

Post-crash fires in road vehicles

**Paul Otxoterena Af Drake
Ulf Björnstig
Mats Lindkvist**

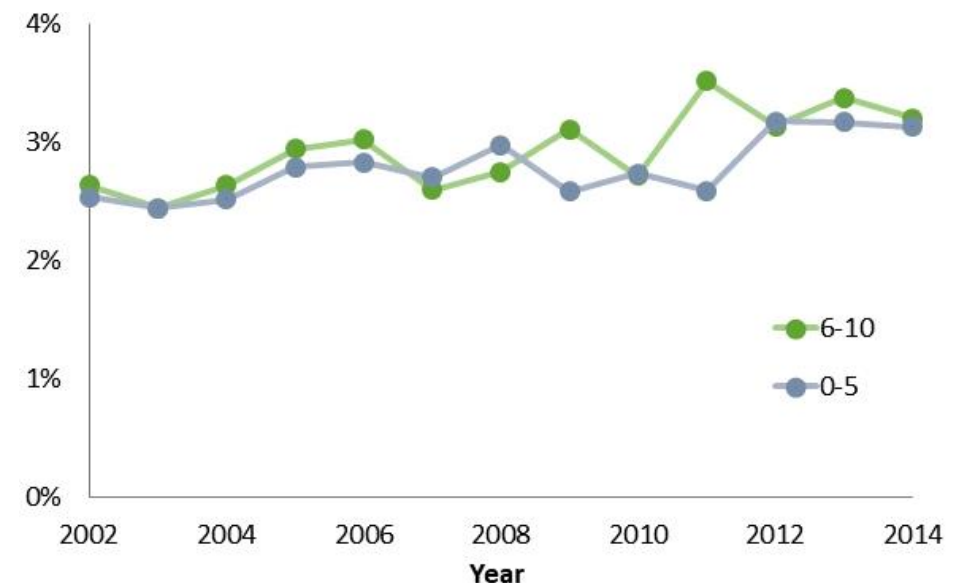
Is this important?

Year	Total vehicles involved	Vehicles catching fire (%)	Fatalities occurring in vehicle catching fire (%)
2002	58 426	2.95	4.54
2003	58 877	2.77	4.30
2004	58 729	2.79	4.20
2005	59 495	2.98	4.71
2006	58 094	3.03	4.71
2007	56 253	2.96	4.60
2008	50 660	3.01	4.50
2009	45 540	2.93	4.58
2010	44 862	2.86	4.47
2011	44 119	3.03	4.77
2012	45 960	3.31	5.17
2013	45 102	3.14	5.24
2014	44 858	3.28	5.36

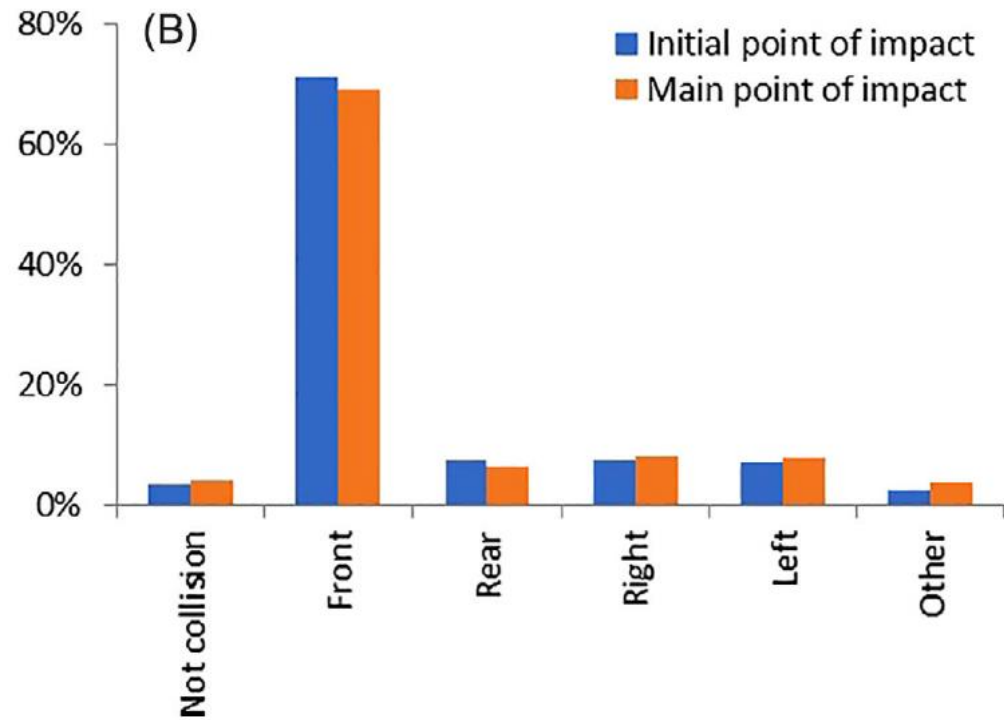
- 5 % of all fatalities in Swedish roads due to collisions in passenger cars, sport utility vehicles, vans and minibuses which took place between 1998 and 2008 occurred in burning vehicles
- The cause of death in one third of the reported incidents was attributable to fire only with no or limited trauma injuries
- In U.S.A. 31 vehicle fires are reported per hour and these are responsible for around 300 deaths and 800 injured persons per year.
- These fires are involved in 12 % of fire deaths, 8 % of civilian fire injuries and 9 % of the direct property damage from reported fires

Primary factor involved in ignition and fire rate according to age

Primary factor involved in ignition	Vehicle fires (%)	Fatalities (%)
Mechanical failure, malfunction	43.3	10.7
Electrical failure, malfunction	21.1	1.3
Misuse of material or product	12.6	13.1
Other factors	7.2	14.8
Fire spread or control	7.6	2.3
Operational deficiency		
Collision	3.6	55.2
Other	3.2	2.1
Design, manufacture, installation deficiency	0.7	0.2
Natural condition	0.6	0.3

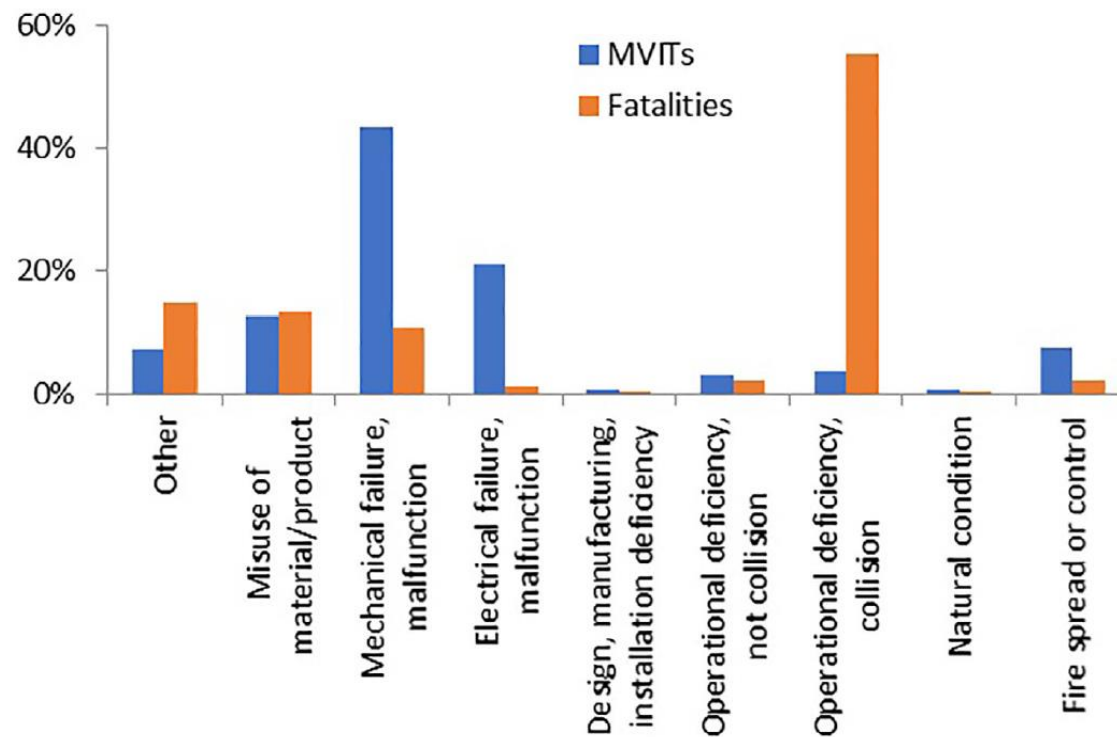
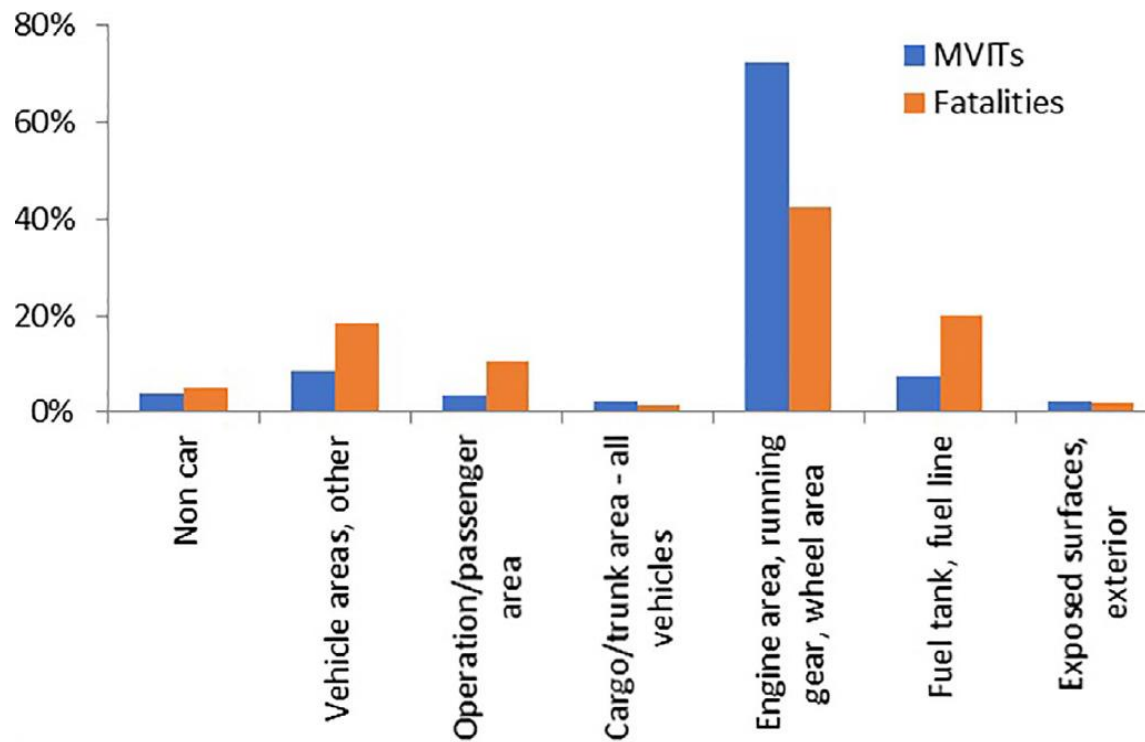


Initial point of impact and origin of minor and major fire

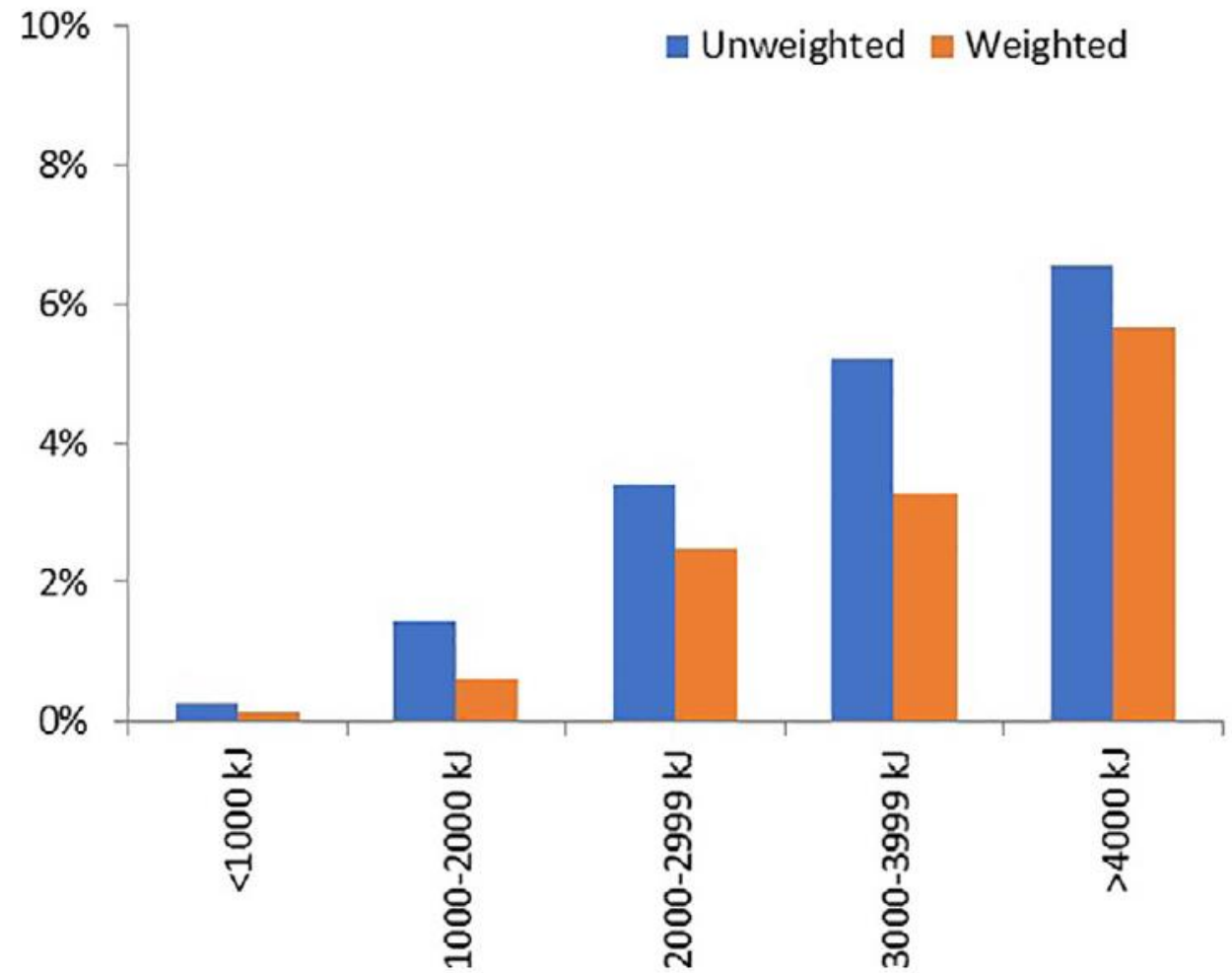


Occurrence	Origin	Unweighted	Weighted
Minor	Engine compartment	147	16 364
	Fuel tank	4	780
	Passenger area	3	291
	Other	16	1389
	Missing	2	33
Major	Engine compartment	163	25 595
	Fuel tank	47	2568
	Passenger area	6	469
	Other	24	3037
	Missing	47	2717

Area of origin and cause of fire

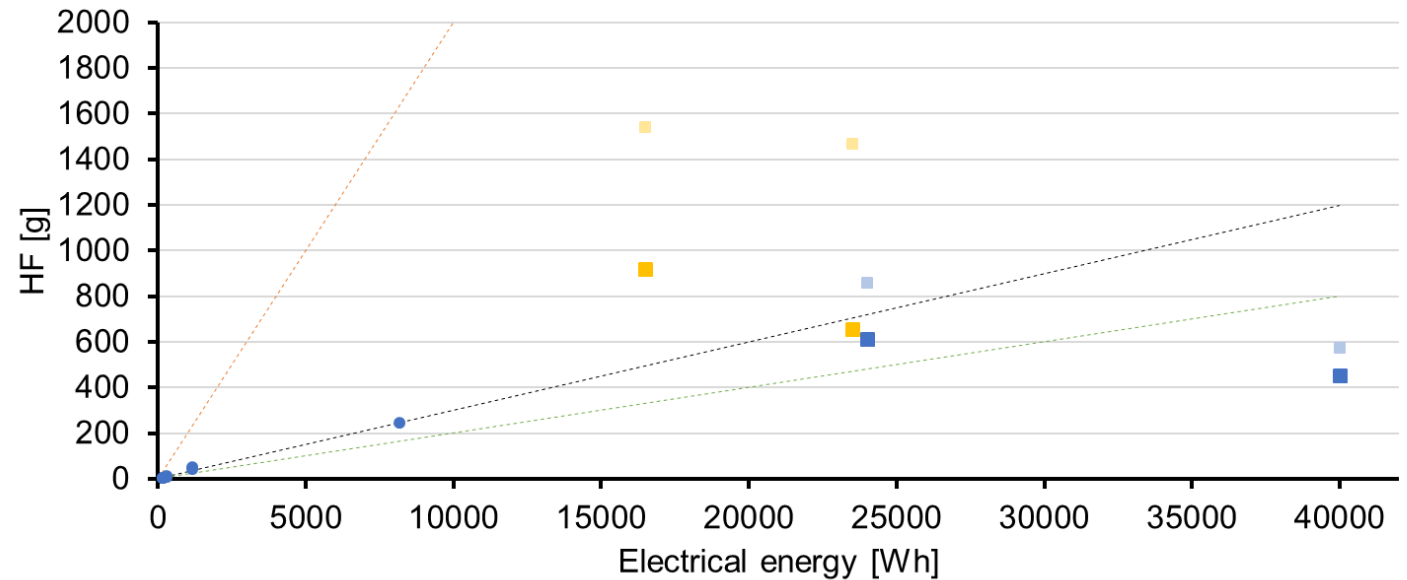
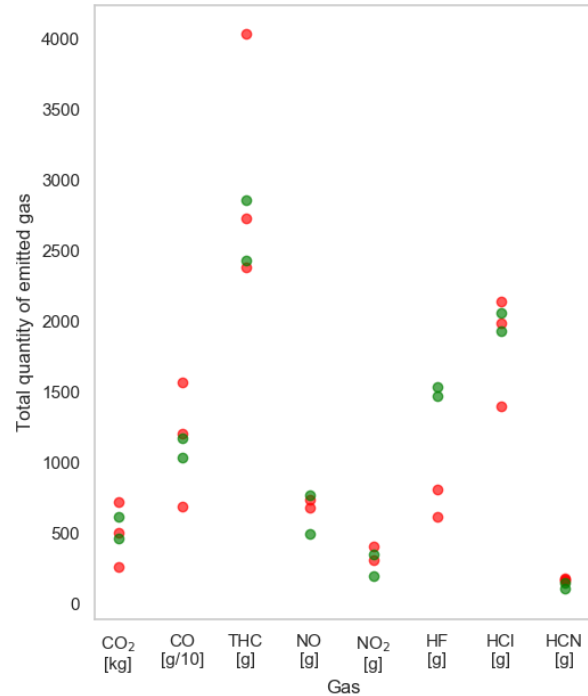


Fire rates in crashes according to energy absorption



Gas release (EV and ICEV)

Test	CO2 kg	CO g/10	THC g	NO g	NO2 g	HF g	HCl g	HCN g
1	344	642	2368	452	44	11	1098	-
2	335	779	3131	371	25	573	1586	-
3	438	951	2751	617	76	859	1803	155



- E-TOX battery tests
- Lower limit based on RISE cell tests
- E-TOX vehicle tests (total)
- INERIS vehicle tests (total)
- Trendline for E-TOX battery tests
- Upper limit based on RISE cell tests
- E-TOX vehicle tests (battery)
- INERIS vehicle tests (battery)

Thanks

Otxoterena P, Björnstig U, Lindkvist M. Post-collision fires in road vehicles between 2002 and 2015. *Fire and Materials*. 2020;1–9. <https://doi.org/10.1002/fam.2862>