accompanied by fire with a fatality in the crash, per million years of use



Notes: Each bar represents a different model of vehicle. Subject SUVs are: ZJ Grand Cherokee 1993-1998, WJ Grand Cherokee 1999-2004, and Liberty 2002-2007. Other vehicles are model years 1993-2005. FARS data 1992-2011. Registration data from RL Polk. Rear collision includes either initial or principal impact to clock points 5, 6, or 7. Includes collisions where the vehicle experienced a post-collision fire. Fatality in any vehicle in the crash. Vertical lines are 95% confidence intervals about the rates.

Conclusions

Comparisons of Rates of Rear Collisions with Fire and Fatality in the Crash SUVs with Aft-Axle Tanks

- This FARS analysis confirms that there are other SUVs with aft-axle fuel tanks that have higher rates of rear collisions accompanied by fire and fatality in the crash than the Subject SUVs.

- The Subject SUVs have rates of rear collisions accompanied by fire with fatality in the crash that are not statistically significantly* different from most or all of the other SUVs with aft-axle tanks.

* Statistical significance between rates is calculated by comparing the 95% confidence intervals about those rates. If the 95% confidence intervals for two rates overlap, then the difference in these rates is not considered statistically significant.

EA12-005

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6-18-2013

Appendix D

Relevance of Confidence Intervals to the Analysis of FARS Data, FARS Confidence Interval Discussion 8-29-2012

EA12-005
Relevance of
Confidence Intervals
to the Analysis of FARS Data

8/29/2012

Objective of Discussion

- Engage NHTSA & NCSA in order to:
  - Better understand your perspective on the use of confidence intervals when analyzing FARS data
  - Share Chrysler's view as to why it is both appropriate and necessary to use confidence intervals when analyzing and drawing well-founded conclusions from FARS data
    - Especially when analyzing rates of infrequent events (e.g., EA12-005 – rear impact post-collision fires)

The Appropriateness of Using Confidence Intervals

- FARS records represent fatal crashes occurring on public roads in the U.S.
- The frequencies of fatal crashes are determined, in part, by systematic factors including:
  - Vehicle attributes
  - Environmental conditions
  - Driver factors
- The frequencies of fatal crashes are also determined, in part, by the "play of chance"—i.e., they are partly probabilistic
- It is therefore appropriate to use confidence intervals to account for the "play of chance" in FARS data when comparing the crash performance of vehicle models
  - Especially when analyzing rates of infrequent events, as in EA12-005

Illustrative Example of the "Play of Chance" in FARS

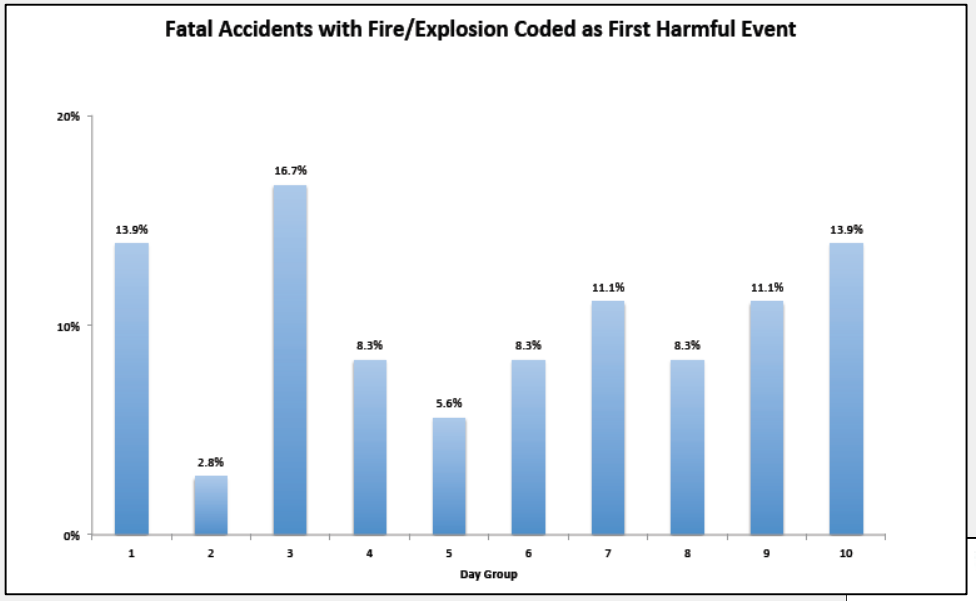
- Using FARS 2005-2009, compare the safety performance of the U.S. vehicle fleet in 10 sets of approximately 183 days, defined as follows:

- Set 1: Every 10th day starting on January 1, 2005: January 1, January 11, January 21, January 31, February 10, …
- Set 2: Every 10th day starting on January 2, 2005: January 2, January 12, January 22, February 1, February 11, …
- …
- Set 10: Every 10th day starting on January 10, 2005: January 10, January 20, January 30, February 9, February 19, …

- In each set, tally the number of accidents with FHE = Fire/Explosion, as well as the number of accidents with FHE = Vehicle in Transport

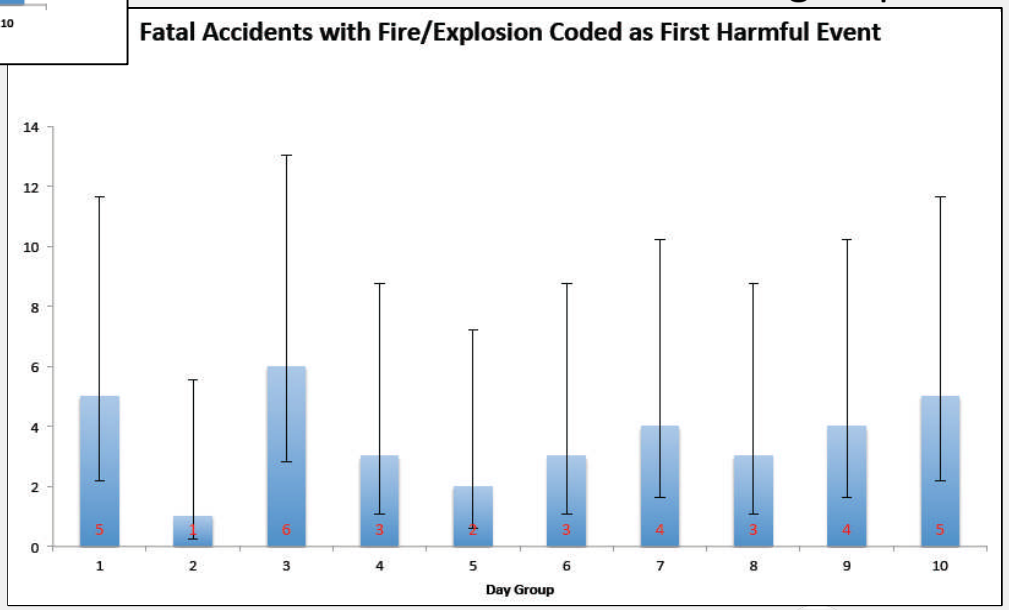
Illustrative Example #1 of the "Play of Chance" in FARS

Results:



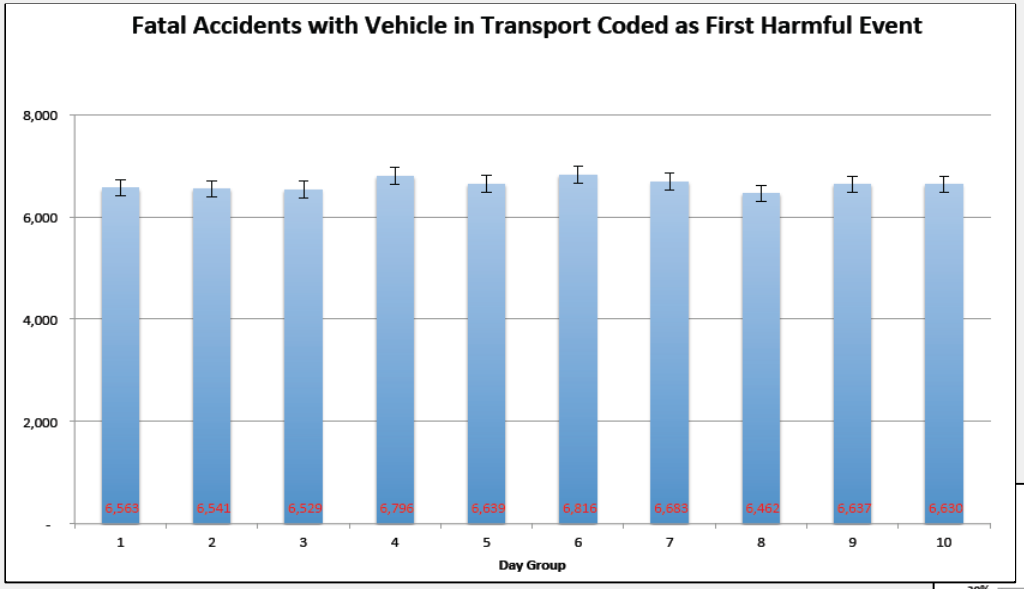
- Example #1 resembles EA12-005
  - Small number of subject events
- The smaller the number of subject events, the greater the relative importance of chance variation
- While the ratio of group 3 to group 2 is relatively large, this rate difference cannot logically represent a true difference between groups 2

- This example demonstrates that the "play of chance" can significantly affect measured rates, especially rates of low frequency events
- The overlapping 95% confidence intervals of groups 2 and 3 show that their rates are, in fact, statistically indistinguishable



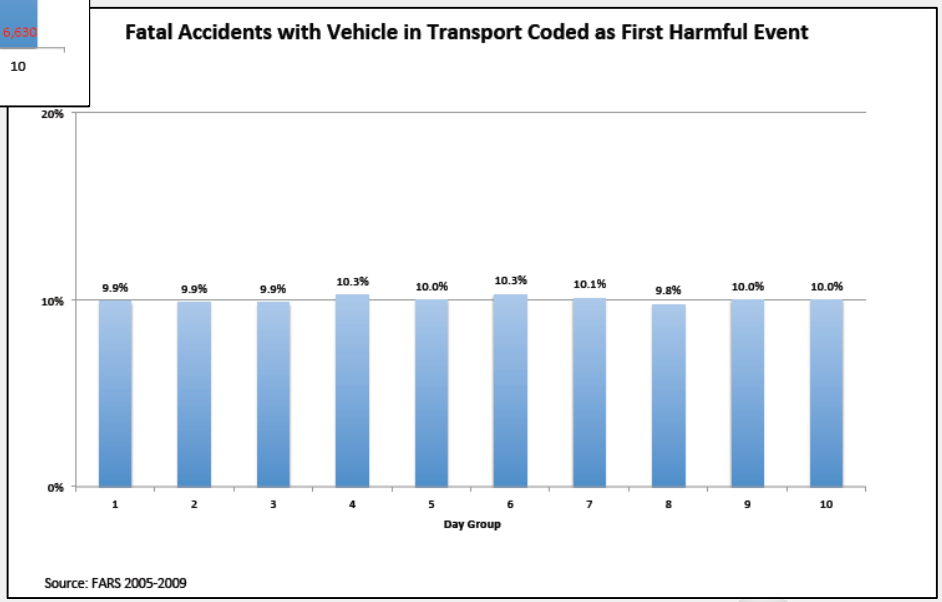
Illustrative Example #2 of the "Play of Chance" in FARS

Results:



- Example #2 resembles a more typical application of FARS analysis involving a relatively large number of subject events (vs. EA12-005)
- The greater the number of subject events, the smaller the relative importance of chance variation
- In this case, it is possible to compare the rates without confidence intervals, because they are very close to the same

- This example demonstrates that the relative importance of the "play of chance" is smaller with larger sample sizes, i.e., that the chance differences between the rates are relatively small
- The overlapping confidence intervals again reveal that these rates are statistically indistinguishable



Conclusion – Examples #1 & #2

- In Illustrative Example #1, there is no logical reason why a fatal accident beginning with Fire/Explosion would be six times more likely on calendar dates ending in “3” than “2” (e.g., January 23 vs. January 22), yet that is what the Example #1 data would suggest without confidence intervals.
  - The only logical explanation for these data is the “play of chance”
  - This is why confidence intervals are both appropriate and necessary, especially when analyzing rates of infrequent events (e.g., rear-impact post-collision fires)

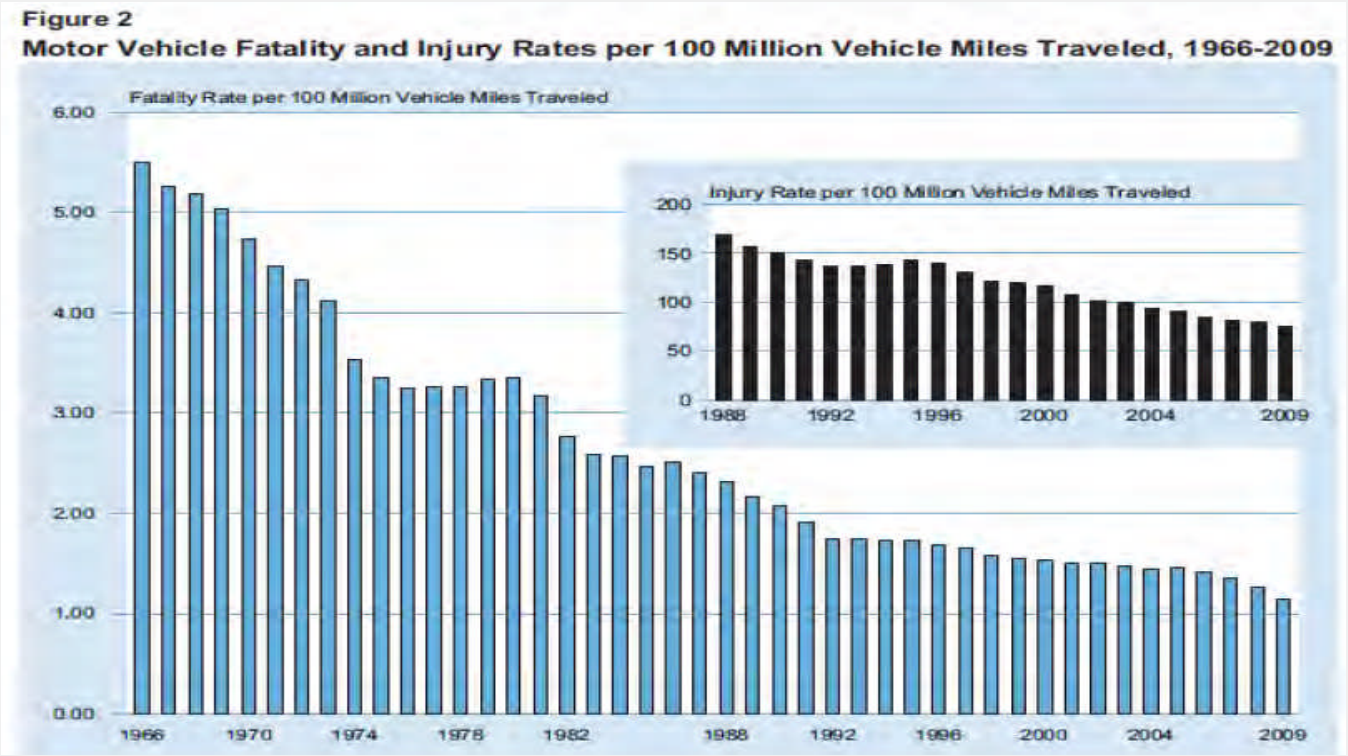
- Illustrative Example #2 demonstrates that the relative importance of the “play of chance” is smaller with larger sample sizes, i.e., that the chance differences between the rates are relatively small
  - The greater the number of subject events, the smaller the relative importance of chance variation

Method of Determining Confidence Intervals

- The confidence intervals shown in Examples #1 and #2 are based on the Poisson probability distribution, which reasonably describes the probabilistic nature of accident frequencies
- The Poisson distribution is commonly used for this purpose, as is the negative binomial distribution:
  - "The negative binomial and Poisson distributions are commonly used in modeling crashes over time or miles."
    (DOT Report HS 811 572, June 2012, p. 4)
- The binomial distribution used in previous Chrysler submissions closely approximates the Poisson distribution in the case of infrequent events

Are there circumstances where Confidence Intervals should not be used, or need not be used?

- While it is never wrong to account for the effect of probabilistic chance variation using confidence intervals, there are circumstances where these intervals are foreseeably uninformative, e.g., in a display of a consistent, gross, long-term trend, base on large numbers of subject events:



Differentiating Between Chance and Systematic Variation

- Is there a method for differentiating between the variation that is due to chance and the variation due to systematic factors?
- "Poisson regression" and "negative binomial regression" are well-established statistical methods for detecting and measuring any effects of specified systematic factors, and for differentiating their effects from chance variation in accident data:

  - Lord, Dominique, Simon P Washington, and John N Ivan. "Poisson, Poisson-gamma and Zero-inflated Regression Models of Motor Vehicle Crashes: Balancing Statistical Fit and Theory." *Accident Analysis and Prevention* 37, no. 1 (January 2005): 35–46.

- What about our circumstances…..can this be done?

Summary

- The frequencies of fatal crashes/accidents are determined, in part, by both systematic factors and the "play of chance"
- Illustrative Example #1, demonstrates that:
  - The "play of chance" can significantly affect measured rates, especially rates of low frequency FARS events as in EA12-005
  - Confidence intervals allows a statistical evaluation as to whether or not FARS rates are distinguishably different; without confidence intervals, A to B comparisons may yield misleading results when the seemingly different rates are not statistically distinguishable
- Example #2 demonstrates that the relative importance of the "play of chance" is smaller with larger sample sizes, i.e., that the chance differences between the rates are relatively small
- While one would never be wrong to account for the effect of probabilistic chance variation using confidence intervals, often it is unnecessary due to large numbers of subject events
- Confidence intervals are a valid and appropriate way to account for the effects of the "play of chance"
- This is why Chrysler believes that it is not only appropriate, but necessary to apply confidence intervals to the FARS data involving a small number of rear impacts resulting in a post-collision fire over an extended period of time with a large number of vehicles as is the case with EA12-005

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Appendix E

FARS RVY Within Sister SUVs

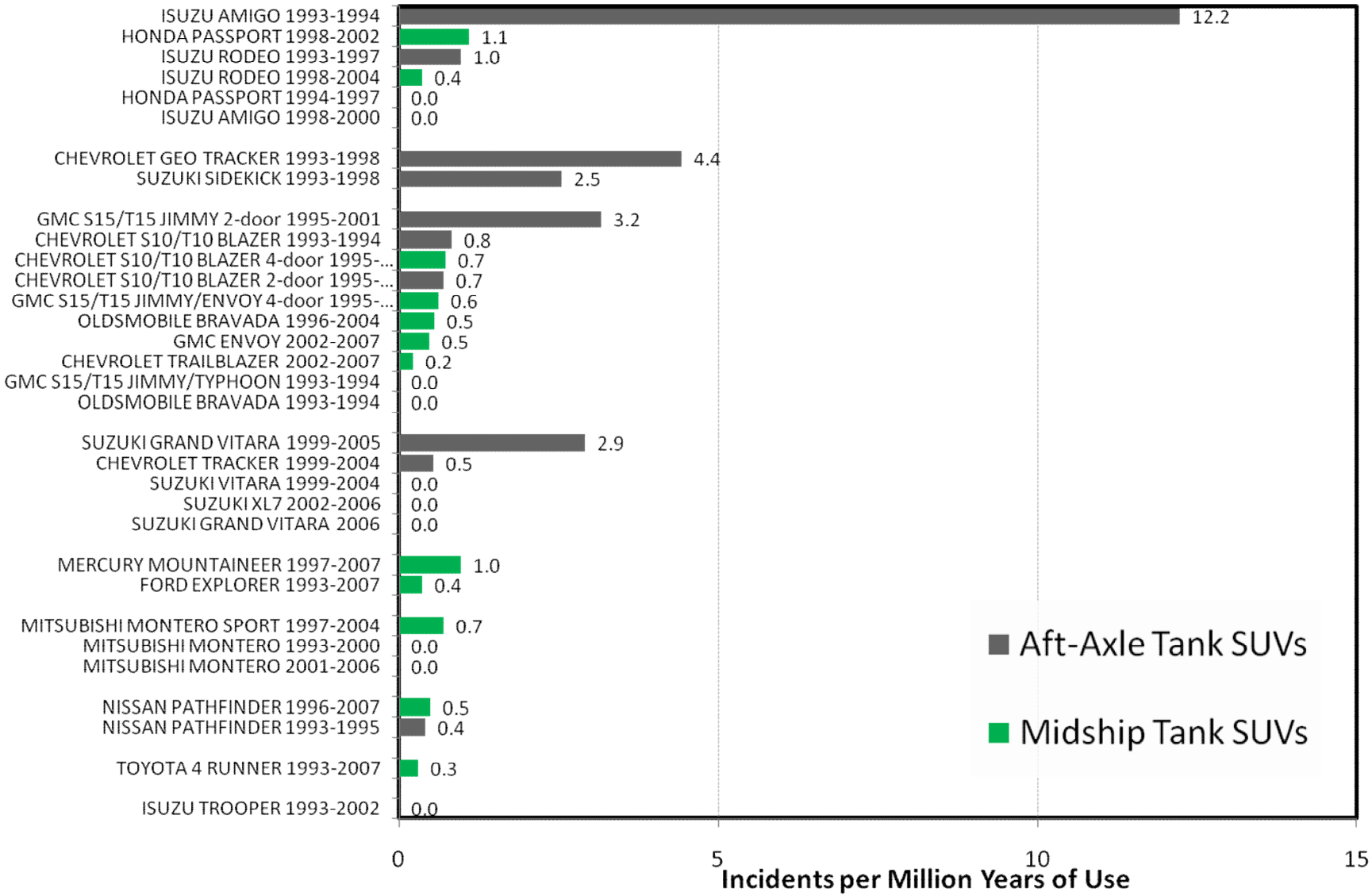
Ungrouped vehicles from NHTSA List by impact point

Contents

- Vehicles are all in NHTSA's List of Peer Vehicles
- Individual models have been ungrouped (for example, Explorer and Mountaineer are shown separately)
- Records are as coded in FARS. No corrections made for miscoded fire or impact location
- Slides include the following:
  - Rates of rear collision fires in fatal crashes
    - All rear impacts with fire (clock point 5, 6, or 7), whether initial or principal impact, and whether or not vehicle also experienced a rollover
    - Initial impact to the rear with fire (clock point 5, 6, or 7), not including vehicles that also experienced a rollover
    - Principal rear impact with fire (clock point 5, 6, or 7), not including vehicles that also experienced a rollover
  - Rates of rear + side collision fires in fatal crashes
    - Initial impact to the side or rear with fire (clock points 2-10), not including vehicles that also experienced a rollover
    - Principal impact to the side or rear with fire (clock points 2-10), not including vehicles that also experienced a rollover

Vehicles in Fatal Crashes with Initial or Principal Impact to Rear

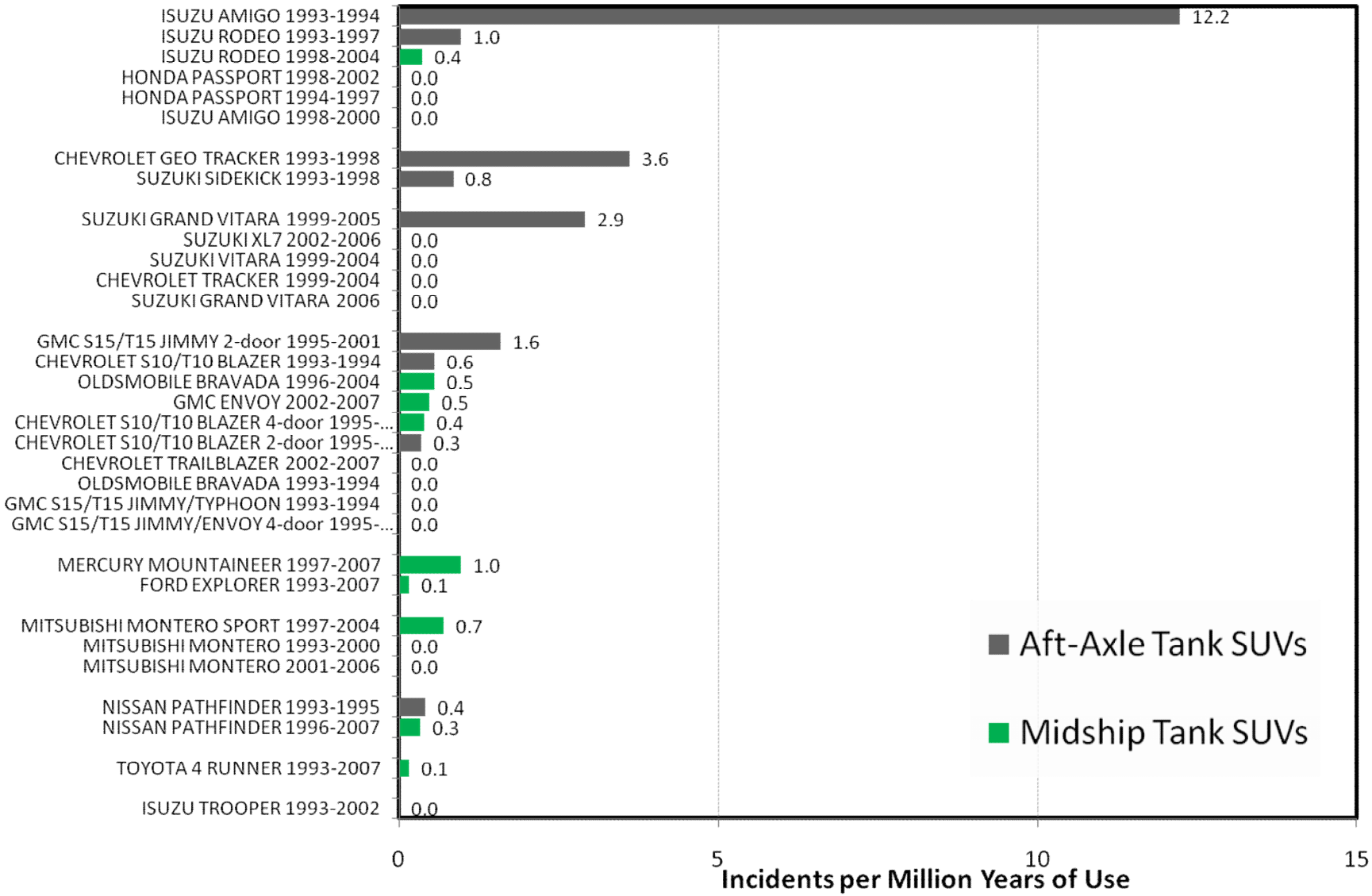
and Accompanied by Fire



Notes: FARS 1992-2011 using data as coded. Registration data from R.L. Polk and Co. Includes crashes where the SUV experienced a rear collision (clock points 5-7) as either the initial or principal impact, whether or not the vehicle experienced a rollover. Fatality in the crash, not necessarily in the SUV. Vehicles identified as peer vehicles by NHTSA. Numbers adjacent bars are rates of incidents per million years of use.

Vehicles in Fatal Crashes with Initial Impact to Rear

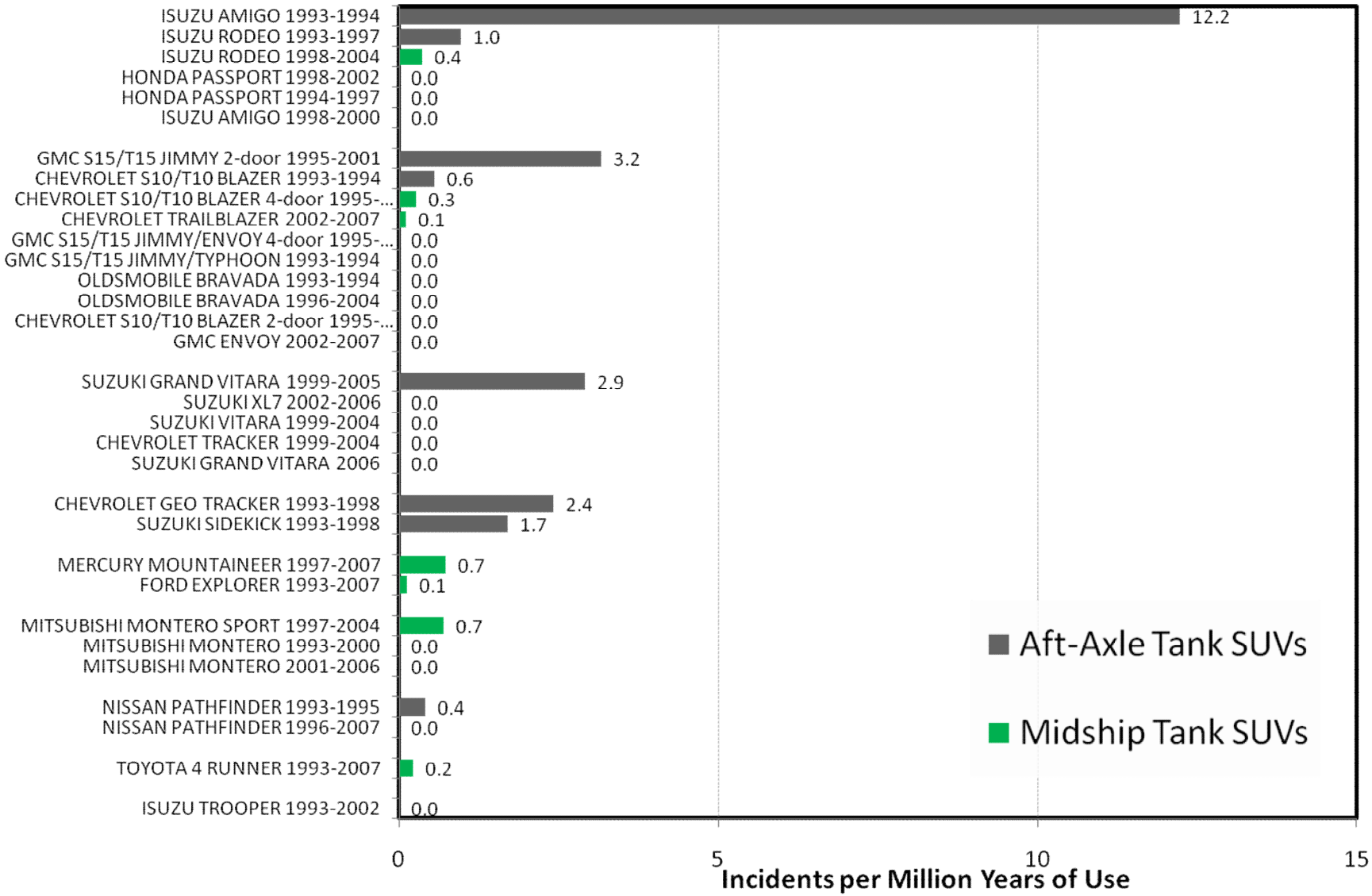
and Accompanied by Fire



Notes: FARS 1992-2011 using data as coded. Registration data from R.L. Polk and Co. Includes crashes where the SUV experienced a rear collision (clock points 5-7) as the initial impact, excluding vehicles that rolled over. Fatality in the crash, not necessarily in the SUV. Vehicles identified as peer vehicles by NHTSA. Numbers adjacent bars are rates of incidents per million years of use.

Vehicles in Fatal Crashes with Principal Impact to Rear

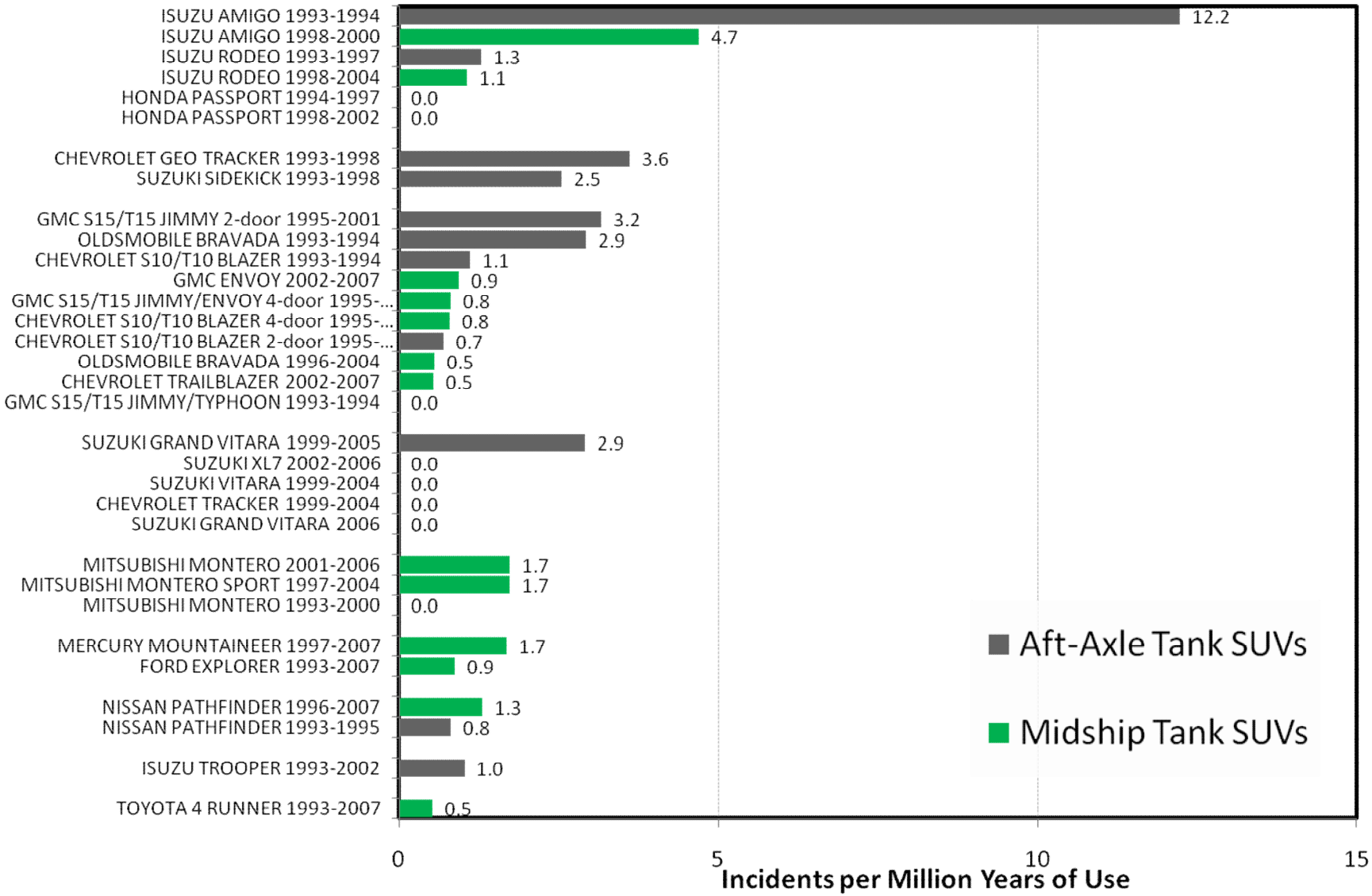
and Accompanied by Fire



Notes: FARS 1992-2011 using data as coded. Registration data from R.L. Polk and Co. Includes crashes where the SUV experienced a rear collision (clock points 5-7) as the principal impact, excluding vehicles that rolled over. Fatality in the crash, not necessarily in the SUV. Vehicles identified as peer vehicles by NHTSA. Numbers adjacent bars are rates of incidents per million years of use.

Vehicles in Fatal Crashes with Initial Impact to Rear or Side

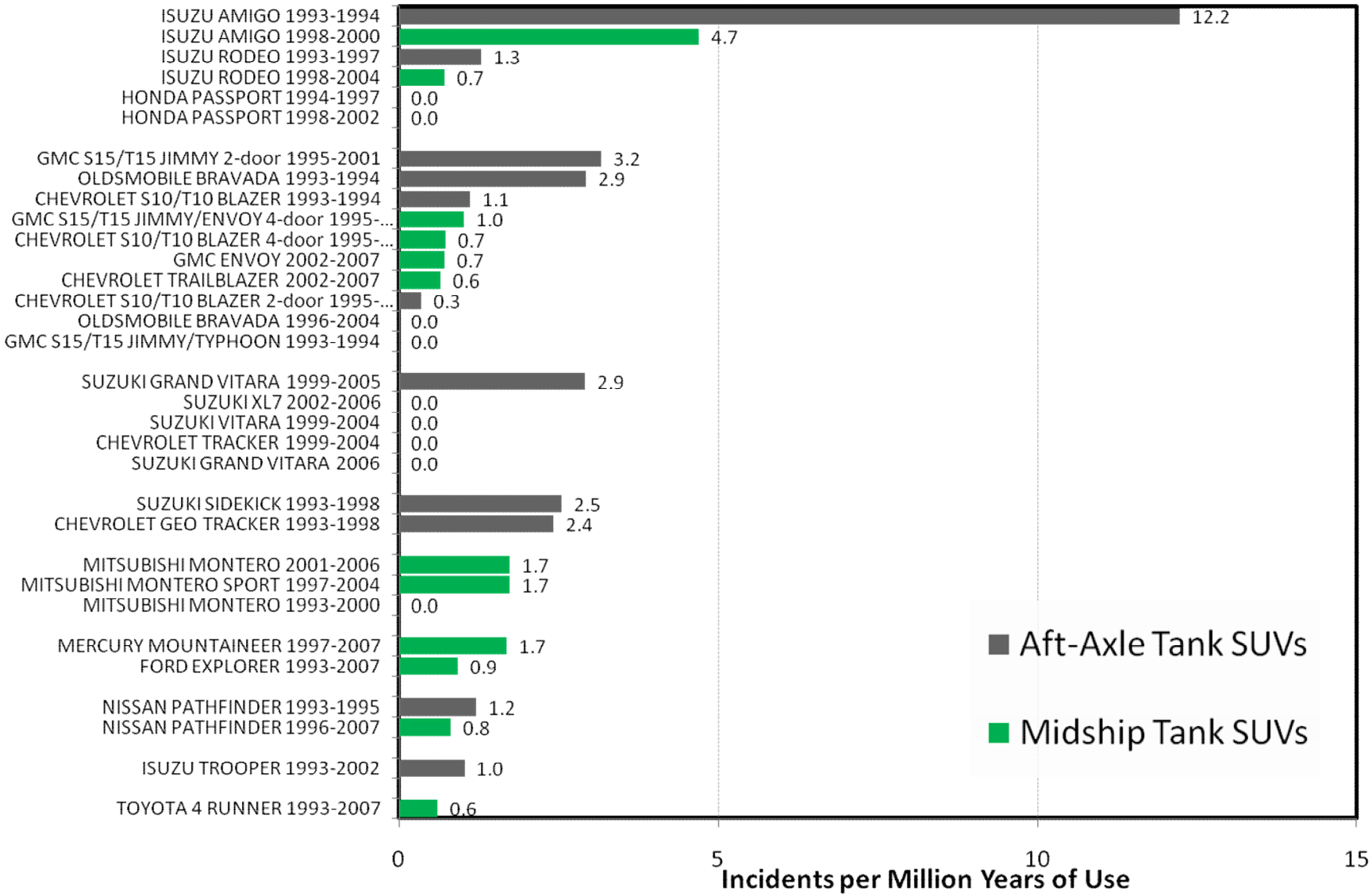
and Accompanied by Fire



Notes: FARS 1992-2011 using data as coded. Registration data from R.L. Polk and Co. Includes crashes where the SUV experienced a rear or side collision (clock points 2-10) as the initial impact, excluding vehicles that rolled over. Fatality in the crash, not necessarily in the SUV. Vehicles identified as peer vehicles by NHTSA. Numbers adjacent bars are rates of incidents per million years of use.

Vehicles in Fatal Crashes with Principal Impact to Rear or Side

and Accompanied by Fire



Notes: FARS 1992-2011 using data as coded. Registration data from R.L. Polk and Co. Includes crashes where the SUV experienced a rear or side collision (clock points 2-10) as the principal impact, excluding vehicles that rolled over. Fatality in the crash, not necessarily in the SUV. Vehicles identified as peer vehicles by NHTSA. Numbers adjacent bars are rates of incidents per million years of use.

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Appendix F

Peer Vehicle Measurement Study

Ground to Tank & Ground to Skid Plate measurements 6-14-13

Ground to Tank and Ground to Skid Plate Measurement Data

Item #	Model Year	Brand	Model	Model	VIN	Vertical distance from ground to fuel tank Vertical Distance from the ground to skid plate
1	1996	Acura	SLX	SLX 1996 MY Item # 1	JAEDJ58V2T	29.210
2	1987	Chevrolet	Blazer	Blazer 1987 MY Item # 2	1GNCT18R6H	35.243
3	1994	Chevrolet	Blazer	Blazer 1994 MY Item # 3	1GNEK18KX	33.973
4	1994	Chevrolet	Blazer	Blazer 1994 MY Item # 4	1GNEK18KX	35.560
5	1998	Chevrolet	Blazer	Blazer 1998 MY Item # 5	1GNCT18W5	38.000
6	1999	Chevrolet	Blazer	Blazer 1999 MY Item # 6	1GNCT18W0	39.000
7	2001	Chevrolet	Blazer	Blazer 2001 MY Item # 7	1GNCT18W9	38.000
8	2001	Chevrolet	Blazer	Blazer 2001 MY Item # 8	1GNCT18W6	42.000
9	2002	Chevrolet	Blazer	Blazer 2002 MY Item # 9	1GNCT18XX	34.290
10	2002	Chevrolet	Blazer	Blazer 2002 MY Item # 10	1GNCS18W9	39.000
11	2002	Chevrolet	Blazer	Blazer 2002 MY Item # 11	1GNCT18W5	38.000
12	2003	Chevrolet	Blazer	Blazer 2003 MY Item # 12	1GNCT18X5	33.814
13	1985	Chevrolet	Blazer K10 2dr	Blazer K10 2Dr 1985 MY Item # 13	1G8EK18H5	45.403
14	1991	Chevrolet	Blazer V10	Blazer V10 1991 MY Item # 14	1GNEV18KX	42.228
15	1988	Chevrolet	Suburban	Suburban 1988 MY Item # 15	1GNEV16K7	34.290
16	1989	Chevrolet	Suburban	Suburban 1989 MY Item # 16	1GNEV16K1	39.053
17	1991	Chevrolet	Suburban	Suburban 1991 MYItem # 17	1GNGV26J3	50.006
18	1997	Chevrolet	Tahoe	Tahoe 1997 MY Item # 18	3GNEK18R5	36.830
19	1997	Chevrolet	Tracker	Tracker 1997 MY Item # 19	2CNBJ184X	30.004
20	2001	Chevrolet	Tracker	Tracker 2001 MY Item # 20	2CNBJ7349	25.400
21	2001	Chevrolet	Tracker	Tracker 2001 MY Item # 21	2CNBJ78C8	27.305
22	2003	Chevrolet	Tracker	Tracker 2003 MY Item # 22	2CNBJ6345	26.194
23	1987	Dodge	Raider	Raider 1987 MY Item # 23	JB7FJ43E2H	26.670
24	1984	Dodge	Ramcharger	Ramcharger 1984 MY Item # 24	1B4GW12T3	43.498
25	1985	Ford	Bronco	Bronco 1985 MY Item # 25	1FMDU15HX	38.735
26	1986	Ford	Bronco	Bronco 1986 MY Item # 26	IFMDU15N5	31.115
27	1996	Ford	Bronco	Bronco 1996 MY Item # 27	1FMEU15H8	33.655
28	1989	Ford	Bronco II	Bronco II 1989 MY Item # 28	1FMCU12T3	30.480
29	1994	GMC	Jimmy	Jimmy 1994 MY Item # 29	1GKDT13W9	33.338
30	1994	GMC	Yukon	Yukon 1994 MY Item # 30	1GKEK18KX	38.100
31	1995	GMC	Yukon	Yukon 1995 MY Item # 31	1GKEK18S7	34.608
32	1997	Honda	Passport	Passport 1997 MY Item # 32	4S6CY58V6	30.480
33	1996	Isuzu	Rodeo	Rodeo 1996 MY Item # 33	452CM58V4	32.703
34	2000	Isuzu	Trooper	Trooper 2000 MY Item # 34	JACDJ58X9	33.020
35	1989	Isuzu	Trooper 2dr	Trooper 2dr 1989 MY Item # 35	JACCH57E6	27.305
36	1989	Isuzu	Trooper 4dr	Trooper 4dr 1989 MY Item # 36	LESCH58E2	24.130
37	1984	Jeep	Cherokee	Cherokee 1984 MY Item # 37	1JCWB782S	30.798
38	1994	Jeep	Cherokee	Cherokee 1994 MY Item # 38	1J4FJ68S2	35.878
39	1997	Jeep	Cherokee	Cherokee 1997 MY Item # 39	1J4FJ27S5	35.560
40	2001	Jeep	Cherokee	Cherokee 2001 MY Item # 40	1J4FF48S3	31.750
41	1993	Jeep	ZJ Grand Cherokee	ZJ Grand Cherokee 1993 MY Item # 41	PC53	31.115
42	1993	Jeep	ZJ Grand Cherokee	ZJ Grand Cherokee 1993 MY Item # 42	PC57	33.655
43	1994	Jeep	ZJ Grand Cherokee	ZJ Grand Cherokee 1994 MY Item # 43	RC18	33.020
44	1994	Jeep	ZJ Grand Cherokee	ZJ Grand Cherokee 1994 MY Item # 44	RC17	35.560
45	1994	Jeep	ZJ Grand Cherokee	ZJ Grand Cherokee 1994 MY Item # 45	RC27	35.560
46	1995	Jeep	ZJ Grand Cherokee	ZJ Grand Cherokee 1995 MY Item # 46	1J4G258S8	28.893
47	1995	Jeep	ZJ Grand Cherokee	ZJ Grand Cherokee 1995 MY Item # 47	1J4GZ58SX	32.544
48	1995	Jeep	ZJ Grand Cherokee	ZJ Grand Cherokee 1995 MY Item # 48	SC70	35.560
49	1995	Jeep	ZJ Grand Cherokee	ZJ Grand Cherokee 1995 MY Item # 49	SC50	30.798
50	1995	Jeep	ZJ Grand Cherokee	ZJ Grand Cherokee 1995 MY Item # 50	SC59	34.925
51	1995	Jeep	ZJ Grand Cherokee	ZJ Grand Cherokee 1995 MY Item # 51	SC78	33.655
52	1996	Jeep	ZJ Grand Cherokee	ZJ Grand Cherokee 1996 MY Item # 52	TC25	35.878
53	1997	Jeep	ZJ Grand Cherokee	ZJ Grand Cherokee 1997 MY Item # 53	VC51	35.243
54	1997	Jeep	ZJ Grand Cherokee	ZJ Grand Cherokee 1997 MY Item # 54	VC59	34.290
55	1997	Jeep	ZJ Grand Cherokee	ZJ Grand Cherokee 1997 MY Item # 55	VC50	33.020
56	1998	Jeep	ZJ Grand Cherokee	ZJ Grand Cherokee 1998 MY Item # 56	IJ4GZ58SX	32.385
57	1999	Jeep	WJ Grand Cherokee	WJ Grand Cherokee 1999 MY Item # 57	XC55	26.947
58	2000	Jeep	WJ Grand Cherokee	WJ Grand Cherokee 2000 MY Item # 58	1J4GW58N	29.051
59	2000	Jeep	WJ Grand Cherokee	WJ Grand Cherokee 2000 MY Item # 59	YC35	30.213
60	2001	Jeep	WJ Grand Cherokee	WJ Grand Cherokee 2001 MY Item # 60	1C50	28.527

Ground to Tank and Ground to Skid Plate Measurement Data

61	2002	Jeep	WJ Grand Cherokee	WJ Grand Cherokee 2002 MY Item # 61	1J4GW48SX2	25.718
62	2002	Jeep	WJ Grand Cherokee	WJ Grand Cherokee 2002 MY Item # 62	2C2540	27.750
63	2003	Jeep	WJ Grand Cherokee	WJ Grand Cherokee 2003 MY Item # 63	IJ4GW48S63	27.305
64	2003	Jeep	WJ Grand Cherokee	WJ Grand Cherokee 2003 MY Item # 64	3C5186	28.047
65	2004	Jeep	WJ Grand Cherokee	WJ Grand Cherokee 2004 MY Item # 65	4C2175	26.132
66	2002	Jeep	Liberty	Liberty 2002 MY Item # 66	1J4GL58K02V	32.068
67	2004	Jeep	Liberty	Liberty 2004 MY Item # 67	1J4GL48K94V	32.703
68	2005	Jeep	Liberty	Liberty 2005 MY Item # 68	1J4GL48K45V	31.750
69	1984	Jeep	Scrambler	Scrambler 1984 MY Item # 69	1JCCE88E0E	43.180
70	1992	Jeep	Wrangler	Wrangler 1992 MY Item # 70	2J4FY19P7N	30.998
71	1993	Jeep	Wrangler	Wrangler 1993 MY Item # 71	1J4FY2954P	27.940
72	1995	Jeep	Wrangler	Wrangler 1995 MY Item # 72	1J4FY19P7S	31.274
73	1999	Jeep	Wrangler	Wrangler 1999 MY Item # 73	1J4FJ49S8XP	27.305
74	2004	Jeep	Wrangler	Wrangler 2004 MY Item # 74	1J4FA39S44	26.670
75	1998	Mitsubishi	Montero	Montero 1998 MY Item # 75	JA7FJ43EKJ	30.480
76	1999	Mitsubishi	Montero	Montero 1999 MY Item # 76	JA4LS41R9X	0.000
77	1991	Nissan	Pathfinder	Pathfinder 1991 MY Item # 77	JN8HD17Y9M	45.085
78	1994	Nissan	Pathfinder	Pathfinder 1994 MY Item # 78	JN8HD17Y0R	44.450
79	2001	Suzuki	Grand Vitara	Grand Vitara 2001 MY Item # 79	JS3TD62V51	26.035
80	2001	Suzuki	Grand Vitara	Grand Vitara 2001 MY Item # 80	JS3TD62V81	24.765
81	1987	Suzuki	Samurai	Samurai 1987 MY Item # 81	JS4JC51C7H4	26.353
82	1993	Suzuki	Sidekick	Sidekick 1993 MY Item # 82	2S3TA01C1P6	31.750
83	1995	Suzuki	Sidekick	Sidekick 1995 MY Item # 83	2S3TD03V3S6	30.480
84	2002	Suzuki	Vitara	Vitara 2002 MY Item # 84	2S3TA52C826	26.035
85	2001	Suzuki	Vitara 4dr	Vitara 4 Dr 2001 MY Item # 85	2S3TD52V116	25.876
86	2003	Suzuki	XL-7	XL-7 2003 MY Item # 86	JS3TY92VX54	27.940

Ground to Tank and Ground to Skid Plate Measurement Data

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Appendix F

Peer Vehicle Measurement Study

Peer vehicle Tank Height Data

Measured vs. Calculated Vertical Distance from Ground to Tank (cm's)

Item #	Model Year	Brand	Model	VIN#	Measured vs Calculated Vertical Distance from Ground to Fuel Tank cm
1	1987	Chevrolet	Blazer 1987 MY Item # 1	1GNCT18R6H8	39.370
2	1994	Chevrolet	Blazer 1994 MY Item # 2	1GNEK18KXRJ	35.243
3	1994	Chevrolet	Blazer 1994 MY Item # 3	1GNEK18KXRJ	39.688
4	1998	Chevrolet	Blazer 1998 MY Item # 4	1GNCT18W5W	38.000
5	1999	Chevrolet	Blazer 1999 MY Item # 5	1GNCT18W0X	39.000
6	2001	Chevrolet	Blazer 2001 MY Item # 6	1GNCT18W91	38.000
7	2001	Chevrolet	Blazer 2001 MY Item # 7	1GNCT18W61	42.000
8	2002	Chevrolet	Blazer 2002 MY Item # 8	1GNCT18XX3K	37.465
9	2002	Chevrolet	Blazer 2002 MY Item # 9	1GNCS18W92	39.000
10	2002	Chevrolet	Blazer 2002 MY Item # 10	1GNCT18W52	38.000
11	2003	Chevrolet	Blazer 2003 MY Item # 11	1GNCT18X53K	37.624
12	1988	Chevrolet	Suburban 1988 MY Item # 12	1GNEV16K7JF	37.465
13	1991	Chevrolet	Suburban 1991 MYItem # 13	1GNGV26J3M	50.006
14	1989	Chevrolet	Suburban V1500 1989 MY Item # 14	1GNEV16K1KF	39.053
15	2001	Chevrolet	Tracker 2001 MY Item # 15	2CNBJ78C816	28.258
16	2001	Chevrolet	Tracker 2001 MY Item # 16	2CNBJ734916	27.305
17	2003	Chevrolet	Tracker 2003 MY Item # 17	2CNBJ634536	27.146
18	1987	Dodge	Raider 1987 MY Item # 18	JB7FJ43E2HJ	27.781
19	1986	Ford	Bronco 1986 MY Item # 19	IFMDU15N5G	32.703
20	1996	Ford	Bronco 1996 MY Item # 20	1FMEU15H8T	34.608
21	1989	Ford	Bronco II 1989 MY Item # 21	1FMCU12T3J	33.179
22	1994	GMC	Jimmy 1994 MY Item # 22	1GKDT13W9R	37.148
23	1994	GMC	Yukon 1994 MY Item # 23	1GKEK18KXRJ	39.053
24	1995	GMC	Yukon 1995 MY Item # 24	1GKEK18S7SJ	35.560
25	1996	Isuzu	Rodeo 1996 MY Item # 25	452CM58V4T4	34.925
26	1989	Isuzu	Trooper 2dr 1989 MY Item # 26	JACCH57E6K8	29.210
27	2000	Isuzu	Trooper 2000 MY Item # 27	JACDJ58X9Y7	36.195
28	1989	Isuzu	Trooper 4dr 1989 MY Item # 28	LESCH58E2K6	26.353
57	1992	Jeep	Wrangler 1992 MY Item # 57	2J4FY19P7NJ	30.998
58	1993	Jeep	Wrangler 1993 MY Item # 58	1J4FY2954PP	27.940
59	1999	Jeep	Wrangler 1999 MY Item # 59	1J4FJ49S8XP4	27.623
60	2004	Jeep	Wrangler 2004 MY Item # 60	1J4FA39S44P	26.670
61	1998	Mitsubishi	Montero 1998 MY Item # 61	JA7FJ43EKJ0	30.480
62	1999	Mitsubishi	Montero 1999 MY Item # 62	JA4LS41R9XP	N/A
63	1991	Nissan	Pathfinder 1991 MY Item # 63	JN8HD17Y9MV	48.260
64	1994	Nissan	Pathfinder 1994 MY Item # 64	JN8HD17Y0RW	46.990
65	2001	Suzuki	Grand Vitara 2001 MY Item # 65	JS3TD62V514	28.575
66	2001	Suzuki	Grand Vitara 2001 MY Item # 66	JS3TD62V814	27.305
67	1993	Suzuki	Sidekick 1993 MY Item # 67	2S3TA01C1P6	33.338
68	1995	Suzuki	Sidekick 1995 MY Item # 68	2S3TD03V3S6	32.385
69	2003	Suzuki	XL-7 2003 MY Item # 69	JS3TY92VX54	29.210
				Ground to Tank Average	34.728

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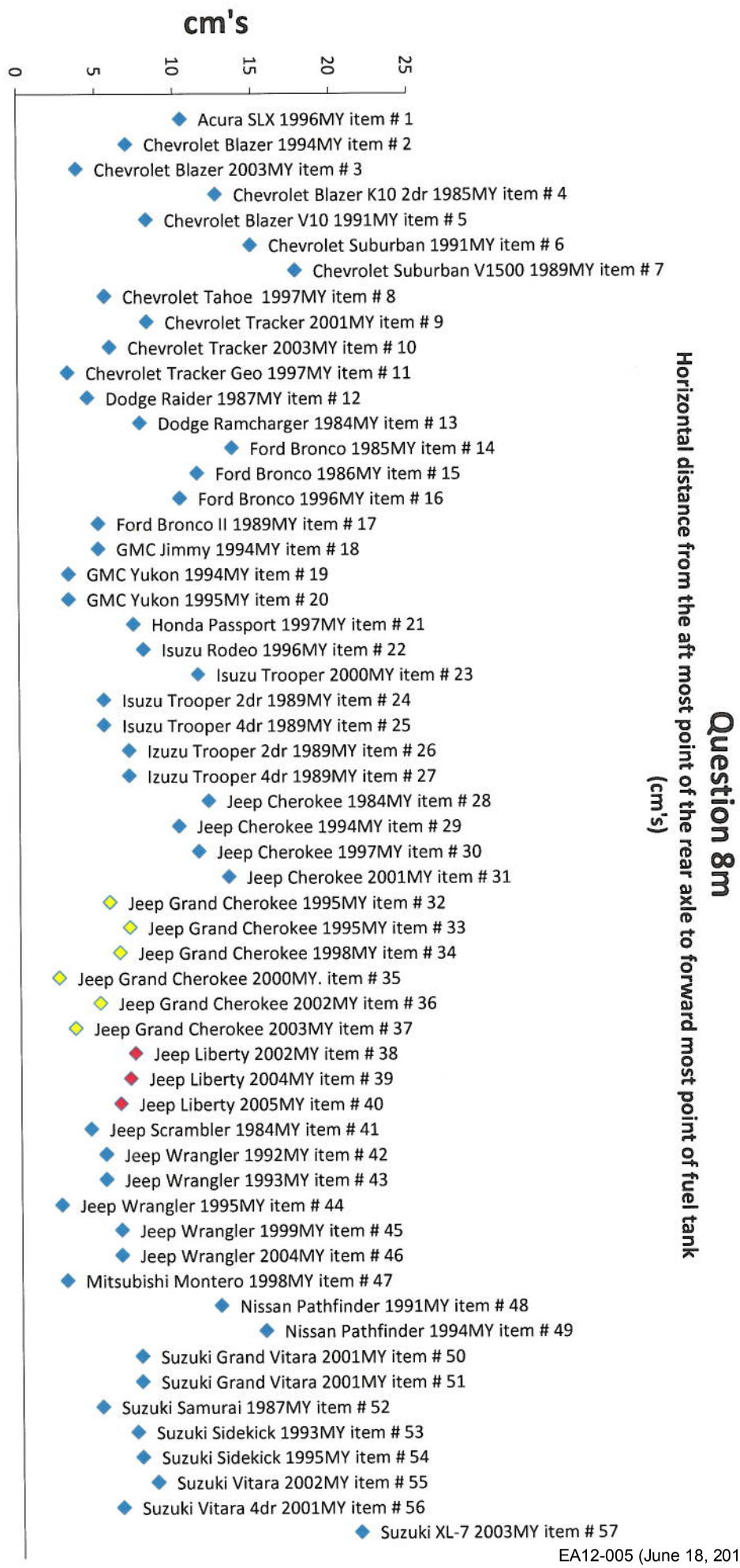
Appendix F

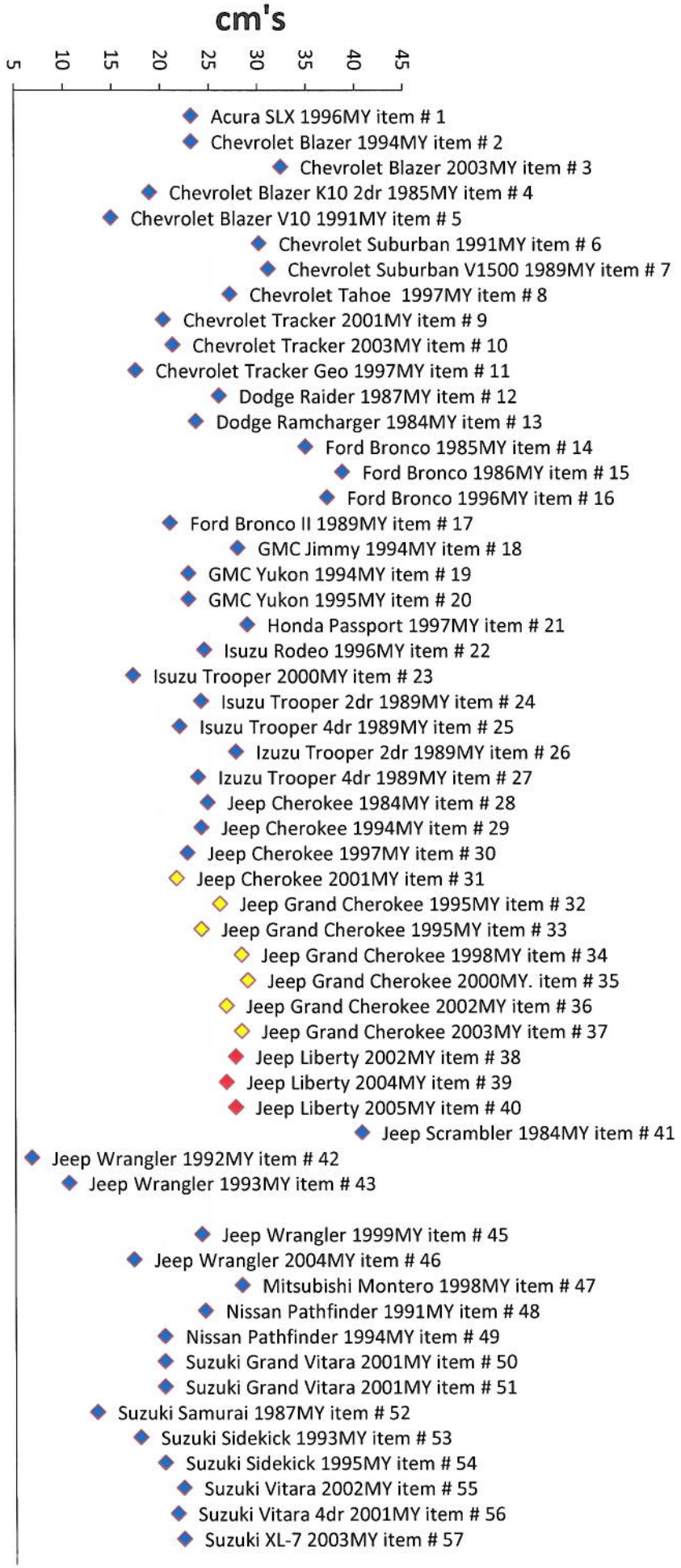
Peer Vehicle Measurement Study

Updated Peer and Subject Vehicle Measurement Data 6-14-13

Updated Peer and Subject Vehicle Measurement Data

Brand	Model	Model Year	Item #	VIN#	Question 8m Horizontal distance (inches) from the aft most point of the rear axle to forward most point of fuel tank	Question 8n Horizontal distance (inches) from the aft most point of the fuel tank to the aft most point of the rear bumper	Question 8o Vertical distance from the bottom/lower most surface of the Fuel tank to the bottom/lower most surface of the bumper at center line position - indicates below bumper + indicates above bumper	Question 8p part (i) Vertical distance (inches) from the ground to the bottom of the rear bumper at the centerline position	Question 8p part (ii) Vertical distance (inches) from the ground to the bottom of the vehicles tow hitch at the centerline position **(if equipped)**
					inch/cm	inch/cm	inch/cm	inch/cm	inch/cm
Acura	SLX	1996MY	item # 1	JAEDJ58V2T	4.125/10.4775	9.125/23.1775	-6.0625/-15.39875	18.3125/46.51	14.3125
Chevrolet	Blazer	1994MY	item # 2	1GNEK18KXR	2.75/6.985	9.125/23.1775	-6.625/-16.8275	20.5/52.07	16.1875/41.11625
Chevrolet	Blazer	2003MY	item # 3	1GNCT18X53	1.5/3.81	12.75/32.385	-2.375/-6.0325	17.1875/43.65625	12.875/32.7025
Chevrolet	Blazer K10 2dr	1985MY	item # 4	1G8EK18H5F	5/12.7	7.4375/18.89125	-9.1875/-23.33625	27.0625/68.74	17
Chevrolet	Blazer V10	1991MY	item # 5	1GNEV18KXM	3.25/8.255	5.875/14.9225	-8.9375/-22.70125	26.3125/66.83	15.375
Chevrolet	Suburban	1991MY	item # 6	1GNGV26J3M	5.875/14.9225	11 .875/30.1625	-10.4375/-26.51125	30.125/76.5175	19/48.26
Chevrolet	Suburban V1500	1989MY	item # 7	1GNEV16K1K	7.0/17.78	12.25/31.115	-4.875/-12.3825	20.25/51.435	15.125/38.4175
Chevrolet	Tahoe	1997MY	item # 8	3GNEK18R5V	2.1875/5.55752	10.6875/27.14625	N/A	21 .75/55.25	N/A
Chevrolet	Tracker	2001MY	item # 9	2CNBJ73491	3.25/8.255	8.0/20.32	-6/-15.24	16.75/42.545	N/A
Chevrolet	Tracker	2003MY	item # 10	2CNBJ63453	2.3125/5.87375	8.375/21.2725	-5.9375/-15.08125	16.625/42.2275	14.1875/36.03625
Chevrolet	Tracker Geo	1997MY	item # 11	2CNBJ184XR	1.25/3.175	6.875/17.4625	-15.75/-40.005	15.75/40.01	N/A
Dodge	Raider	1987MY	item # 12	JB7FJ43E2H	1.75/4.445	10.25/26.035	-5.4375/-13.81125	16.375/41.5925	14.5625/36.98875
Dodge	Ramcharger	1984MY	item # 13	1B4GW12T3E	3.0625/7.77875	9.3125/23.65375	-5.25/-13.335	22.375/56.83	17.25
Ford	Bronco	1985MY	item # 14	1FMDU15HXI	5.375/13.6525	13.75/34.925	-5.6875/-14.44625	21.0625/53.50	N/A
Ford	Bronco	1986MY	item # 15	IFMDU15N5G	4.5/11.43	15.25/38.735	-5.625/-14.2875	18.5/46.99	14.25/36.195
Ford	Bronco	1996MY	item # 16	1FMEU15H8T	4.06/10.3124	14.625/37.1475	-5.25/-13.335	18.875/47.9425	16.625/42.2275
Ford	Bronco II	1989MY	item # 17	1FMCU12T3J	2.0/5.08	8.25/20.955	-15.39875	19.125/48.5775	21.5/54.61
GMC	Jimmy	1994MY	item # 18	1GKDT13W9F	2.0/5.08	11.0/27.94	-4.5/-11.43	19.125/48.5775	12.875/32.7025
GMC	Yukon	1994MY	item # 19	1GKEK18KXR	1.25/3.175	9.0/22.86	-6/-15.24	21.375/54.2925	17.875/45.4025
GMC	Yukon	1995MY	item # 20	1GKEK18S7S	1.25/3.175	9.0/22.86	-6.625/-16.8275	20.625/52.3875	15.75/40.005
Honda	Passport	1997MY	item # 21	4S6CY58V6R	2.875/7.3025	11 .375/28.8925	-5.237795/-17.30375	18.8125/47.78	11 .6875
Isuzu	Rodeo	1996MY	item # 22	452CM58V4T	3.125/7.9375	9.625/24.4475	-6.75/-17.145	20.5/52.07	N/A
Isuzu	Trooper	2000MY	item # 23	JACDJ58X9Y	4.5/11.43	6.75/17.145	-4.75/-12.065	19/48.26	N/A
Isuzu	Trooper 2dr	1989MY	item # 24	JACCH57E6K	2.125/5.3975	9.5/24.13	-7.25/-18.415	18.75/47.625	16/40.64
Isuzu	Trooper 4dr	1989MY	item # 25	LESCH58E2K	2.125/5.3975	8.625/21.9075	-6.625/-16.8275	17.0/43.18	N/A
Izuzu	Trooper 2dr	1989MY	item # 26	JACCH57E6K	2.75/6.985	10.125/27.7175	-7.25/-18.415	18.75/47.63	16
Izuzu	Trooper 4dr	1989MY	item # 27	LESCH58E2K	2.75/6.985	9.375/23.8125	-6.625/-16.8275	17.0/43.18	N/A
Jeep	Cherokee	1984MY	item # 28	1JCWB7829E	4.75/12.065	9.75/24.765	-6.625/-16.8275	18.75/47.625	N/A
Jeep	Cherokee	1994MY	item # 29	1J4FJ68S2RI	4.0/10.16	9.5/24.13	-6.1875/-15.71625	20.5625/52.22875	14.4375/36.67125
Jeep	Cherokee	1997MY	item # 30	1J4FJ27S5VI	4.5/11.43	8.9375/22.70125	-6.625/-16.8275	20.875/53.0225	N/A
Jeep	Cherokee	2001MY	item # 31	1J4FF48S31I	5.25/13.335	8.5/21.59	-6.625/-16.8275	19.125/48.5775	N/A
Jeep	Grand Cherokee	1995MY	item # 32	1J4G258S8T	2.25/5.715	10.25/26.035	-3.5/-8.89	16.25/41.275	12.125/30.7975
Jeep	Grand Cherokee	1995MY	item # 33	1J4GZ58SXS	2.75/6.985	9.5/24.13	-6.4375/-16.35125	19.25/48.895	15.5/39.37
Jeep	Grand Cherokee	1998MY	item # 34	IJ4GZ58SXW	2.5/6.35	11.125/28.2575	-6/-15.24	18.75/47.625	N/A
Jeep	Grand Cherokee	2000MY.	item # 35	1J4GW58N9Y	0.969/2.46126	11.375/28.8925	-6.45624/-16.39885	18/45.75	17.5625/44.60875
Jeep	Grand Cherokee	2002MY	item # 36	1J4GW48SX2	2.0/5.08	10.5/26.67	-6.375/-16.1925	16.5/41.91	N/A
Jeep	Grand Cherokee	2003MY	item # 37	IJ4GW48S63	1.375/3.4925	11.125/28.2575	-6.75/-17.145	17.5/44.45	N/A
Jeep	Liberty	2002MY	item # 38	1J4GL58K02	2.875/7.3025	10.875/27.6225	-5.4375/-13.81125	18.0625/45.87875	N/A
Jeep	Liberty	2004MY	item # 39	1J4GL48K94	2.75/6.985	10.5/26.67	-5.25/-13.335	18.125/46.0375	N/A
Jeep	Liberty	2005MY	item # 40	1J4GL48K45	2.5/6.35	10.875/27.6225	-5.5/-13.97	18.0/45.72	N/A
Jeep	Scrambler	1984MY	item # 41	1JCCE88E0E	1.75/4.445	16/40.64	-4.0/-10.16	21.5/54.61	17
Jeep	Wrangler	1992MY	item # 42	2J4FY19P7N	2.125/5.3975	2.625/6.6675	-6.29626/-15.9925	18.5/46.99	N/A
Jeep	Wrangler	1993MY	item # 43	1J4FY2954P	2.125/5.3975	4.125/10.4775	-3/-7.62	14.0/35.56	11.0625/28.09875
Jeep	Wrangler	1995MY	item # 44	1J4FY19P7S	1/2.54	N/A	-6.1875/-15.71625	18.75/47.63	N/A
Jeep	Wrangler	1999MY	item # 45	1J4FJ49S8X	2.5/6.35	9.5/24.13	-6.125/-15.5575	17.0/43.18	11.5/29.21
Jeep	Wrangler	2004MY	item # 46	1J4FA39S44	2.5/6.35	6.75/17.145	-6.25/-15.875	16.75/42.545	11.75/29.845
Mitsubishi	Montero	1998MY	item # 47	JA7FJ43EKJ	1.125/2.8575	11.125/28.2575	-2.75/-6.985	15.25/38.735	16.625/42.2275
Nissan	Pathfinder	1991MY	item # 48	JN8HD17Y9M	5.0/12.7	9.625/24.4475	-1.5625/-3.96875	20.5625/52.22875	17.1875/43.65625
Nissan	Pathfinder	1994MY	item # 49	JN8HD17Y0R	6.125/15.5575	8.0/20.32	-1.375/-3.4925	19.875/50.4825	N/A
Suzuki	Grand Vitara	2001MY	item # 50	JS3TD62V51	3.0/7.62	8.0/20.32	-6.75/-17.145	18.0/45.72	N/A
Suzuki	Grand Vitara	2001MY	item # 51	JS3TD62V81	3.0/7.62	8.0/20.32	-5/-12.7	15.75/40.005	N/A
Suzuki	Samurai	1987MY	item # 52	JS4JC51C7H	2/5.08	5.25/13.335	-8.875/-22.5425	19 .75/50.17	11.1875
Suzuki	Sidekick	1993MY	item # 53	2S3TA01C1P	2.875/7.3025	7.0/17.78	-2.625/-6.6675	15.75/40.005	13.5/34.29
Suzuki	Sidekick	1995MY	item # 54	2S3TD03V3S	3.0/7.62	8.0/20.32	-7.25/-18.415	20.0/50.8	N/A
Suzuki	Vitara	2002MY	item # 55	2S3TA52C82	3.375/8.5725	8.75/22.225	-5.5/-13.97	16.25/41.28	N/A
Suzuki	Vitara 4dr	2001MY	item # 56	2S3TD52V11	2.5/6.35	8.5/21.59	-5.4375/-13.81125	16.0/40.64	N/A
Suzuki	XL-7	2003MY	item # 57	JS3TY92VX5	8.5/21.59	8.75/22.225	-6.25/-15.875	17.75/45.085	N/A


cm's
0
5
10
15
20
25
Acura SLX 1996MY item # 1
Chevrolet Blazer 1994MY item # 2
Chevrolet Blazer 2003MY item # 3
Chevrolet Blazer K10 2dr 1985MY item # 4
Chevrolet Blazer V10 1991MY item # 5
Chevrolet Suburban 1991MY item # 6
Chevrolet Suburban V1500 1989MY item # 7
Chevrolet Tahoe 1997MY item # 8
Chevrolet Tracker 2001MY item # 9
Chevrolet Tracker 2003MY item # 10
Chevrolet Tracker Geo 1997MY item # 11
Dodge Raider 1987MY item # 12
Dodge Ramcharger 1984MY item # 13
Ford Bronco 1985MY item # 14
Ford Bronco 1986MY item # 15
Ford Bronco 1996MY item # 16
Ford Bronco II 1989MY item # 17
GMC Jimmy 1994MY item # 18
GMC Yukon 1994MY item # 19
GMC Yukon 1995MY item # 20
Honda Passport 1997MY item # 21
Isuzu Rodeo 1996MY item # 22
Isuzu Trooper 2000MY item # 23
Isuzu Trooper 2dr 1989MY item # 24
Isuzu Trooper 4dr 1989MY item # 25
Izuzu Trooper 2dr 1989MY item # 26
Izuzu Trooper 4dr 1989MY item # 27
Jeep Cherokee 1984MY item # 28
Jeep Cherokee 1994MY item # 29
Jeep Cherokee 1997MY item # 30
Jeep Cherokee 2001MY item # 31
Jeep Grand Cherokee 1995MY item # 32
Jeep Grand Cherokee 1995MY item # 33
Jeep Grand Cherokee 1998MY item # 34
Jeep Grand Cherokee 2000MY. item # 35
Jeep Grand Cherokee 2002MY item # 36
Jeep Grand Cherokee 2003MY item # 37
Jeep Liberty 2002MY item # 38
Jeep Liberty 2004MY item # 39
Jeep Liberty 2005MY item # 40
Jeep Scrambler 1984MY item # 41
Jeep Wrangler 1992MY item # 42
Jeep Wrangler 1993MY item # 43
Jeep Wrangler 1995MY item # 44
Jeep Wrangler 1999MY item # 45
Jeep Wrangler 2004MY item # 46
Mitsubishi Montero 1998MY item # 47
Nissan Pathfinder 1991MY item # 48
Nissan Pathfinder 1994MY item # 49
Suzuki Grand Vitara 2001MY item # 50
Suzuki Grand Vitara 2001MY item # 51
Suzuki Samurai 1987MY item # 52
Suzuki Sidekick 1993MY item # 53
Suzuki Sidekick 1995MY item # 54
Suzuki Vitara 2002MY item # 55
Suzuki Vitara 4dr 2001MY item # 56
Suzuki XL-7 2003MY item # 57
Question 8m
Horizontal distance from the aft most point of the rear axle to forward most point of fuel tank (cm's)

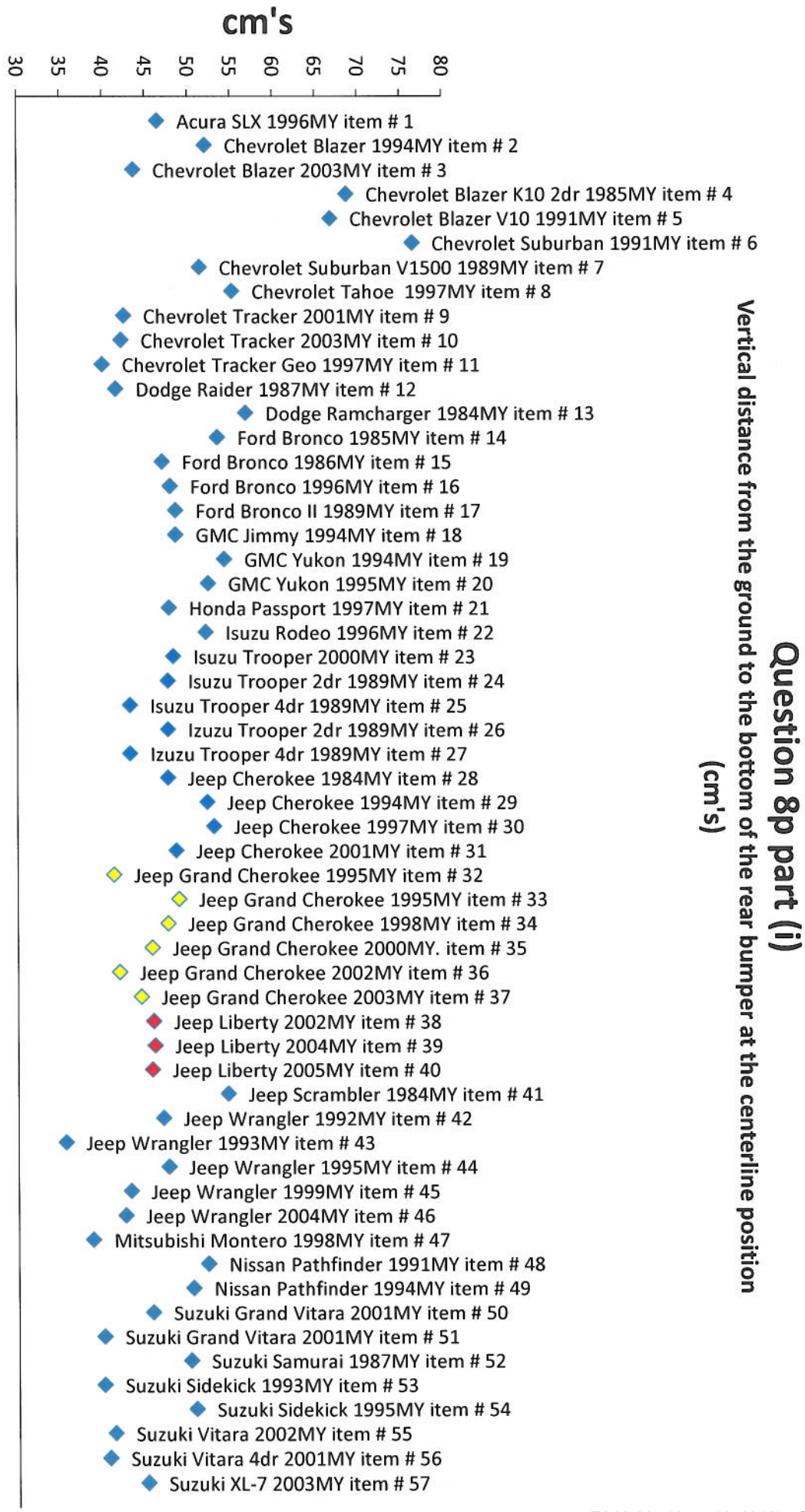


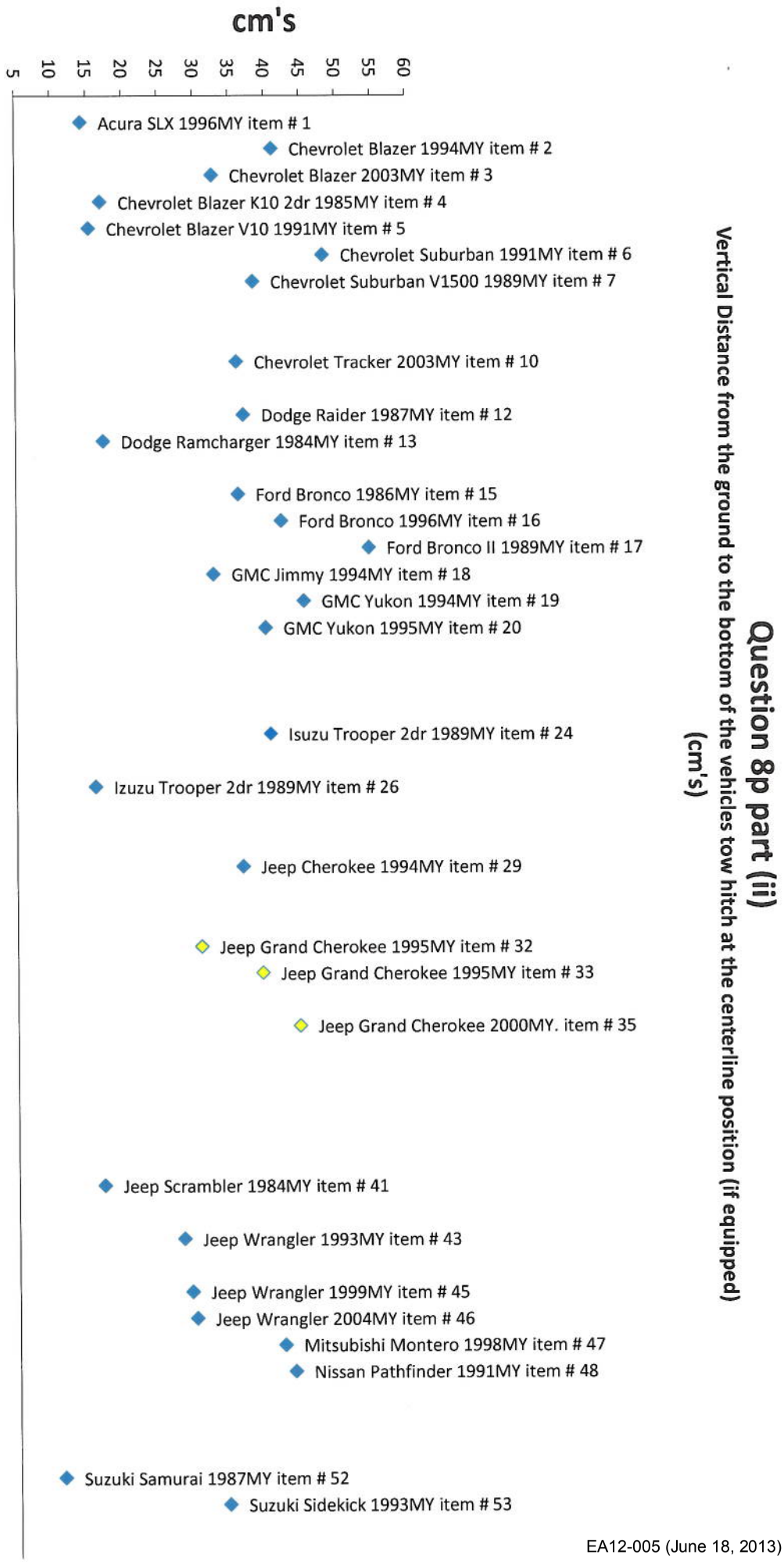
Question 8n

Horizontal distance from the aft most point of the fuel tank to the aft most point of the rear bumper (cm's)

Question 8o

Vertical distance from the bottom/lower most surface of the Fuel tank to the bottom/lower most surface of the bumper at center line position.
(positive value indicates tank surface is above bumper, negative values are below bumper)
(cm's)


cm's
30
35
40
45
50
55
60
65
70
75
80
Acura SLX 1996MY item # 1
Chevrolet Blazer 1994MY item # 2
Chevrolet Blazer 2003MY item # 3
Chevrolet Blazer K10 2dr 1985MY item # 4
Chevrolet Blazer V10 1991MY item # 5
Chevrolet Suburban 1991MY item # 6
Chevrolet Suburban V1500 1989MY item # 7
Chevrolet Tahoe 1997MY item # 8
Chevrolet Tracker 2001MY item # 9
Chevrolet Tracker 2003MY item # 10
Chevrolet Tracker Geo 1997MY item # 11
Dodge Raider 1987MY item # 12
Dodge Ramcharger 1984MY item # 13
Ford Bronco 1985MY item # 14
Ford Bronco 1986MY item # 15
Ford Bronco 1996MY item # 16
Ford Bronco II 1989MY item # 17
GMC Jimmy 1994MY item # 18
GMC Yukon 1994MY item # 19
GMC Yukon 1995MY item # 20
Honda Passport 1997MY item # 21
Isuzu Rodeo 1996MY item # 22
Isuzu Trooper 2000MY item # 23
Isuzu Trooper 2dr 1989MY item # 24
Isuzu Trooper 4dr 1989MY item # 25
Izuzu Trooper 2dr 1989MY item # 26
Izuzu Trooper 4dr 1989MY item # 27
Jeep Cherokee 1984MY item # 28
Jeep Cherokee 1994MY item # 29
Jeep Cherokee 1997MY item # 30
Jeep Cherokee 2001MY item # 31
Jeep Grand Cherokee 1995MY item # 32
Jeep Grand Cherokee 1995MY item # 33
Jeep Grand Cherokee 1998MY item # 34
Jeep Grand Cherokee 2000MY. item # 35
Jeep Grand Cherokee 2002MY item # 36
Jeep Grand Cherokee 2003MY item # 37
Jeep Liberty 2002MY item # 38
Jeep Liberty 2004MY item # 39
Jeep Liberty 2005MY item # 40
Jeep Scrambler 1984MY item # 41
Jeep Wrangler 1992MY item # 42
Jeep Wrangler 1993MY item # 43
Jeep Wrangler 1995MY item # 44
Jeep Wrangler 1999MY item # 45
Jeep Wrangler 2004MY item # 46
Mitsubishi Montero 1998MY item # 47
Nissan Pathfinder 1991MY item # 48
Nissan Pathfinder 1994MY item # 49
Suzuki Grand Vitara 2001MY item # 50
Suzuki Grand Vitara 2001MY item # 51
Suzuki Samurai 1987MY item # 52
Suzuki Sidekick 1993MY item # 53
Suzuki Sidekick 1995MY item # 54
Suzuki Vitara 2002MY item # 55
Suzuki Vitara 4dr 2001MY item # 56
Suzuki XL-7 2003MY item # 57
Question 8p part (i)
Vertical distance from the ground to the bottom of the rear bumper at the centerline position
(cm's)


cm's
5
10
15
20
25
30
35
40
45
50
55
60
Acura SLX 1996MY item # 1
Chevrolet Blazer 1994MY item # 2
Chevrolet Blazer 2003MY item # 3
Chevrolet Blazer K10 2dr 1985MY item # 4
Chevrolet Blazer V10 1991MY item # 5
Chevrolet Suburban 1991MY item # 6
Chevrolet Suburban V1500 1989MY item # 7
Chevrolet Tracker 2003MY item # 10
Dodge Raider 1987MY item # 12
Dodge Ramcharger 1984MY item # 13
Ford Bronco 1986MY item # 15
Ford Bronco 1996MY item # 16
Ford Bronco II 1989MY item # 17
GMC Jimmy 1994MY item # 18
GMC Yukon 1994MY item # 19
GMC Yukon 1995MY item # 20
Isuzu Trooper 2dr 1989MY item # 24
Izuzu Trooper 2dr 1989MY item # 26
Jeep Cherokee 1994MY item # 29
Jeep Grand Cherokee 1995MY item # 32
Jeep Grand Cherokee 1995MY item # 33
Jeep Grand Cherokee 2000MY. item # 35
Jeep Scrambler 1984MY item # 41
Jeep Wrangler 1993MY item # 43
Jeep Wrangler 1999MY item # 45
Jeep Wrangler 2004MY item # 46
Mitsubishi Montero 1998MY item # 47
Nissan Pathfinder 1991MY item # 48
Suzuki Samurai 1987MY item # 52
Suzuki Sidekick 1993MY item # 53
Question 8p part (ii)
Vertical Distance from the ground to the bottom of the vehicles tow hitch at the centerline position (if equipped) (cm's)