October 2023

NETS®
Network of Employers for Traffic Safety

STRENGTH IN NUMBERS®

FLEET SAFETY BENCHMARK REPORT

DATA YEAR 2022

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EXECUTIVE SUMMARY

This report continues a series of annual benchmark surveys on road safety that have been conducted exclusively for members of the Network of Employers for Traffic Safety since 2008 (Data Year 2007).

Data Year 2022 Participation

This year, 62 NETS members participated in the benchmark process. Participation requires that a member submit 2022 metrics and respond to a survey regarding 2022 road safety programs, practices and policies. Together, the 62 members represent a fleet population of 487,306 vehicles traveling 7.53 billion miles in 2022, with a composite CPMM (collisions per million miles) of 4.55. For purposes of analytics, NETS excludes 2/3-wheel vehicles from company CPMMs (see page 6). After removing 2/3 wheeled vehicles, this brought the totals for analytics to 482,490 vehicles traveling 7.49 billion miles, with a composite CPMM of 4.58.

<u>Company Metrics (also see pages 12-17)</u>

- 62 NETS members submitted metrics and program survey responses

<u>Country Metrics (also see pages 18-21)</u>

- The 62 participating companies reported specific metrics for 131 individual countries
- 59 (95%) companies reported metrics for the U.S., which is the largest country fleet
- 44 (71%) reported metrics for North America only
- 17 (27%) reported metrics for North America and beyond
- 1 company was not able to report specific metrics broken out by country

<u>Vehicle-Category Metrics (also see pages 22-26</u>

- 62 companies (100%) reported metrics for light vehicles
- 24 companies (39%) reported metrics for medium-weight vehicles
- 25 companies (40%) reported metrics for heavy vehicles
- 5 companies (8%) reported metrics for 2/3-wheel vehicles
- 10 companies (16%) could not report some portion or all of their metrics by vehicle category and reported by mixed vehicles

<u>Injury Metrics (also see pages 27-29)</u>

- 46 of 62 U.S.-reporting companies reported injuries in the U.S.
- 16 of 18 companies reporting for North America and beyond and/or global data reported global injuries

The Benchmark Process

As described further on page 6, the benchmark process included the collection of key road safety metrics: total vehicles, total miles, total crashes, and limited injury data for as many as five vehicle categories per company. These metrics were used to calculate collisions per million miles (CPMM) as referred to in graphs and tables in this report. [CPMM = Total Collisions x 1,000,000 / Total Miles.] In addition, participants completed a survey regarding the processes, practices and policies that were included in their road safety programs in 2022. We periodically make some modifications to the survey to ensure it is up to date with current road safety innovations and practices. This year, additional questions were added regarding the number of preventable crashes, the ability to track and classify serious injuries and fatalities (SIFs) and/or potential serious injuries and fatalities (PSIFs), a breakout of lagging vs. leading indicators that were either included on a road safety scorecard and/or tracked, and additional questions regarding the parameters/settings for in-vehicle monitoring system(s) in light, medium, and heavy-duty fleet vehicles.

The Analytical Process

The metrics and survey responses that are collected from NETS members are used to conduct our analytical processes. The purpose of these processes is to identify practices that may be statistically associated with CPMM, IPMM and %Fleet results. That said, the results of our analytics must be taken in context. We do not believe that any of the practices we highlight are likely to be effective in isolation; instead, we strongly suggest that they need to be part of a comprehensive, well supported road safety program to be effective. A summary of the results of this year's analytics is presented on pages 30-40. A more academic summary is provided in the appendices to this report (*Appendix 1* and *Appendix 2*).

Confidentiality and Copyright

All member companies have been randomly assigned identification numbers. These remain constant from year to year and are used in lieu of company names to maintain confidentiality in all reports, databases and documents that are provided to members throughout the benchmark process. To further ensure confidentiality, all contents of this report are copyrighted, including text, metrics, graphs, tables, and appendices. As a condition of NETS membership, each member agrees not to share any NETS benchmark metrics, databases or analytical results with any person or organization outside its own company without written permission.

The Benchmark Participants

This year, 62 member companies participated in the benchmark process by submitting both metrics and survey responses. We have listed all participating members in alphabetical order on the following page. This list is confidential and is provided for the information of NETS members only.

Company Listing of Data Year 2022 Benchmark Participants

Abbott	Glaxo SmithKline
AbbVie	Hess
ADT	Imperial Brands
Alnylam Pharmaceuticals	Inizio (formerly UDG Healthcare)
Amgen	Johnson & Johnson
Arizona Public Services (APS)	Land O'Lakes
Asplundh	Liberty Mutual
Astra Zeneca	Magellan Midstream Partners
Bayer	Merck
Black & McDonald Ltd.	National Grid
Boehringer-Ingelheim	Nationwide
BP	Novartis
Bristol-Myers Squibb	Pacific Gas and Electric
Cargill	Peak Utility Services
Chevron	Pfizer
CHS Inc.	Portland General Electric
Chubb	PPG Industries
Cintas	PSE&G
Comcast	PSEG Long Island
Consolidated Edison	Retail Business Services LLC
Corteva	Rollins
Denbury	Sanofi
DHL Supply Chain	Schlumberger
Diebold	State Farm
Dow	Sunbelt Rentals
DTE Energy	Syngenta
Ecolab	Terracon
El Paso Electric Company	Truckee Meadows Water Authority
Eli Lilly	Turning Point Brands
Enbridge	USIC LLC
Genentech	Wonderful

FLEET SAFETY METRICS

NETS Metrics Standards

We ask participants to conform to certain reporting standards, as described below. Complying with these standards helps NETS ensure that our analytics are as reliable as possible, and helps members make accurate comparisons between companies.

Crash Totals: Traditional NETS Exclusions

Each company is expected to exclude the following eight categories of events, and only these events, from their crash data.

- Acts of God/nature
- Collisions with animals
- Fire, theft, vandalism
- Object hit vehicle
- Hit while parked
- Collisions with debris
- Glass-only damage
- Vehicle failure

Exclusion of 2/3-Wheel Vehicles from CPMMs

CPMM (collisions per million miles) rates for individual companies are based on total metrics reported in all countries for all vehicle categories except 2/3-wheel vehicles. These adjusted totals affected five companies and are reflected in crash and injury rates in this report, except where noted—for example in the Countries section of the report. Our decision to make these changes was based on the fact that our analytical processes look for correlations between metrics (primarily crash and injury rates) and programs in place. However, it is difficult to accurately reflect issues with 2/3-wheel vehicles in our program survey because we ask questions that do not apply in the 2/3-wheel environment (e.g., commentary drives, IVMS) and we omit questions that would likely be significant (e.g., helmet policies, passenger policies) because the 2/3 wheeled fleet size is small compared to other vehicle types.

Vehicle Categories (detailed and graphed on pages 23-27)

Participants may report data in 5 vehicle categories:

- Light: SUVs, sedans, pick-up trucks, passenger vans
- Medium: 10,001 to 26,000 pounds
- Heavy: 26,001 pounds or more
- 2/3-Wheel: motorized 2- and 3-wheel vehicles.
- Mixed Vehicles: used only when unable to break out the totals by vehicle type

Injury Metrics (detailed and graphed on pages 28-29)
Injury metrics are collected for the U.S. as well as globally.

- The U.S. injury metric includes only crash-related Occupational Safety and Health Administration (OSHA) recordable injuries. This metric is required to be reported for all U.S.-reporting companies.
- Injury data were also requested for total global crash-related injuries. This metric includes injuries where:
  - Medical treatment is rendered beyond first aid;
  - Restricted work activity is imposed or an employee is temporarily or permanently transferred to another job;
  - There is a lost work day or work days from work;
  - There is a loss of consciousness.
  - It is considered a Serious Injury or Illness Case (SIIC), i.e., an injury that has a major impact or effect on the health of the employee. This includes death, amputation, fracture (other than hairline fracture of any bone or non-displaced fracture of a digit), in-patient hospitalization (other than for observation), surgical intervention and continuous impairment.

SUMMARY OF FUNDAMENTAL METRICS

The *Summary of Fundamental Metrics* on the following pages will be helpful to members in identifying which fleets are comparable to their own. For that purpose, this table separates participating members into two groups: those reporting only for North American countries (United States, Canada, Puerto Rico), and those reporting for countries outside North America as well.

For those who prefer visual representations of data, later in this report we have provided tables and/or graphs of CPMMs by company (pages 13-18), by country (pages 19-22), and by vehicle category (pages 23-27), as well as injury rates for the U.S. and globally (pages 28-29).

Note Regarding Exclusion of 2/3-Wheel Vehicles
The Summary Table excludes 2/3-wheel vehicles from the totals that are used for calculating CPMMs. The explanation for these exclusions is detailed on page 6.

Table 1: Summary of Fundamental 2022 Metrics

The footnotes at the end of the table (page 12) provide additional details about the information in the table.

ID	# of Countries Reported	*NETS Total Vehicles (excl. 2/3 wheel)	NETS Total Mileage (excl. 2/3 wheel)	NETS Miles Per Vehicle (excl. 2/3 wheel)	NETS Total Crashes (excl. 2/3 wheel)	*NETS CPMM (excl. 2/3 wheel)	*% of Fleet	IPMM: US	IPMM: Global	**Total Employer Cost of Crashes (USD) (Total Crashes x $26,081)
MEMBERS REPORTING FOR NORTH AMERICA ONLY (44 MEMBERS)										
1420	1	7,115	158,096,694	22,220	671	4.24	9.4%	0.30		$17,500,351
1388	1	235	4,083,789	17,378	18	4.41	7.7%	0.24		$469,458
1334	1	2506	52,712,626	21,035	122	2.31	4.9%	0.23		$3,181,882
1531	1	1,211	14,233,232	11,753	41	2.88	3.4%	0.00		$1,069,321
1674	1	18,451	400,253,018	21,693	452	1.13	2.4%	0.05		$11,788,612
1263	1	4,331	76,051,693	17,560	218	2.87	5.0%	0.08		$5,685,658
1216	1	1,750	30,409,607	17,377	102	3.35	5.8%	N/A		$2,660,262
1801	1	3,007	67,632,233	22,492	177	2.62	5.9%	0.22		$4,616,337
1751	1	3,345	29,686,163	8,875	18	0.61	0.5%	0.13		$469,458
1089	1	5,861	90,377,973	15,420	110	1.22	1.9%	0.09		$2,868,910
1946	1	1,519	20,815,797	13,704	95	4.56	6.3%	0.00		$2,477,695
1488	1	21,442	477,041,616	22,248	1876	3.93	8.7%	0.07		$48,927,956
1540	1	24000	220,100,000	9,171	1262	5.73	5.3%	0.53		$32,914,222
1221	1	4,525	28,870,855	6,380	408	14.13	9.0%	1.32		$10,641,048
1004	1	2,382	52,000,000	21,830	129	2.48	5.4%	0.06		$3,364,449
1862	1	469	5,792,931	12,352	15	2.59	3.2%	0.00		$391,215
1701	1	2,140	56,818,159	26,551	309	5.44	14.4%	0.67		$8,059,029
1644	1	7,576	41,314,702	5,453	233	5.64	3.1%	0.05		$6,076,873
1457	2	3,141	66,851,492	21,284	377	5.64	12.0%	0.13		$9,832,537
1067	1	459	4,296,898	9,361	51	11.87	11.1%	0.47		$1,330,131
1621	2	1,302	62,886,500	48,300	77	1.22	5.9%	0.00		$2,008,237
1093	1	1,711	16,315,096	9,535	128	7.85	7.5%	0.18		$3,338,368

ID	# of Countries Reported	*NETS Total Vehicles (excl. 2/3 wheel)	NETS Total Mileage (excl. 2/3 wheel)	NETS Miles Per Vehicle (excl. 2/3 wheel)	NETS Total Crashes (excl. 2/3 wheel)	*NETS CPMM (excl. 2/3 wheel)	*% of Fleet	IPMM: US	IPMM: Global	**Total Employer Cost of Crashes (USD) (Total Crashes x $26,081)
1620	1	2,470	58,984,360	23,880	761	12.90	30.8%	0.58		$19,847,641
1738	1	1,119	41,095,908	36,726	51	1.24	4.6%	0.00		$1,330,131
1588	1	1,772	29,326,294	16,550	68	2.32	3.8%	0.07		$1,773,508
1023	1	638	10,685,699	16,749	10	0.94	1.6%	0.19		$260,810
1224	1	6,237	32,114,334	5,149	353	10.99	5.7%	0.65		$9,206,593
1437	1	1,522	20,313,384	13,347	64	3.15	4.2%	0.00		$1,669,184
1337	1	21,740	138,363,334	6,364	767	5.54	3.5%	0.11		$20,004,127
1766	1	1,193	9,723,825	8,151	28	2.88	2.3%	2.78		$730,268
1904	1	1,993	9,490,624	4,762	82	8.64	4.1%	0.32		$2,138,642
1944	3	3,336	63,916,008	19,159	270	4.22	8.1%	0.14		$7,041,870
1304	1	5,351	38,003,002	7,102	332	8.74	6.2%	0.21		$8,658,892
1070	1	1,088	5,830,521	5,359	65	11.15	6.0%	0.00		$1,695,265
1660	1	2,711	143,410,470	52,899	1105	7.71	40.8%	0.20		$28,819,505
1135	1	14,074	284,436,303	20,210	1615	5.68	11.5%	0.38		$42,120,815
1833	1	4,959	27,654,759	5,577	157	5.68	3.2%	0.00		$4,094,717
1761	2	12,095	277,259,286	22,923	1621	5.85	13.4%	0.04		$42,277,301
1119	1	1,694	35,206,402	20,783	76	2.16	4.5%	0.14		$1,982,156
1259	1	3,375	47,000,000	13,926	133	2.83	3.9%	0.28		$3,468,773
1819	1	182	1,408,065	7,737	5	3.55	2.7%	0.00		$130,405
1247	1	151	3,840,970	25,437	17	4.43	11.3%	0.26		$443,377
1599	1	14,016	259,114,253	18,487	506	1.95	3.6%	0.16		$13,196,986
1528	1	1359	26,401,429	19,427	85	3.22	6.3%	0.34		$2,216,885
NORTH AMERICA:		**221,553**	**3,540,220,303**	**15,979**	**15,060**	**4.25**				**$392,779,860**

ID	# of Countries Reported	*NETS Total Vehicles (excl. 2/3 wheel)	NETS Total Mileage (excl. 2/3 wheel)	NETS Miles Per Vehicle (excl. 2/3 wheel)	NETS Total Crashes (excl. 2/3 wheel)	*NETS CPMM (excl. 2/3 wheel)	*% of Fleet	IPMM: US	IPMM: Global	**Total Employer Cost of Crashes (USD) (Total Crashes x $26,081)
MEMBERS REPORTING FOR NORTH AMERICA &/OR BEYOND (17 MEMBERS)										
1012	77	16,797	278,529,968	16,582	751	2.70	4.1%	0.05	0.17	$19,586,831
1832	71	13,505	247,795,283	18,348	1535	6.19	11.3%	0.04	0.06	$40,034,335
1868	63	23,128	343,415,604	14,848	996	2.90	4.0%	0.10	0.05	$25,976,676
1987	30	7,672	100,120,577	13,050	974	9.73	12.7%	0.17	0.24	$25,402,894
1852	53	4872	51,009,240	10,470	63	1.24	1.3%	0.00	0.00	$1,643,103
1551	2	7393	397,217,965	53,729	4030	10.15	54.5%	1.86	0.47	$105,106,430
1405	40	3,633	20,067,425	5,524	77	3.84	2.1%	0.23	0.10	$2,008,237
1610	92	23,196	827,187,000	35,661	1771	2.14	7.6%	0.08	0.04	$46,189,451
1099	2	438	5,932,627	13,545	2	0.34	0.5%	0.00	0.00	$52,162
1008	45	56,874	85,110,145	1,496	370	4.35	0.7%	0.00	0.05	$9,649,970
1133	10	1599	26,641,395	16,661	191	7.17	11.9%	0.00	0.23	$4,981,471
1301	69	33,780	503,376,295	14,902	2846	5.65	8.3%	0.08	0.05	$74,226,526
1575	59	15,492	254,024,046	16,397	1152	4.54	7.3%	0.03	0.02	$30,045,312
1960	17	10,203	166,567,431	16,325	1240	7.44	12.2%	0.04	0.13	$30,045,312
1670	45	11,872	160,576,296	13,526	2056	12.80	17.3%	0.33	0.12	$53,622,536
1845	61	14,517	218,514,650	15,052	980	4.48	6.4%	0.04	0.14	$25,559,380
1709	153	8,984	211,299,566	23,520	94	0.44	1.0%	0.00	0.01	$2,451,614
N. AMER./BEYOND:		**253,955**	**3,897,385,512**	**15,347**	**19,128**	**4.91**				**$498,877,368**
MEMBERS SUBMITTING GLOBAL DATA, NOT BROKEN OUT BY COUNTRY (1 COMPANIES)										
1920	N/A	6,982	55,100,000	7,892	105	1.91	1.5%	N/A	0.09	$2,738,505
GLOBAL SUBTOTALS:		**6,982**	**55,100,000**	**7,892**	**105**	**1.91**				**$2,738,505**
GRAND TOTALS:		**482,490**	**7,492,705,815**	**15,529**	**34,293**	**4.58**				**$894,395,733**

SUMMARY TABLE NOTES

* Total Crashes, CPMM and % of Fleet are per traditional NETS exclusions

** Estimated Costs are based on costs per crash ($26,081 USD) as estimated in NETS *Cost of Motor Crashes to Employers -2019 R*eport

Full summary table including types of vehicles, business models, and vehicles/drivers can be found on nets website with the Benchmark Report.

KEY DATA YEAR 2022 METRICS BY COMPANY

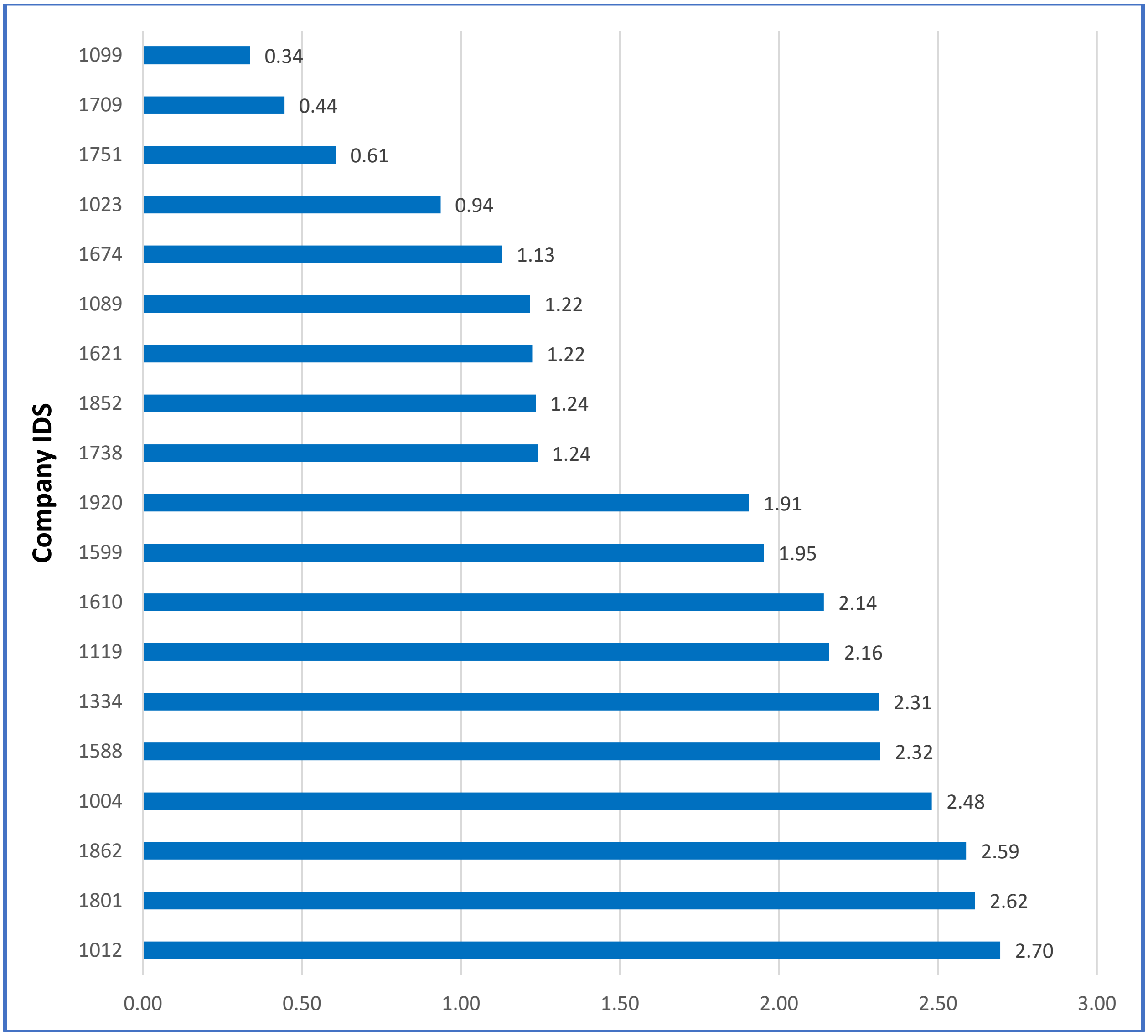
The graphs in this section include:

- Data year 2022 CPMMs, all companies
- Data year 2022 CPMMs, companies reporting data for North America only
- Data year 2022 CPMMs, companies reporting for North America and/or outside North America.

Note Regarding Exclusion of 2/3-Wheel Vehicle Metrics
The formulas for calculating CPMMs are shown on the graphs. As explained on page 6, all CPMMs in these graphs exclude 2/3-wheel vehicles.

Note Regarding CPMM Ranges in Graphs 1-3
The number of reporting members has reached a point where it is not possible to include all companies' CPMMs in a single, legible graph. We have therefore broken the data into three graphs. The CPMM ranges used in the graphs have no statistical relevance; they were simply convenient cut-off points for creating three graphs of fairly equal size.

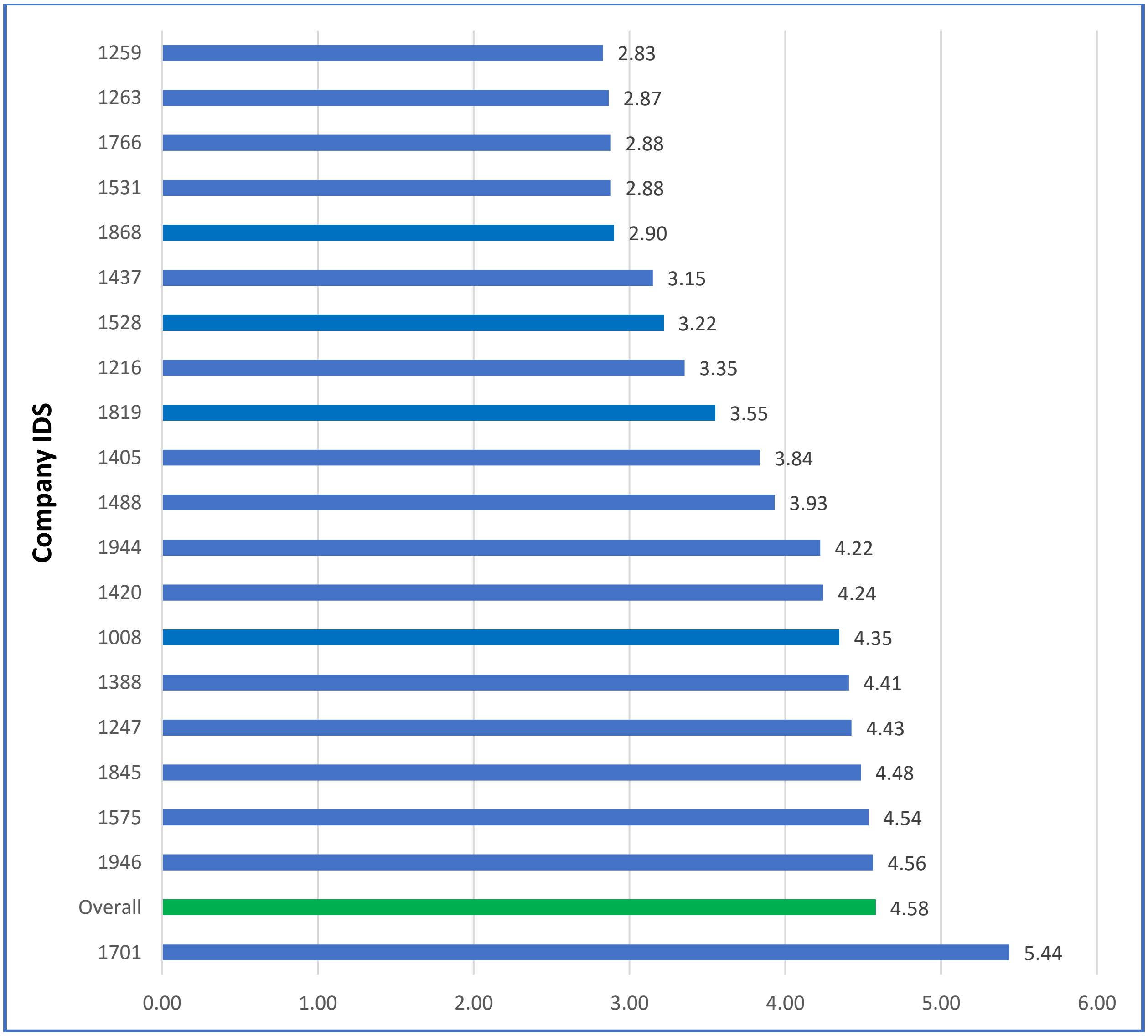
Graph 1: DY 2022 CPMMs, Companies with CPMMs 0.34 to 2.70.



CPMM = Total Collisions x 1,000,000 ÷ Total Mileage

Collisions per million miles (CPMMs) in this graph include all light, medium and heavy vehicles in all countries, but totals for 2/3-wheel vehicles were excluded (see page 6). The CPMM range in this graph is not statistically relevant (see page 13).

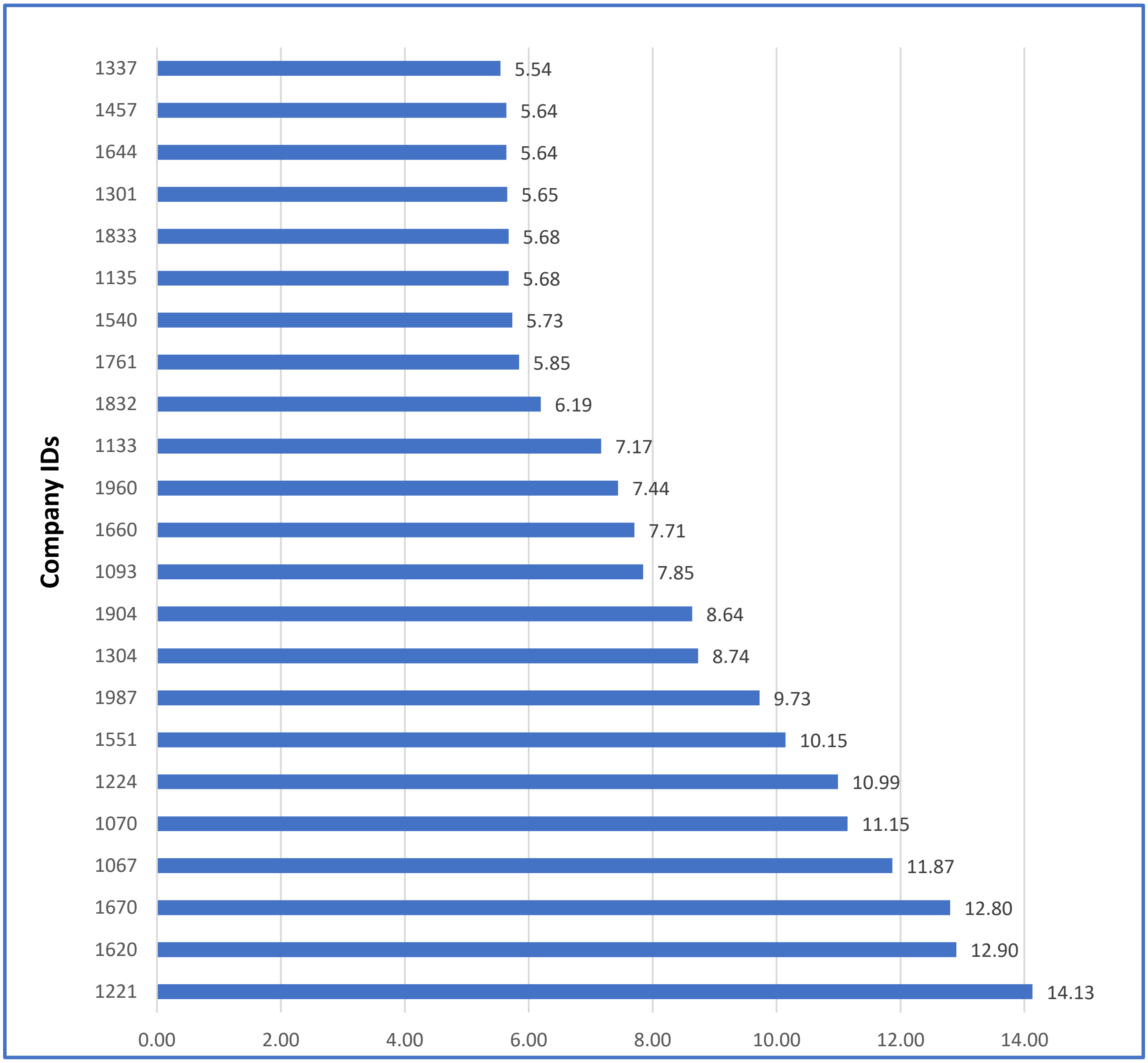
Graph 2: DY 2022 CPMMs, Companies with CPMMs 2.83 to 5.44



CPMM = Total Collisions x 1,000,000 ÷ Total Mileage

Collisions per million miles (CPMMs) in this graph include all light, medium and heavy vehicles in all countries, but totals for 2/3-wheel vehicles were excluded (see page 6). The CPMM range in this graph is not statistically relevant (see page 13).

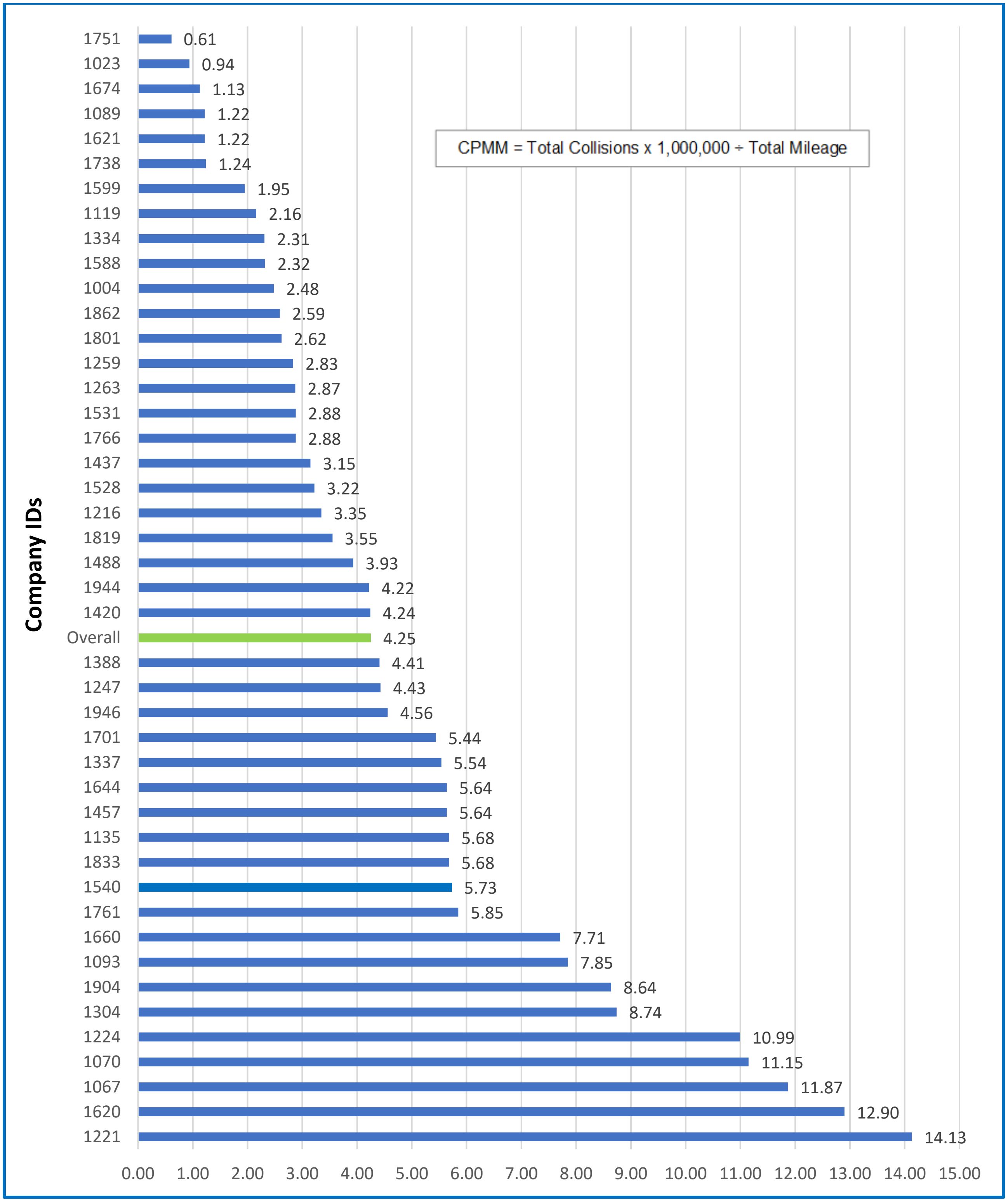
Graph 3: DY 2022 CPMMs, Companies with CPMMs 5.54 to 14.13



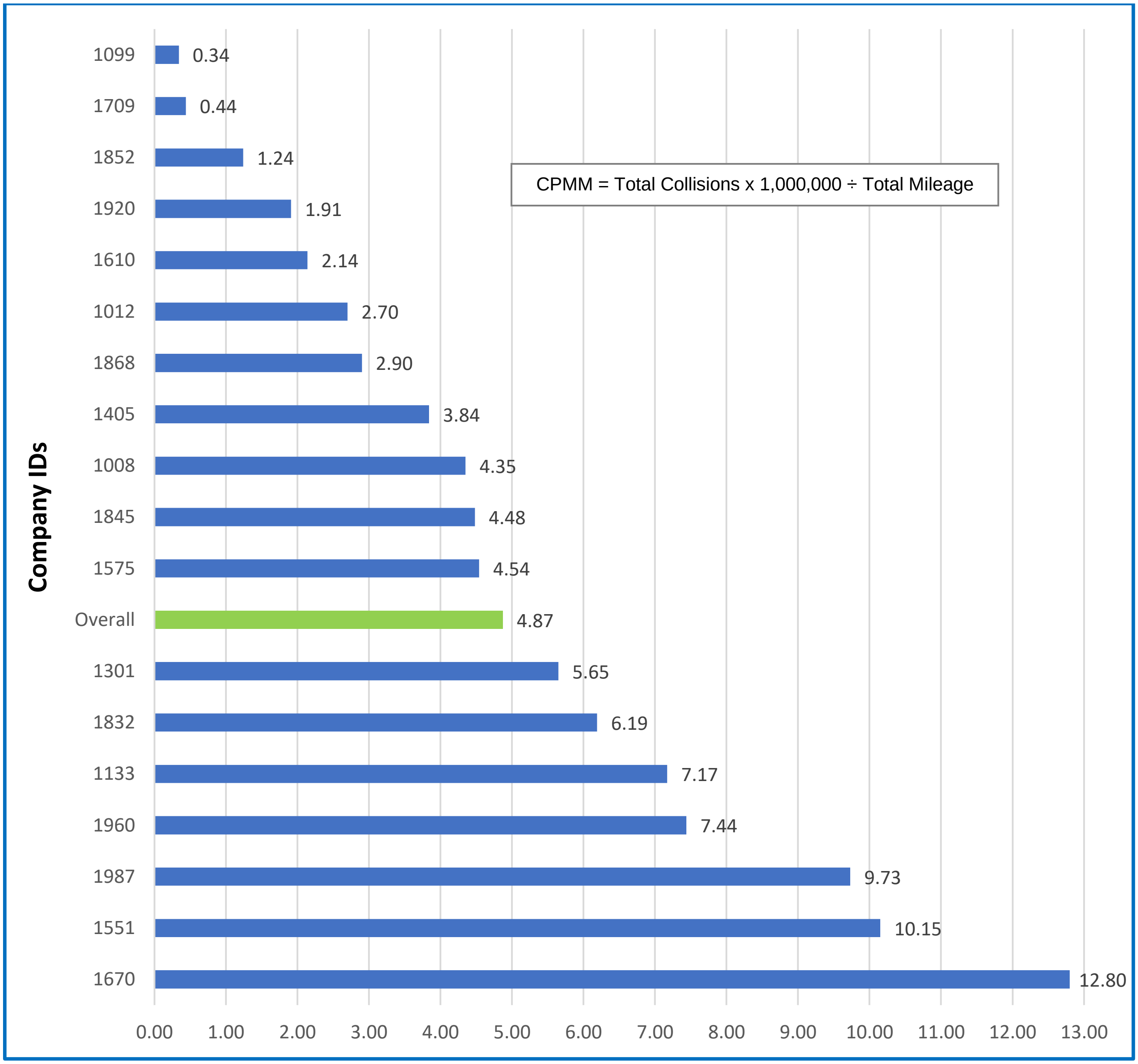
CPMM = Total Collisions x 1,000,000 ÷ Total Mileage

Collisions per million miles (CPMMs) in this graph include all light, medium and heavy vehicles in all countries, but totals for 2/3-wheel vehicles were excluded (see page 6). The CPMM range in this graph is not statistically relevant (see page 13).

Graph 4: 2022 CPMMs, 44 Companies Reporting for North America Only



Graph 5: 2022 CPMMs, 18 Companies Reporting for North America and Beyond*



The 18 companies* that reported metrics beyond North America are graphed above in order of their CPMMs for all light, medium and heavy vehicles that were reported; 2/3-wheel vehicles are excluded from these CPMMs (see page 6).

*Note that one company was unable to segregate any metrics by country but is included in this group for graphing purposes.

KEY 2022 METRICS BY COUNTRY

The tables on pages 20-21 list all countries that were reported individually by at least one company. Altogether, 130 countries/regions are represented on the table. They are listed in order from largest to smallest fleet. Vehicle totals are listed for each country. CPMMs are listed for all countries with 100 or more vehicles. CPMMs for the 17 largest country fleets (3000+ vehicles) are graphed on page 22.

Notes Regarding Country Metrics

1. Because 2/3-wheel vehicles predominate in a number of countries—such as India, Indonesia and Vietnam, to name a few—we have *not* excluded this class of vehicles from the metrics in this section.
2. In *Table 2*, you will note that NETS does not calculate or publish CPMMs for fleets under 100 vehicles; this is because CPMMs in these small fleets are substantially affected by small numbers of collisions.

Table 2: 2022 Fleet Size and CPMMs for 130 Reported Countries

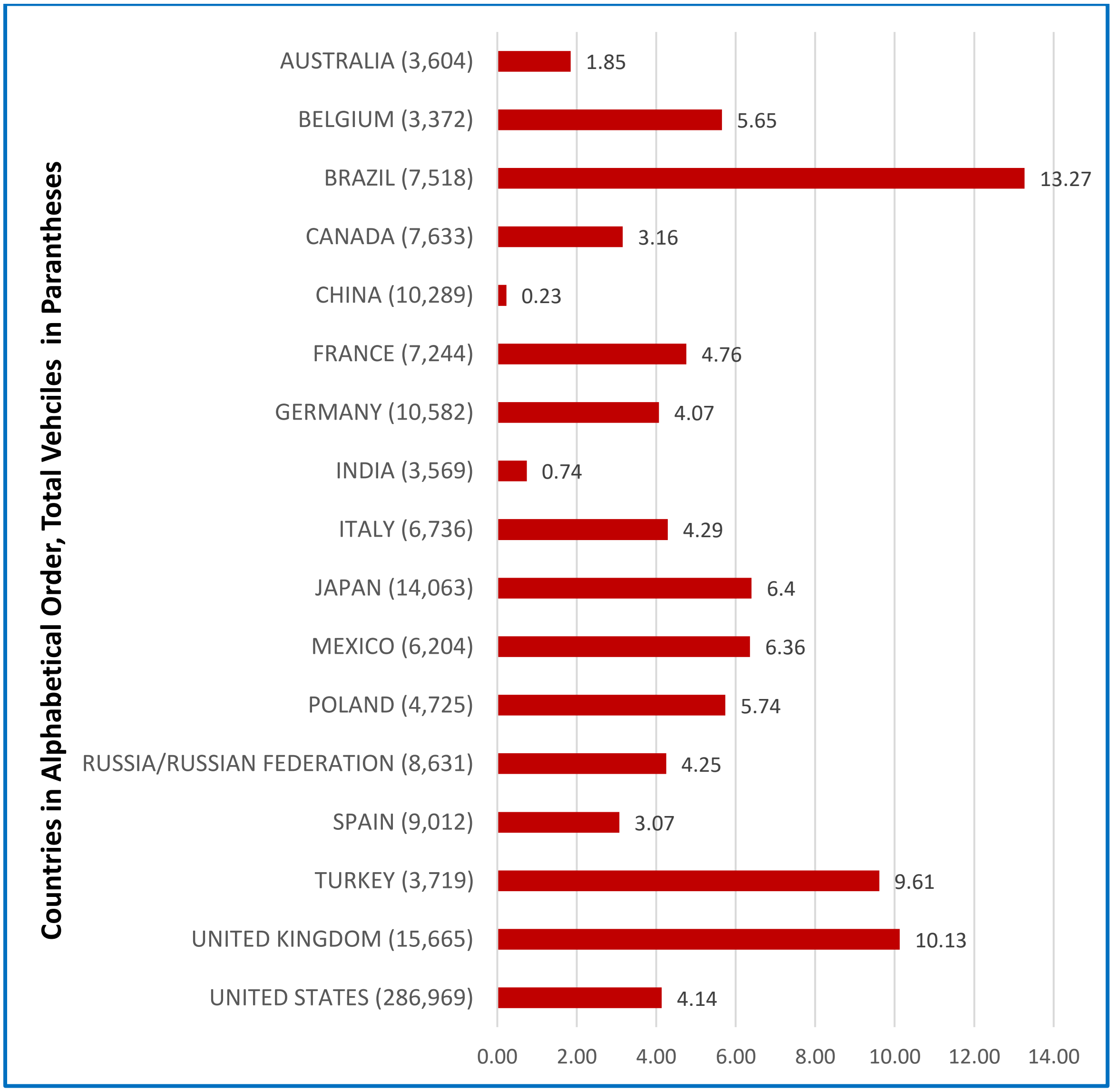
Note: 2/3-wheel vehicles are included in the totals and CPMMs in these country tables. The CPMMs for the 17 largest country fleets (3000+ vehicles) are grayed out in this table and are also graphed on page 22.

Country	Total Vehicles	CPMM	Country	Total Vehicles	CPMM
UNITED STATES	286,969	4.14	BURKINA FASO	1,592	0.65
UNITED KINGDOM	15,665	10.13	SWEDEN	1,495	7.43
JAPAN	14,063	6.40	KOREA	1,418	2.66
GERMANY	10,582	4.07	PORTUGAL	1,410	5.66
CHINA	10,289	0.23	BENELUX	1,363	5.64
SPAIN	9,012	3.07	HUNGARY	1,184	5.07
RUSSIA/RUSSIAN FEDERATION	8,631	4.25	MADAGASCAR	1,105	2.39
CANADA	7,633	3.16	AUSTRIA	1,091	4.42
BRAZIL	7,518	13.27	SWITZERLAND	1,030	8.13
FRANCE	7,244	4.76	SLOVAK REPUBLIC	959	5.49
ITALY	6,736	4.29	SOUTH AFRICA	955	3.00
MEXICO	6,204	6.36	ISRAEL	952	13.64
POLAND	4,725	5.74	SENEGAL	941	0.00
TURKEY	3,719	9.61	MALI	941	0.00
AUSTRALIA	3,604	1.85	ALGERIA	920	5.42
INDIA	3,569	0.74	SLOVENIA	909	1.56
BELGIUM	3,372	5.65	MALAYSIA	884	0.95
MOROCCO	2,769	8.78	CONGO, DEMOCRATIC REPLUBLIC of	859	0.00
UKRAINE	2,603	8.86	NEW ZEALAND	846	2.32
ARGENTINA	2,594	8.62	BULGARIA	827	9.33
TAIWAN	2,183	3.41	PAKISTAN	778	1.08
SAUDI ARABIA	2,151	0.82	UNITED ARAB EMIRATES	757	0.65
CAMBODIA	2,150	2.92	CHILE	685	3.31
VIETNAM	2,108	0.07	NORWAY	671	2.10
COLOMBIA	2,073	4.61	IRELAND	631	1.98
CZECH REPUBLIC	2,067	6.39	CHAD	630	0.00
ROMANIA	1,983	8.53	FINLAND	601	5.94
IVORY COAST	1,889	1.20	COSTA RICA	549	9.55
GREECE	1,805	8.74	ECUADOR	537	2.38
THAILAND	1,780	1.96	OMAN	447	0.21
INDONESIA	1,756	1.11	PUERTO RICO	479	6.86
EGYPT	1,713	1.03	DENMARK	412	5.69
NETHERLANDS	1,689	4.44	PERU	379	12.82
PHILIPPINES	1,627	5.59	KUWAIT	335	0.61

Table 2 Continued: 2022 Fleet Size and CPMMs for 130 Reported Countries

Country	Total Vehicles	CPMM	Country	Total Vehicles	CPMM
TUNISIA	332	9.24	BANGLADESH	34	-
GUATEMALA	329	9.21	HONDURAS	34	-
AZERBAIJAN	313	0.00	MACAU/MACAO	34	-
MACEDONIA	302	3.95	BAHRAIN	32	-
SINGAPORE	287	1.30	EL SALVADOR	32	-
JORDAN	282	0.00	KENYA	31	-
KAZAKHSTAN	260	2.37	BURMA	24	-
SERBIA/MONTENEGRO	258	2.13	SUDAN	24	-
PANAMA	253	8.43	CYPRUS	23	-
CROATIA	233	4.09	BOLIVIA	22	-
NIGERIA	233	1.69	NICARAGUA	21	-
LA REUNION	217	0.00	JAMAICA	21	-
ANGOLA	199	0.58	URUGUAY	21	-
CENTRAL AFRICAN REPUBLIC	186	0.00	GHANA	20	-
LIBYA	144	0.00	MOZAMBIQUE	19	-
VENEZUELA	142	0.88	RGN: CNTL AM, LAT AM, CARIB	18	-
GULF / LEVANT	131	0.36	BELARUS	11	-
QATAR	123	0.71	SURINAME	10	-
IRAQ	123	0.18	UGANDA	10	-
LITHUANIA	104	0.72	BRUNEI	9	-
GEORGIA	104	1.07	CAMEROON	8	-
LEBANON	102	0.00	CUBA	7	-
DOMINICAN REPUBLIC	93	-	TANZANIA	7	-
LATVIA	61	-	FIJI	6	-
TRINIDAD AND TOBAGO	61	-	MAURITANIA	6	-
ESTONIA	57	-	UZBEKISTAN	5	-
GABON	48	-	ALBANIA	4	-
HONG KONG	48	-	PARAGUAY	4	-
KYRGYZSTAN	48	-	BOSNIA AND HERZEGOVINA	2	-
TURKMENISTAN	48	-	EQUATORIAL GUINEA	2	-
LUXEMBOURG	46	-	PAPUA NEW GUINEA	1	-

Graph 6: 2022 CPMMs, 15 Largest Country Fleets
(3,000+ Vehicles)



CPMM = Total Collisions x 1,000,000 ÷ Total Mileage

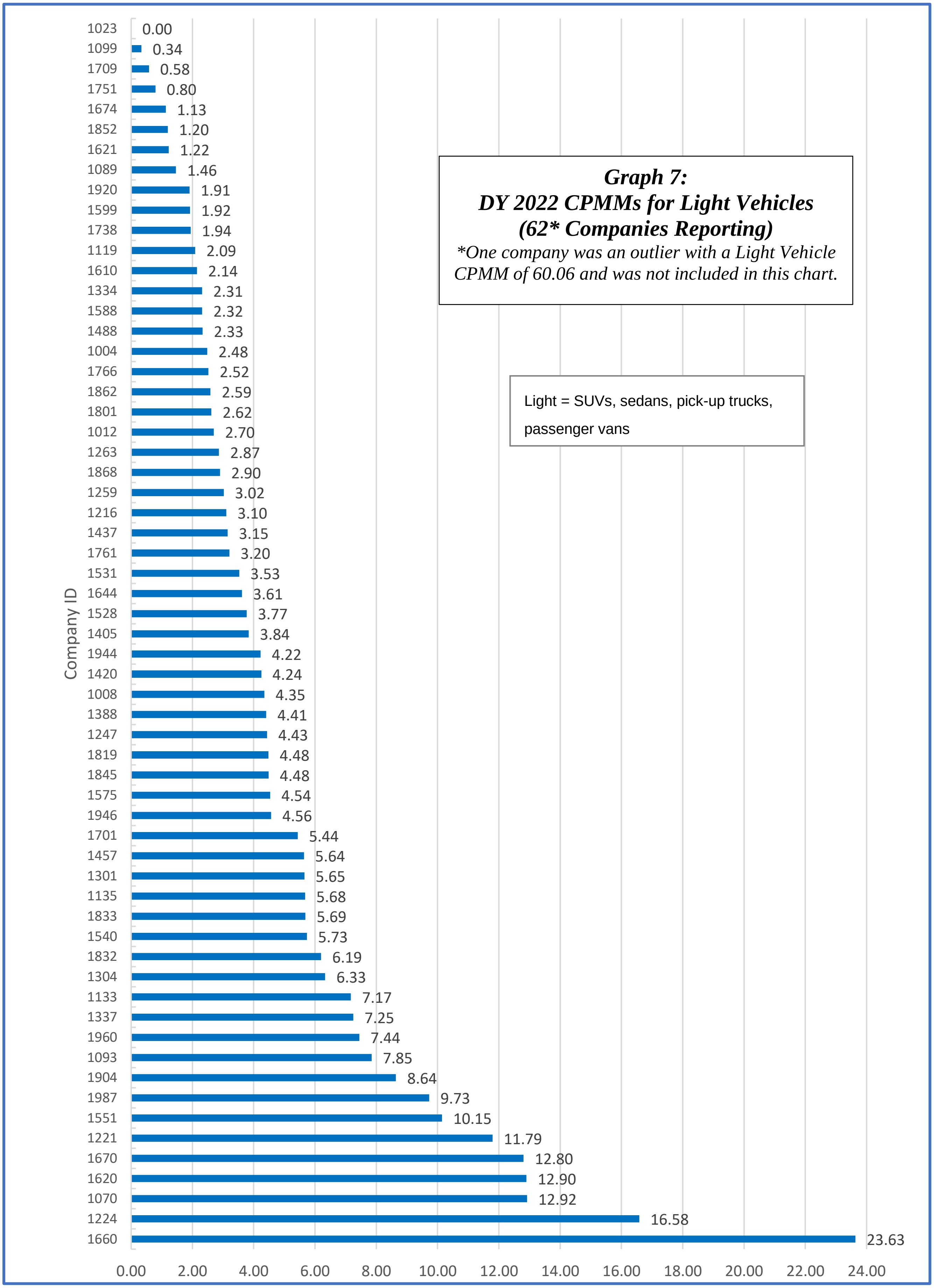
The countries with the 17 largest fleets (3,000 or more vehicles) are graphed in alphabetical order above. CPMMs are based on totals, by country, for all vehicles combined**:** 2/3-wheel vehicles are included in the CPMMs in this graph. See Notes 1 and 2 on page 19.

KEY 2022 METRICS BY VEHICLE CATEGORY

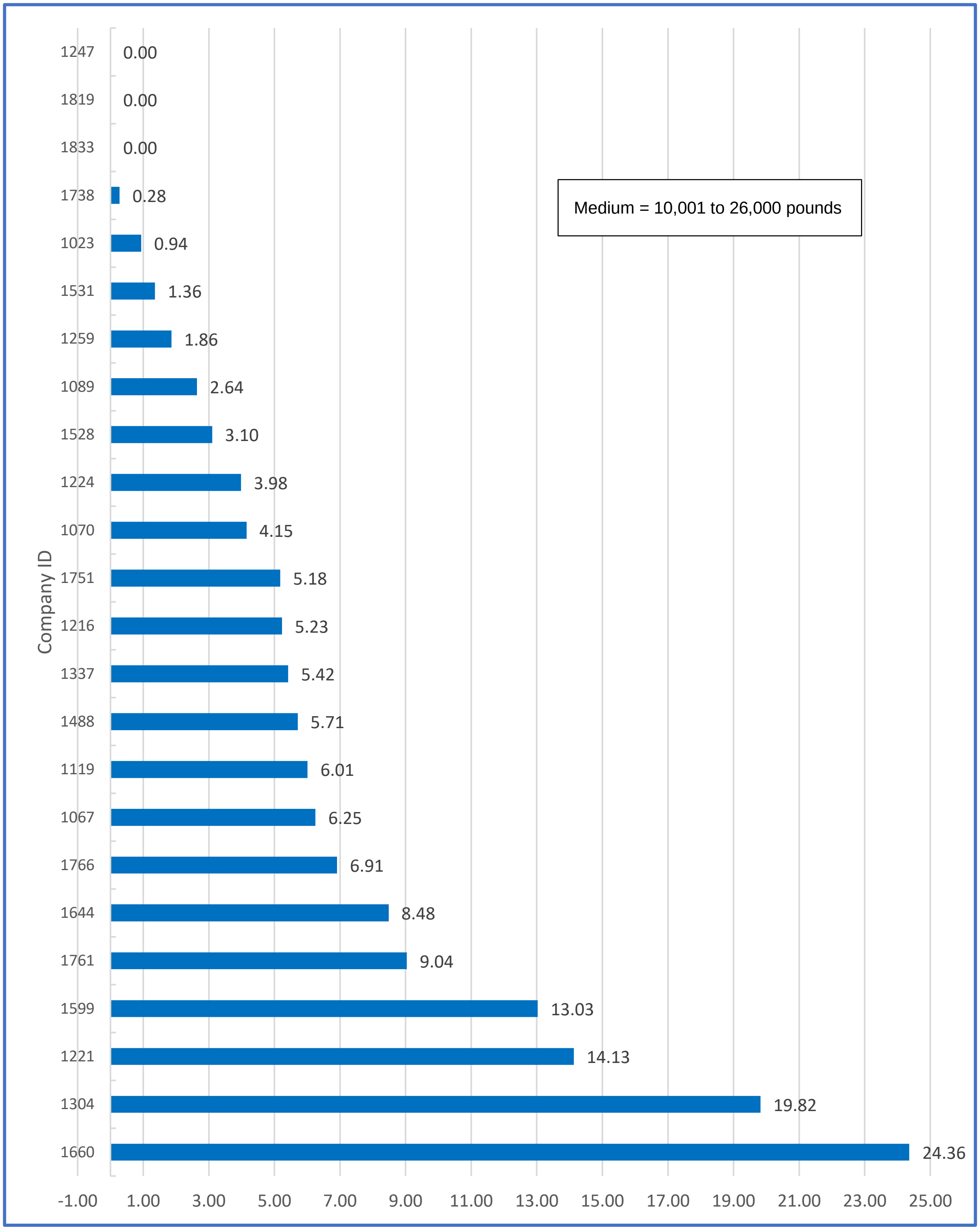
Benchmark participants are invited to submit data for five specific categories of vehicles as follows:

- Light: SUVs, sedans, pick-up trucks, passenger vans
- Medium: 10,001 to 26,000 pounds
- Heavy: 26,001 pounds or more
- 2/3-Wheel: motorized 2- and 3-wheel vehicles.
- Mixed Vehicles: used only when unable to break out the totals by vehicle type

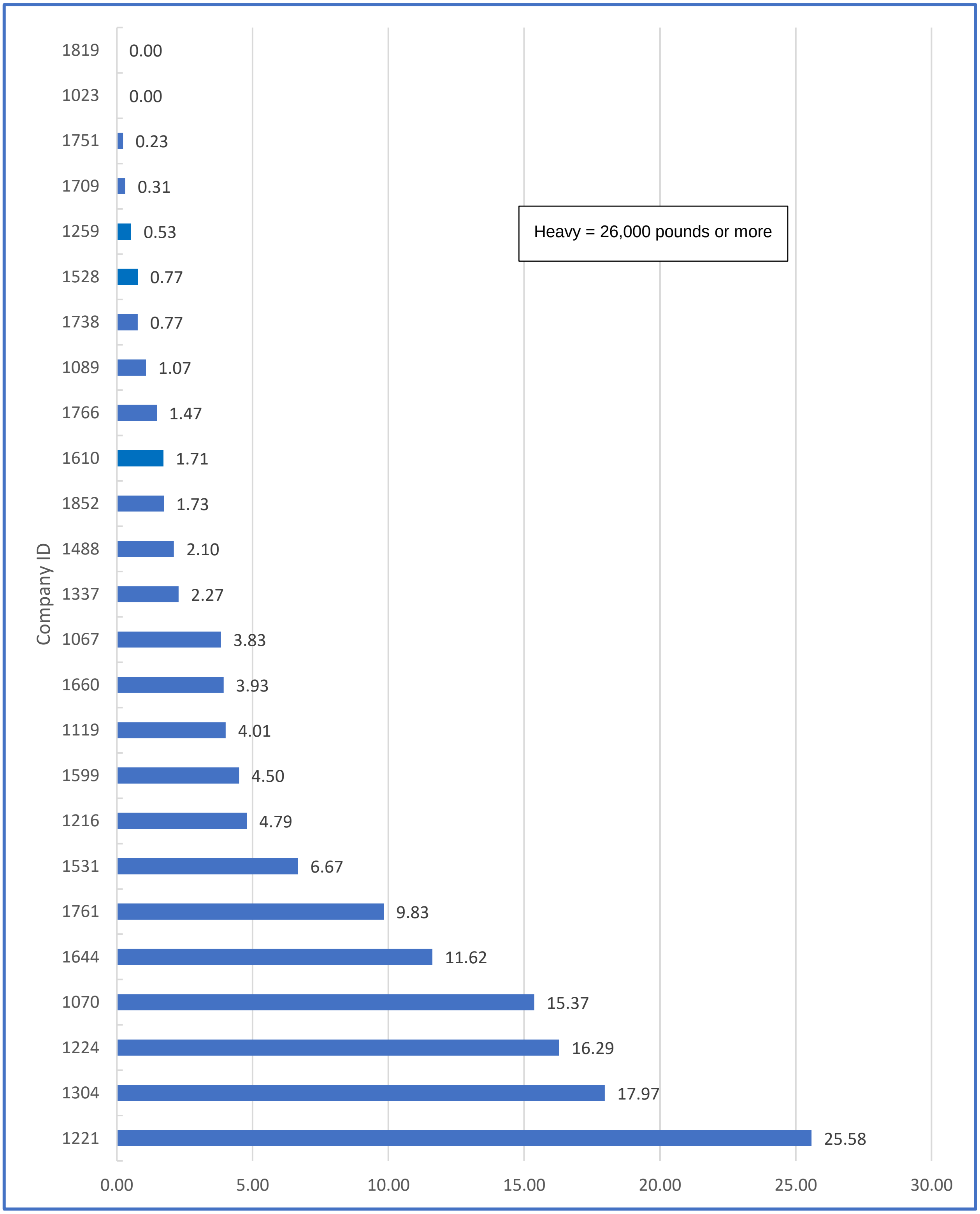
Graphs 7-10 show CPMMs for each of these vehicle categories except mixed vehicles.


Graph 7:
DY 2022 CPMMs for Light Vehicles
(62* Companies Reporting)
*One company was an outlier with a Light Vehicle CPMM of 60.06 and was not included in this chart.
Light = SUVs, sedans, pick-up trucks, passenger vans
Company ID
1023 0.00
1099 0.34
1709 0.58
1751 0.80
1674 1.13
1852 1.20
1621 1.22
1089 1.46
1920 1.91
1599 1.92
1738 1.94
1119 2.09
1610 2.14
1334 2.31
1588 2.32
1488 2.33
1004 2.48
1766 2.52
1862 2.59
1801 2.62
1012 2.70
1263 2.87
1868 2.90
1259 3.02
1216 3.10
1437 3.15
1761 3.20
1531 3.53
1644 3.61
1528 3.77
1405 3.84
1944 4.22
1420 4.24
1008 4.35
1388 4.41
1247 4.43
1819 4.48
1845 4.48
1575 4.54
1946 4.56
1701 5.44
1457 5.64
1301 5.65
1135 5.68
1833 5.69
1540 5.73
1832 6.19
1304 6.33
1133 7.17
1337 7.25
1960 7.44
1093 7.85
1904 8.64
1987 9.73
1551 10.15
1221 11.79
1670 12.80
1620 12.90
1070 12.92
1224 16.58
1660 23.63
0.00 2.00 4.00 6.00 8.00 10.00 12.00 14.00 16.00 18.00 20.00 22.00 24.00

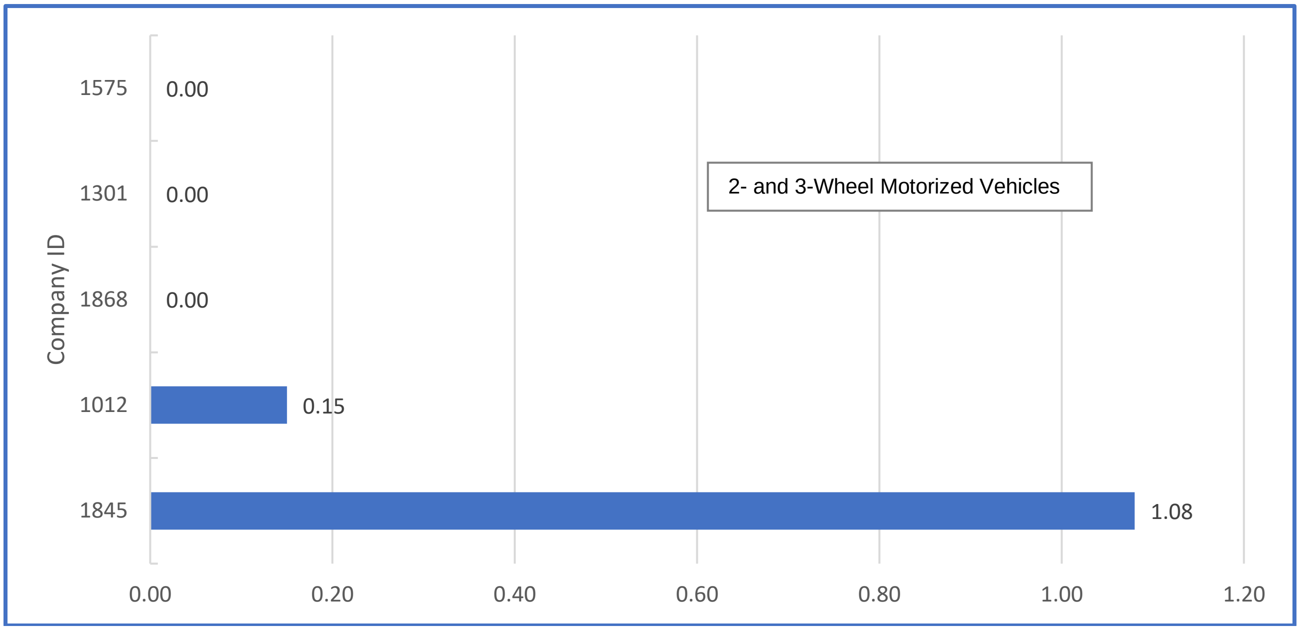
Graph 8: DY 2022 CPMMs for Medium Vehicles
(24 Companies Reporting)



Graph 9: DY 2022 CPMMs for Heavy Vehicles (25 Companies Reporting)



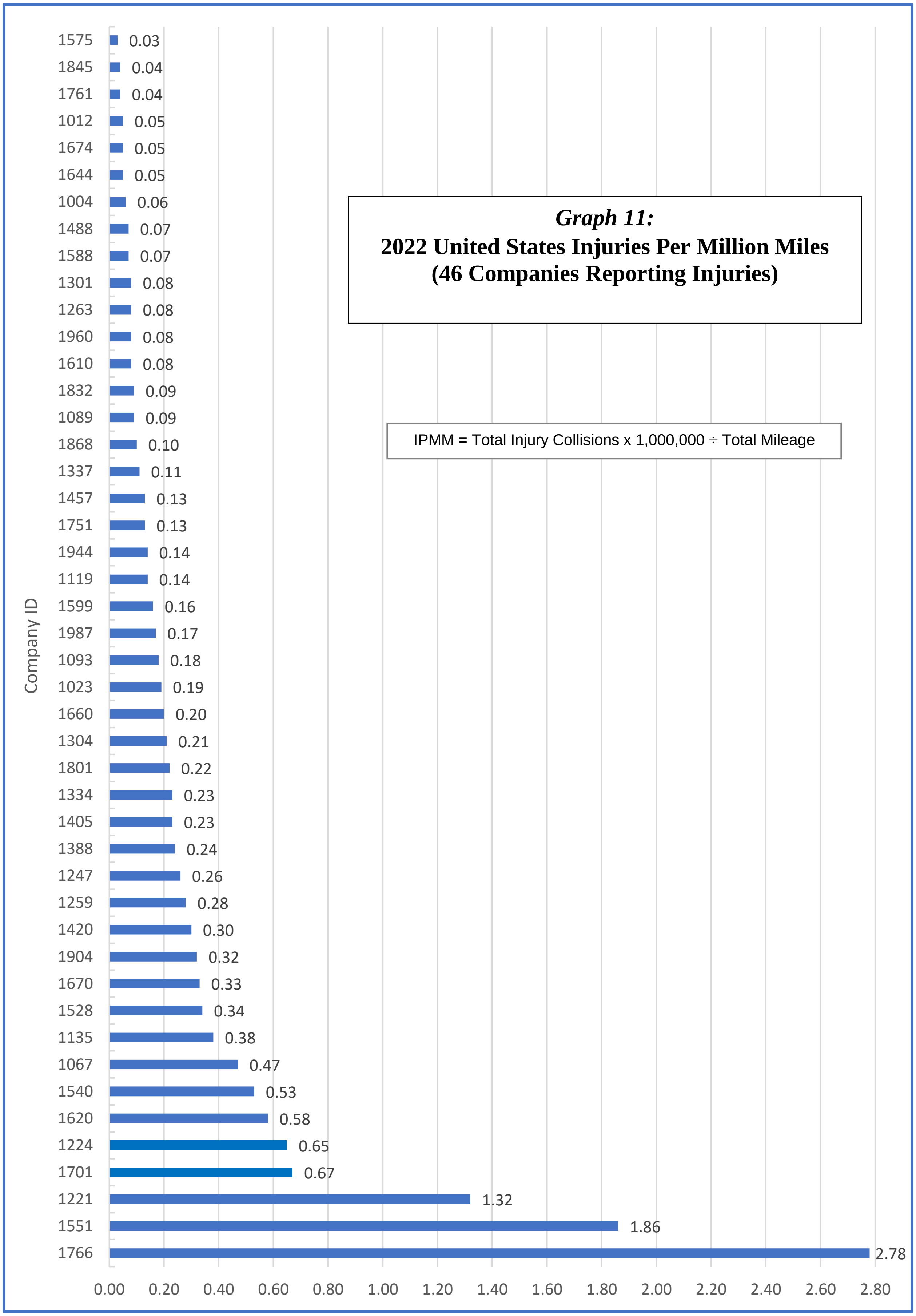
Graph 10: DY 2022 CPMMs for Motorized 2/3-Wheel Vehicles
(5 Companies Reporting)



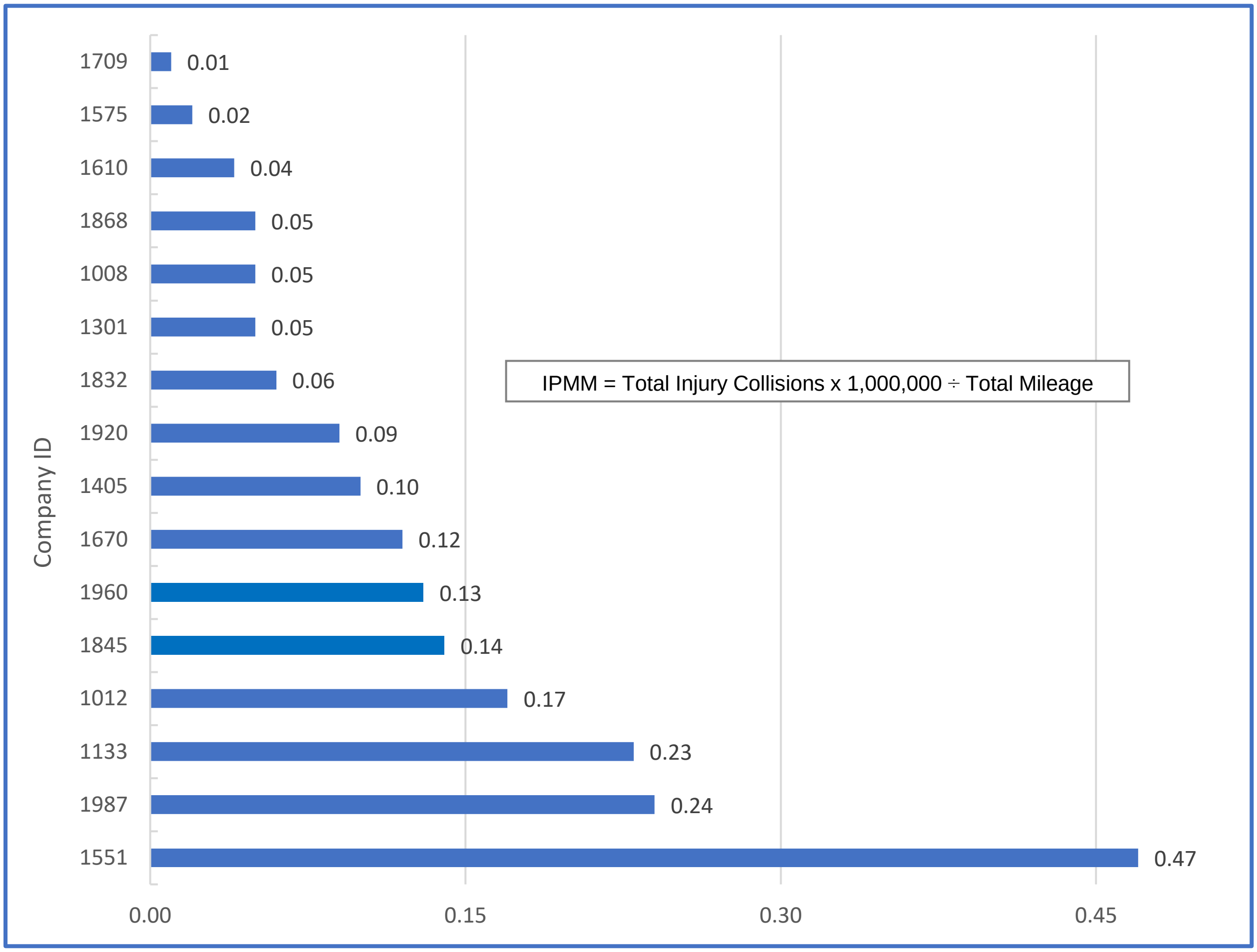
2022 INJURY DATA
UNITED STATES AND GLOBAL

Injury metrics were collected this year for the U.S. as well as globally.

- The U.S. injury metric includes only collision-related Occupational Safety and Health Administration (OSHA) recordable injuries. This metric is required to be reported for all U.S.-reporting companies.
- Injury data were also requested for total global crash-related injuries. This metric includes injuries where:
  - Medical treatment is rendered beyond first aid;
  - Restricted work activity is imposed or an employee is temporarily or permanently transferred to another job;
  - There is a lost work day or work days from work;
  - There is a loss of consciousness.
  - It is considered a Serious Injury or Illness Case (SIIC), i.e., an injury that has a major impact or effect on the health of the employee. This includes death, amputation, fracture (other than hairline fracture of any bone or non-displaced fracture of a digit), in-patient hospitalization (other than for observation), surgical intervention and continuous impairment.


Graph 11:
2022 United States Injuries Per Million Miles
(46 Companies Reporting Injuries)
IPMM = Total Injury Collisions x 1,000,000 ÷ Total Mileage
Company ID
1575 0.03
1845 0.04
1761 0.04
1012 0.05
1674 0.05
1644 0.05
1004 0.06
1488 0.07
1588 0.07
1301 0.08
1263 0.08
1960 0.08
1610 0.08
1832 0.09
1089 0.09
1868 0.10
1337 0.11
1457 0.13
1751 0.13
1944 0.14
1119 0.14
1599 0.16
1987 0.17
1093 0.18
1023 0.19
1660 0.20
1304 0.21
1801 0.22
1334 0.23
1405 0.23
1388 0.24
1247 0.26
1259 0.28
1420 0.30
1904 0.32
1670 0.33
1528 0.34
1135 0.38
1067 0.47
1540 0.53
1620 0.58
1224 0.65
1701 0.67
1221 1.32
1551 1.86
1766 2.78
0.00 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.20 2.40 2.60 2.80

Graph 12: 2021 Global Injuries Per Million Miles
(16 Companies Reporting Injuries)



ABOUT THE ANALYTICAL PROCESSES

In order to further develop the statistical process and add additional analytical review of the results, NETS benchmark analytical processes are led by Jonathon Vivoda, Ph.D., Associate Professor, Miami University, Oxford, Ohio; Kenneth P. Kolosh, Manager, Statistics, & Alan De La Cruz, Statistician Associate, National Safety Council (NSC).

The analytical processes examine relationships between practices in member companies, as indicated by their responses to our program survey, and metrics, as measured by collision rates (**CPMM**, collisions per million miles) and injury rates (U.S. **IPMM**, injuries per million miles) for light, medium and heavy vehicles. The analytical processes also examine the interrelationship of the practices themselves. Additional analyses were also conducted on percent of fleet involved in a crash (**%Fleet**), as well as whether past fleet safety program characteristics are associated with current fleet safety program performance.

This year, 62 members submitted both metrics and survey responses. Initial analyses of each of the three metrics revealed some statistically influential outliers; none for CPMM, and three each for %Fleet and IPMM. Because the focus of the bivariate and regression analyses is to provide information about how practices and polices affect the metrics across NETS member companies on average, the influential outliers were removed from further analyses to reduce the bias their inclusion would introduce.

The longitudinal data analysis reviewed the program data for 58 companies who had provided data for both 2019 and 2022 in order to assess the association of reported fleet safety program characteristics with CPMMs and IPMMs. One statistical outlier was removed from the analysis because CPMM and IPMM fell three standard deviations above the mean.

A full academic description of methodology, all statistical processes, and all results is provided in *Appendix 1* and *Appendix 2* which accompany this report. Participants should read the full report to put our findings in full context. What follows is a synopsis of significant findings as well as important caveats to be applied to the interpretation of those findings.

Caveats

In reading this summary material, please keep in mind:

- Causal connections cannot be made given the existing data: i.e., **the mean difference** in the tables does not indicate that any specific company achieved or would achieve a specific CPMM, %Fleet, or IPMM reduction by implementing any given practice.

- **We continue to refine** our survey questionnaire to better serve our analytics.

- As noted throughout *Appendices 1 and 2*, the practices we have singled out as having strong associations with lower CPMM, %Fleet, or IPMM are not likely to be effective in isolation. In addition, these results do not suggest that adopting a given practice in any given company resulted in a reduction in CPMM (or the other metrics) similar to the mean difference shown in the tables. Likewise, the results do not suggest that adopting a given practice in the future will result in a reduction similar to the mean difference. Causal connections cannot be made given the existing data and analyses.

If anything, our analytics seem to tell us that the practices we highlight for their potential to affect CPMM, IPMM, or %Fleet are most likely to be effective in the **context of a comprehensive road safety program** that builds culture through involvement at several levels and multiple approaches to safe driving.

READING THE TABLES

Benchmark Annual Data Analytics Tables

Table A.1 (page 46) shows the statistical results for the practices that were significantly associated with **CPMM**. *Table A.4* (page 51) shows the statistical results for the practices that were found to be significantly associated with **%Fleet**. *Table A.7* (page 56) shows the statistical results for the practices that were found to be significantly predictive of **IPMM**.

Benchmark Longitudinal Data Analytics Tables

Table B.1 (page 65) shows the statistical results of the analysis that was done to determine if past fleet safety program characteristics are associated with current fleet safety program performance. Specifically, the analysis assessed the association of reported fleet safety program characteristics in 2019 with CPMMs in 2022.

Summary Notes Regarding Data Analytics

1. All of the practices included in the tables were found to have a clear statistical association with CPMM (*TableA.1)*, %Fleet (*Table A.4),* IPMM (*Table A.7)*, and/or 2019/2022 Program Practices (*Table B.1*).

2. The strongest associations have the largest mean differences or largest *r*-value (negative or positive – the largest absolute value), coupled with a low *p*-value. The ***mean difference*** can be interpreted as the difference in average CPMMs (or %Fleet or IPMM, depending on the table) between NETS companies that do have a given practice in place, compared to NETS companies that do not.

3. A **positive** mean difference indicates that companies with a given practice in place had a **lower** CPMM, %Fleet, or IPMM on average, while a **negative** mean difference indicates an association with a **higher** CPMM, %Fleet, or IPMM on average.

4. ***p*-values** represent the probability of getting the observed results if no relationship between the variables actually exists. The lower the *p*-value, the lower this probability.

5. ***r*-values** indicates the strength and direction of the relationship between each numeric variable and CPMM, %Fleet, or IPMM. *R*-values can range from -1 to 1, and an *r*-value of 0 indicates no association. Please read *Appendix 1* and *Appendix 2* for a complete explanation.

PRACTICES ASSOCIATED WITH CPMM

Following is a simplified list of the individual practices that were associated with a **lower** mean CPMM among companies that do have these practices in place compared to those companies that do not:

- Fatigue-related program elements
  - Light vehicles: Nighttime driving restrictions
  - Heavy vehicles: refresher training for all drivers; restrictions on night driving; considering deploying fatigue system in 2022
- IVMS Usage:
  - Having an IVMS device that beeps or flashes
  - IVMS events recorded: speed; harsh braking; seatbelt usage
  - IVMS parameters: decelerations
  - IVMS metrics distribution to all drivers
  - IVMS activities to encourage coaching: ongoing mentorship
  - IVMS type: plug-in; app-based
  - Having a greater number of IVMS device features
  - Distributing IVMS metrics to more people
  - Supervisors reviewing IVMS metrics with each driver
- Road Safety Scorecards:
  - Scorecard data points: severity; driver coaching events
  - Tracked in organization: severity; (potential) serious injuries and fatalities
- Global Light Vehicle Purchase Requirements: auto emergency braking; IVMS
- COVID effects: Reduction in number of employee drivers
- Capability to report crashes by severity
- High-risk response: IVMS placed in drivers' vehicles
- Commentary drives conducted for all per standard requirements
- Collision review process: determination of severity; report issue to senior management
- Consequence of crash while violating phone policy: termination
- Having road safety practices in place with supply chain contractors or third party operators

Some practices this year resulted in CPMMs that were **higher** for a company with a given practice, compared to companies without that practice. Some results are counter-intuitive and possible reasons for the results are noted.

These included:

- IVMS features: non-safety features such as route planning [Noted that all companies reporting this feature also identified safety features in their IVMS units as well so there may be something unique about the companies that use IVSM in this way.]
- Frequency of motor vehicle records: continuously [Likely represents companies' responses to previously observing higher crash rates.]

- COVID effects: increase in number of employee drivers; loss of road safety resources; increase in speeding violations

PRACTICES ASSOCIATED WITH %FLEET

Following is a simplified list of the individual practices that were associated with a **lower** mean %Fleet among companies that do have these practices in place compared to those companies that do not:

- High risk drivers: source is IVMS
- Collision review process: follow up to corrective actions
- Fatigue-related program elements:
    - Light Vehicle Fleet:
        - Restrictions on night driving
    - Medium Vehicle Fleet:
        - Required fatigue training for new drivers
        - Restrictions on night driving
        - Having more fatigue practices in place
    - Heavy Vehicle Fleet:
        - Having more fatigue practices in place
        - Required fatigue training for new hires
        - Restrictions on night driving
- IVMS: metrics distributed to all drivers; having a greater number of IVMS device features; distributing IVMS metrics to more people; used to identify high risk drivers; used to mitigate speeding behaviors; reviewed IVMS metrics after all crashes
- Require IVMS on global light vehicle fleet purchases
- COVID effects: reduction in number of employee drivers; changes in driver training
- Corporate executive: higher road safety rating
- "Other" approach to address speeding
- Mobile phone policies: banned all phone/device use

Several practices this year were associated with **higher** %Fleet for a company with a given practice, compared to companies without that practice. Some results are counter-intuitive and possible reasons for the results are noted.

- Collision reviews as response to high-risk driver classification [Collision review may occur too late to prevent a crash.]
- Including the dangers of speeding in driver training [Other responses to high-risk driving may be more effective.]
- Scorecard: including %fleet and cost of collisions [Tracking and reporting these factors may be a response to observing higher %fleet and therefore result in higher costs.]

- Checking motor vehicle records two times per year [Checking records with a different frequency may be more effective.]

PRACTICES ASSOCIATED WITH IPMM

Following is a simplified list of the individual practices that were associated with a **lower** mean IPMM among companies that do have these practices in place compared to those companies that do not:

- Strategy for alternative mobility
- Significant revision to program: crash reviews
- Commentary drives conducted for all per standard requirement
- Fatigue-related program elements:
  - Heavy Vehicle Fleet: periodic refresher training for all drivers
- Consequence of violating phone policy: termination
- Requirements for global light vehicle purchases: backup camera/sensor; lane departure warning; forward collision warning; automatic emergency braking; IVMS
- Identifying "other" factors related to speed mitigation
- Stronger mobile phone policies: formal written company-wide policy; formal written policy at the discretion of countries/units
- IVMS settings: defined harsh accelerations differently than the choices provided (medium and heavy-duty fleets)
- IVMS settings: defined harsh decelerations differently than the choices provided (medium and heavy-duty fleets)

Some practices this year were associated with **higher** IPMM for a company with a given practice, compared to companies without that practice. Some results are counter-intuitive and possible reasons for the results are noted.

- Fatigue-related program elements: optional fatigue training (light vehicle fleet) [Stronger fatigue program elements may be needed to affect injury rates.]
- Consequence of crash while violating phone policy: no action

2019 PRACTICES ASSOCIATED WITH 2022 CPMM

Following is a simplified list of the individual 2019 practices that were associated with either lower or higher 2022 CPMMs compared to other companies that did not have these practices in place as of 2019. This analysis is important for two reasons. First, it helps to identify potentially beneficial practices that may provide long-term benefit but may not immediately result in lower CPMMs. Second, it helps to confirm lower CPMMs persist over time. This analysis included a total of 52 companies that participated in multiple Strength IN Numbers® Benchmark programs and provided both 2019 and 2022 data. There were no statistical outliers.

Having the following practices in place in 2019 were associated with <u>lower</u> CPMMs in 2022:

- Collision review process: determination of severity per specific criteria involving extent of damage, costs, injuries
- Fatigue management program (light vehicle fleet):
    - Required training for new hires; periodic refresher training for all drivers; restrictions on night driving
- Scorecard: data points included collisions per million miles or similar, severity, and near-misses
- Scorecard published to senior management
- Safety features required on all light-vehicle purchases of leases of US fleet: electronic stability control
- Motor vehicle records checked annually

Having the following practices in place in 2019 were associated with <u>higher</u> CPMMs in 2022. Several results are counter intuitive. When interpreting these results, it is important to keep in mind that causality or the direction of causality should not be assumed. For example, companies with high CPMM rates may have been prompted to adopt these practices in response to their higher rates, rather than the implementation of the practices resulting in higher CPMM rates.

- In the process of developing a comprehensive fleet safety program
- High-risk driver classification: driver and collision related metrics used in statistically validated predictive models
- Commentary drives conducted as part of the follow up when collisions occur
- Violation of phone policy: training assigned
- Motor vehicle records checked continuously

2019 PRACTICES ASSOCIATED WITH 2022 IPMM

Following is a simplified list of the individual 2019 practices that were associated with either lower or higher 2022 IPMMs compared to other companies that did not have these practices in place as of 2019.

As with other analyses, these results do not suggest that adopting a given practice in any given company resulted in a reduction in IPMM similar to the mean difference shown in Table B.3. Likewise, the results do not suggest that adopting a given practice in the future will result in a reduction similar to the mean difference. Causal connections cannot be made given the existing data and analyses.

Having the following practices in place in 2019 were associated with lower IPMMs in 2022:

- Scorecard: included CPMM or similar

Having the following practices in place in 2019 were associated with higher IPMMs in 2022.

- Conducted commentary drives for new hires
- IVMS data management: managers reviewed IVMS metrics with all drivers who reported to them, as a group
- Scorecard: included collisions per 100 vehicles or similar

2019 PRACTICES ASSOCIATED WITH 2022 %FLEET

Following is a simplified list of the individual 2019 practices that were associated with either lower or higher 2022 %Fleet compared to other companies that did not have these practices in place as of 2019.

Having the following practices in place in 2019 were associated with lower %Fleet in 2022:

- High-risk drivers: using IVMS to classify high-risk drivers
- Fatigue management:
  - Light vehicle fleet: required fatigue training for new hires
  - Heavy vehicle fleet: restrictions on night driving
- Scorecard:
  - Including severity of crashes; collisions per million miles or similar; and near-misses

  - Published scorecard to senior management; field management or other middle management; drivers

Having the following practices in place in 2019 were associated with <u>higher</u> %Fleet in 2022.

- Driver training: drivers who are deemed high-risk or at risk; family members of employees
- High-risk driver classification response: remote driver training (online, CD, DVD); driver-paid portion of collision costs or other monetary penalty; disciplinary action possibly including termination or suspension
- Fatigue management (medium vehicle fleet): company standards established for driving and rest hours
- IVMS: past the pilot stage but IVMS devices used in less than 80% of fleet
- Scorecard: included percentage of fleet involved in collisions; cost of collisions
- Action when driver involved in a collision in violation of phone policy: assign training; classify high-risk driver
- Safety features required on all light-vehicle purchases of leases of US fleet: blind spot sensor/side camera; emergency braking assistance
- Motor vehicle record checks two times per year

2019 PRACTICES AND POLICIES RELATED TO 2022 CPMMS, IPMMS, AND %FLEET (LOWER AND HIGHER)

- Road safety scorecard
  - Publishing the scorecard to senior management associated with lower CPMM and %Fleet in 2022.
  - Providing scorecard to drivers associated with lower %Fleet in 2022.
  - Including near-misses and severity associated with lower CPMM and %Fleet in 2022.
  - Included collisions per million miles or similar associated with lower CPMM, IPMM and %Fleet in 2022.
- Fatigue Management
  - Required fatigue training for new hires associated with lower CPMM and %Fleet in 2022.
  - Night-time driving restrictions associated with lower CPMM and %Fleet in 2022.
- Collision Response:
  - Using driver-and-collision-related metrics used in statistically validated predictive models in 2019 was associated with higher mean CPMM in 2022.
  - Conducting commentary drives following a collision in 2019 was associated with higher mean CPMM in 2022.
  - Assigning training to drivers in response to a collision involving an infraction of the cell phone policy in 2019 was associated with higher mean CPMM in 2022.
- High Risk Drivers:
  - Providing training to drivers deemed as high risk and, in particular, remote training (online, CD, DVD) in 2019 is associated with higher mean %Fleet in 2022.
  - Disciplining high risk drivers or imposing monetary penalties on high-risk drivers in 2019 was associated with higher mean %Fleet in 2022.
  - Classifying drivers following a collision involving a violation of the cell phone policy was associated with higher mean %Fleet in 2022.

OVERALL STATISTICAL ANALYSIS CONCLUSIONS

The analyses of the 2022 NETS data identified several important practices/policies that were related to either lower CPMM, lower %Fleet, or lower IPMM, and were also related to specific program practices in 2019 in NETS member companies. **Please read *Appendix 1* and *Appendix 2* for a full understanding of these conclusions.**

While some differences exist, many of the same practices predicted CPMM, %Fleet, and IPMM. Overall, road safety advocates in member companies should pay particular attention to the practices that were predictive of all three metrics, as well as those practices that represent changes that can easily be made. One final issue to note is that the variable created to represent the total *number* of practices in which a company engages, regardless of the specific practices, was also significantly related to CPMM. This finding may reflect a strong road safety culture within companies that should be fostered to the extent possible.

APPENDIX 1: DATA ANALYTICS

Prepared by Jonathon M. Vivoda, PhD, MPH
Associate Professor
Miami University, Oxford, Ohio

STUDY CHARACTERISTICS

Sixty-two (62) companies provided data to NETS during the 2022 data year. The data included responses to survey questions and information used to calculate collisions per million miles traveled (CPMM), percent of fleet involved in a crash (%Fleet), and injuries per million miles traveled (IPMM) for each company. Those three metrics were the primary variables of interest in these analyses.

Most companies also provided data to allow CPMM to be parsed by three different types of vehicles: light, medium, and heavy, for use with questionnaire items related to specific vehicle sizes (e.g., fatigue questions). Miles and collisions for two/three-wheeled vehicles were excluded from the analyses, because many of the questionnaire items were not relevant to those vehicles, and because data were limited for those vehicle types. The IPMM metric reported in this appendix refers only to data from the United States (US) due to reporting differences across countries, and lack of data from other locales. A total of 60 companies provided data about IPMM in the US.

METHODOLOGY

The data management and statistical approach involved univariate, bivariate, and multiple regression techniques to assess each variable individually, as well as the relationships between each of the predictors and the outcomes of interest: CPMM, %Fleet, and IPMM. In addition to the individual items included in the NETS questionnaire, several variables were also created to maximize the value of the NETS benchmarking program. For example, some questionnaire items asked companies to select all practices that applied in a given situation. Q10 is related to how fatigue was being addressed in companies' light vehicle fleets. A new variable was created to represent the sum of fatigue-related practices among light vehicles (Q10/sum), which allowed for the relationship between collision/injury rates and the total number of related elements to be analyzed, in addition to each individual practice. Those analyses assessed the extent to which the comprehensiveness of a given program area affected rates.

Questions that indicated degrees of response about a given practice were combined to allow for more precise comparisons. For example, Q17.1 asked about companies' mobile phone policies, with each response representing an increasing degree of restriction (banning/restricting texting/typing only, banning hand-held phones only, and banning all mobile phone use while driving). These responses were assessed as a single variable, so that each category could be individually compared to every other category, a more effective approach than comparing each practice to the combination of all the others.

Finally, two variables intended to represent each company's overall fleet safety program were created, and their association with CPMM, %Fleet, and IPMM were assessed. To create these variables, all company practices were summed across all topics assessed in the NETS questionnaire. One variable was a simple sum of items, while the other accounted for differences in the number of questionnaire items used to assess different topics. For that variable, each topic was equally weighted before the overall sum was calculated.

All statistical tests between practices/policies and CPMM utilized the overall CPMM variable, except for the fatigue questions, which were specifically related to each company's light, medium, or heavy vehicle fleets. Those items were assessed using the CPMM metrics specific to each vehicle size. Vehicle size-specific metrics were only available for CPMM, so overall %Fleet and IPMM were used to assess their association with all questionnaire responses.

Univariate Analysis Procedures

Once data management was complete, univariate descriptive statistics (means, medians, standard deviations, and frequencies, as appropriate) were calculated for the primary variables of interest. Histograms and boxplots were also generated to examine the distributions of key variables.

Bivariate Analysis Procedures

Bivariate statistical tests were used to assess the relationships of each predictor (questionnaire item response) with CPMM, %Fleet, and IPMM. As noted earlier, each predictor represented a given practice, policy, or was the sum/composite of those elements. Bivariate tests assessed whether any observed differences between groups (or correlations) were statistically significant.

For all tests, a level of $p<0.05$ was used to assess statistical significance (this is described in more detail later). The appropriate statistical test was conducted, depending upon the nature of the variables being analyzed. For example, many of the predictors were binary in nature (Yes/No), so independent samples t-tests were conducted between those and each numeric outcome. Other predictors had more than two response categories, which required use of a one-way analysis of variance (ANOVA), including the Tukey method to compare differences between the categories. Finally, several variables were numeric (variables representing a sum of related practices, for example), for which Pearson product-moment correlations were used.

RESULTS

The data from all 62 companies were analyzed, beginning with an assessment of the three metrics of interest. The composite CPMM for all vehicles in 2022 was 4.58, with a mean across companies of 4.85 (SD = 3.38), a median of 4.23, and a range from 0.34 to 14.13. The mean for %Fleet in 2022 was 7.83 (SD = 8.92), with a median of 5.74 and a range from 0.46 to 54.51 The IPMM mean in 2022 was 0.24 (SD = 0.46), with a median of 0.10 and a range from 0.00 to 2.78.

Initial analyses of each of the metrics revealed some statistically influential outliers. No influential outliers were observed for CPMM, but three each were removed for %Fleet and IPMM. Because the focus of the bivariate and regression analyses is to provide information about how practices and polices affect the metrics across NETS member companies on average, the influential outliers were removed from further analyses to reduce the bias their inclusion would introduce. After removal, the mean for %Fleet (n=59) was 6.09 (SD = 3.91), with a median of 5.42, and a range from 0.46 to 17.32. The adjusted IPMM (n=57) mean was 0.15 (SD = 0.17), with a median of 0.09, and a range from 0.00 to 0.67.

The relationships between the key metrics in this study – CPMM, %Fleet, and IPMM – were assessed next, as a check of the integrity of the variables. Although each of these assess something different, they all measure fleet safety in some way, and are therefore conceptually related. Prior to removal of the outliers, CPMM was significantly related to %Fleet ($r(60)=0.54$, $p<0.001$) and IPMM ($r(58)=0.32$, $p<0.05$). The relationship between %Fleet and IPMM was also statistically significant ($r(58)=0.37$, $p<0.01$). After the influential outliers were removed, all metrics remained significantly related to each other as follows: CPMM with %Fleet ($r(57)=0.61$, $p<0.001$) and IPMM ($r(55)=0.49$, $p<0.001$); IPMM with %Fleet ($r(53)=0.35$, $p<0.01$).

The overall means for all three metrics (CPMM, %Fleet, IPMM) were compared between data years 2021 and 2022 to assess whether change had occurred. Because different NETS member companies provided data in those years, only companies that provided data for both years were used in the comparisons. Each metric was compared two ways: the rates with all companies included, and the rates with outliers removed. Paired samples t-tests revealed no statistically significant differences in overall CPMM, %Fleet, or IPMM rates between 2021 and 2022 data years using either approach.

Results showing which practices and polices had a statistically significant relationship to CPMM, %Fleet, and IPMM are identified in the remaining sections of the Results. Separate subsections are provided for each metric. Aside from the results presented in the tables and figures that follow, a few counter-intuitive results were also observed. Those without an obvious explanation are not included in the tables/figures (described in text only) because the focus of this appendix is on identifying what a company can do or avoid doing to improve each metric.

Bivariate Findings: CPMM

Table A.1 and Figure A.1 show the statistical results for the practices that were found to be significantly related to CPMM. Included in Table A.1 are the survey question and response numbers, a brief description of what practice or policy the question assessed, the difference between the means for binary variables (see #2-4 below), the correlation (*r*-value) for numeric variables (see #5 below), and the significance level for each test (see #1 below). Related practices are grouped together in the table with a very brief description of their topic. Figure A.1 shows the same mean differences as listed in Table A.1, but presented in a graphical format with the values of the differences sorted from largest to smallest. The key below the figure provides a brief description of the questions associated with each number listed in the figure.

1. All the practices included in the tables were found to have a clear statistical association with CPMM.
2. The strongest associations have the largest *mean differences* or largest *r*-value (negative or positive – the largest absolute value), coupled with a low *p*-value.
3. The ***mean difference*** can be interpreted as the *average* difference in CPMMs between NETS companies that have the given practice in place, compared to NETS companies that do not (see NOTE below).
    a. A **positive** mean difference means that companies responding “yes” to a given question had a **lower** CPMM on average, while a **negative** difference means that companies responding “yes” to a given question had a **higher** CPMM on average.
        i. For example, the mean difference for Q8.1/3 (determining severity as part of the collision review process) was 2.13, a positive value. This positive value means that CPMM was more than two points *lower* for companies that determined severity as part of their collision review process, compared to those that did not. In contrast, the value for Q14.2/7 (identifying a non-safety function for IVMS use) was -4.80. That value means that CPMM was 4.80 points *higher* on average for companies that used IVMS for such a non-safety function, compared to others.
4. ***p*-values** represent the probability of getting the observed results, if no relationship between the variables actually existed. The lower the *p*-value, the lower the probability.
5. The ***r*-value** indicates the strength and direction of the correlation between numeric variables with CPMM. *R*-values can range from -1 to 1, and an *r*-value of 0 indicates no association. For example, Q14.4/sum represents the number of different types of people (e.g., drivers, safety staff) to whom IVMS metrics were distributed. The *r*-value of -0.27 suggests that as the number of different types of people increased, CPMM rates decreased, and this relationship was significant at the $p<0.05$ level.

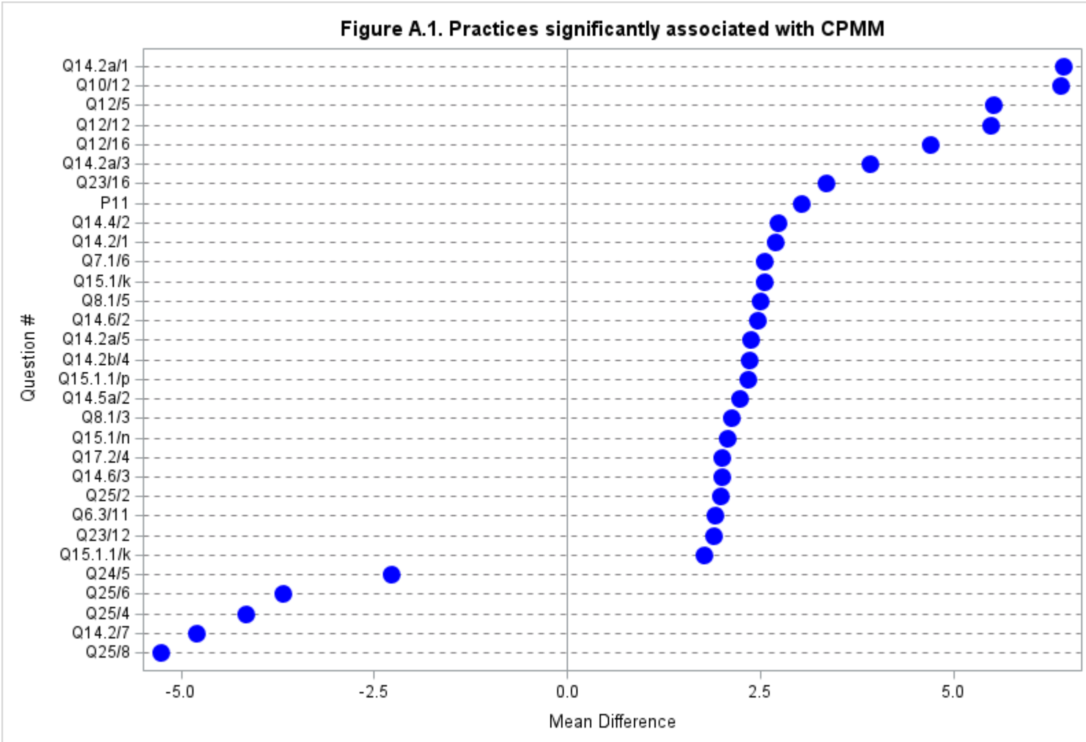
NOTE: These analyses do not suggest that adopting a given practice in a company resulted in a reduction in CPMM similar to the mean difference shown in the table. Likewise, the results do not suggest that adopting a given practice in the future will result in a reduction similar to the mean difference. Causal connections cannot be made given the existing data.

In addition to the findings included in the table, two counter-intuitive results were observed related to CPMM. Both factors were related to fatigue practices in medium-duty fleets. Empowering workers to report fatigue was associated with higher CPMM, as was engaging in more fatigue practices among medium-duty drivers. These factors may reflect companies’ reactions to observing higher crash rates within this fleet, where a change from these practices may be observed in the future. A description of the findings in Table A.1 are included later, in the *Conclusions: CPMM* section.

Table A.1. Practices significantly associated with CPMM – t-test and correlation results

Question#/ Response#	**Practice**	**Mean diff.**	**Corr. (*r*)**
P11	Capability to report crashes by severity	3.03**	
P14	Number of global crash-related injuries		0.38*
Q6.3/11	High risk response: IVMS placed in drivers' vehicles	1.92*	
Q7.1/6	Commentary drives conducted: for all per standard requirements	2.56*	
Q8.1/3	Collision review process: determination of severity	2.13*	
Q8.1/5	Collision review process: report issue to senior management	2.51*	
Q10-Q12	Fatigue program		
Q10/12	Fatigue (light): restrictions on night driving	6.39**	
Q12/5	Fatigue (heavy): refresher training for all drivers	5.52*	
Q12/12	Fatigue (heavy): restrictions on night driving	5.49**	
Q12/16	Fatigue (heavy): considering deploying fatigue system in 2022	4.70*	
Q14	IVMS use		
Q14.2/1	IVMS features: device beeps or flashes	2.70**	
Q14.2/7	IVMS features: non-safety function such as route planning	-4.80*	
Q14.2a/1	IVMS events recorded: speed	6.43**	
Q14.2a/3	IVMS events recorded: harsh braking	3.93*	
Q14.2a/5	IVMS events recorded: seatbelt usage	2.38*	
Q14.2b/4	IVMS parameters: decelerations	2.36*	
Q14.4/2	IVMS metrics distribution: drivers	2.73**	
Q14.4/sum	IVMS metrics distribution: sum of all people		-0.27*
Q14.5a/2	IVMS activities to encourage coaching: ongoing mentorship	2.24*	
Q14.6/2	IVMS type: plug-in	2.46*	
Q14.6/3	IVMS type: app-based	2.00*	
Q14.6/sum	IVMS type: sum of all types		-0.51***
Q15	Road safety scorecard and tracking		
Q15.1/k	Scorecard data points: severity	2.55*	
Q15.1/n	Scorecard data points: driver coaching events	2.08*	
Q15.1.1/k	Tracked in organization: severity	1.78*	
Q15.1.1/p	Tracked in organization: (potential) serious injuries and fatalities	2.34**	
Q17.2/4	Consequence of crash while violating phone policy: termination	2.01*	
Q23/12	Require on global light vehicle purchases: auto emergency braking	1.90**	
Q23/16	Require on global light vehicle purchases: IVMS	3.36***	
Q24/5	Frequency of motor vehicle records: continuously	-2.27*	
Q25	COVID's effect		
Q25/2	COVID's effect: reduction in number of employee drivers	1.99*	
Q25/4	COVID's effect: increase in number of employee drivers	-4.15***	
Q25/6	COVID's effect: loss of road safety resources	-3.67*	
Q25/8	COVID's effect: increase in speeding violations	-5.26*	

*$p<0.05$ **$p<0.01$ ***$p<0.001$; diff.=difference, corr.=correlation



Question Key

Question	Practice
Q14.2a/1	IVMS events recorded: speed
Q10/12	Fatigue (light): restrictions on night driving
Q12/5	Fatigue (heavy): refresher training for all drivers
Q12/12	Fatigue (heavy): restrictions on night driving
Q12/16	Fatigue (heavy): considering deploying fatigue system in 2022
Q14.2a/3	IVMS events recorded: harsh braking
Q23/16	Require on global light vehicle purchases: IVMS
P11	Capability to report crashes by severity
Q14.4/2	IVMS metrics distribution: drivers
Q14.2/1	IVMS features: device beeps or flashes
Q7.1/6	Commentary drives conducted: for all per standard requirements
Q15.1/k	Scorecard data points: severity
Q8.1/5	Collision review process: report issue to senior management
Q14.6/2	IVMS type: plug-in
Q14.2a/5	IVMS events recorded: seatbelt usage
Q14.2b/4	IVMS parameters: decelerations
Q15.1.1/p	Tracked in organization: (potential) serious injuries and fatalities
Q14.5a/2	IVMS activities to encourage coaching: ongoing mentorship
Q8.1/3	Collision review process: determination of severity
Q15.1/n	Scorecard data points: driver coaching events
Q17.2/4	Consequence of crash while violating phone policy: termination
Q14.6/3	IVMS type: app-based
Q25/2	COVID’s effect: reduction in number of employee drivers
Q6.3/11	High risk response: IVMS placed in drivers’ vehicles
Q23/12	Require on global light vehicle purchases: auto emergency braking
Q15.1.1/k	Tracked in organization: severity
Q24/5	Frequency of motor vehicle records: continuously
Q25/6	COVID’s effect: loss of road safety resources
Q25/4	COVID’s effect: increase in number of employee drivers
Q14.2/7	IVMS features: non-safety function such as route planning
Q25/8	COVID’s effect: increase in speeding violations

Table A.2 shows the results of one-way ANOVAs to compare differences in CPMM for various categories of categorical variables. The question, practice/policy, and significant differences between the categories are shown in the table, along with the actual differences between the CPMM means. For example, comparisons between categories of Q14.5 revealed one significant difference: companies that manage their IVMS data by having supervisors review metrics with each driver have CPMM rates 5.23 points lower on average than companies that do not actively manage their IVMS data. Additional discussion is provided in the Conclusions: CPMM section.

Table A.2. Practices significantly associated with CPMM – ANOVA results

Question	Practice/policy	Comparisons significant at p<0.05, *md*
Q14.5	IVMS: managing data 1. IVMS not actively managed 2. Drivers review own IVMS metrics 3. Supervisors review IVMS metrics with drivers as a group 4. Supervisors review IVMS metrics with each driver	4<1: 5.23
Q27	Road safety practices with supply chain/3rd party contractors 1. Yes 2. No 3. Not applicable	1<2: 3.11

Notes: md = mean difference.
*p < 0.05. **p < 0.01. ***p < 0.001.

Multivariable Regression: CPMM

The bivariate analyses (the data in the preceding tables) only assessed the relationship between each individual practice, one at a time, with CPMM. Those results identified average differences in CPMM between companies that do and do not have a particular practice/policy in place, or correlations between practices/policies and CPMM, without regard to any of the other practices. A company's fleet safety program, however, is comprised of many different elements that are in place all at the same time. In fact, it is likely that many of the significant elements identified in the preceding analyses co-occur within a company; companies that have low CPMMs are likely have many of these elements in place. That makes it difficult to determine how much of an independent influence a given practice/policy has on CPMM.

One way to examine the independent influence of each predictor is to use multivariable regression techniques, in which multiple independent variables are included in a single statistical model at the same time. Regression analyses determine how much of the variance in the outcome is being explained by each of the predictor variables, while controlling for (or parceling out) the influence of all the other variables. Due to the limited sample size of 62, and the relatedness of many of the factors, it was not possible to put all predictors in the regression model at once. Therefore, the variables that were statistically significant in the bivariate context, and those that had little missing data (e.g., some questions were only asked as follow-ups to initial queries, thus resulting in missing data for those items) were initially included in the regression model. Several models were fit, assessing the significance levels of each variable and the overall amount of variance explained by each, followed by the removal of variables with the highest p-values from the model. That process was repeated until the model was finalized, with results shown in Table A.3, including the parameter estimates (beta values), standard errors, t-values, and significance significance levels. The final model included variables related to having the ability to report crashes by severity, the types of IVMS used, frequency of motor vehicle record checks, COVID's effect on companies' road safety programs, and whether companies have road safety policies in place with supply chain operators/third party contractors. These factors explained 54% of the variance in CPMM, and are discussed in the Conclusions: CPMM subsection that follows.

Table A.3. Multivariable regression results – CPMM

Var	Practice	*Beta*	*SE*	*t*
P11	Ability to report crashes by severity	-1.63*	0.73	-2.22
Q14.6/sum	Type of IVMS used: sum of all types	-1.02*	0.39	-2.64
Q24/5	Checking motor vehicle records continuously	1.96**	0.69	2.85
Q25/4	COVID resulting in an increase in employee drivers	3.88***	1.04	3.74
Q27	Safety policies with supply chain/third party (ref=No)			
	Yes	-2.19**	0.81	-2.69
	Does not apply	-1.84*	0.83	-2.20

Notes: Var = variable; SE = standard error.

*$p<0.05$ **$p<0.01$ ***$p<0.001$

Conclusions: CPMM

As the preceding tables and figures illustrate, the vast majority of the CPMM findings were in the expected direction. The following bullet points describe some of the key overall CPMM-related findings.

- Numerous questions on the survey asked about in-vehicle monitoring systems (IVMS) and more of these factors were significantly related to CPMM than any other issue. Findings included aspects of device features, events recorded, parameter settings, distribution, activities to encourage coaching, and IVMS type. Two device features were significantly related to CPMMs; having a device that beeps or flashes was associated with CPMMs 2.70 points lower compared to not having such a device, while devices with non-safety functions such as route planning were related to CPMMs that were 4.80 points higher. However, all eight companies who reported this feature identified safety features in their IVMS units as well, so there may be something unique about the companies that use IVMS in this way. Recording speeding events (CPMMs 6.43 points lower), harsh braking (3.93), and seatbelt use (2.38) were also related to lower CPMMs. Including harsh decelerations as a parameter in one's light vehicle fleet was related to CPMMs 2.36 points lower. Distributing IVMS metrics to drivers was also important (2.73 points lower), as was distributing such metrics to more types of people ($r(60)=-0.27$). Companies that used a plug-in type IVMS had CPMMs 2.46 points lower, while app-based IVMSs were associated with CPMMs 2.00 points lower. Using more different IVMS types was also related to lower CPMMs overall ($r(42)=-0.51$).

- Four fatigue-related program elements were related to lower CPMMs, mostly among heavy vehicle fleets. These included refresher training for all drivers (md=5.25), restrictions on night driving (md=5.49), and consideration of deploying fatigue technology (md=4.70). In addition, placing restrictions on night driving for light vehicle fleets was also related to lower CPMMs (md=6.39).
- The lasting effects of COVID also played a role in data year 2022. Reporting a reduction in the number of employee drivers had a positive effect on CPMMs (md=1.99), while an increase in the number of employee drivers had the opposite effect (md=-4.15). Likewise, reporting a loss of road safety resources (md=-3.67) and an increase in speeding violations (md=-5.26) were both also related to higher CPMMs.
- Company representatives were asked whether several factors were included in their road safety scorecards, and whether they track such information in the company (regardless of whether it was included on the scorecard). Including severity and driver coaching events on the scorecard was related to CPMM rates 2.55 and 2.08 points lower, respectively. Tracking severity (md=1.78) and serious injuries and fatalities (md=2.34) within the organization were also associated with significantly lower CPMMs.
- Other items related to lower CPMMs included requiring automatic emergency braking (md=1.90) and IVMS (md=3.36) for global light vehicle purchases, identifying the ability to report crashes by severity (md=3.03), placing IVMS in drivers' vehicles as a response to high risk classification (md=1.92), conducting commentary drivers for all drivers (md=2.56), determining severity (md=2.13) and issuing a report to senior management (md=2.51) as part of the collision review process, and having termination as a consequence of a crash when violating the mobile phone policy (md=2.01). Continuously checking motor vehicle records was related to higher CPMMs (md=-2.27), which likely represents companies' responses to previously observing higher crash rates.
- The ANOVAs allowed for more direct comparisons within different practices related to a given aspect of companies' road safety program. Those findings suggested that actively managing IVMS metrics is important. Companies that manage their IVMS data by having supervisors review metrics with each driver have CPMM rates 5.23 points lower on average than companies that do not actively manage their IVMS data. Likewise, companies that had road safety practices in place with supply chain operators or third party contractors had CPMMs 3.11 points lower than those that did not.
- Results of the regression model further support several of the findings described above. After controlling for other variables in the model, companies with the ability to report crashes by severity had CPMMs 1.63 points lower than those that did not. Each additional type of IMVS used (a total of three were possible) was related to 1.02 lower CPMM rates reported, and having safety policies in place with supply chain operators or third part contractors were related to 2.19 points lower CPMM rates. In contrast,

checking motor vehicle records continuously and reporting an increase in employee drivers due to COVID were related to 1.96 and 3.88 higher rates of CPMMs on average, compared to companies that did not report these issues.

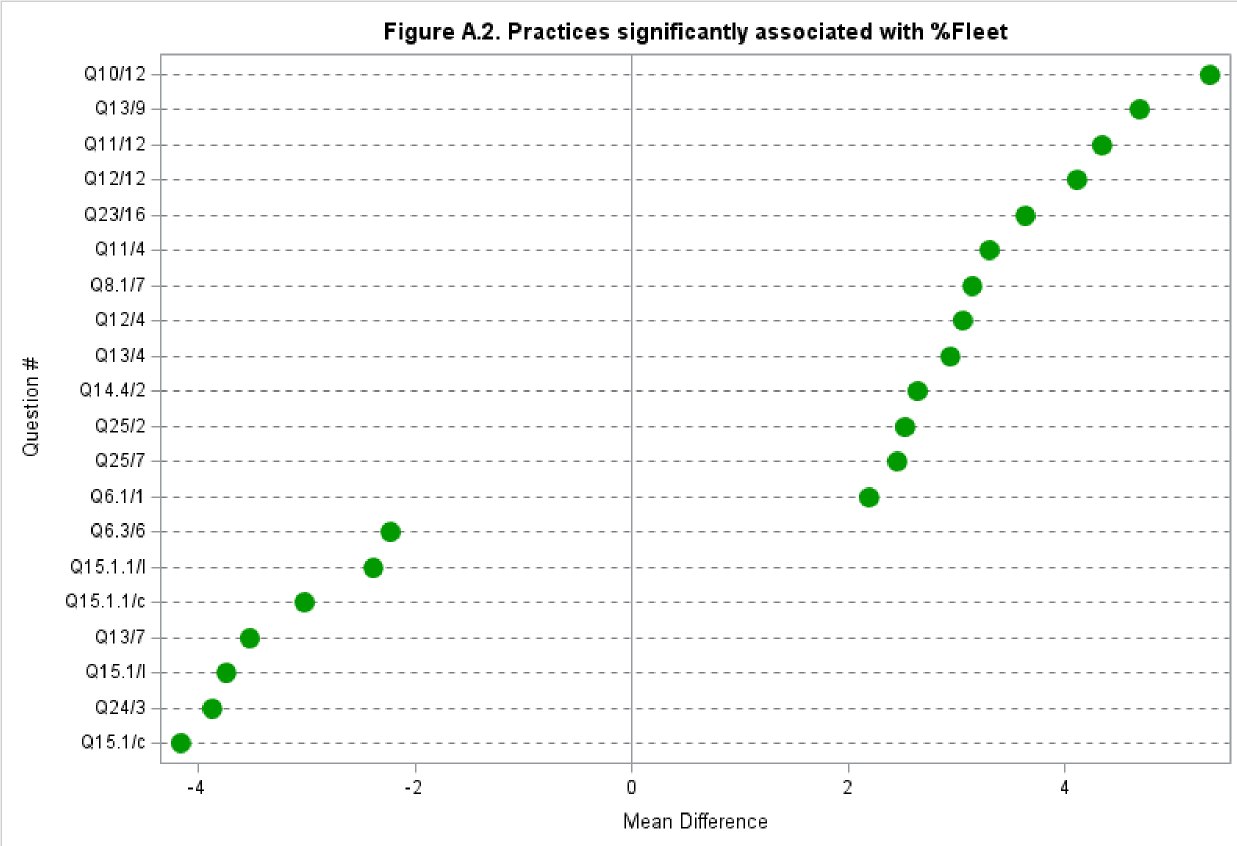
Bivariate Findings: %Fleet

Table A.4 shows the statistical results for practices/policies that were significantly related to %Fleet, using t-tests and correlations. Figure A.2 shows the same mean differences as Table A.4, but sorted from largest to smallest.

Table A.4. Practices significantly associated with %Fleet – t-test and correlation results

Question#/ Response#	Practice	Mean difference	Correlation (*r*)
Q6	High risk drivers		
Q6.1/1	High risk source: IVMS	2.19*	
Q6.3/6	High risk response: collision reviews	-2.22*	
Q8.1/7	Collision review process: follow-up to corrective actions	3.14*	
Q10-Q12	Fatigue program		
Q10/12	Fatigue (light): restrictions on night driving	5.34***	
Q11/4	Fatigue (medium): required fatigue training for new hires	3.30***	
Q11/12	Fatigue (medium): restrictions on night driving	4.34***	
Q11/sum	Fatigue (medium): sum of all practices		-0.28*
Q12/4	Fatigue (heavy): required fatigue training for new hires	3.06***	
Q12/12	Fatigue (heavy): restrictions on night driving	4.11***	
Q12/sum	Fatigue (heavy): sum of all practices		-0.33**
Q13	Speeding		
Q13/4	Speeding: IVMS	2.94**	
Q13/7	Speeding: dangers included in driver training	-3.53***	
Q13/9	Speeding: Other	4.69**	
Q14	IVMS		
Q14.4/2	IVMS metrics distribution: drivers	2.64**	
Q14.4/sum	IVMS metrics distribution: sum of all people		-0.34**
Q14.6/sum	IVMS type: sum of all types		-0.36**
Q15	Scorecard and tracking		
Q15.1/c	Scorecard data points: %Fleet	-4.16**	
Q15.1/l	Scorecard data points: costs of collisions	-3.74*	
Q15.1.1/c	Tracked in organization: %Fleet	-3.02*	
Q15.1.1/l	Tracked in organization: costs of collisions	-2.38*	
Q20.1	Corporate executive road safety rating (higher=better)		-0.36*
Q23/16	Require on global light vehicle purchases: IVMS	3.63*	
Q24/3	Frequency of motor vehicle records: two times per year	-3.87*	
Q25/2	COVID’s effect: reduction in number of employee drivers	2.52*	
Q25/7	COVID’s effect: changes in driver training	2.45*	

*p<0.05 **p<0.01 ***p<0.001



Question Key

Question	Practice
Q10/12	Fatigue (light): restrictions on night driving
Q13/9	Speeding: Other
Q11/12	Fatigue (medium): restrictions on night driving
Q12/12	Fatigue (heavy): restrictions on night driving
Q23/16	Require on global light vehicle purchases: IVMS
Q11/4	Fatigue (medium): required fatigue training for new hires
Q8.1/7	Collision review process: follow-up to corrective actions
Q12/4	Fatigue (heavy): required fatigue training for new hires
Q13/4	Speeding: IVMS
Q14.4/2	IVMS metrics distribution: drivers
Q25/2	COVID's effect: reduction in number of employee drivers
Q25/7	COVID's effect: changes in driver training
Q6.1/1	High risk source: IVMS
Q6.3/6	High risk response: collision reviews
Q15.1.1/l	Tracked in organization: costs of collisions
Q15.1.1/c	Tracked in organization: %Fleet
Q13/7	Speeding: dangers included in driver training
Q15.1/l	Scorecard data points: costs of collisions
Q24/3	Frequency of motor vehicle records: two times per year
Q15.1/c	Scorecard data points: %Fleet

Table A.5 shows the results of one-way ANOVAs to compare differences in %Fleet between categories of categorical variables. As with the CPMM ANOVAs (Table A.2), the question, practice/policy, and significant differences between specific categories are shown in the table, along with the actual differences between the %Fleet means. As shown in the table (and discussed in the Conclusions: %Fleet section later), lower %Fleet was related to using IVMS, reviewing IVMS information after all crashes, and banning all phone/device use while driving.

Table A.5. Practices significantly associated with %Fleet – ANOVA results

Question	Practice/policy	Comparisons significant at p<0.05, *md*
Q14	IVMS use overall 1. Yes 2. No 3. Planning to use IVMS in the future	1<2: 2.73
Q14.3	IVMS: review information after a crash 0. Does not use IVMS 1. No, this was not standard procedure 2. Yes, for series crashes only 3. Yes, for all crashes	3<0: 3.62
Q17.1	Mobile phone policy 1. Only banned texting/typing while driving 2. Only allowed hands-free 3. Banned all phone/device use while driving	3<2: 2.99

Notes: md = mean difference.
*p < 0.05. **p < 0.01. ***p < 0.001.

Multivariable Regression: %Fleet

Regression techniques were used to assess the effect of each practice on %Fleet, while controlling for the influence of the other practices included in the model. The same model building process described for CPMM was used with %Fleet analyses, with results shown in Table A.6. Statistically significant factors related to %Fleet included efforts to address speeding, tracking collision costs, and the effects of COVID. These factors explained 48% of the variance in %Fleet, and a detailed discussion is provided in the Conclusions: %Fleet subsection.

Table A.6. Multivariable regression results – %Fleet

Var	Practice	*Beta*	*SE*	*t*
Q13/7	Speeding: dangers included in driver training	2.47*	0.93	2.65
Q13/9	Speeding: other	-4.61**	1.57	-2.94
Q15.1.1/l	Tracked in organization: costs of collisions	1.99*	0.87	2.29
Q25/2	COVID's effect: reduction in number of employee drivers	-2.58**	0.85	-3.04
Q25/7	COVID's effect: changes in driver training	-2.62**	0.78	-3.35

Notes: Var = variable; SE = standard error.

*p<0.05 **p<0.01 ***p<0.001

Conclusions: %Fleet

As the preceding tables and figure illustrate, numerous practices and policies were significantly related to %Fleet in the expected direction, and are summarized below.

- Companies' fatigue programs had the most individual factors significantly related to %Fleet, particularly among medium and heavy vehicles. However, for light vehicle fleets, placing restrictions on night driving was associated with %Fleet about 5.34 points lower compared to companies that did not engage in this practice. Nighttime restrictions were also statistically significant among medium (*md*=4.34) and heavy-duty (*md*=4.11) vehicle fleets. Requiring fatigue training for new hires (medium-duty: *md*=3.30 | heavy-duty: *md*=3.06) and including more practices overall (medium: *r*(57)=-0.28 | heavy: *r*(57)=-0.33) were also both statistically significant within medium and heavy duty fleets.
- Several IVMS-related factors were also significantly associated with %Fleet. Companies that distributed IVMS metrics to drivers had %Fleet rates about 2.64 points lower than those that did not. Distributing IVMS metrics to more types of people (r(57)=-0.34) and using more different types of IVMS devices (r(57)=-0.36) were also related to lower %Fleet. Companies that used IVMS as a tool to identify high risk drivers (md=2.19) and to mitigate speeding behaviors (md=2.94) also reported lower %Fleet rates.
- Using collision reviews as a response to high risk driver classification was actually associated with higher %Fleet (md=-2.22), as was including the dangers of speeding in driver training (md=-3.53). These findings suggest that other approaches might be more meaningful for companies to mitigate these issues. For example, a collision review will obviously occur too late in the process to prevent the crash, while other responses may be useful between the high risk driver classification, but before a crash occurs.
- Several other factors were also related to lower %Fleet, including a follow-up to corrective actions during the collision review process (md=3.14), requiring IVMS on global light vehicle purchases (md=3.63), having a corporate executive with a higher road safety rating (r(29)=-0.36), and identify "other" as the approach to address speeding (md=4.69). After closer review, only four companies identified an alternative speeding mitigation approach, and these results may be unrelated to such measures. For example, the companies identified included technology to monitor driving statistics, Samba record review, IVMS review at the local level only, and having speed limiting devices deployed to only a portion of their fleet. Many of these factors are related to the standard options identified, but seem to be deployed in a slightly different way within the companies that chose this option.
- Interestingly, tracking and including information on the road safety scorecard about %Fleet (tracking: *md*=-3.02 | scorecard: *md*=-4.16) and costs of collisions (tracking: *md*=-2.38 | scorecard: *md*=-3.74) were related to higher overall %Fleet. Tracking and reporting these factors may be a response to observing higher %Fleet involved in collisions and therefore higher costs. Finally, checking motor vehicle records two times per year was

also related to higher %Fleet (*md*=-3.87). Checking such records with a different frequency may represent a more effective approach.

- Results of the ANOVAs confirmed some of the t-test findings related to IVMS use, and provided insight about the importance of mobile phone policies. Specifically, IVMS use was related to lower overall %Fleet than not using IVMS (*md*=2.73). Likewise, companies that reviewed IVMS metrics after all crashes reported lower %Fleet (*md*=3.62) compared to companies that did not use IVMS. In terms of mobile phone policies, companies that banned all phone/device use while driving had %Fleet rates 2.99 points lower than those that allowed hands-free use.
- The multiple regression model for %Fleet included five statistically significant factors, with some showing a positive and others a negative relationship with %Fleet. After controlling for other factors in the model, having an alternative strategy to address speeding (marking the “other” category) was related to 4.61 points lower %Fleet. Likewise, reporting that COVID resulted in a reduction in the number of employee drivers and that it resulted in changes to driver training were related to %Fleet rates that were 2.58 and 2.62 points lower, respectively. In contrast, including dangers of speeding in driver training was related to higher %Fleet (2.47 points), as was tracking the costs of collisions (1.99 points higher). As suggested earlier, companies may consider taking other approaches to speeding mitigation. Reporting that collision costs are tracked within the company is likely a response to observing higher %Fleet in the past.

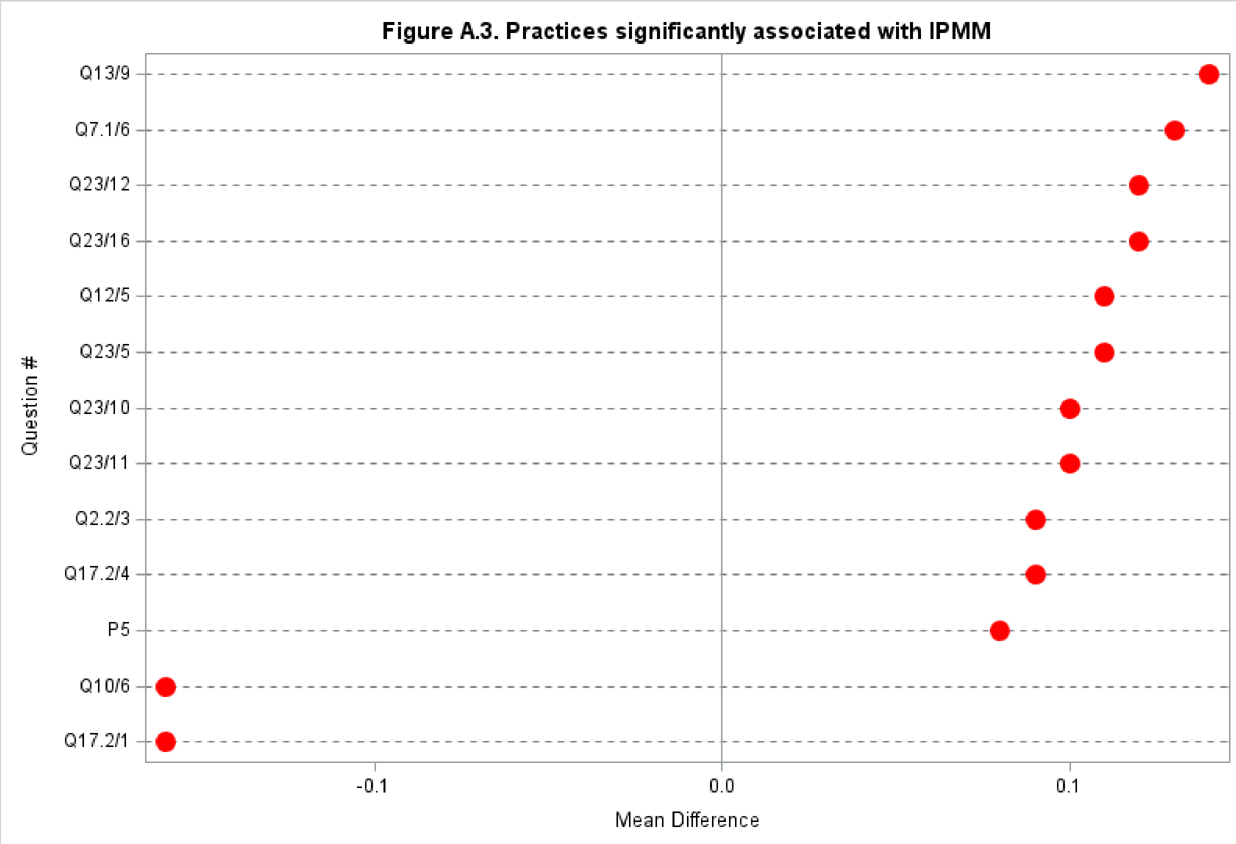
Bivariate Findings: IPMM

Table A.7 shows the statistical results for practices/policies that were found to be significantly related to IPMM, using t-tests. No correlations were significant with this year's data, so that column in the table is not included. As with the previous figures, Figure A.3 shows the same mean differences as Table A.7, but sorted from largest to smallest. Three counter-intuitive results were observed related to IPMM. Checking motor vehicle records only at hire was related to lower IPMMs, while tracking collisions per 100 vehicles and publishing the company scorecard to the leaders of the safety, health, and environment group were both related to higher IPMMs. The reasons for these counter-intuitive results were unclear, and these findings will be assessed again during the next data year to see if they occurred only by chance. Details of the results shown in Table A.7 are discussed in the Conclusions: IPMM subsection.

Table A.7. Practices significantly associated with IPMM – t-test results

Question#/ Response#	Practice	Mean difference
P5	Strategy for alternative mobility (e.g., rideshare/pooling, etc.)	0.08*
Q2.2/3	Significant revision to program: crash reviews	0.09***
Q7.1/6	Commentary drives conducted: for all per standard requirements	0.13*
Q10/6	Fatigue (light): optional fatigue training	-0.16*
Q12/5	Fatigue (heavy): periodic refresher training for all drivers	0.11*
Q13/9	Speeding: Other	0.14***
Q17.2/1	Consequence of crash while violating phone policy: no action	-0.16*
Q17.2/4	Consequence of crash while violating phone policy: termination	0.09*
Q23	Requirements for global light vehicle purchases	
Q23/5	Global light vehicle purchases: back-up camera/sensor	0.11**
Q23/10	Global light vehicle purchases: lane-departure warning	0.10**
Q23/11	Global light vehicle purchases: forward collision warning	0.10**
Q23/12	Global light vehicle purchases: automatic emergency braking	0.12***
Q23/16	Global light vehicle purchases: IVMS	0.12**

*p<0.05 **p<0.01 ***p<0.001; corr = correlation



Question Key

Question	Practice
Q13/9	Speeding: Other
Q7.1/6	Commentary drives conducted: for all per standard requirements
Q23/12	Global light vehicle purchases: automatic emergency braking
Q23/16	Global light vehicle purchases: IVMS
Q12/5	Fatigue (heavy): periodic refresher training for all drivers
Q23/5	Global light vehicle purchases: back-up camera/sensor
Q23/10	Global light vehicle purchases: lane-departure warning
Q23/11	Global light vehicle purchases: forward collision warning
Q2.2/3	Significant revision to program: crash reviews
Q17.2/4	Consequence of crash while violating phone policy: termination
P5	Strategy for alternative mobility (e.g., rideshare/pooling, etc.)
Q10/6	Fatigue (light): optional fatigue training
Q17.2/1	Consequence of crash while violating phone policy: no action

Table A.8 shows the results of one-way ANOVAs to compare differences in IPMM rates between categories of categorical variables. As with the ANOVAs related to the previous metrics, the question, practice/policy, and significant differences between specific categories are shown in the table, along with the actual differences between the IPMM means. Findings suggested that lower IPMMs were related to a recent revision to the road safety program, various IVMS settings, and having stronger mobile phone policies. More discussion is provided in the *Conclusions: IPMM* subsection.

Table A.8. Practices significantly associated with IPMM – ANOVA results

Question	Practice/policy	Comparisons significant at p<0.05, *md*
Q2	Significant revision to road safety program	1<3: 0.22
	1. 2022	
	2. 2 to 5 years ago	
	3. More than 5 years ago	
Q14.2c	IVMS settings for medium-duty fleet	
/3	Harsh accelerations	5<3: 0.25
	1. Increase between 1-4 mi/km per second	
	2. Increase between 5-9 mi/km per second	
	3. Increase between 10-15 mi/km per second	
	4. Increase between more than 15 mi/km per second	
	5. Other	
/4	Harsh decelerations	2<3: 0.27
	1. Decrease between 1-4 mi/km per second	5<3: 0.27
	2. Decrease between 5-9 mi/km per second	
	3. Decrease between 10-15 mi/km per second	
	4. Decrease between more than 15 mi/km per second	
	5. Other	
Q14.2d	IVMS settings for heavy-duty fleet	
/3	Harsh accelerations	5<3: 0.27
	1. Increase between 1-4 mi/km per second	
	2. Increase between 5-9 mi/km per second	
	3. Increase between 10-15 mi/km per second	
	4. Increase between more than 15 mi/km per second	
	5. Other	
/4	Harsh decelerations	2<3: 0.27
	1. Decrease between 1-4 mi/km per second	5<3: 0.29
	2. Decrease between 5-9 mi/km per second	
	3. Decrease between 10-15 mi/km per second	
	4. Decrease between more than 15 mi/km per second	
	5. Other	
Q17	Mobile phone policy	5<1: 0.52
	1. No formal, written policy and no plans to develop one	4<1: 0.55
	2. No formal, written policy, but working on one	
	3. Guidelines or recommendations only	
	4. Formal, written policy at discretion of countries/units	
	5. Formal, written companywide policy	

Notes: md = mean difference.
*p < 0.05. **p < 0.01. ***p < 0.001.

Multivariable Regression: IPMM

As with the other metrics, regression techniques were applied to IPMM rates to control for the influence of other practices/policies. The same model building process described earlier was used with IPMM, but only one statistically significant factor was observed in the model at a time. As such, the regression results did not add any useful information to the bivariate analyses reported above. The lack of significant findings in the regression model is likely a result of fewer factors having a significant relationship with IPMM (compared to the other two metrics), as well as the limited number of companies available to analyze on this factor (n=57).

Conclusions: IPMM

Most practices significantly associated with IPMM were in the expected direction. A summary of those findings is included next.

- Requirements for global light vehicle purchases had the most items significantly related to lower IPMM rates. These safety-conscious purchases may have indeed lowered injury rates, or these relationships may reflect companies with greater resources or more mature road safety programs. Specific items related to lower IPMMs included back-up camera/sensors (*md*=0.11), lane-departure warnings (*md*=0.10), forward collision warnings (*md*=0.10), automatic emergency braking (*md*=0.12), and IVMS (*md*=0.12).
- The consequences of a crash while violating companies' mobile phone policies were also related to IPMM rates, but in opposite ways. Higher IPMMs were significantly related to taking no action if a driver violated the company's phone policy and got into a crash (*md*=-0.16). Only six companies identified this choice, but it is not surprising that receiving no consequences for a crash while distracted would be related to higher injury rates. In contrast, reporting that termination was a potential consequence of crashing while using a mobile device in violation of company policy (*md*=0.09) was related to significantly lower IPMM rates.
- Two fatigue program elements were also related to IPMMs in opposite ways. Within light vehicle fleets, including optional fatigue training was related to higher IPMM rates (*md*=-0.16). Again, only six companies identified this practice, but it may be the case that stronger fatigue program elements are needed to affect injury rates. In contrast, including periodic refresher training for all drivers was related to IPMM rates 0.11 points lower within heavy vehicle fleets.
- Other factors related to lower IPMM rates included having a strategy for alternative mobility (*md*=0.08), having made a significant revision to one's road safety program related to crash reviews (*md*=0.09), conducting commentary drives for all drivers per standard requirements (*md*=0.13), and identifying some "other" factor related to one's speeding mitigation program (*md*=0.14). As noted in the %Fleet section, only four companies identified an alternative speeding mitigation approach, and these results may be unrelated to such alternative measures.
- Several statistically significant factors were also observed in the IPMM ANOVAs. Companies that revised their road safety program in 2022 reported lower IPMM rates

compared to those who last had a revision more than five years ago (*md*=0.22). Stronger mobile phone policies also reflected lower IPMMs. Specifically, companies with a formal written companywide policy had IPMM rates 0.55 points lower than those without a policy, and companies with a formal written policy at the discretion of countries/units also had lower IPMMs than companies with no policy (*md*=0.52). Several new questionnaire items addressed IMVS settings, and showed significant relationships with IPMM rates. For example, within medium and heavy-duty fleets, companies that defined harsh accelerations differently from the choices provided had IPMMs 0.25 (medium) and 0.27 (heavy) points lower than those who identified this as between 10-15 mi/km per second. In assessing what criteria were used by these companies, most identified a specific g-force threshold or stated that it was analyzed by vehicle weight class, rather than a change in speed per second. Likewise, companies that used another definition (medium: *md*=0.27 | heavy: *md*=0.29) or 5-9 mi/km decrease per second (medium: *md*=0.27 | heavy: *md*=0.27) to define harsh *decelerations* had lower IPMMs than those who used the 10-15 mi/km per second criteria. Overall, these results suggest that using the 10-15 mi/km per second criteria may not be a stringent enough setting.

OVERALL CONCLUSIONS

The 2023 analyses of the 2022 NETS data identified several important practices/policies that were related to lower CPMM, %Fleet, and IPMM in NETS member companies. The following are some of the major themes that were identified for each metric:

CPMM analyses revealed that:

- Using IMVSs that beep/flash; record speeding, harsh braking, and seatbelt use; distributing metrics to drivers and others; using more types of devices; requiring IVMS for vehicle purchases; using it for high risk driver identification; actively managing IMVS metrics; and reviewing results with drivers were all related to lower CPMMs. Refresher fatigue training for all drivers and placing restrictions on night driving were both also related to lower CPMM rates, as were including severity and driver coaching events on road safety scorecards, as well as tracking severity and serious injuries. Also related to lower CPMMs were requiring automatic emergency braking on vehicle purchases, identifying and addressing crash severity, using commentary drives for all drivers, having termination as a consequence of a crash when violating mobile phone policy, and including road safety practices with supply chain/third party contractors. COVID-related changes also played a role, but such factors are not easily modifiable.

%Fleet analyses revealed that:

- Companies with ambitious fatigue mitigation programs had a lower percentage of their fleet involved in collisions, particularly related to night driving restrictions and requiring fatigue training for new hires. Distributing IVMS metrics to drivers and more types of people was also associated with lower %Fleet, as was using more types of IVMS devices, using IVMS to identify high risk drivers and mitigate speeding, requiring IVMS for global light vehicle purchases, and reviewing IVMS after all crashes. Other factors related to lower %Fleet included following-up on corrective actions in the collision review process, having a corporate executive with a strong safety rating, and banning all phone/device use while driving.

IPMM analyses revealed that:

- Companies that required numerous safety features for new global light vehicle purchases had lower IPMMs than other companies. Taking some action when a driver experiences a crash while violating the mobile phone policy, particularly with termination as an option, was also related to lower IPMMs. Including periodic refresher fatigue training; having made a recent road safety program revision, particularly related to crash reviews; conducting commentary drives for all drivers; having a formal written mobile phone policy, and several specific IMVS settings were all related to lower IPMMs.

Although some differences exist, many of the same practices were related to CPMM, %Fleet, and IPMM. Overall, road safety advocates in member companies should pay particular attention to the practices that were predictive of all three metrics, as well as those practices that represent changes that can easily be made.

APPENDIX 2: LONGITUDINAL ANALYSIS

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Longitudinal Analysis Objective

The objective of this report was to determine if past fleet safety program characteristics were associated with current fleet safety program performance. Specifically, this analysis assessed the association of reported fleet safety program characteristics in 2019 with collisions per million miles (CPMM) traveled, injuries per million miles (IPMM) traveled, and percent of fleet involved in a crash (%Fleet) in 2022.

Data Characteristics

Fifty-two (N = 52) companies provided program data for both 2019 and 2022. Like other benchmark analyses, the CPMM, IPMM, and %Fleet estimates excluded mileage and crashes involving two- and three-wheeled vehicles.

Before assessing relationships between fleet management practices with fleet management outcomes, the data were analyzed to identify statistical outliers that could potentially interfere with the main analyses. CPMM (N = 52) had no statistical outliers or missing cases. The mean 2022 CPMM was 4.95 (SD = 3.37), with a median of 4.30 and a range from 0.34 to 14.13. IPMM (N = 49) had one statistical outlier three deviations above the mean removed from the sample and two missing cases. The mean 2022 IPMM was 0.18 (SD = 0.24), with a median of 0.1 and a range from 0 to 1.32. %Fleet (N = 51) had one outlier three deviations above the mean removed from the sample. The mean 2022 %Fleet was 6.73 (SD = 5.18), with a median of 5.83 and a range from 0 to 31.

The 2022 CPMM, IPMM, and %Fleet means of the 52 companies that provided 2019 data were compared to the 2022 CPMM, IPMM, and %Fleet means of the 10 companies that did not previously provide 2019 data. There were no significant differences in the 2022 CPMM, IPMM, and %Fleet means between groups that provided 2019 data and those who did not. Although this finding suggests that the organizations included in this longitudinal analysis experience similar CPMM, IPMM, and %Fleet outcomes as the other NETS companies, caution should be used when generalizing all results of this analysis to all NETS members.

Methodology

The analysis methodology described previously in this report (see Appendix 1) is also applied to assess relationships between 2019 fleet safety practices and 2022 safety outcomes.

Results

Bivariate Findings: CPMM

Table B.1 and Figure B.1 display the statistical results for the 2019 reported safety management practices that were found to be significantly related to 2022 CPMM. Included in Table B.1 are the 2019 survey questions and response category numbers, a brief description of what practice or policy the questions assessed, the difference between the means for binary variables, the correlation (r-value) for continuous variables, and the statistical significance level for the test (p-value). Related practices were grouped together in Table B.1 with a brief description of their topic.

1. All the 2019 practices included in Table B.1 were found to have a clear statistical association with 2022 CPMM.
2. The strongest associations had the largest mean differences or largest r-value (negative or positive), coupled with a low p-value.
3. The mean difference can be interpreted as the average difference in 2022 CPMM between NETS companies that had the given practice in 2019, compared to NETS companies that did not.
    a. A positive mean difference indicates that companies responding “yes” in 2019 to a given question had a lower 2022 CPMM on average, while a negative difference indicates that companies responding “yes” in 2019 to a given question had a higher 2022 CPMM on average.
        i. For example, the mean difference for Q21/2 (Companies that check motor vehicle records annually for employees who drove company owned or company-leased vehicles) is a positive value, whereas the mean difference for Q21/5 (Continuously – employer automatically notified of any changes to driver’s records) is a negative value. The positive value (2.0) indicates that the 2022 CPMM was two points lower for companies that checked motor-vehicle records annually in 2019.The negative value (-2.6) indicates that the 2022 CPMM was more than two points higher for companies that checked motor-vehicle records continuously or when notified of any changes to driver’s records in 2019.
    b. The p-value represents the probability of getting the observed results if no relationship between the variables actually exists. The lower the p-value, the lower the probability of obtaining the results by chance.
    c. The r-value indicates the strength and direction of the relationship between each continuous variable and CPMM in 2022. An r-value can range from -1 to 1, and an r-value of 0 indicates no association. For example, in Q5.1, as the total number of circumstances where commentary drives were conducted increases, the mean CPMM in 2022 also increases (positive correlation). Conversely, in Q1, as the total number of years a company had a comprehensive road safety program for which they submitted NETS metrics increases, mean CPMM in 2022 decreases (negative correlation).

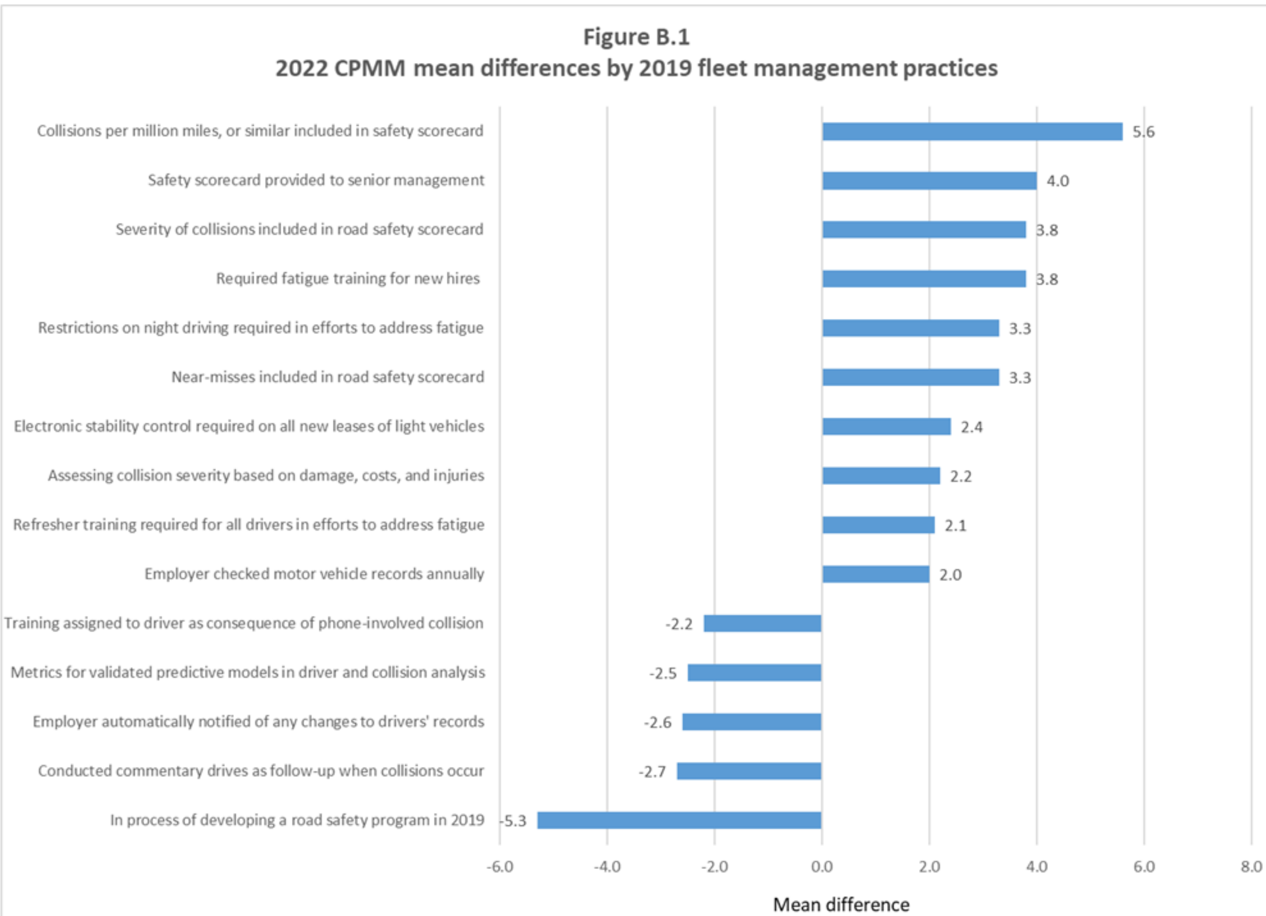
Table B.1
2019 Practices significantly associated with 2022 CPMM

Question #/ Response Category	Fleet Safety Management Practice	Mean Difference	Correlation (r)
Q1	As of 2019, how many years had your company had a comprehensive road safety program in place within the fleet for which you submitted metrics to NETS? (Total number of years)		(-0.30)*
Q1/1	We were in the process of developing or redeveloping a comprehensive program in 2019	-5.3**	
Q4.2	In 2019, how did you apply the information collected to classify a driver high risk?		
Q4.2/3	Driver-and-collision-related metrics used in statistically validated predictive models	-2.5*	
Q5.1	In 2019, in which of the following circumstances did you conduct commentary drives? (Total number of practices)		(0.39)*
Q5.1/3	As part of the follow-up when collisions occur	-2.7**	
Q6.1	In 2019, which of the following was/were required as part of your collision review process?		
Q6.1/3	Determination of severity per specific criteria involving extent of damage, costs, and injuries	+2.2*	
Q7	Which of the following were included in your company's 2019 efforts to address fatigue as a safety concern in your light-vehicle fleet?		
Q7/4	Required fatigue training for new hires	+3.8*	
Q7/5	Periodic refresher training required for all drivers	+2.1*	
Q7/12	Restrictions on night driving	+3.3*	
Q13.1	In 2019, which of the following data points were included on your road safety scorecard?		
Q13.1/1	Collisions per million miles, or similar	+5.6*	
Q13.1/7	Severity	+3.8**	
Q13.1/10	Near-misses	+3.3*	
Q13.2	In 2019, to which of the following groups did you publish your scorecard?		
Q13.2/2	Senior management	+4.0*	
Q15.2	What would happen if a driver were involved in a collision while talking on the phone, in violation of your written policy?		
Q15.2/6	Assign training	-2.2*	
Q20	In 2019, which of the following safety features were REQUIRED on ALL new purchases or leases of light-vehicles in your U.S. fleet?		
Q20/7	Electronic stability control	+2.4*	

Table B.1 (Continued)

Question #/ Response Category	Fleet Safety Management Practice	Mean Difference	Correlation (r)
Q21	In 2019, how often did your company check motor vehicle records for employees who drove company-owned or company-leased vehicles?		
Q21/2	Annually	+2.0*	
Q21/5	Continuously (employer automatically notified of any changes to drivers' records)	-2.6*	

*p < 0.05, **p < 0.01, ***p < 0.001



As can be seen in Figure B1, the largest positive mean difference (5.6) was among organizations that included collisions per million miles in their safety scorecard. Including the severity of collisions, as well as near-misses, also contributed to lower CPMM rates by 3.8 and 3.3, respectively. CPMM also tended to be lower among organizations who provided a safety scorecard to senior management (4.0). Companies who required fatigue training for new hires had CPMM rates 3.8 points lower in 2022 compared to other NETS participants. Consequently, companies that required restrictions on night driving in an effort to address fatigue also had lower CPMM rates. In total, six out of the nine most beneficial practices were related to safety scorecards and fatigue training. Requiring electronic stability control, assessing collision severity based on damage, and checking vehicle records annually were also amongst the highest rated practices.

The largest negative mean difference (-5.3) was experienced by organizations who were in the process of developing a road safety program in 2019 but did not yet have one.

Several counter intuitive results were also found. When interpreting these results, it is important to keep in mind that causality or the direction of causality should not be assumed. For example, companies with high CPMM rates may have been prompted to adopt these practices in response to their higher rates, rather than the implementation of the practices resulting in higher CPMM rates. Companies who performed commentary drives as a follow up for collisions also displayed higher CPMM rates (by 2.7 points) than companies who did not participate in this practice in 2019. Employers who were automatically notified of driver record changes also displayed higher CPMM rates (by 2.6 points). Using collected metrics in validated predictive collision models and training drivers as a consequence of phone-involved collisions were also both associated with higher CPMM rates.

Multivariable Regression Analysis: CPMM

As discussed in Appendix 1, multiple regression analysis determines how much of the variance in the outcome variable is being explained by each of the predictor variables, while controlling for the influence of all the other variables. Regression is particularly useful in this longitudinal analysis because it allows controlling for (parceling out) the 2019 CPMM before testing for relationships between 2019 program elements and 2022 CPMM. There is a strong relationship over time regarding CPMM, that is, companies that tend to have lower CPMM in 2019 also tend to have lower CPMM in 2022 (r (52) = 0.63, $p < 0.01$). Given 2019 CPMM is being used as the first predictor in the regression model, the remaining predictors were identified through stepwise selection to maximize the amount of variance explained in the model.

In this analysis, CPMM in 2019 is so strongly associated with CPMM in 2022 that very little variance was left for other variables. Therefore, two models were performed to better understand the relationship between CPMM in 2022 and program elements in 2019.

1. The first model included only one variable that was independently associated with CPMM: CPMM level in 2019. This model was significant ($p < 0.001$) and explained 63% of the variance ($R^2 = 0.63$).
2. The second model did not include 2019 CPMM and allowed for examination of two other variables that significantly contribute to predicting 2022 CPMM: (a) provided collisions per million miles in the scorecard (Q13.1/1); and (b) employer automatically notified of any changes to driver's records (Q21/5). This model was significant ($p < 0.01$) and explained 32% of the variance ($R^2 = 0.32$).

The first model aids in understanding the relationship between CPMM levels in 2019 and 2022 CPMM but does not take into consideration any other 2019 program elements in the model. The second model displays the relationship between 2022 CPMM and 2019 program elements but does not take into consideration the effects of CPMM levels in 2019, hence, the lower proportion of the variance that can be attributed to the program elements. Therefore, caution should be taken when considering the effects of 2019 program elements with 2022 CPMM without the control of 2019 CPMM. The individual results of each model are shown in Table B.2, including the parameter estimates (beta values), standard errors, t-values, and significance levels.

Table B.2
Multivariable regression results – 2019 program elements and 2022 CPMM

Variable	2019 Program Element	Beta	SE	t
Model 1				
CPMM	CPMM levels in 2019	0.56***	0.10	5.73
Model 2				
Q13.1/1	Provided collisions per million miles in the scorecard	-5.67**	1.99	-2.85
Q21/5	Employer automatically notified of any changes to driver's records	2.95*	1.19	2.48

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Conclusions: CPMM

As shown in Table B.2, the following is a brief description of the interpretation of the regression findings:

Model 1:

- The 2019 CPMM variable is continuous in nature. The beta value of 0.56 can be interpreted as follows: for every one-point increase in 2019 CPMM levels, the 2022 CPMM increases 0.56 points. The converse is also true, with every one-point decrease in 2019 CPMM a corresponding 0.56-point decrease in 2022 CPMM occurs. This relationship was statistically significant ($p < 0.001$).

Model 2:

- Providing collisions per million miles in the scorecard is a categorical variable. Beta values are interpreted differently for categorical variables because these variables have a comparison group. Companies that provided collisions per million miles in the scorecard experienced 5.67 points lower in mean CPMM in 2022 than companies that did not ($p < 0.01$).
- Employer automatically notified of any changes to driver's records is also a categorical variable. Companies that were automatically notified of any changes to driver's records experienced 2.95 points higher in mean CPMM in 2022 than companies that did not ($p < 0.05$).

As shown in Table B.1, the following practices in place in 2019 were statistically significantly associated with 2022 CPMM. A description of some of the main findings follows:

- Fatigue Management:
    - Companies that required refresher training for all drivers in an effort to address fatigue achieved 2.1 points lower in mean CPMM than other NETS members in 2022 ($p < 0.05$).

  - Companies that required restrictions on night driving to address fatigue experienced 3.3 points lower in mean CPMM in 2022 ($p < 0.05$).
  - Companies that required fatigue training for new hires in 2019 demonstrated 3.8 points lower in mean CPMM than other NETS members in 2022 ($p < 0.05$).
- Road Safety Scorecard:
  - Companies that included near-misses in the road safety scorecard achieved 3.3 points lower in mean CPMM in 2022 ($p < 0.05$).
  - Companies that included the severity of collisions in the road safety scorecard experienced 3.8 points lower in mean CPMM than other NETS members in 2022 ($p < 0.01$).
  - Companies that provided the safety scorecard to senior management performed 4.0 points lower in mean CPMM in 2022 ($p < 0.05$).
  - Companies that included collisions per million miles or similar in the safety scorecard achieved 5.6 lower in mean CPMM than other NETS members in 2022 ($p < 0.05$).
- Driver Intervention/ Improvement:
  - Companies that assessed collision severity based on damage, costs, and injuries experienced 2.2 points lower in mean CPMM in 2022 ($p < 0.05$).
  - Companies that checked motor-vehicle records annually demonstrated 2.0 points lower in mean CPMM in 2022 ($p < 0.05$). In contrast, companies that were automatically notified of any driver record changes in 2019 experienced mean CPMM 2.6 points higher in 2022 ($p < 0.05$).
  - Counter intuitive results were found regarding the management of high-risk drivers and the use of commentary drives. When interpreting these apparently counter intuitive results it is important to keep in mind that causality or the direction of causality should not be assumed. For example, companies with high CPMM rates may have been prompted to adopt these practices in response to their higher rates rather than the implementation of the practices resulting in higher CPMM rates.
    - Companies that used driver and collision related metrics in statistically validated predictive models in 2019 experienced mean CPMM 2.5 points higher in 2022 ($p < 0.05$).
    - The more circumstances prompting commentary drives in 2019, the higher mean CPMM was in 2022 ($r(52) = +0.39$, $p < 0.05$). In addition, companies that conducted commentary drives in response to collisions in 2019 experience mean CPMM 2.7 points higher in 2022 ($p < 0.01$).
- Required Vehicle Safety Features:
  - Companies that included electronic stability control on all new leases of light vehicles experienced mean CPMM 2.4 points lower in 2022 ($p < 0.05$).
- Overall Fleet Safety:

The longer companies had their road safety program in place, the lower their mean CPMM in 2022 ($r(52) = -0.30$, $p < 0.05$). In contrast, companies that were

  - still in the process of developing a comprehensive program in 2019 experienced a mean CPMM 5.3 points higher compared to other companies in 2022 ($p < 0.01$).
- Cell Phone Policy:
  - Companies that only assigned training in response to a collision involving a cell phone policy violation experienced mean CPMM 2.2 points higher in 2022 ($p < 0.05$).

NOTE: As with other analyses, these results do not suggest that adopting a given practice in any given company resulted in a reduction in CPMM similar to the mean difference shown in Table B.1. Likewise, the results do not suggest that adopting a given practice in the future will result in a reduction similar to the mean difference. Causal connections cannot be made given the existing data and analyses.

Bivariate Findings: IPMM

Table B.3 and Figure B.2 show the statistical results for the 2019 practices that were found to be significantly related to the 2022 IPMM. Included in Table B.3 are the 2019 survey questions and response category numbers, a brief description of what practice or policy the questions assessed, the difference between the means for binary variables, and the statistical significance level for the test. Related practices are grouped together in Table B.3 with a brief description of their topic. There were no significant correlations (*r*-value) for 2022 in the IPMM analyses.

1. All the 2019 practices included in Table B.3 were found to have a clear statistical association with 2022 IPMM.
    a. Results this year identified substantially fewer significant findings compared to previous reports. This year's analysis identified only four significant findings compared to 15 significant findings in the 2022 Strength in Numbers report. In addition, several counter intuitive results were found this year. These results are discussed below, along with guidance on possible interpretation.
2. The strongest associations had the largest mean differences, coupled with a low *p*-value.
3. The mean difference can be interpreted as the average difference in 2022 IPMM between NETS companies that had the given practice in 2019, compared to NETS companies that did not.
    a. A positive mean difference indicates that companies responding "yes" in 2019 to a given question had a lower 2022 IPMM on average, while a negative difference indicates that companies responding "yes" in 2019 to a given question had a higher 2022 IPMM on average.
        i. For example, the mean difference for Q13.1/1 (Collisions per million miles, or similar included in the safety scorecard) is a positive value, whereas the mean difference for Q13.1/2 (Collisions per 100 vehicles, or similar included in the safety scorecard) is a negative value. The positive value (0.48) indicates that the 2022 IPMM was 0.48 points lower for companies that included collisions per million miles, or similar in the road safety scorecard back in 2019. The negative value (-0.50) means that the

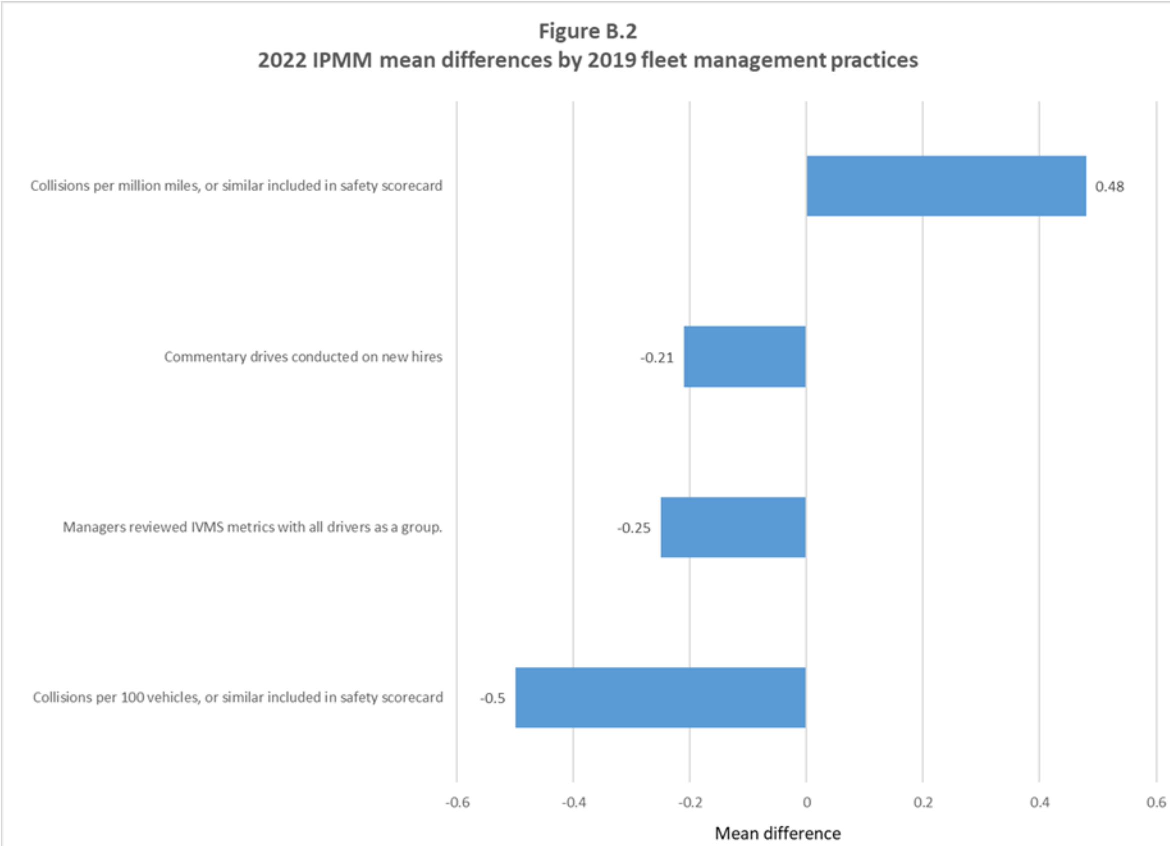
2022 IPMM was 0.50 points higher for companies that included collisions per 100 vehicles, or similar in the road safety scorecard in 2019.

b. The *p*-value represents the probability of getting the observed results if no relationship between the variables actually exists. The lower the *p*-value, the lower the probability of obtaining the results by chance.

Table B.3
2019 Practices significantly associated with 2022 IPMM

Question #/ Response Category	Fleet Safety Management Practice	Mean Difference
Q5.1	In 2019, did your company conduct commentary drives?	
Q5.1/1	For new hires	-0.21*
Q12.4	Which of the following best describes how you managed the data generated by your IVMS equipment in 2019?	
Q12.4/3	Managers reviewed IVMS metrics with all drivers who reported to them, as a group.	-0.25*
Q13.1	In 2019, which of the following data points were included on your road safety scorecard?	
Q13.1/1	Collisions per million miles, or similar	0.48**
Q13.1/2	Collisions per 100 vehicles, or similar	-0.50**

*p<0.05, **p<0.01, ***p<0.001



As can be seen in Figure B.2, the only positive mean difference was among organizations that included collisions per million miles, or similar in the safety scorecard. These organizations had IPMM rates 0.48 points lower in 2022 compared to other NETS participants.

The largest negative mean difference was experienced by organizations that included collisions per 100 vehicles, or similar in the safety scorecard in 2019. These companies demonstrated IPMM rates 0.50 points higher in 2022 that other NETS participants. Counter intuitively, practices such as conducting commentary drives with new hires and managers reviewing IVMS metrics as a group also displayed higher IPMM rates of 0.21 and 0.25 points, respectively.

Multivariable Regression Analysis: IPMM

Multiple regression analysis determines how much of the variance in the outcome variable is explained by each of the predictor variables, while controlling for the influence of all the other variables. There is a strong statistically significant relationship between 2019 IPMM and 2022 IPMM (r (49) = 0.63, $p < 0.001$). In other words, companies with low IPMM in 2019 were more likely to also have low IPMM in 2022. Using multiple regression, we can determine which 2019 practices were most significantly associated with 2022 IPMM.

In this analysis, IPMM in 2019 is so strongly associated with IPMM in 2022 that very little variance was left for other variables. Therefore, no 2019 program element was significantly related to 2022 IPMM after accounting for 2019 IPMM. The only significant model is summarized below:

- The model includes only one variable that was independently associated with IPMM: IPMM level in 2019. This model was significant ($p < 0.001$) and explained 93% of the variance ($R^2 = 0.93$).

This model aids in understanding the relationship between IPMM levels in 2019 and 2022, but does not take into consideration any other 2019 program elements in the model. The model is summarized in Table B.4, including the parameter estimates (beta values), standard errors, t-values, and significance levels.

Table B.4
Multivariable Regression Results – 2019 program elements and 2022 IPMM

Variable	2019 Program Element	Beta	SE	t
IPMM	IPMM 2019	0.74***	0.05	14.07

***$p < 0.001$

Conclusions: IPMM

The following is a brief description of the interpretation of the regression findings:

- The beta value of 0.74 can be interpreted as follows: for every one-point increase in 2019 IPMM levels, the 2022 IPMM increases 0.74 points. The converse is also true, with every one-point decrease in 2019 IPMM, a corresponding 0.74-point decrease in 2022 IPMM occurs. This relationship was statistically significant ($p < 0.001$).

As shown in Table B.3, only one practice in 2019 was positively associated with 2022 IPMM. These results are different from previous years where multiple fleet management practices were found to positively impact IPMM rates. The 2019 practice that was positively related to 2022 IPMM is displayed below:

- Road Safety Scorecard:
  - Companies that included collisions per 100 vehicles or similar in the safety scorecard achieved 0.48 points lower in mean IPMM than other NETS members in 2022 ($p < 0.01$). In contrast, companies that included collisions per 100 vehicles in their 2019 safety scorecard experienced mean IPMM 0.50 points higher in 2022 ($p < 0.01$).

Several 2019 fleet management practices were found to be associated with higher IPMM in 2022. When interpreting these apparently counter intuitive results it is important to keep in mind that causality or the direction of causality should not be assumed. For example, companies with high IPMM rates may have been prompted to adopt these practices in response to their higher rates rather than the implementation of the fleet safety practices resulting in higher IPMM rates.

- Commentary drives:
  - Companies conducting commentary drives for new hires in 2019 experienced mean IPMM 0.21 points higher than other companies in 2022 ($p < 0.05$).

- IVMS:
    - Companies that in 2019 had managers review IVMS metrics with their employees in groups experienced mean IPMM 0.25 points higher in 2022 ($p < 0.05$).

NOTE: As with other analyses, these results do not suggest that adopting a given practice in any given company resulted in a reduction in IPMM similar to the mean difference shown in Table B.3. Likewise, the results do not suggest that adopting a given practice in the future will result in a reduction similar to the mean difference. Causal connections cannot be made given the existing data and analyses.

Bivariate Findings: %Fleet

Table B.5 and Figure B.3 show the statistical results for the 2019 reported safety management practices that were found to be significantly related to the 2022 %Fleet. Included in Table B.5 are the 2019 survey questions and response category numbers, a brief description of what practice or policy the questions assessed, the difference between the means for binary variables, and the statistical significance level for the test. Related practices are grouped together in Table B.5 with a brief description of their topic. There were no significant correlations (*r*-value) for continuous variables in the 2022 %Fleet analyses.

1. All the 2019 practices included in Table B.5 were found to have a clear statistical association with 2022 %Fleet.
2. The strongest associations had the largest mean differences, coupled with a low *p*-value.
3. The mean difference can be interpreted as the average difference in 2022 %Fleet between NETS companies that had the given practice in 2019, compared to NETS companies that did not.
    a. A positive mean difference indicates that companies responding “yes” in 2019 to a given question had a lower 2022 %Fleet on average, while a negative difference indicates that companies responding “yes” in 2019 to a given question had a higher 2022 %Fleet on average.
        i. For example, the mean difference for Q13.1/7 (Including severity in the road safety scorecard) is a positive value, whereas the mean difference for Q13.1/4 (Including percentage of fleet involved in collisions in the road safety scorecard) is a negative value. The positive value (5.5) indicates that the 2022 %Fleet was over 5 points lower for companies that included severity in the road safety scorecard in 2019. The negative value (-6.3) means that the 2022 %Fleet was over 6 points higher for companies that included percentage of fleet involved in collisions in 2019.
    b. The *p*-value represents the probability of getting the observed results if no relationship between the variables actually exists. The lower the *p*-value, the lower the probability of obtaining the results by chance.

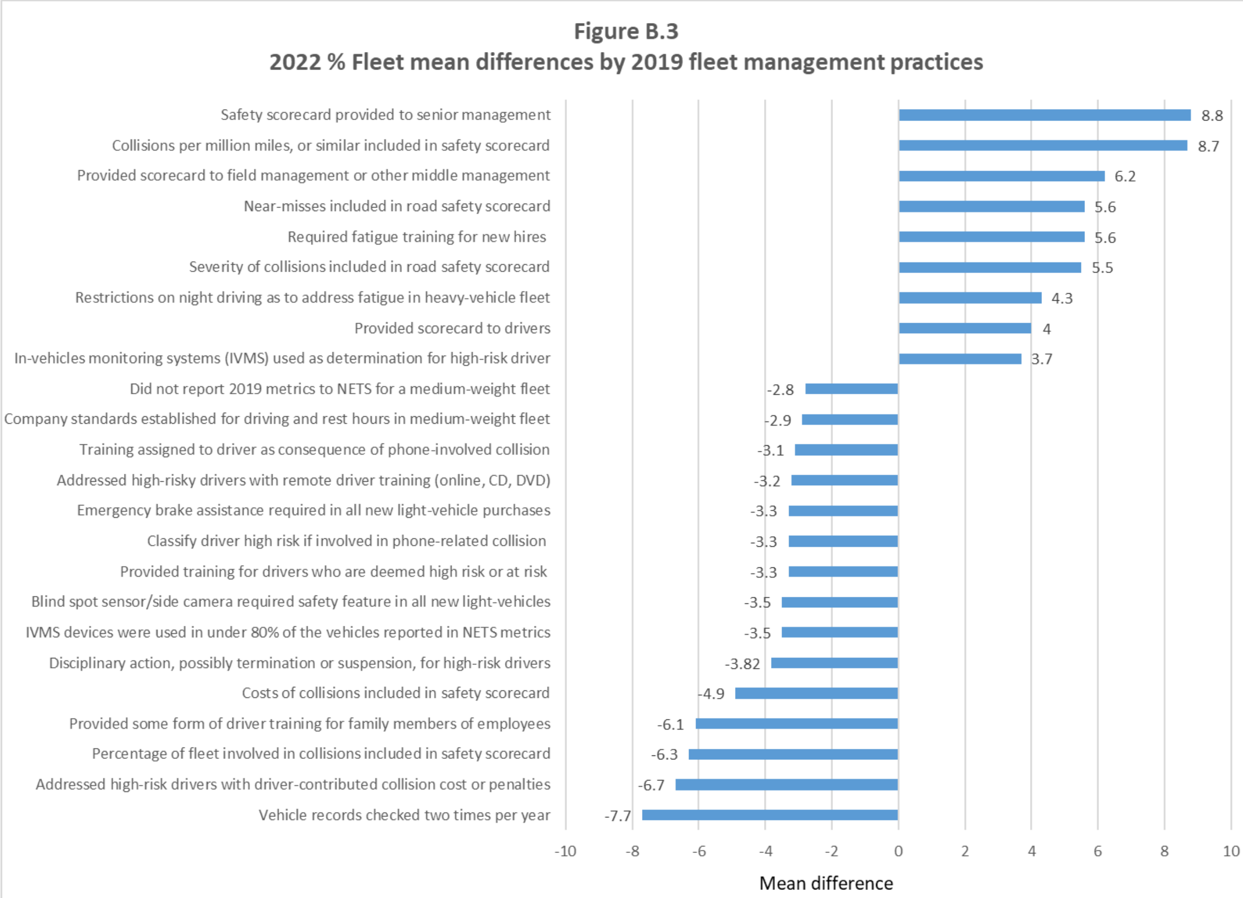
Table B.5
2019 Practices significantly associated with 2022 %Fleet

Question #/ Response Category	Fleet Safety Management Practice	Mean Difference
Q3	In 2019, for which of the following groups of drivers did you provide some form of driver training?	
Q3/3	Drivers who are deemed high risk or at risk	-3.3*
Q3/6	Family members of employees	-6.1*
Q4.1	In 2019, what were the sources of the information you used to classify drivers as "high risk"?	
Q4.1/1	In-vehicle monitoring systems (IVMS)	+3.7*
Q4.3	In 2019, how was your company responding when employee drivers were classified high risk?	
Q4.3/2	Remote driver training (online, CD, DVD)	-3.2*
Q4.3/8	Disciplinary action, possibly including termination or suspension	-3.8*
Q4.3/9	Driver-paid portion of collision costs, or other monetary penalty	-6.7**
Q7	Which of the following were included in your company's 2019 efforts to address fatigue as a safety concern in your light-vehicle fleet?	
Q7/4	Required fatigue training for new hires	+5.6*
Q8	Which of the following were included in your company's 2019 efforts to address fatigue as a safety concern in your medium-weight fleet (10,001 to 26,000 pounds)?	
Q8/1	We did not report 2019 metrics to NETS for a medium-weight fleet	-2.8*
Q8/3	Company standards established for driving and rest hours	-2.9*
Q9	Which of the following were included in your company's 2019 efforts to address fatigue as a safety concern in your heavy-vehicle fleet (over 26,000 pounds)?	
Q9/12	Restrictions on night driving	+4.3*
Q12.1	In the fleet for which you submitted metrics to NETS, which of the following best describes the extent of your use of IVMS technology in 2019?	
Q12.1/2	We were past the pilot stage in 2019, but IVMS devices were used in LESS THAN 80% of the vehicles that were included in our 2019 NETS metrics.	-3.5*
Q13.1	In 2019, which of the following data points were included on your road safety scorecard?	

Table B.5 (Continued)

Question #/ Response Category	Fleet Safety Management Practice	Mean Difference
Q13.1/4	Percentage of fleet involved in collisions	-6.3**
Q13.1/7	Severity	+5.5**
Q13.1/10	Near-misses	+5.6*
Q13.1/17	Costs of collisions	-4.9*
Q13.2	In 2019, to which of the following groups did you publish your scorecard?	
Q13.2/2	Senior management	+8.8**
Q13.2/3	Field management or other middle management	+6.2**
Q13.2/6	Drivers	+4.0*
Q15.2	What would happen if a driver were involved in a collision while talking on the phone, in violation of your written policy?	
Q15.2/6	Assign training	-3.1*
Q15.2/7	Classify driver high risk	-3.3*
Q20	In 2019, which of the following safety features were REQUIRED on ALL new purchases or leases of light-vehicles in your U.S. fleet?	
Q20/9	Blind spot sensor/side camera	-3.5*
Q20/15	Emergency brake assistance	-3.3*
Q21	In 2019, how often did your company check motor vehicle records for employees who drove company-owned or company-leased vehicles?	
Q21/3	Two times per year	-7.7**

*p<0.05, **p<0.01, ***p<0.001



As can be seen in Figure B.3, the largest positive mean difference was among organizations that provided the safety scorecard to senior management. These organizations had %Fleet rates of 8.8 points lower in 2022 compared to other NETS participants. Similarly, including collisions per million miles in the scorecard also was an indicator of %Fleet rates of 8.7 points lower in 2022. Including the two practices above, 6 out of the 10 most beneficial practices were related to the safety scorecard. Practices such as providing the scorecard to field management and to drivers, as well as including near-miss collisions and the severity of collisions suggest lower %Fleet mean scores in 2022 for NETS companies who participated in these practices. Furthermore, required fatigue training for new hires and restrictions on night driving in heavy-vehicle fleet were also significantly lower in %Fleet rates.

In contrast, the largest negative mean difference was experienced by organizations that checked vehicle records two times per year in 2019. These companies demonstrated %Fleet rates of 7.7 points higher in 2022 that other NETS participants. Additionally, practices such as addressing high-risk drivers with driver-contributed collision costs and penalties displayed %Fleet rates of 6.7 points higher than companies that did not participate in these practices. It’s important to note that 5 out of the 15 negative practices involved addressing high-risk drivers (e.g., disciplinary action, driver training, phone-related collisions, remote driver training). Furthermore, other practices experienced by organizations with higher %Fleet rates include using less than 80% of

IVMS devices (including blind spot/ side camera and emergency brake assistance functionality), training of driver's family members, and not reporting 2019 metrics to NETS for medium weight fleet. Several of these negative findings may appear counter intuitive. When interpreting these results, it is important to keep in mind that causality or the direction of causality should not be assumed. For example, companies with high %Fleet rates may have been prompted to adopt these practices in response to their higher rates rather than the implementation of the practices resulting in higher %Fleet.

Multivariable Regression Analysis: %Fleet

Multiple regression analysis determines how much of the variance in the outcome variable is explained by each of the predictor variables, while controlling for the influence of all the other variables. There is a strong statistically significant relationship between 2019 %Fleet and 2022 %Fleet, (r (55) = .65, $p < 0.01$). In other words, companies with low %Fleet rates in 2019 were more likely to also have low %Fleet rates in 2022. Using multiple regression, we can determine which 2019 program elements are most significantly associated with 2022 %Fleet after controlling for %Fleet performance in 2019. Given 2019 %Fleet is used as the first predictor in the regression model, the remaining predictors were identified through stepwise selection to maximize the amount of variance explained in the model.

In this analysis, %Fleet in 2019 is so strongly associated with %Fleet in 2022 that very little variance was left for other variables. Therefore, two models were performed to better understand the relationship between %Fleet in 2022 and program elements in 2019.

1. The first model included only one variable that was independently associated with %Fleet: %Fleet rate in 2019. This model was significant ($p < 0.001$) and explained 42% of the variance ($R^2 = 0.42$).
2. The second model did not include 2019 %Fleet and allowed for examination of one other variable that significantly contributed to predicting 2022 %Fleet. This variable includes: IVMS devices were used in less than 80% of the vehicles that were included in 2019 NETS metrics (12.1/2). This model was significant ($p < 0.05$) and explained 18% of the variance ($R^2 = 0.18$).

The first model aids in understanding the relationship between %Fleet levels in 2019 and 2022 but does not take into consideration any other 2019 program elements in the model. The second model displays the relationship between 2022 %Fleet and 2019 program elements but does not take into consideration the effects of %Fleet rates in 2019, hence, the lower proportion of the variance that can be attributed to the program elements. Therefore, caution should be taken when considering the effects of 2019 program elements with 2022 %Fleet without the control of 2019 %Fleet. The individual results of each model are shown in Table B.6, including the parameter estimates (beta values), standard errors, t-values, and significance levels.

Table B.6
Multivariable Regression Results – 2019 program elements and 2022 %Fleet

Variable	2019 Practice of program element	Beta	SE	t
Model 1				
%Fleet	%Fleet in 2019	0.61*	0.11	5.62
Model 2				
Q12.1/2	IVMS devices were used in less than 80% of the vehicles that were included in 2019 NETS metrics	3.54*	1.37	2.58

*$p < 0.05$

Conclusions: %Fleet

The 2019 %Fleet variable is a continuous variable, while IVMS devices being used in less than 80% of the vehicles that were included in 2019 NETS metrics is a categorical variable, which requires slightly different interpretations of their beta values. The following is a brief description of the interpretation of the regression findings:

Model 1:

- The beta value of 0.61 can be interpreted as follows: for every one-point increase in 2019 %Fleet levels, the 2022 %Fleet increases 0.61 points. The converse is also true, with every one-point decrease in 2019 %Fleet, a corresponding 0.61-point decrease in 2022 %Fleet occurs. This relationship was statistically significant ($p < 0.05$).

Model 2:

- IVMS devices being used in less than 80% of the vehicles that were included in 2019 NETS metrics is a categorical variable. Beta values are interpreted differently for categorical variables because these variables have a comparison group. Companies that used IVMS devices in less than 80% of the vehicles that were included in 2019 NETS metrics experienced 3.54 points lower in mean %Fleet in 2022 than companies that did not ($p < 0.05$).

As shown in Table B.5, the following 2019 practices were statistically significantly associated with 2022 %Fleet. A description of some of the main findings follows:

- Road Safety Scorecard:
    - Companies that provided the safety scorecard to senior management experienced 8.8 points lower in mean %Fleet than other NETS members in 2022 ($p < 0.01$). In contrast, companies that provided the scorecard to field management or other middle management in 2019 experienced mean %Fleet 6.2 points higher in 2022 ($p < 0.01$).
    - Companies that included collisions per million miles or similar in the safety scorecard achieved 8.7 points lower in mean %Fleet in 2022 ($p < 0.05$). In contrast, the inclusion of percentage of fleet involved in collisions was associated with mean %Fleet 6.3 points higher in 2022 ($p < 0.01$).
    - Companies that provided near-misses in the safety scorecard performed 5.6 points lower in mean %Fleet in 2022 ($p < 0.05$). Similarly, companies who included

severity of collisions in road safety scorecard experienced 5.5 lower in mean %Fleet than other NETS members in 2022 ($p < 0.01$). In contrast, companies that included cost of collision in their road safety scorecard experienced mean %Fleet 4.0 points higher in 2022 ($p < 0.05$).
  - Companies that provided the safety scorecard to drivers experienced 4.0 points lower in mean %Fleet in 2022 ($p < 0.05$).
- IVMS:
  - Companies reporting that IVMS devices were used in less than 80% of their vehicles in 2019 experienced mean %Fleet 3.5 points higher in 2022 ($p < 0.05$).
- Fatigue Management:
  - Companies that required restrictions on night driving in an effort to address fatigue in heavy-vehicle fleet achieved 4.3 points lower in mean %Fleet in 2022 than other NETS members who did not participate in this practice in 2019 ($p < 0.05$).
  - Companies who required fatigue training for new hires in their light vehicle fleet achieved 5.6 points lower in mean %Fleet in 2022 ($p < 0.05$).
  - Two fatigue management findings for medium-weight fleets resulted in higher mean %Fleet:
    - Companies that did not report medium-weight fleet metrics in 2019 experienced mean %Fleet 2.8 points higher in 2022 ($p < 0.05$).
    - Counter intuitively, companies reporting the establishment of driving and rest hour standards in 2019 experienced mean %Fleet 2.9 points higher in 2022 ($p < 0.05$). As noted previously, the causality of this finding should not be assumed. It is possible that companies with higher %Fleet were prompted to establish rest hour standards in response to higher rates.
- Driver Intervention/ Improvement:
  - Companies who used in-vehicle monitoring systems (IVMS) as determination for high-risky drivers scored 3.7 points lower in mean %Fleet in 2022 than other NETS members who did not participate in this practice in 2019 ($p < 0.05$).
  - Several high-risk driver intervention practices in 2019 were associated with higher mean %Fleet in 2022. When interpreting these apparently counter intuitive results, it is important to keep in mind that causality or the direction of causality should not be assumed. For example, companies with high %Fleet may have been prompted to adopt these practices in response to their higher rates rather than the implementation of the practices resulting in higher %Fleet.
    - Companies that provided some form of driver training in 2019 to drivers deemed as high-risk experienced mean %Fleet 3.3 points higher in 2022 ($p < 0.05$). Similarly, companies that responded to high-risk drivers by providing remote driver training (online, CD, DVD) experienced mean %Fleet 3.2 points higher in 2022 ($p < 0.05$).
    - Companies that imposed disciplinary action (including the possibility of termination) in response to high-risk driver classification experienced

mean %Fleet 3.82 points higher in 2022 ($p < 0.05$). Similarly, companies that imposed monetary penalties to cover collision costs in 2019 experienced mean %Fleet 6.7 points higher in 2022 ($p < 0.01$).

        - Companies that checked motor-vehicle records two times a year for employees who drove company vehicles experienced mean %Fleet 7.7 points higher in 2022 ($p < 0.01$).

- Cell Phone Policy:
    - Two cell phone policy practices in 2019 were associated with higher mean %Fleet in 2022. As noted above, caution should be used when interpreting potentially counter intuitive findings.
        - Companies that assigned training to drivers in 2019 in response to a collision involving a driver talking on their phone experienced mean %Fleet 3.1 points higher in 2022 ($p < 0.05$). Similarly, companies that classified drivers as high risk because of a cell phone related collision experienced mean %Fleet 3.3 points higher in 2022 ($p < 0.05$).
- Required Safety Features:
    - Two required safety features on all new purchases of light-vehicles in 2019 were associated with higher mean %Fleet in 2022. As noted above, caution should be used when interpreting potentially counter intuitive findings.
        - Companies that required blind spot sensor/side cameras in 2019 experienced mean %Fleet 3.5 points higher in 2022 ($p < 0.05$). Similarly, companies that required emergency brake assistance experienced mean %Fleet 3.3 points higher in 2022 ($p < 0.05$).

NOTE: As with other analyses, these results do not suggest that adopting a given practice in any given company resulted in a reduction in %Fleet similar to the mean difference shown in Table B.5. Likewise, the results do not suggest that adopting a given practice in the future will result in a reduction similar to the mean difference. Causal connections cannot be made given the existing data and analyses.

Overall Conclusions

The most valuable 2019 practices and policies related to 2022 CPMM, IPMM, and %Fleet focused on the road safety scorecard and fatigue management:

- Road Safety Scorecard:
  - Companies that provided the safety scorecard to senior management were associated with lower mean CPMM and %Fleet in 2022. In addition, providing the scorecard to drivers was associated with lower mean %Fleet in 2022.
  - Companies that included near-miss collisions and severity of collisions in the safety scorecard were associated with lower mean CPMM and %Fleet in 2022.
  - Companies that provided collisions per million miles or similar in the safety scorecard were associated with lower mean CPMM, IPMM, and %Fleet in 2022 than other NETS members who did not participate in this practice.
- Fatigue Management:
  - Companies that required fatigue training for new hires were associated with lower mean CPMM and %Fleet in 2022.
  - Companies with night driving restrictions were associated with lower CPMM %Fleet in 2022.

When considering practices across CPMM, IPMM, and %Fleet, 12 out of the 20 most beneficial practices overall focused on the safety scorecard content and who it was provided to. Five out of the remaining 20 practices focused on fatigue management practices across CPMM, IPMM, and %Fleet.

A number of 2019 practices and policies were found to be negatively related to CPMM, IPMM, and %Fleet. When interpreting these negative findings, one must judge if the finding represents the identification of a truly ineffective practice or if the finding is counter intuitive. When interpreting apparently counter intuitive results it is important to keep in mind that causality or the direction of causality should not be assumed. For example, companies with a high crash or injury rate may have been prompted to adopt these practices in response to their higher rates rather than the implementation of the practices resulting in a higher rate. Because of this ambiguity, the decision to adopt these negatively associated practices needs to be done with care to ensure the practice is consistent with the overall fleet safety management strategy of the company.

Of note were several collision response practices that were negatively related to CPMM, and high-risk driver practices that were negatively related to %Fleet:

- Collision Response:
  - Using driver-and-collision-related metrics used in statistically validated predictive models in 2019 was associated with higher mean CPMM in 2022.
  - Conducting commentary drives following a collision in 2019 was associated with higher mean CPMM in 2022.
  - Assigning training to drivers in response to a collision involving an infraction of the cell phone policy in 2019 was associated with higher mean CPMM in 2022.

- High Risk Drivers:
    - Providing training to drivers deemed as high risk and, in particular, remote training (online, CD, DVD) in 2019 is associated with higher mean %Fleet in 2022.
    - Disciplining high risk drivers or imposing monetary penalties on high-risk drivers in 2019 was associated with higher mean %Fleet in 2022.
    - Classifying drivers following a collision involving a violation of the cell phone policy was associated with higher mean %Fleet in 2022.

APPENDIX 3: PROGRAM SURVEY RESPONSES

About the Program Survey

The program survey asks a wide range of questions about what programs and policies are in place in member organizations. Questions are primarily multiple choice, although some questions leave room for limited written commentary. As much as possible, questions remain consistent from year to year, but when necessary new choices are added or wording is revised to improve the clarity of specific questions.

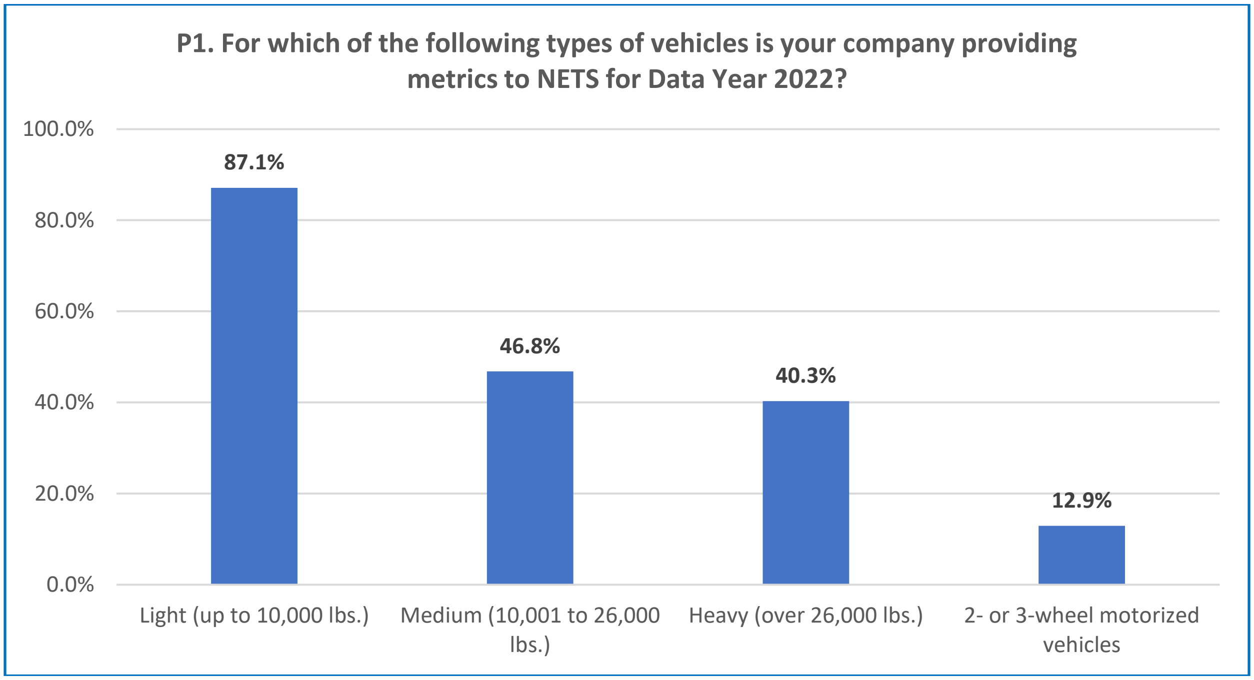
In this section we have graphed, in a simple format, total responses to most survey questions. (Not all survey questions lend themselves to be graphed. For example, "total number of countries where each company has a fleet presence" would be difficult to show all responses in a graph format so those questions are not included.)

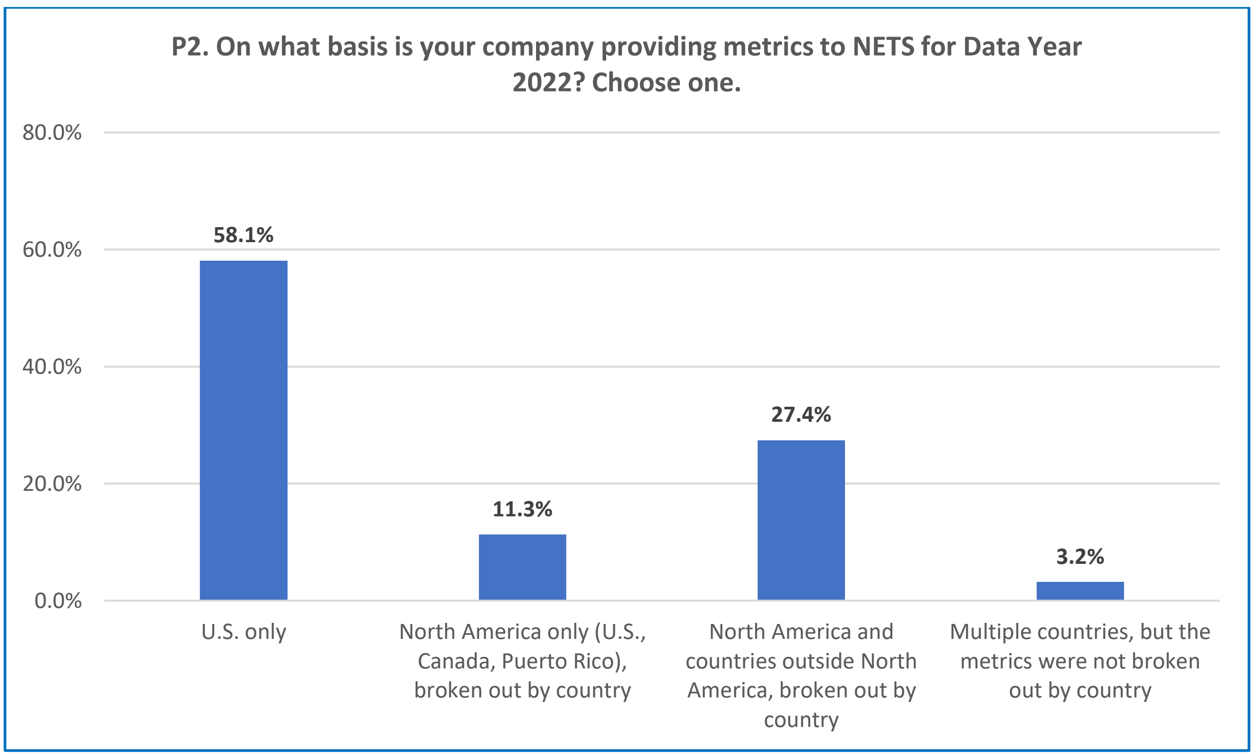
The graphs do include:

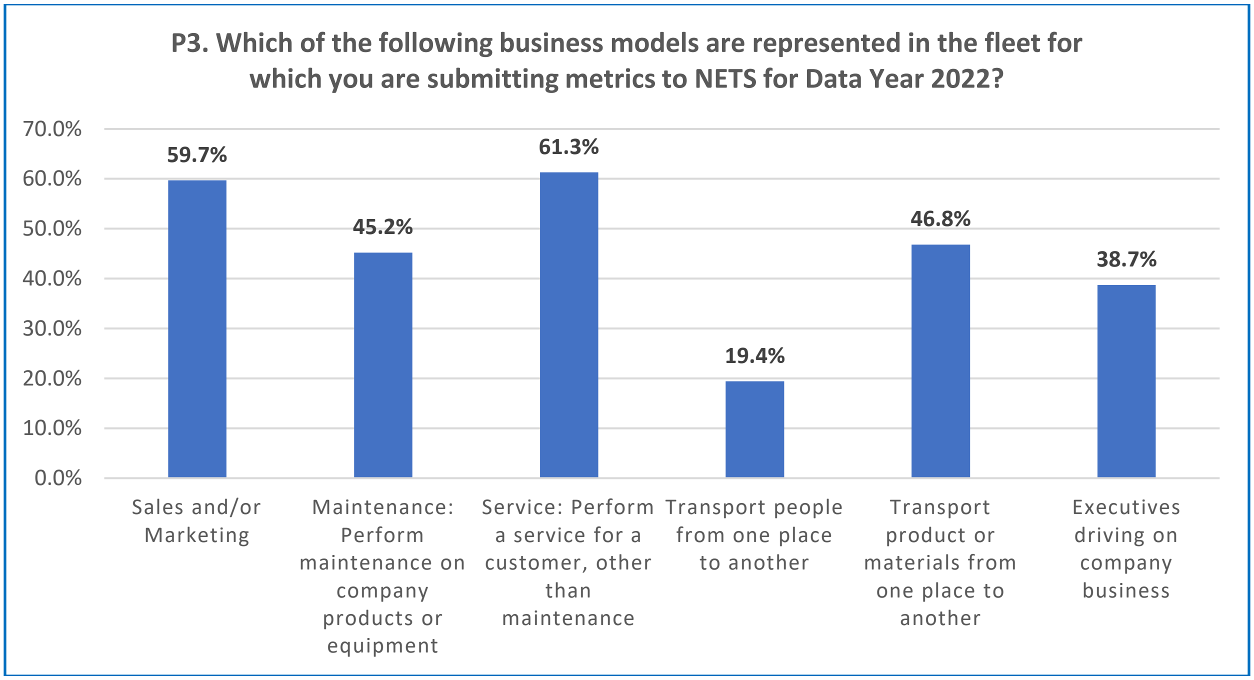
- Preliminary questions that describe the data the company submitted for Data Year 2022
- Questions about practices/programs that are currently in place

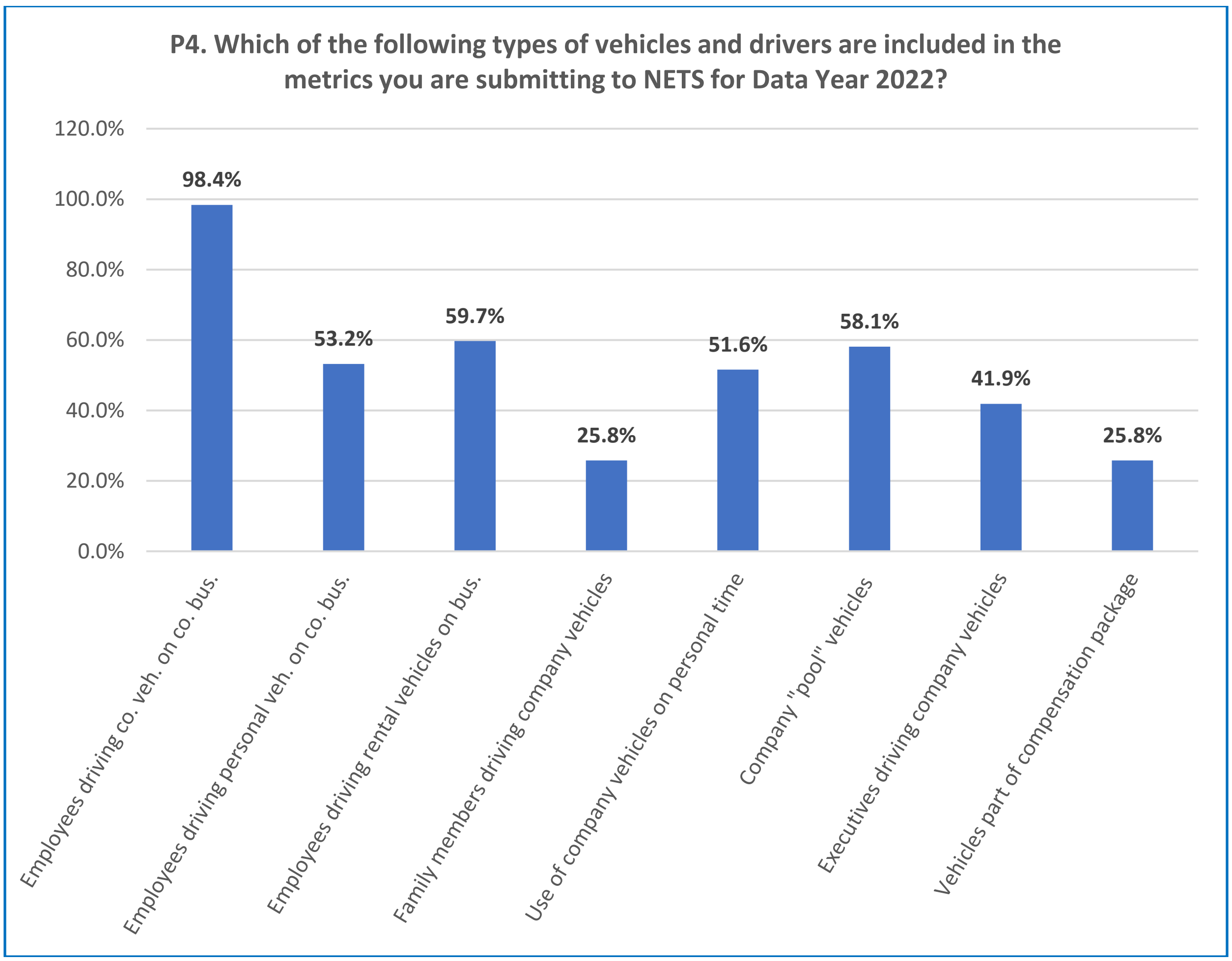
The text for survey questions and responses has been abbreviated in many cases so that it fits on the graph. Please refer to the Data Year 2022 NETS Questionnaire for the full text for all questions.

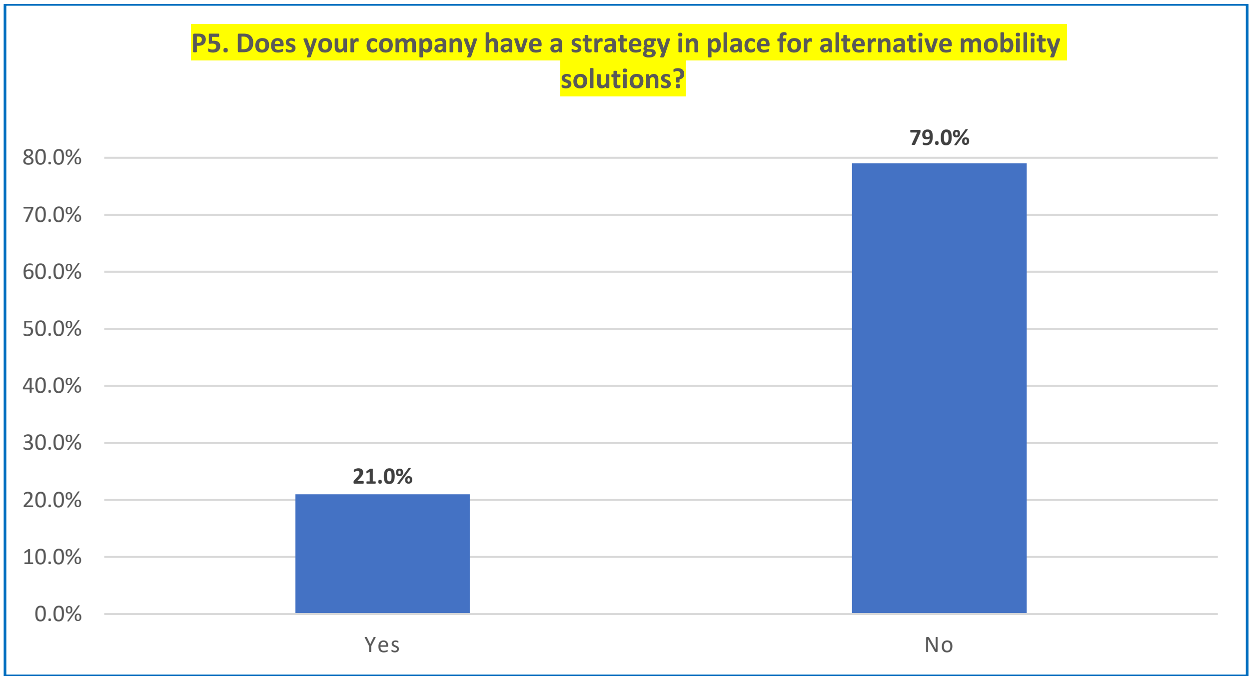
*Note: Not all percentages in the graphs add up to 100% because some questions had more than one possible choice.

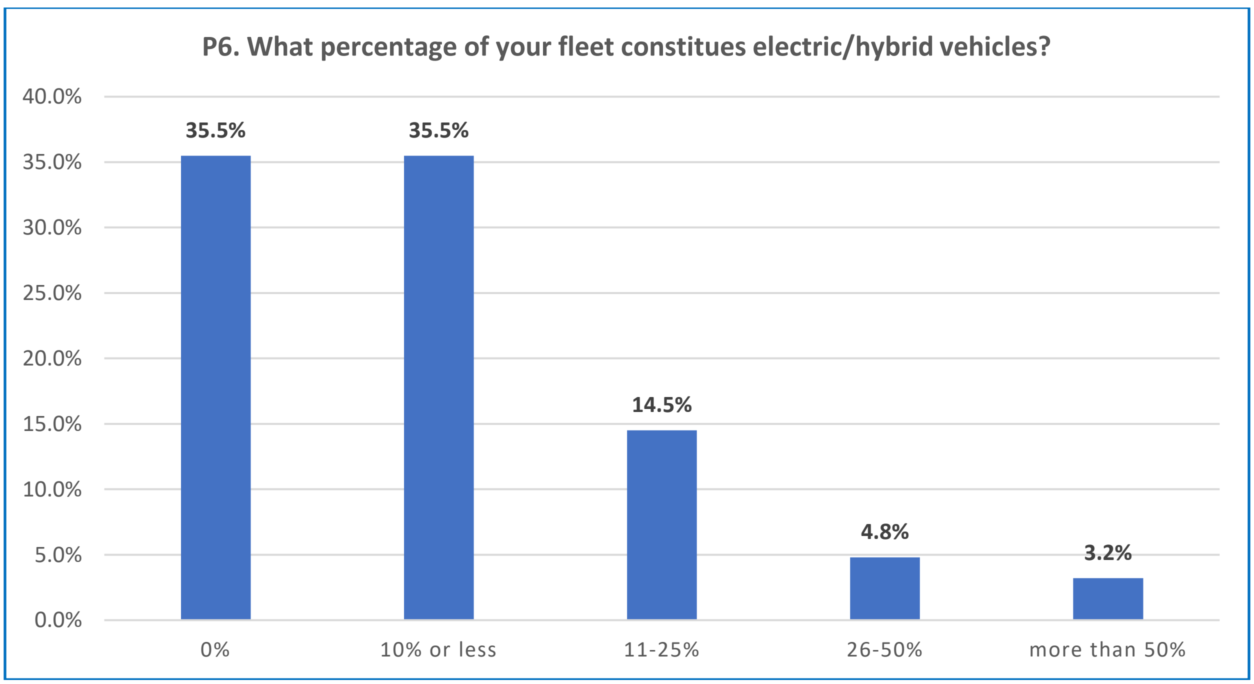

P1. For which of the following types of vehicles is your company providing metrics to NETS for Data Year 2022?
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
87.1%
46.8%
40.3%
12.9%
Light (up to 10,000 lbs.)
Medium (10,001 to 26,000 lbs.)
Heavy (over 26,000 lbs.)
2- or 3-wheel motorized vehicles

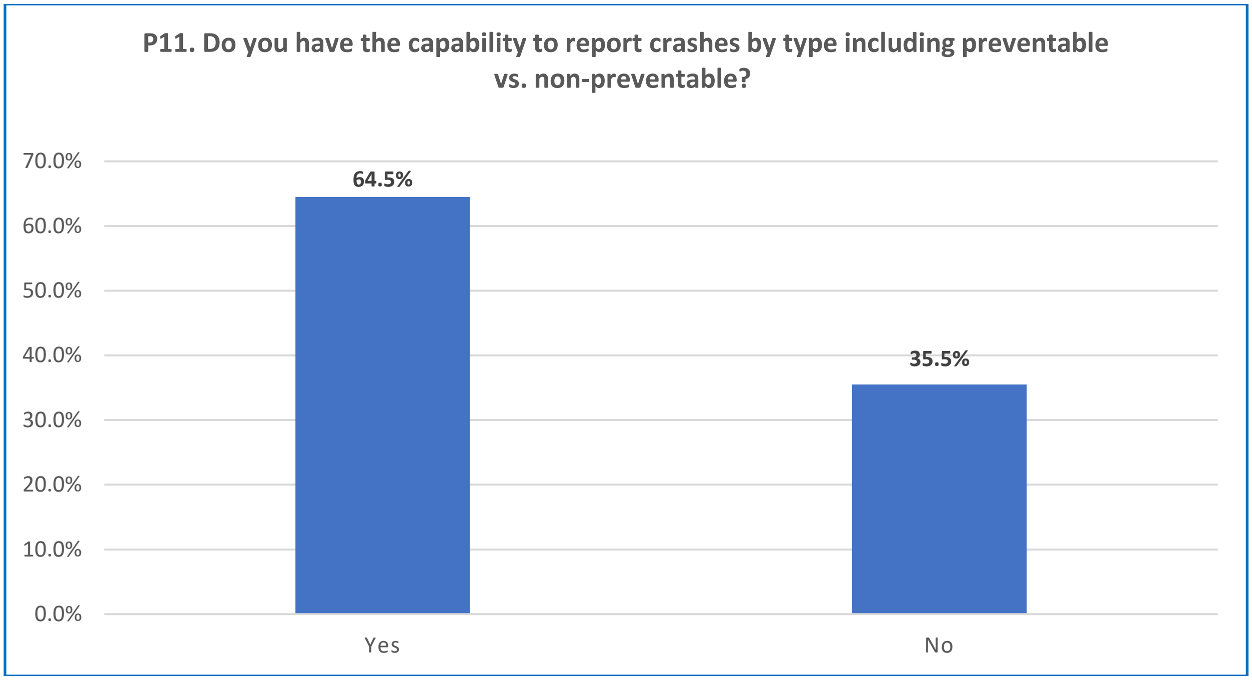

P2. On what basis is your company providing metrics to NETS for Data Year 2022? Choose one.
80.0%
60.0%
40.0%
20.0%
0.0%
58.1%
11.3%
27.4%
3.2%
U.S. only
North America only (U.S., Canada, Puerto Rico), broken out by country
North America and countries outside North America, broken out by country
Multiple countries, but the metrics were not broken out by country


P3. Which of the following business models are represented in the fleet for which you are submitting metrics to NETS for Data Year 2022?
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
59.7%
45.2%
61.3%
19.4%
46.8%
38.7%
Sales and/or Marketing
Maintenance: Perform maintenance on company products or equipment
Service: Perform a service for a customer, other than maintenance
Transport people from one place to another
Transport product or materials from one place to another
Executives driving on company business

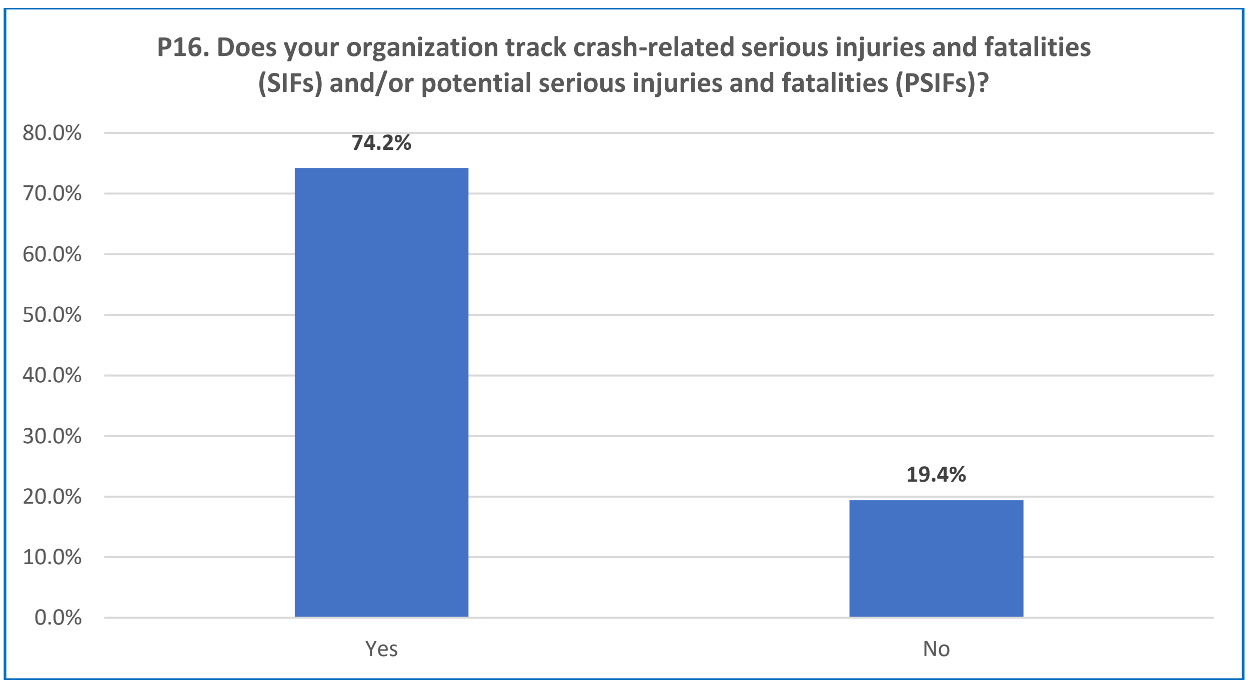

P4. Which of the following types of vehicles and drivers are included in the metrics you are submitting to NETS for Data Year 2022?
120.0%
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
98.4%
53.2%
59.7%
25.8%
51.6%
58.1%
41.9%
25.8%
Employees driving co. veh. on co. bus.
Employees driving personal veh. on co. bus.
Employees driving rental vehicles on bus.
Family members driving company vehicles
Use of company vehicles on personal time
Company "pool" vehicles
Executives driving company vehicles
Vehicles part of compensation package


P5. Does your company have a strategy in place for alternative mobility solutions?
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
21.0%
79.0%
Yes
No

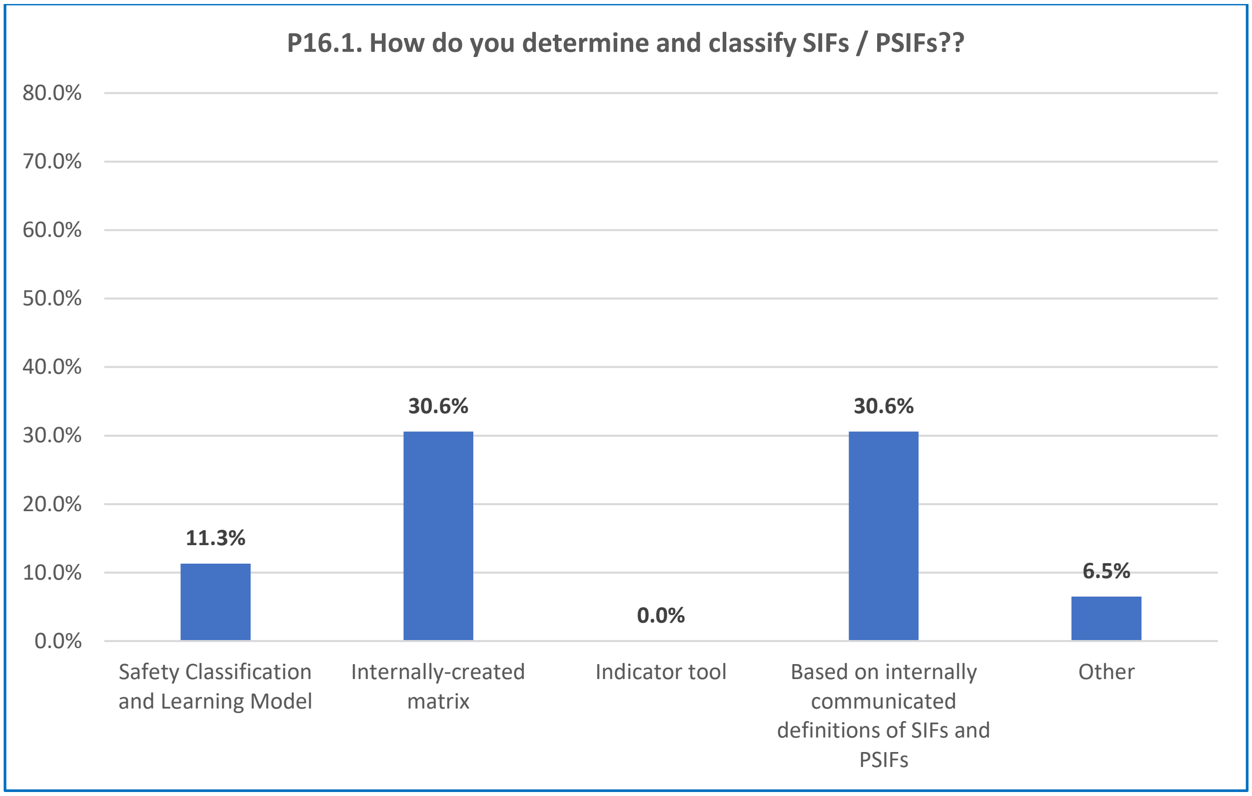

P6. What percentage of your fleet constitues electric/hybrid vehicles?
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
35.5%
35.5%
14.5%
4.8%
3.2%
0%
10% or less
11-25%
26-50%
more than 50%

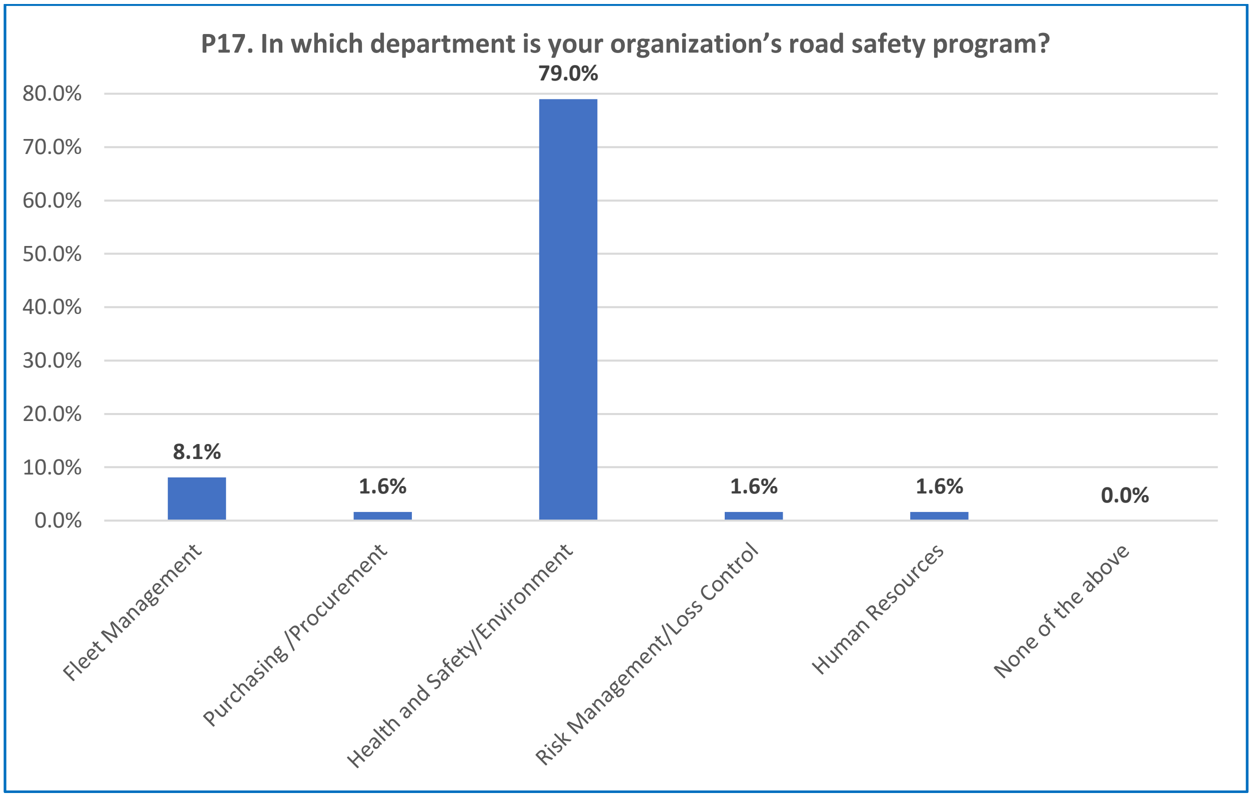


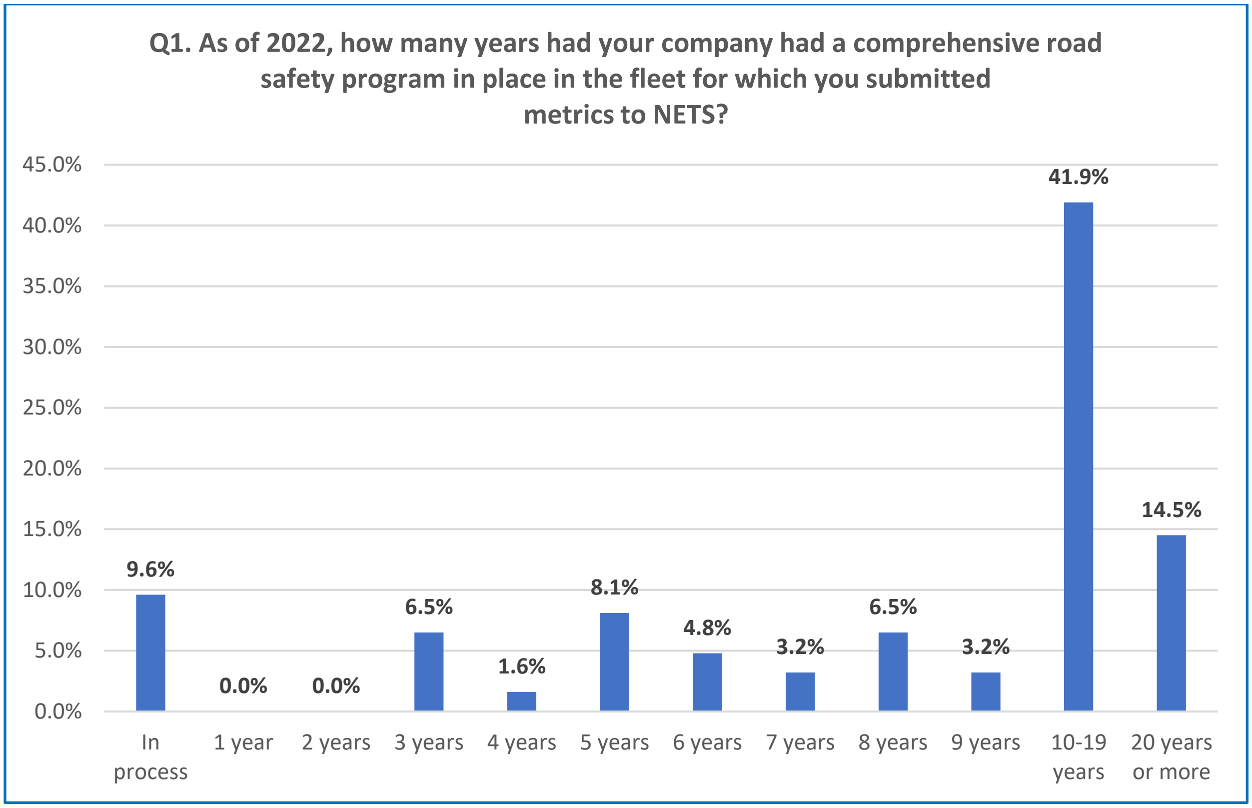
P11. Do you have the capability to report crashes by type including preventable vs. non-preventable?
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
64.5%
35.5%
Yes
No

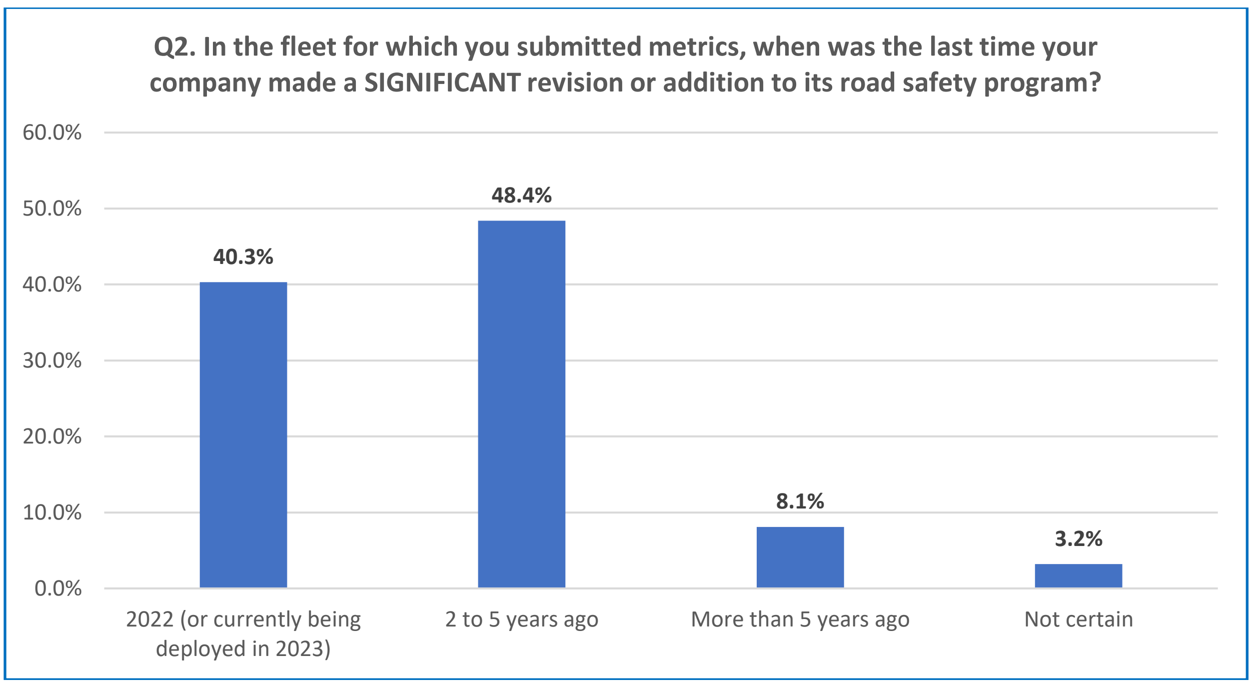


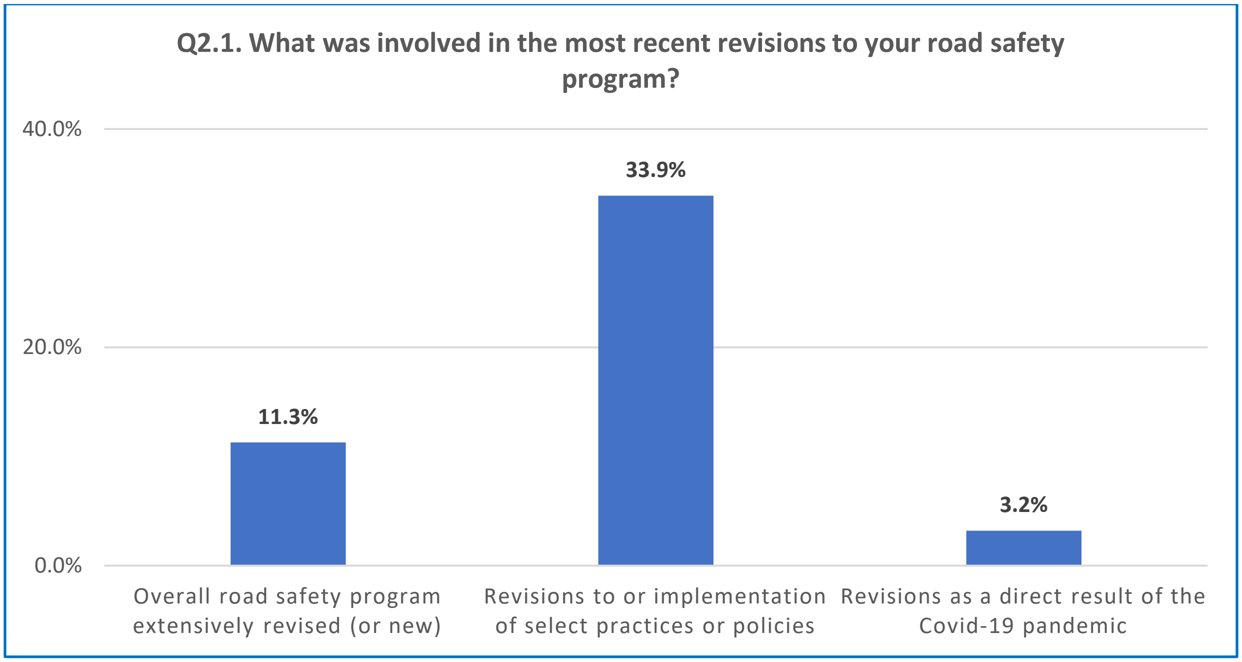
P16. Does your organization track crash-related serious injuries and fatalities (SIFs) and/or potential serious injuries and fatalities (PSIFs)?
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
74.2%
19.4%
Yes
No

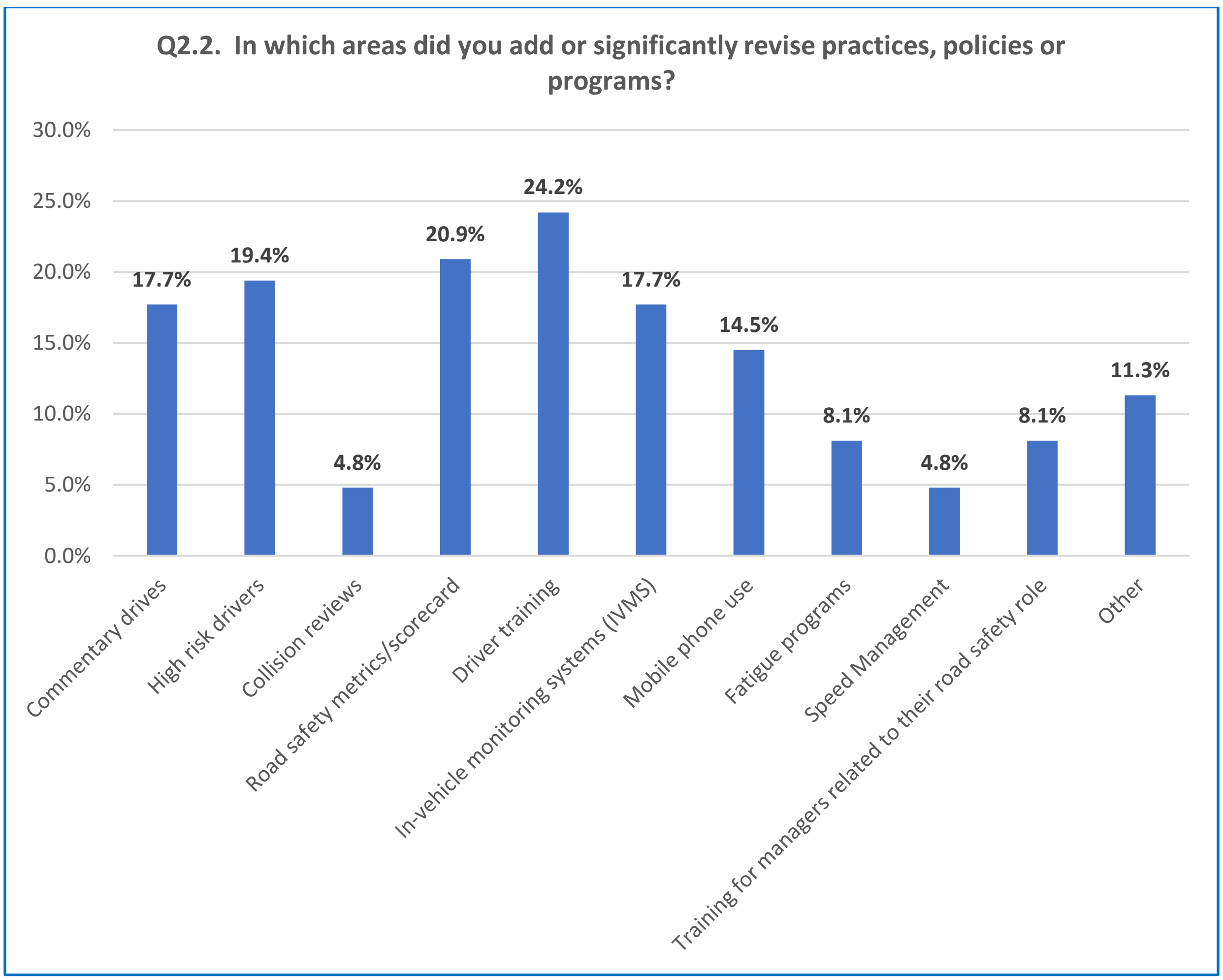

P16.1. How do you determine and classify SIFs / PSIFs??
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
11.3%
30.6%
0.0%
30.6%
6.5%
Safety Classification and Learning Model
Internally-created matrix
Indicator tool
Based on internally communicated definitions of SIFs and PSIFs
Other

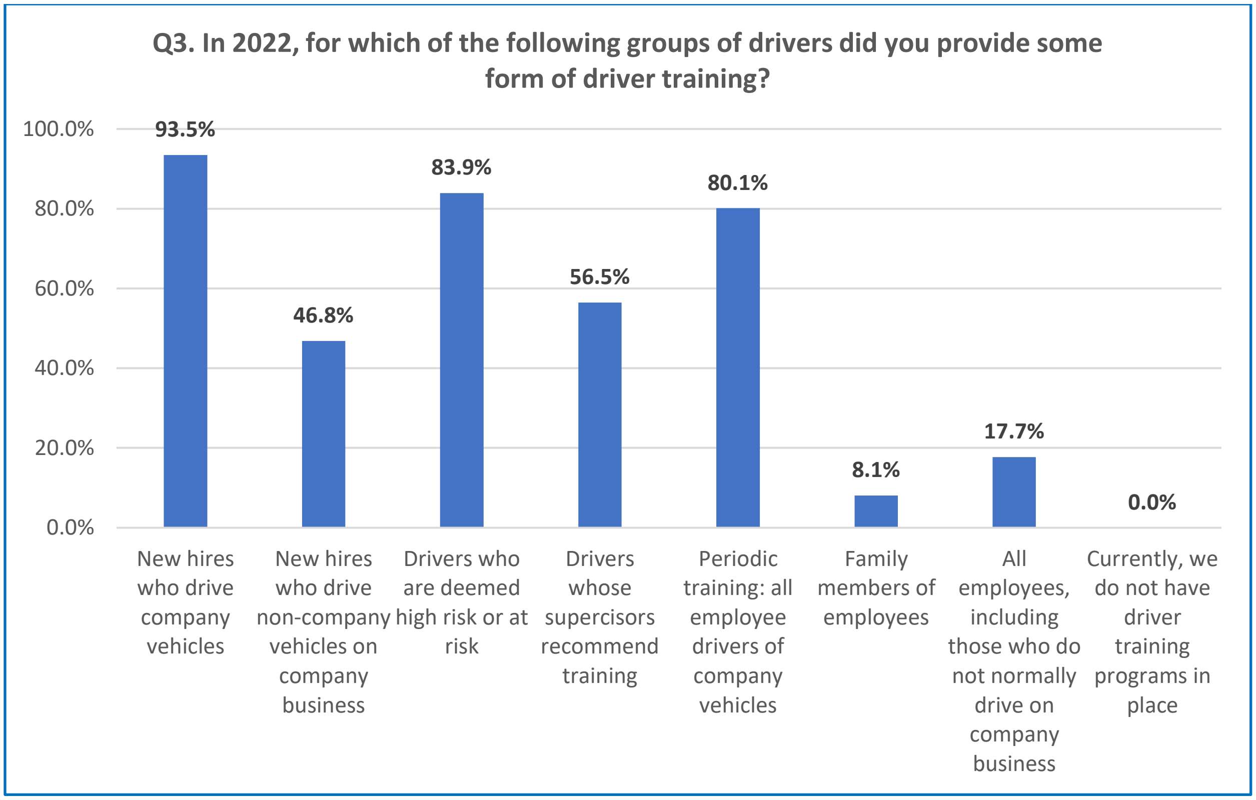

P17. In which department is your organization's road safety program?
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
8.1%
1.6%
79.0%
1.6%
1.6%
0.0%
Fleet Management
Purchasing /Procurement
Health and Safety/Environment
Risk Management/Loss Control
Human Resources
None of the above

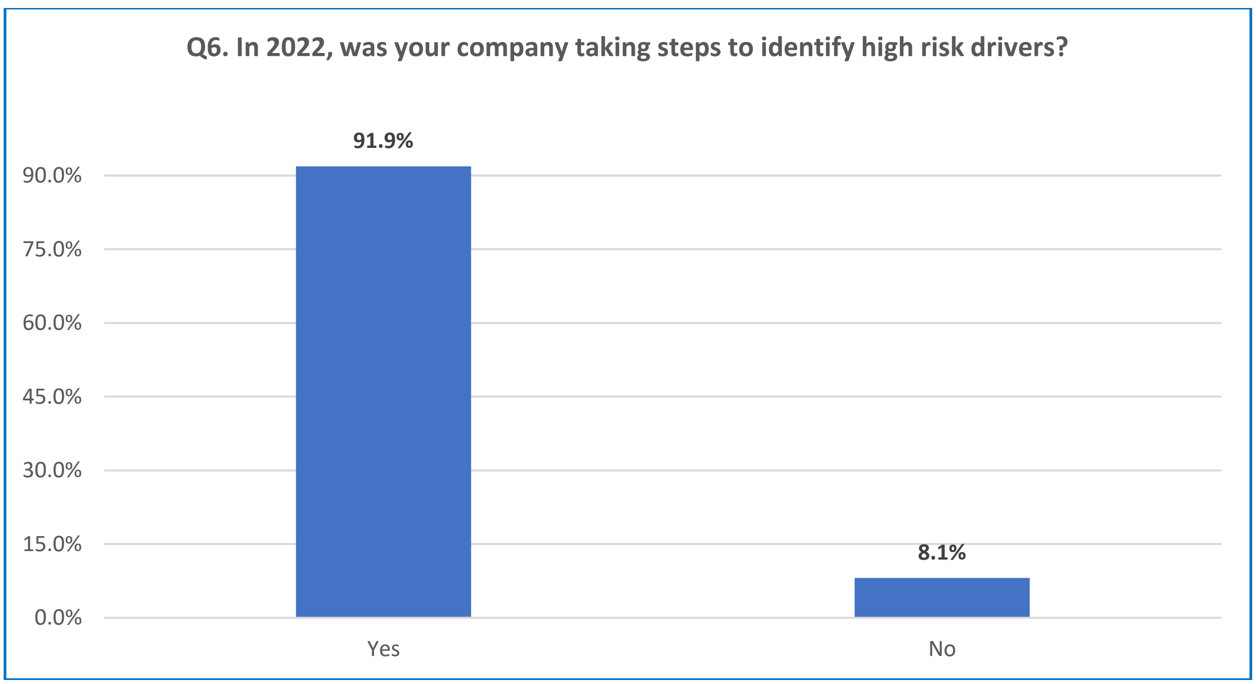

Q1. As of 2022, how many years had your company had a comprehensive road safety program in place in the fleet for which you submitted metrics to NETS?
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
9.6%
0.0%
0.0%
6.5%
1.6%
8.1%
4.8%
3.2%
6.5%
3.2%
41.9%
14.5%
In process
1 year
2 years
3 years
4 years
5 years
6 years
7 years
8 years
9 years
10-19 years
20 years or more

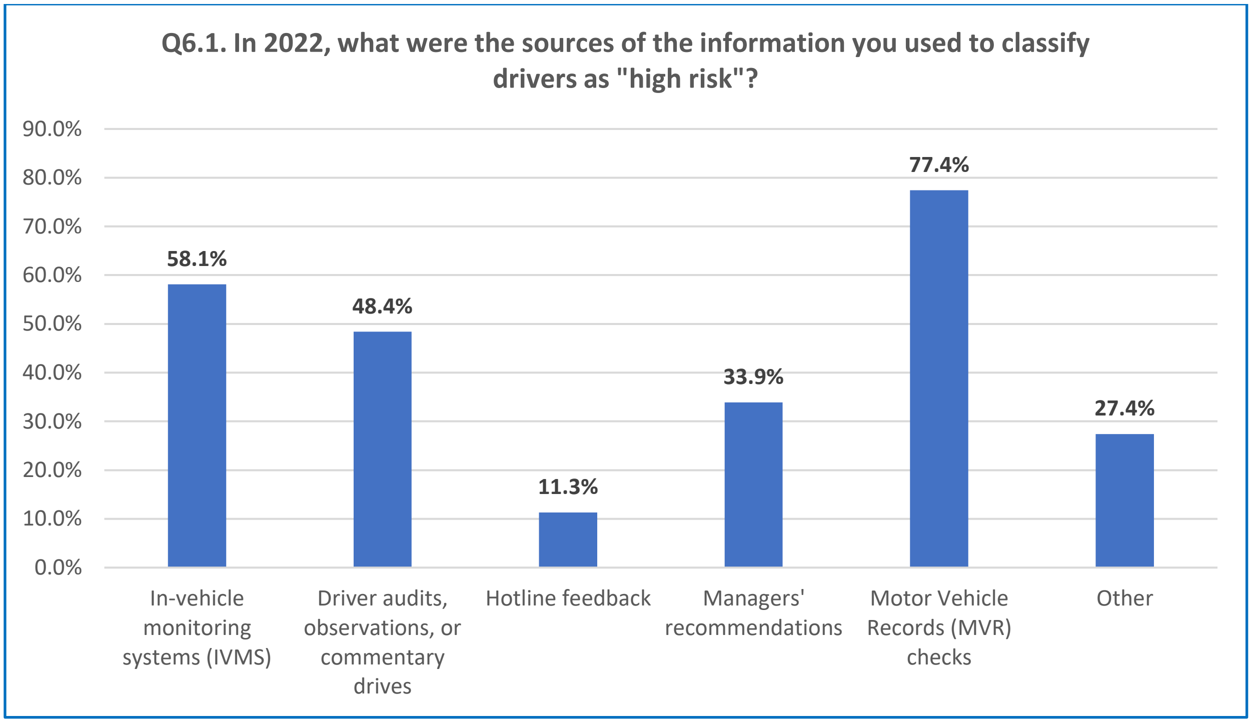

Q2. In the fleet for which you submitted metrics, when was the last time your company made a SIGNIFICANT revision or addition to its road safety program?
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
40.3%
48.4%
8.1%
3.2%
2022 (or currently being deployed in 2023)
2 to 5 years ago
More than 5 years ago
Not certain

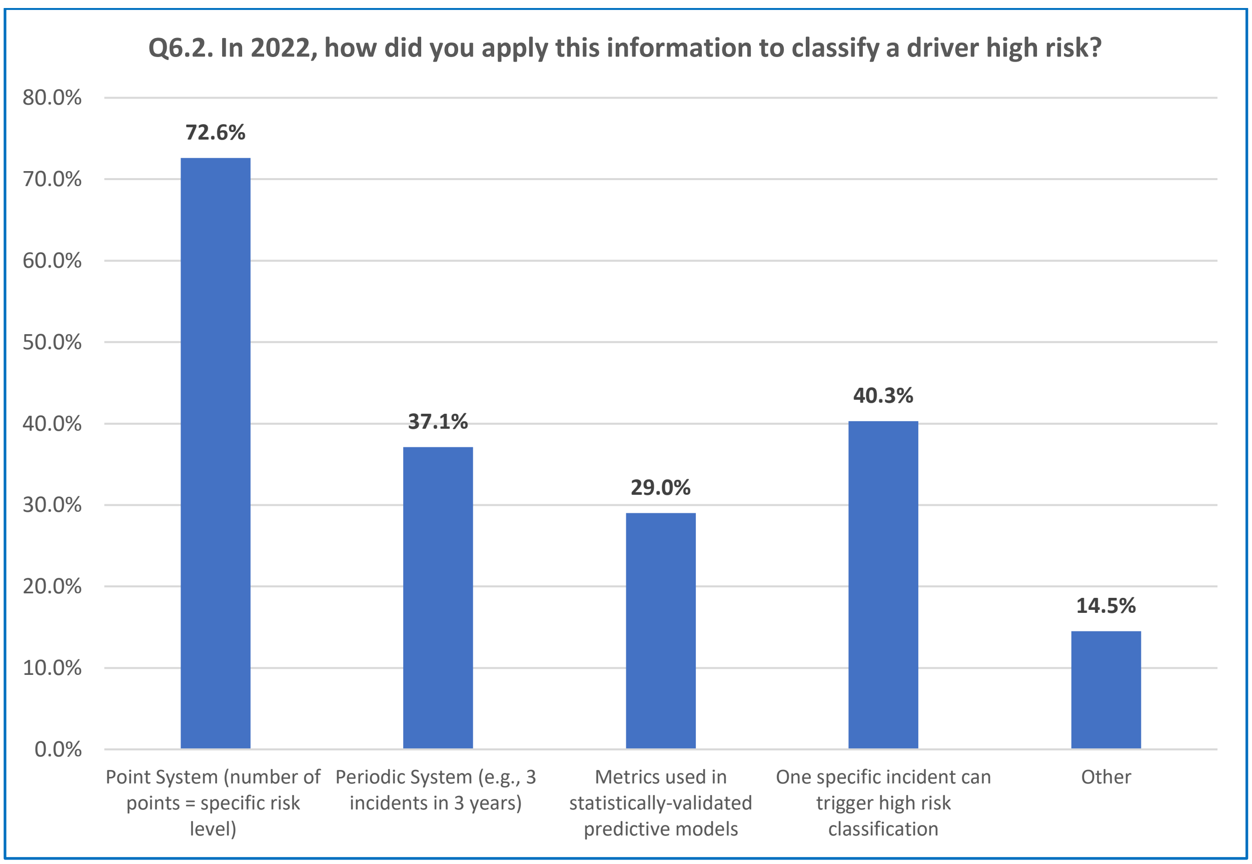

Q2.1. What was involved in the most recent revisions to your road safety program?
40.0%
20.0%
0.0%
11.3%
33.9%
3.2%
Overall road safety program extensively revised (or new)
Revisions to or implementation of select practices or policies
Revisions as a direct result of the Covid-19 pandemic

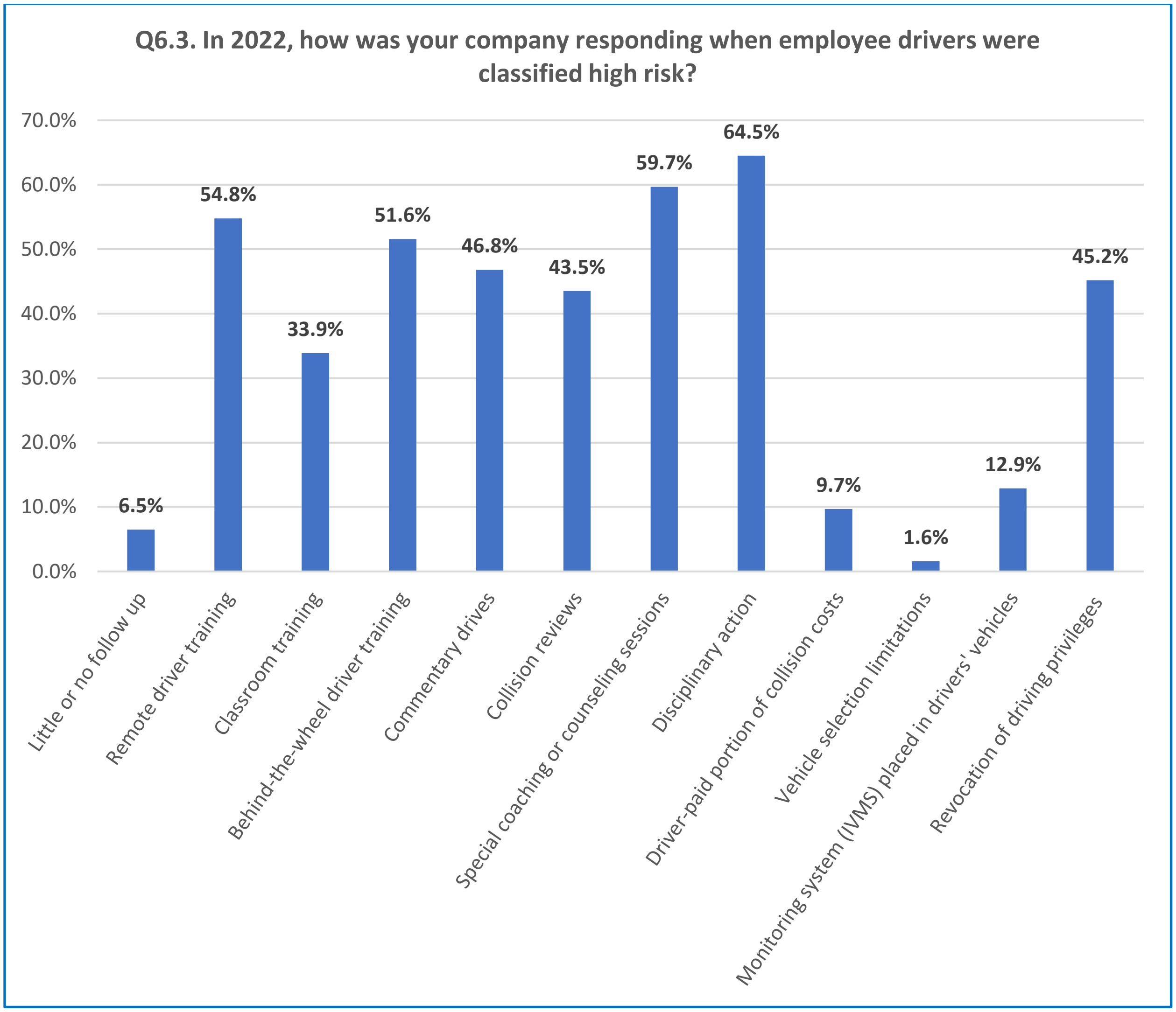

Q2.2. In which areas did you add or significantly revise practices, policies or programs?
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
17.7%
19.4%
4.8%
20.9%
24.2%
17.7%
14.5%
8.1%
4.8%
8.1%
11.3%
Commentary drives
High risk drivers
Collision reviews
Road safety metrics/scorecard
Driver training
In-vehicle monitoring systems (IVMS)
Mobile phone use
Fatigue programs
Speed Management
Training for managers related to their road safety role
Other

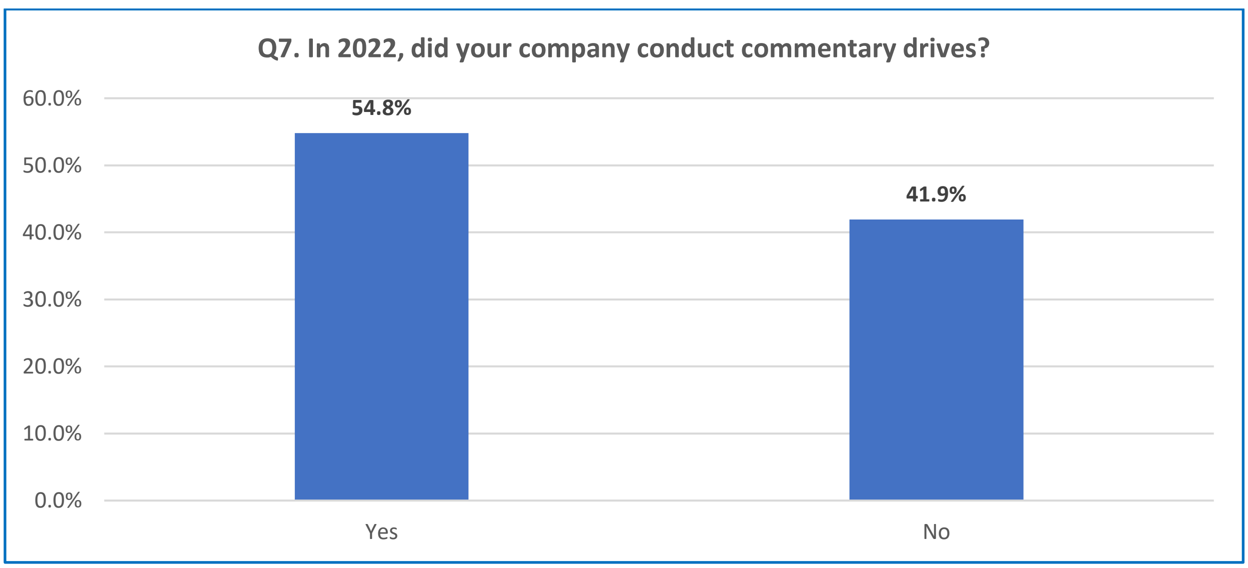

Q3. In 2022, for which of the following groups of drivers did you provide some form of driver training?
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
93.5%
46.8%
83.9%
56.5%
80.1%
8.1%
17.7%
0.0%
New hires who drive company vehicles
New hires who drive non-company vehicles on company business
Drivers who are deemed high risk or at risk
Drivers whose supercisors recommend training
Periodic training: all employee drivers of company vehicles
Family members of employees
All employees, including those who do not normally drive on company business
Currently, we do not have driver training programs in place

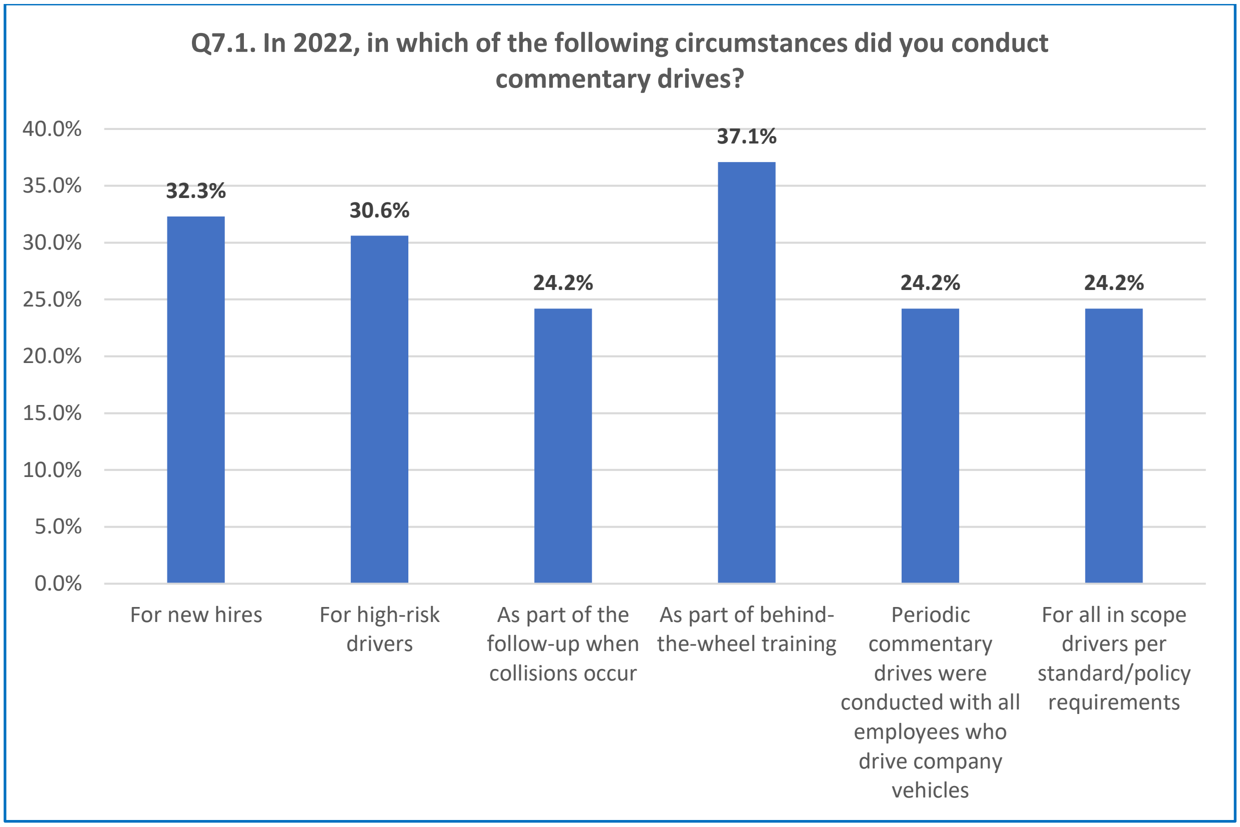

Q6. In 2022, was your company taking steps to identify high risk drivers?
90.0%
75.0%
60.0%
45.0%
30.0%
15.0%
0.0%
91.9%
8.1%
Yes
No

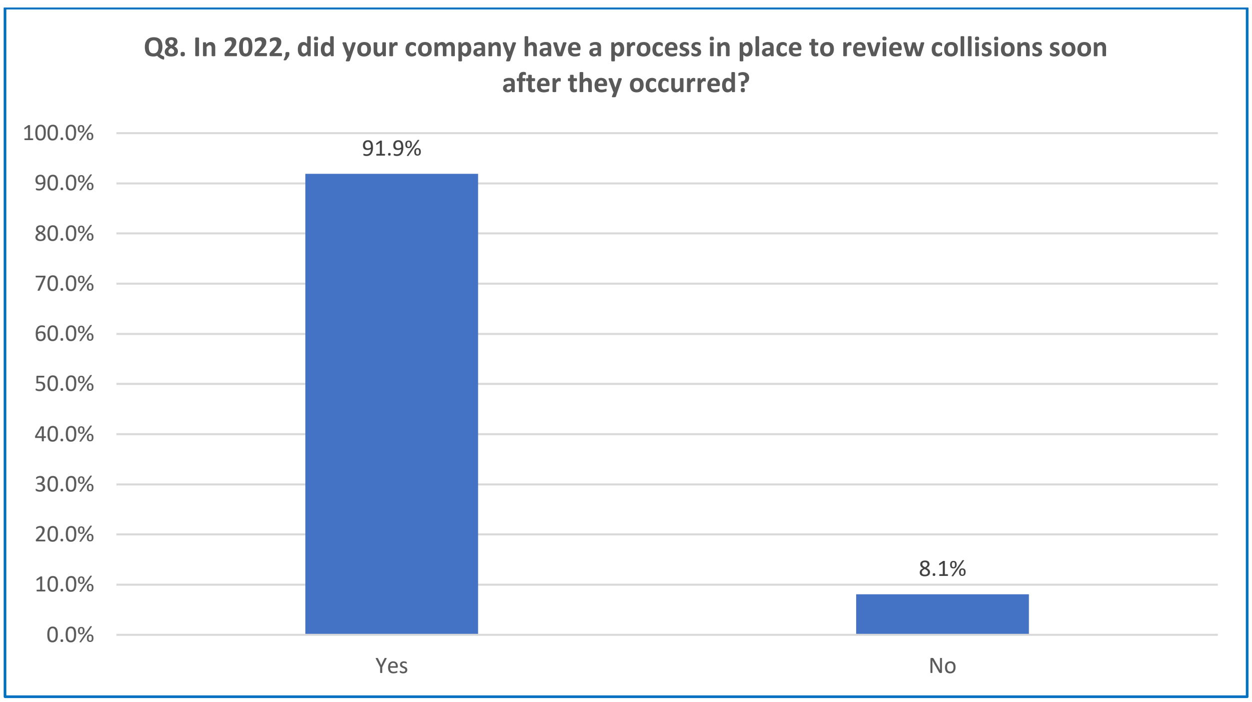

Q6.1. In 2022, what were the sources of the information you used to classify drivers as "high risk"?
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
58.1%
48.4%
11.3%
33.9%
77.4%
27.4%
In-vehicle monitoring systems (IVMS)
Driver audits, observations, or commentary drives
Hotline feedback
Managers' recommendations
Motor Vehicle Records (MVR) checks
Other

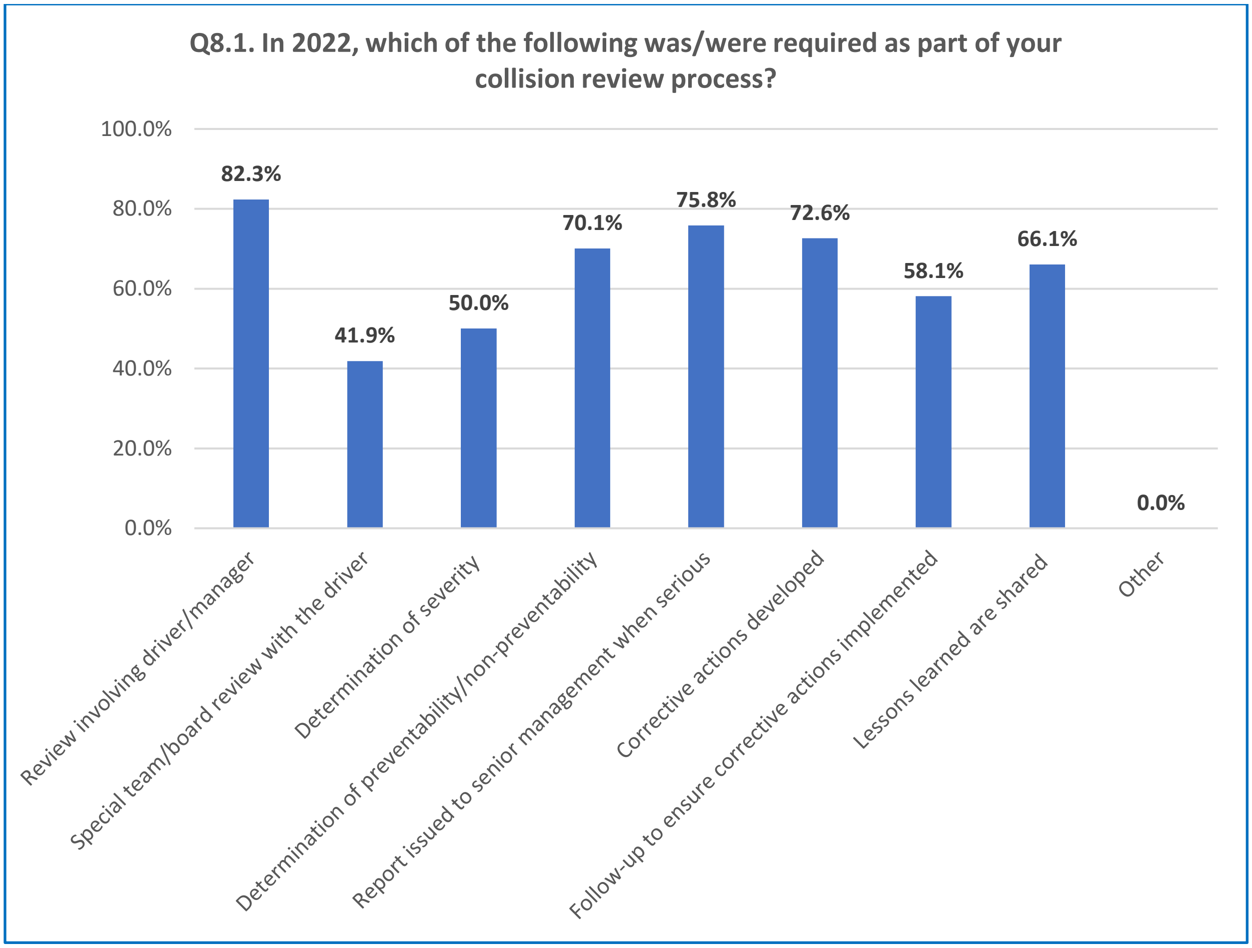

Q6.2. In 2022, how did you apply this information to classify a driver high risk?
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
72.6%
37.1%
29.0%
40.3%
14.5%
Point System (number of points = specific risk level)
Periodic System (e.g., 3 incidents in 3 years)
Metrics used in statistically-validated predictive models
One specific incident can trigger high risk classification
Other

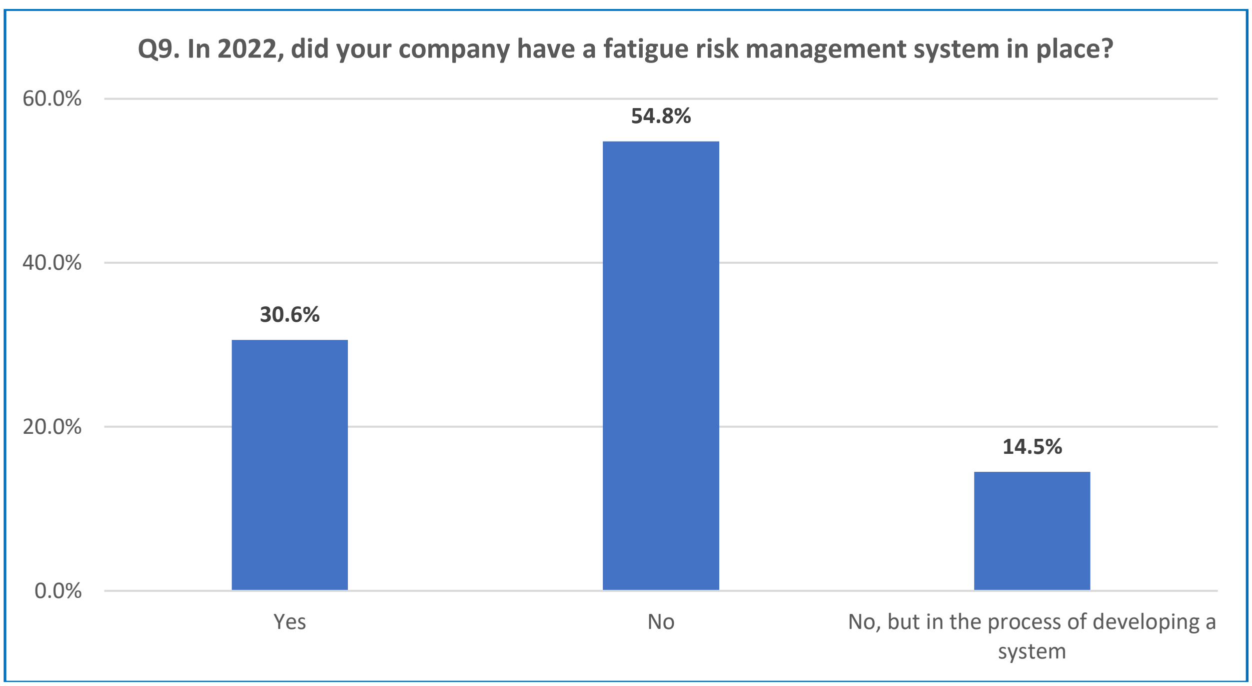

Q6.3. In 2022, how was your company responding when employee drivers were classified high risk?
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
6.5%
54.8%
33.9%
51.6%
46.8%
43.5%
59.7%
64.5%
9.7%
1.6%
12.9%
45.2%
Little or no follow up
Remote driver training
Classroom training
Behind-the-wheel driver training
Commentary drives
Collision reviews
Special coaching or counseling sessions
Disciplinary action
Driver-paid portion of collision costs
Vehicle selection limitations
Monitoring system (IVMS) placed in drivers' vehicles
Revocation of driving privileges

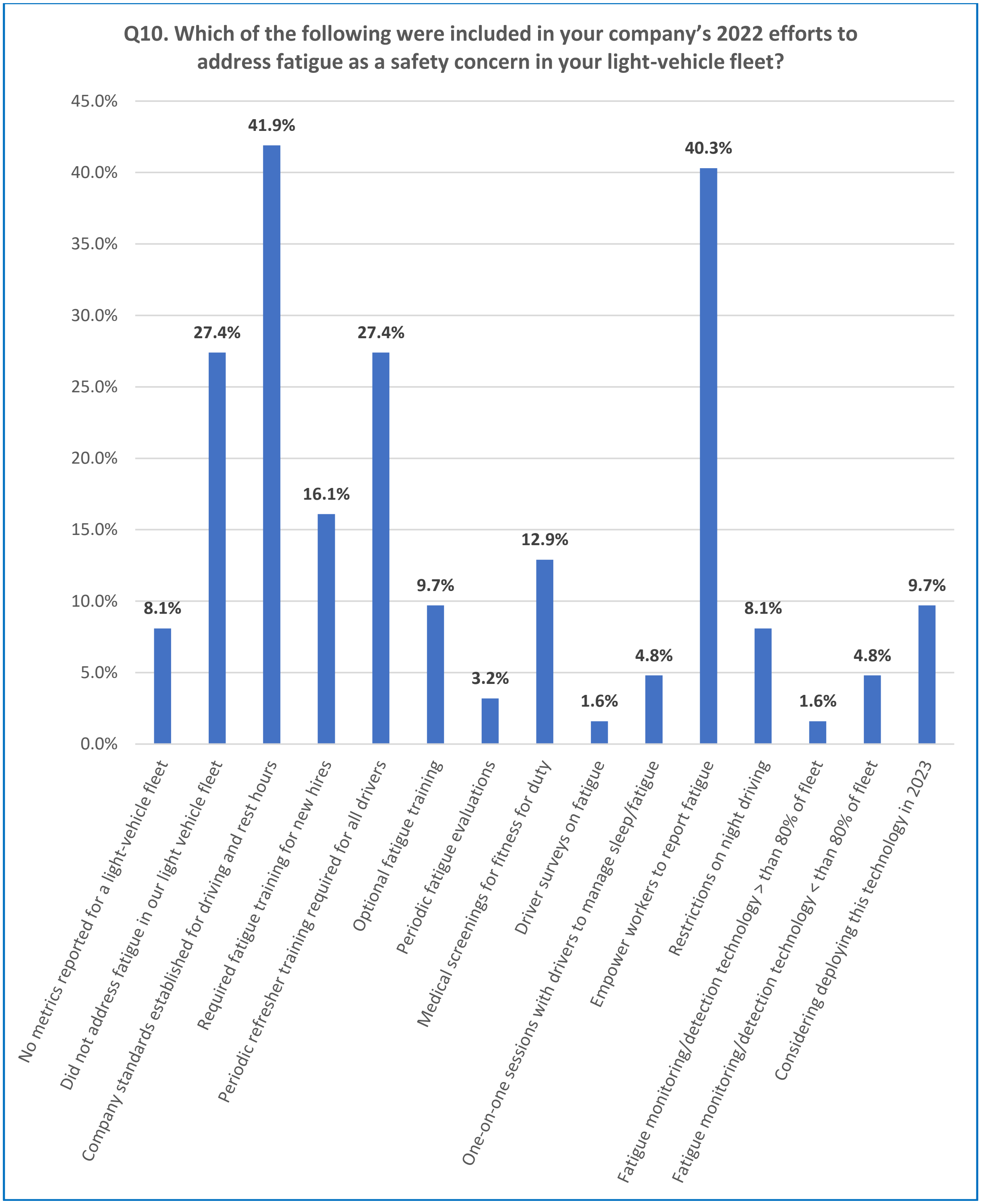

Q7. In 2022, did your company conduct commentary drives?
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
54.8%
41.9%
Yes
No

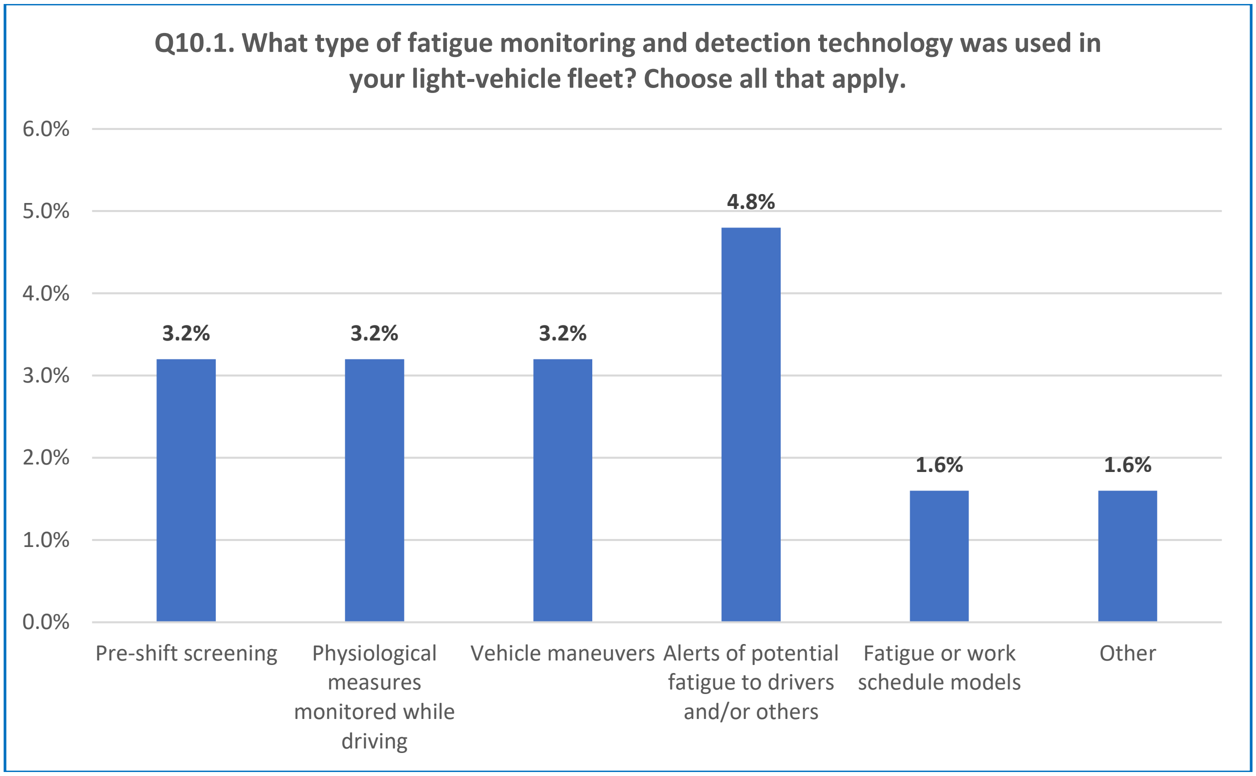

Q7.1. In 2022, in which of the following circumstances did you conduct commentary drives?
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
32.3%
30.6%
24.2%
37.1%
24.2%
24.2%
For new hires
For high-risk drivers
As part of the follow-up when collisions occur
As part of behind-the-wheel training
Periodic commentary drives were conducted with all employees who drive company vehicles
For all in scope drivers per standard/policy requirements

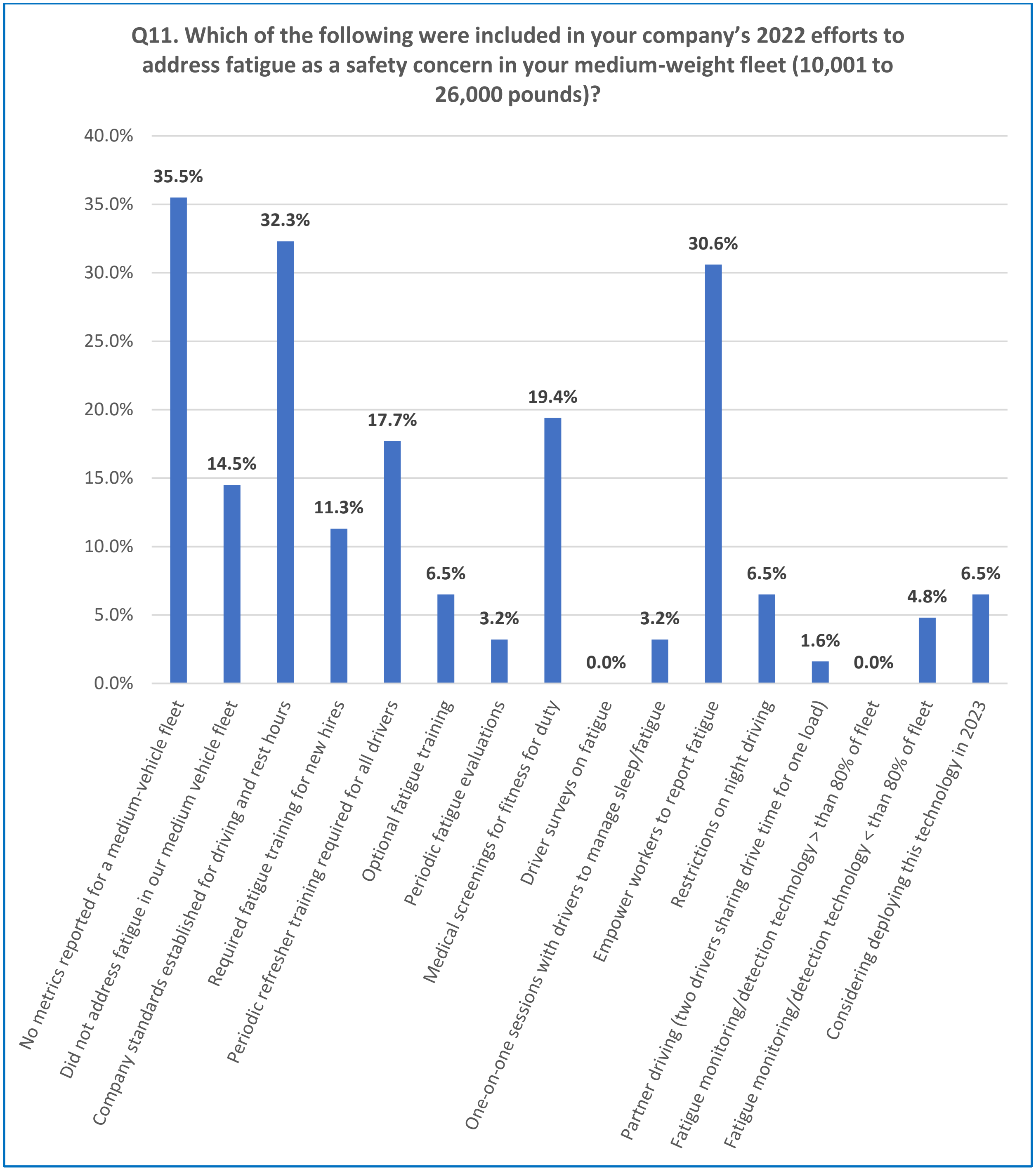

Q8. In 2022, did your company have a process in place to review collisions soon after they occurred?
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
91.9%
8.1%
Yes
No

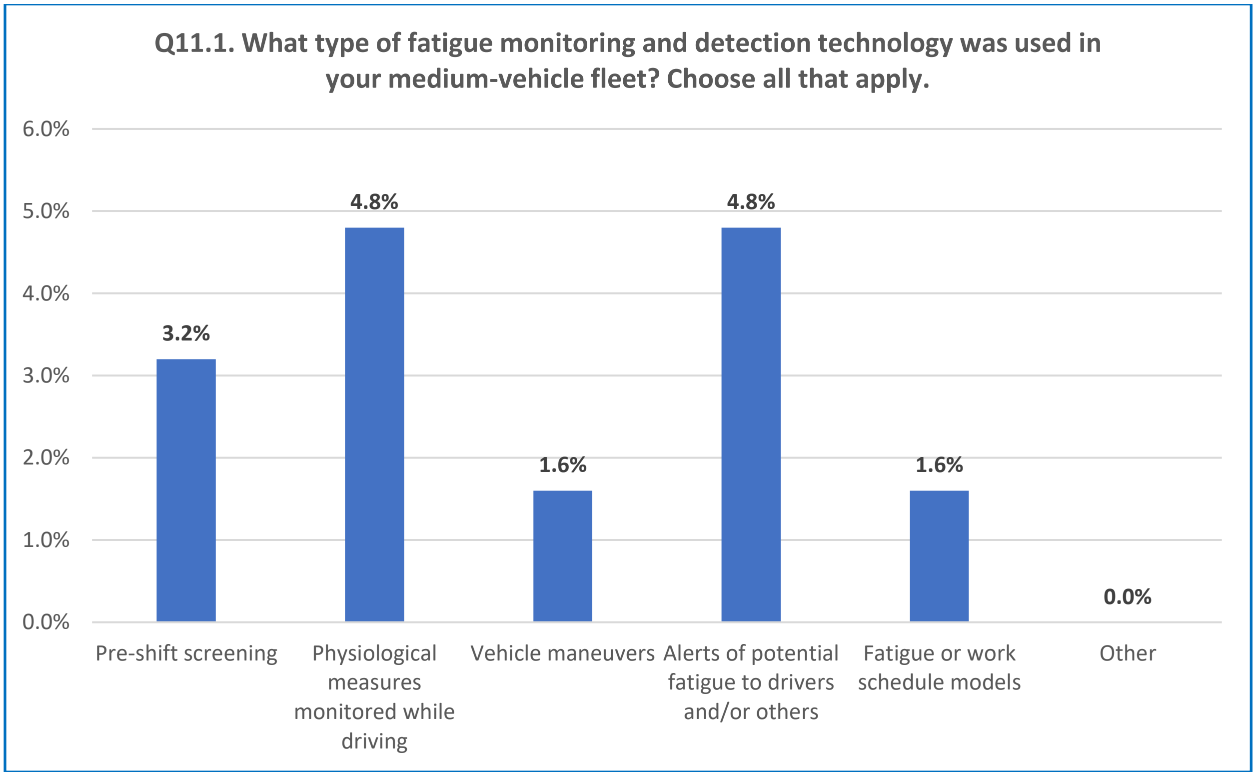

Q8.1. In 2022, which of the following was/were required as part of your collision review process?
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
82.3%
41.9%
50.0%
70.1%
75.8%
72.6%
58.1%
66.1%
0.0%
Review involving driver/manager
Special team/board review with the driver
Determination of severity
Determination of preventability/non-preventability
Report issued to senior management when serious
Corrective actions developed
Follow-up to ensure corrective actions implemented
Lessons learned are shared
Other

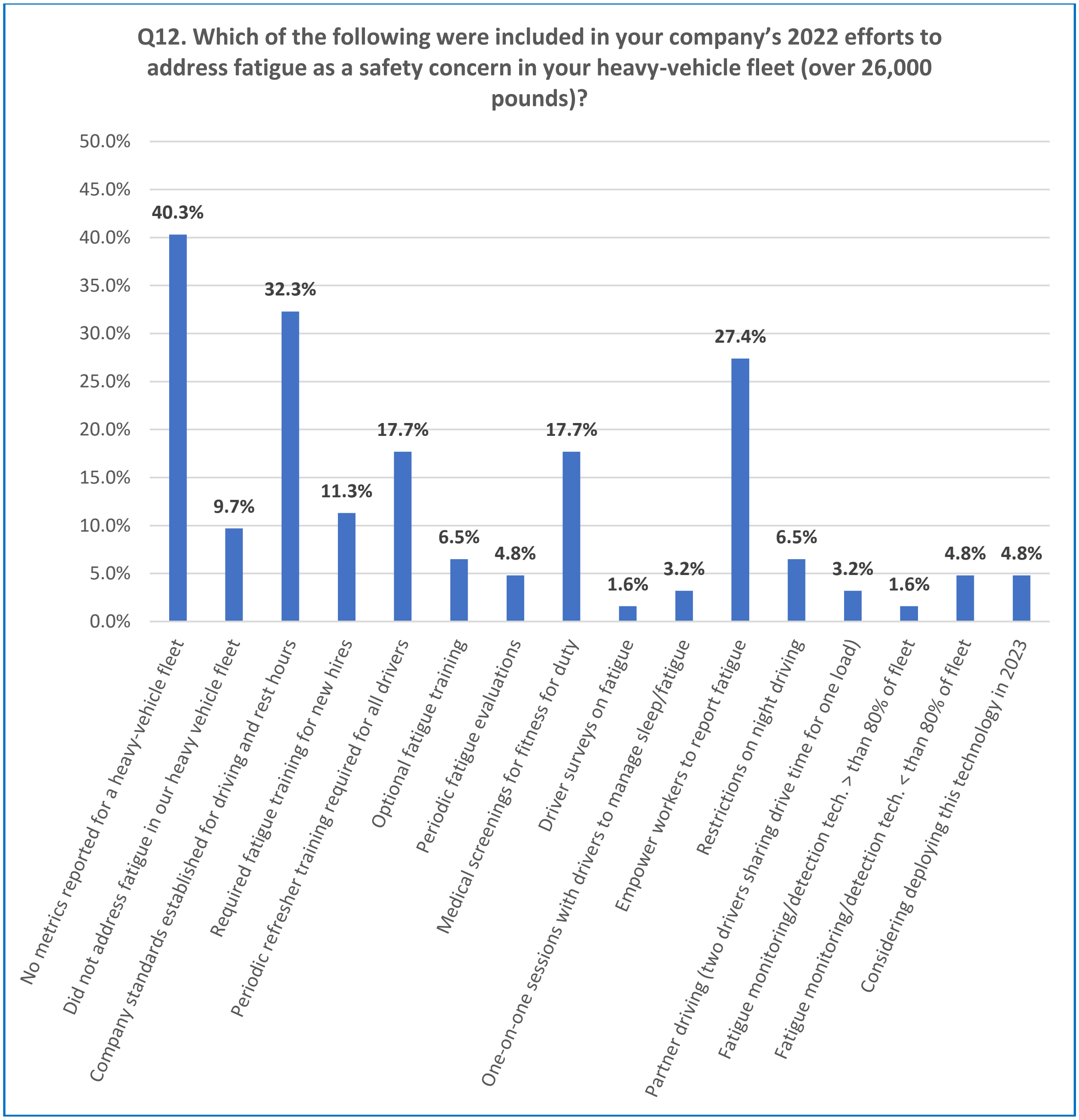

Q9. In 2022, did your company have a fatigue risk management system in place?
60.0%
40.0%
20.0%
0.0%
30.6%
54.8%
14.5%
Yes
No
No, but in the process of developing a system

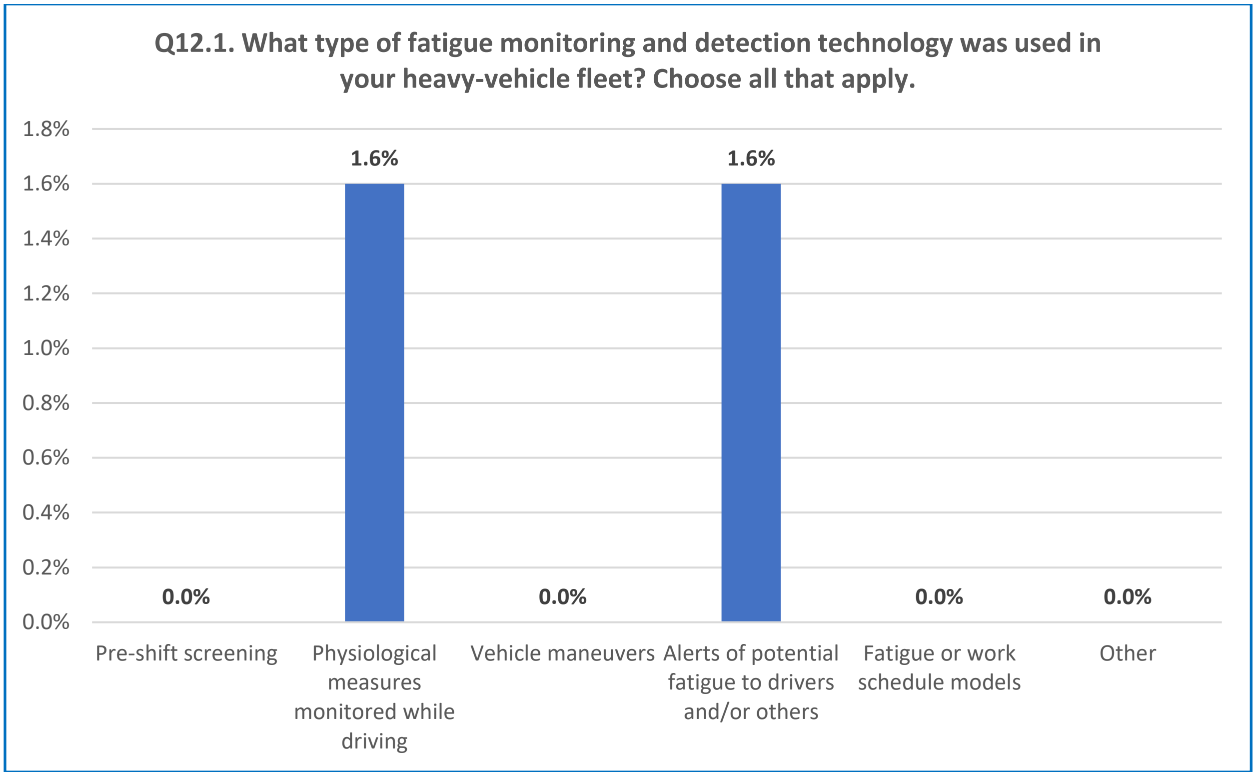

Q10. Which of the following were included in your company's 2022 efforts to address fatigue as a safety concern in your light-vehicle fleet?
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
8.1%
27.4%
41.9%
16.1%
27.4%
9.7%
3.2%
12.9%
1.6%
4.8%
40.3%
8.1%
1.6%
4.8%
9.7%
No metrics reported for a light-vehicle fleet
Did not address fatigue in our light vehicle fleet
Company standards established for driving and rest hours
Required fatigue training for new hires
Periodic refresher training required for all drivers
Optional fatigue training
Periodic fatigue evaluations
Medical screenings for fitness for duty
Driver surveys on fatigue
One-on-one sessions with drivers to manage sleep/fatigue
Empower workers to report fatigue
Restrictions on night driving
Fatigue monitoring/detection technology > than 80% of fleet
Fatigue monitoring/detection technology < than 80% of fleet
Considering deploying this technology in 2023

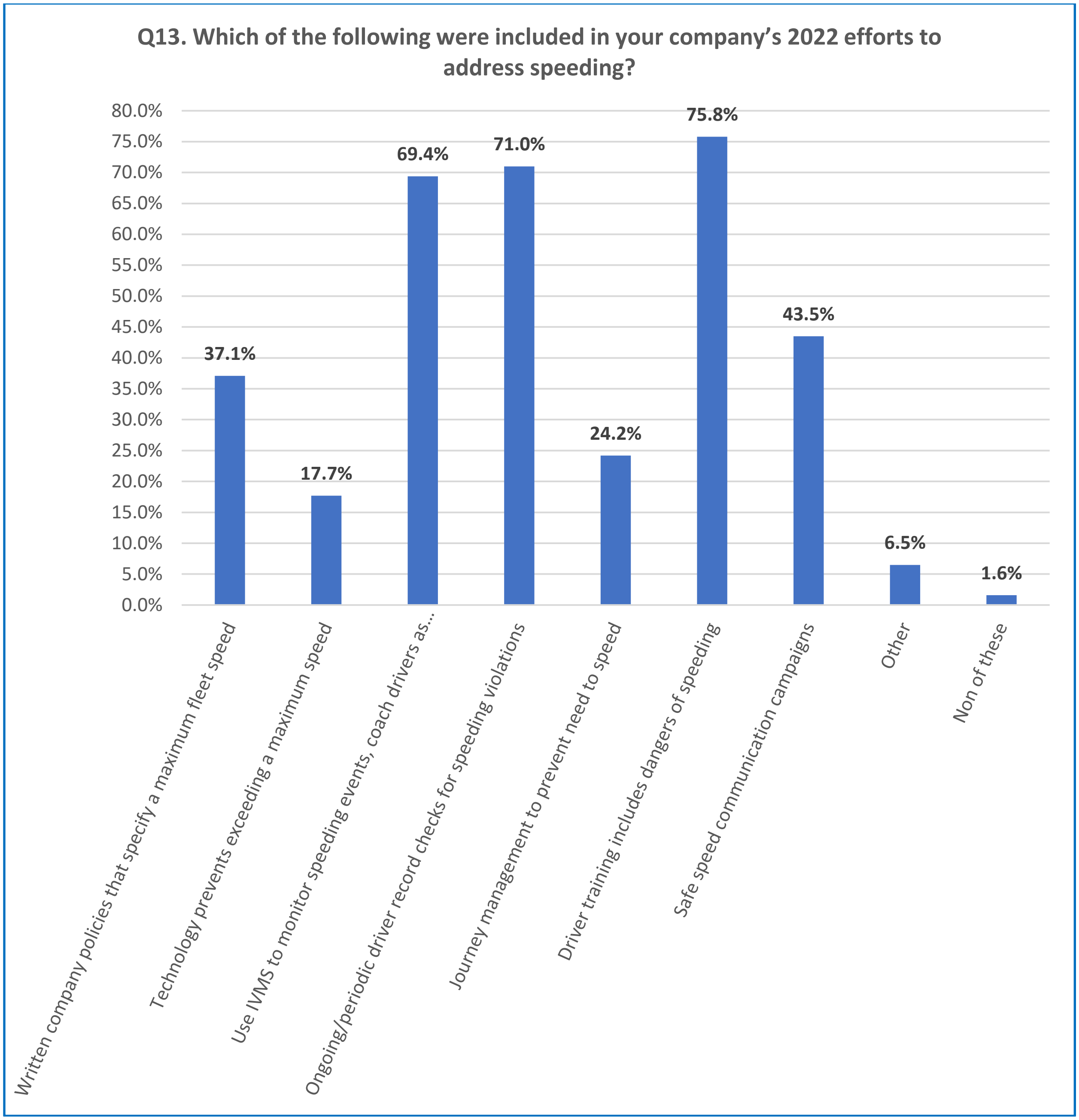

Q10.1. What type of fatigue monitoring and detection technology was used in your light-vehicle fleet? Choose all that apply.
6.0%
5.0%
4.0%
3.0%
2.0%
1.0%
0.0%
3.2%
3.2%
3.2%
4.8%
1.6%
1.6%
Pre-shift screening
Physiological measures monitored while driving
Vehicle maneuvers
Alerts of potential fatigue to drivers and/or others
Fatigue or work schedule models
Other

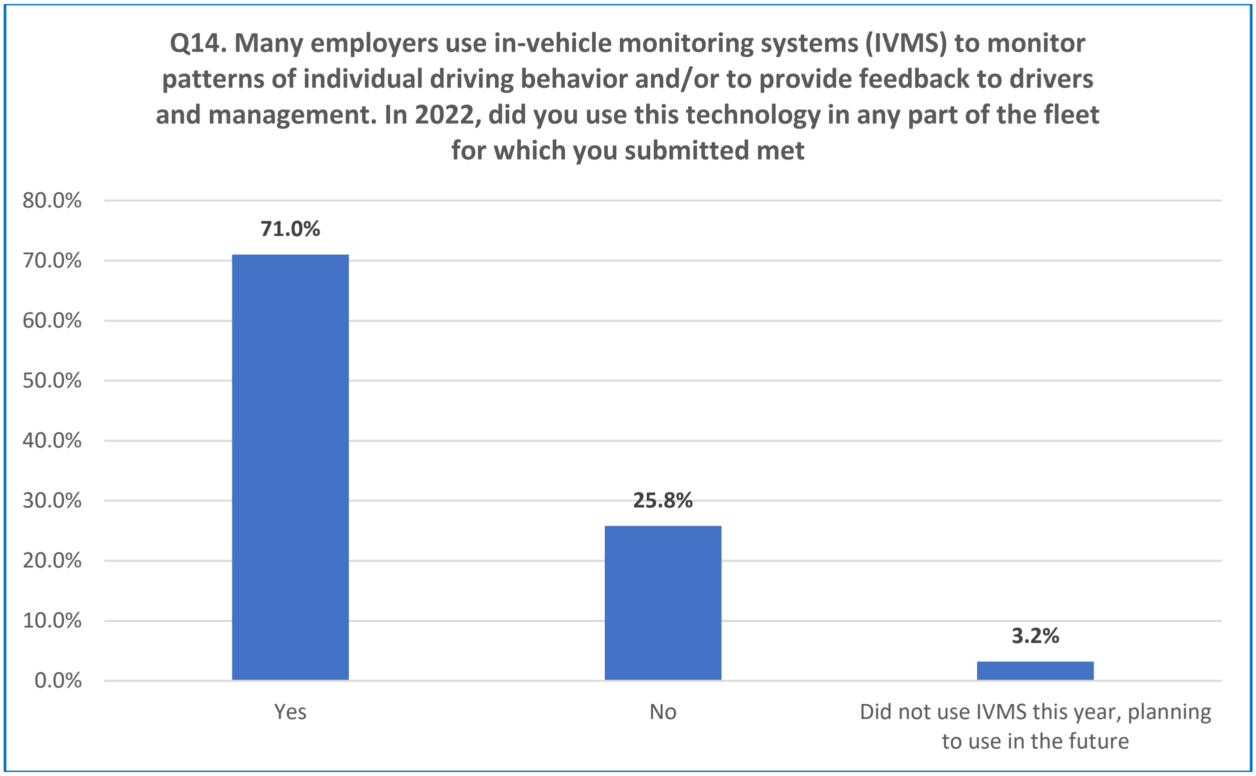

Q11. Which of the following were included in your company's 2022 efforts to address fatigue as a safety concern in your medium-weight fleet (10,001 to 26,000 pounds)?
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
35.5%
14.5%
32.3%
11.3%
17.7%
6.5%
3.2%
19.4%
0.0%
3.2%
30.6%
6.5%
1.6%
0.0%
4.8%
6.5%
No metrics reported for a medium-vehicle fleet
Did not address fatigue in our medium vehicle fleet
Company standards established for driving and rest hours
Required fatigue training for new hires
Periodic refresher training required for all drivers
Optional fatigue training
Periodic fatigue evaluations
Medical screenings for fitness for duty
Driver surveys on fatigue
One-on-one sessions with drivers to manage sleep/fatigue
Empower workers to report fatigue
Restrictions on night driving
Partner driving (two drivers sharing drive time for one load)
Fatigue monitoring/detection technology > than 80% of fleet
Fatigue monitoring/detection technology < than 80% of fleet
Considering deploying this technology in 2023

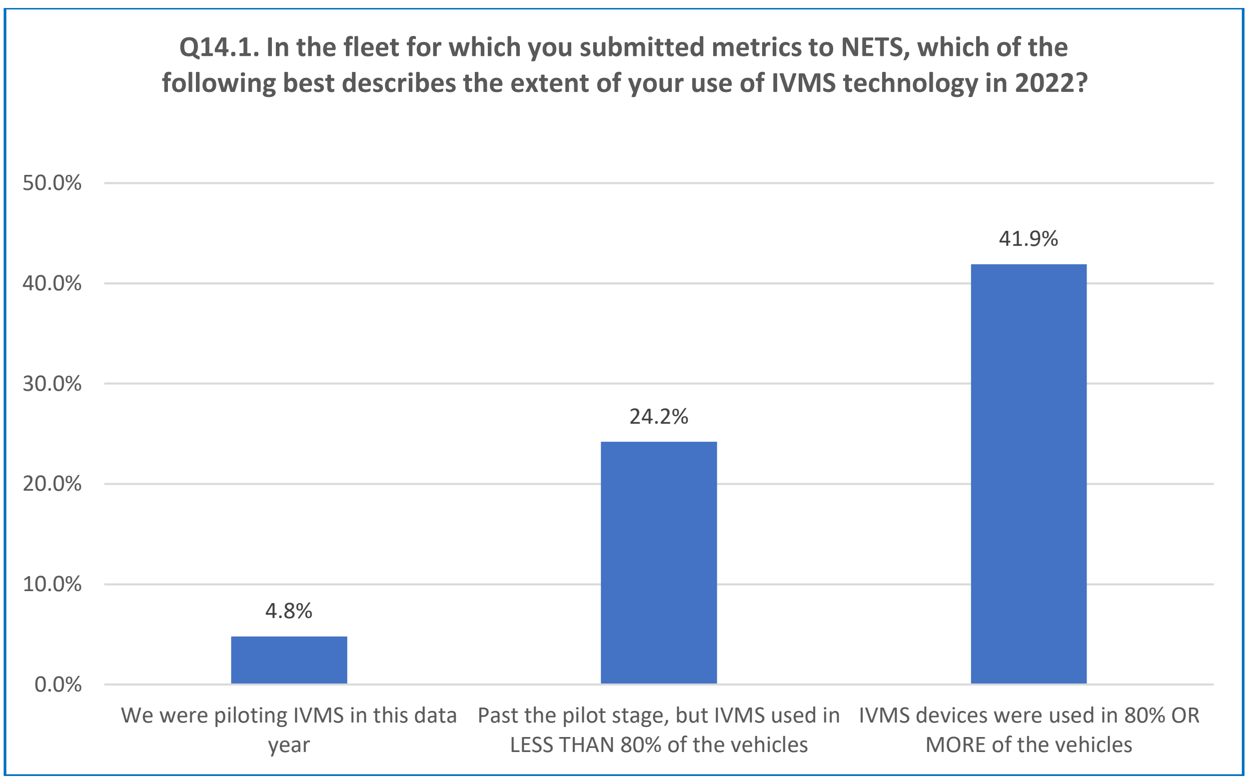

Q11.1. What type of fatigue monitoring and detection technology was used in your medium-vehicle fleet? Choose all that apply.
6.0%
5.0%
4.0%
3.0%
2.0%
1.0%
0.0%
3.2%
4.8%
1.6%
4.8%
1.6%
0.0%
Pre-shift screening
Physiological measures monitored while driving
Vehicle maneuvers
Alerts of potential fatigue to drivers and/or others
Fatigue or work schedule models
Other

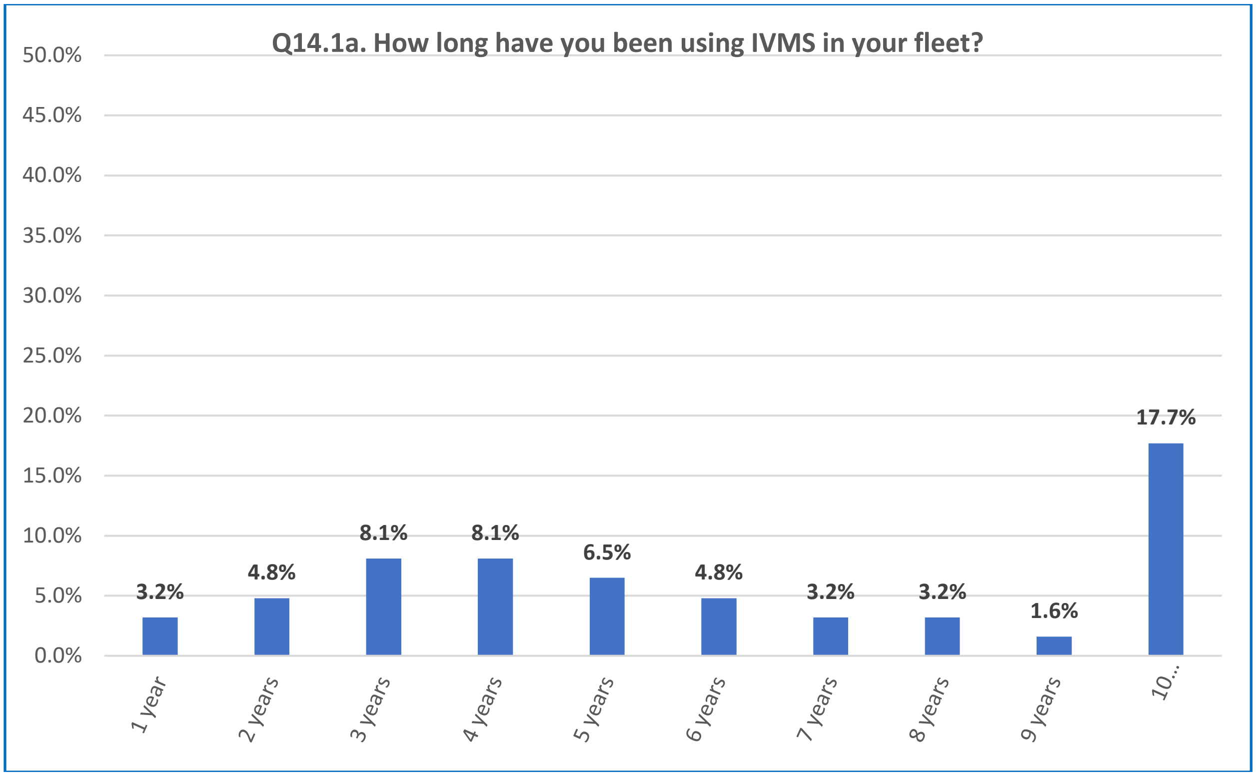

Q12. Which of the following were included in your company's 2022 efforts to address fatigue as a safety concern in your heavy-vehicle fleet (over 26,000 pounds)?
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
40.3%
9.7%
32.3%
11.3%
17.7%
6.5%
4.8%
17.7%
1.6%
3.2%
27.4%
6.5%
3.2%
1.6%
4.8%
4.8%
No metrics reported for a heavy-vehicle fleet
Did not address fatigue in our heavy vehicle fleet
Company standards established for driving and rest hours
Required fatigue training for new hires
Periodic refresher training required for all drivers
Optional fatigue training
Periodic fatigue evaluations
Medical screenings for fitness for duty
Driver surveys on fatigue
One-on-one sessions with drivers to manage sleep/fatigue
Empower workers to report fatigue
Restrictions on night driving
Partner driving (two drivers sharing drive time for one load)
Fatigue monitoring/detection tech. > than 80% of fleet
Fatigue monitoring/detection tech. < than 80% of fleet
Considering deploying this technology in 2023

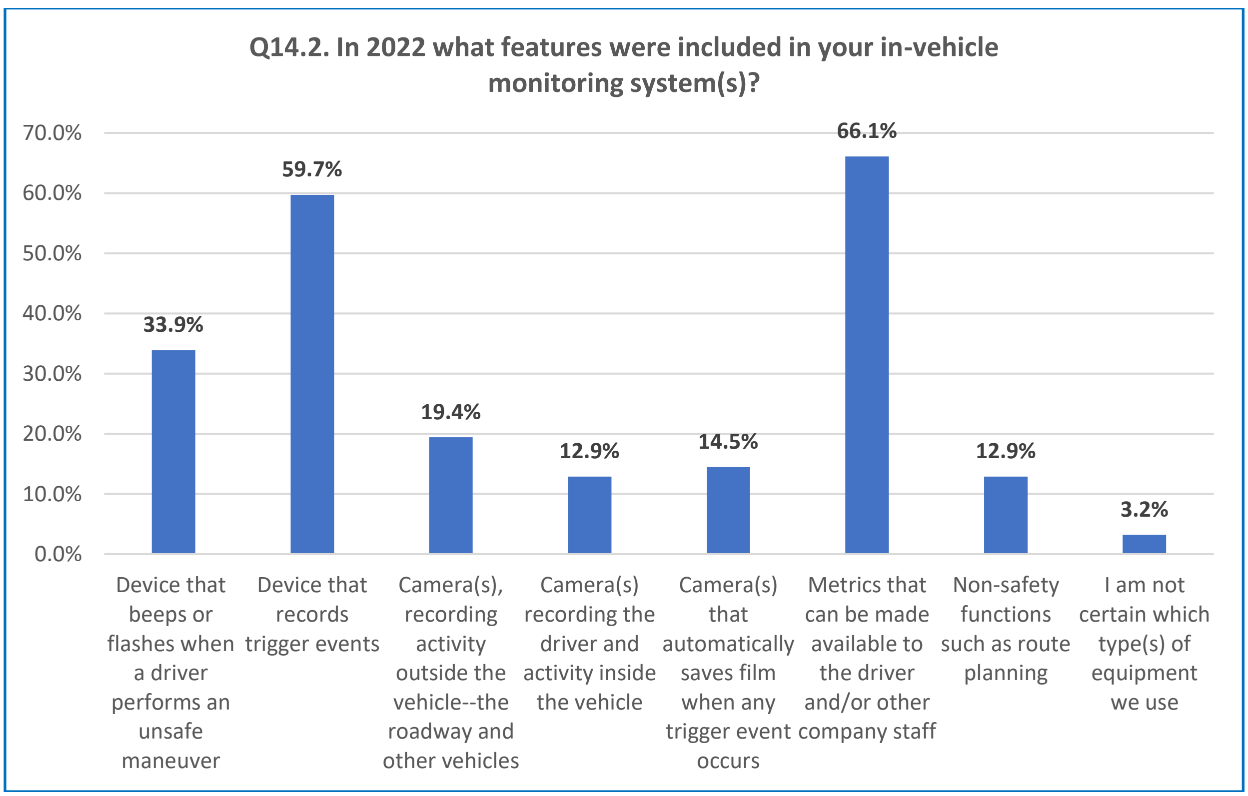

Q12.1. What type of fatigue monitoring and detection technology was used in your heavy-vehicle fleet? Choose all that apply.
1.8%
1.6%
1.4%
1.2%
1.0%
0.8%
0.6%
0.4%
0.2%
0.0%
0.0%
1.6%
0.0%
1.6%
0.0%
0.0%
Pre-shift screening
Physiological measures monitored while driving
Vehicle maneuvers
Alerts of potential fatigue to drivers and/or others
Fatigue or work schedule models
Other

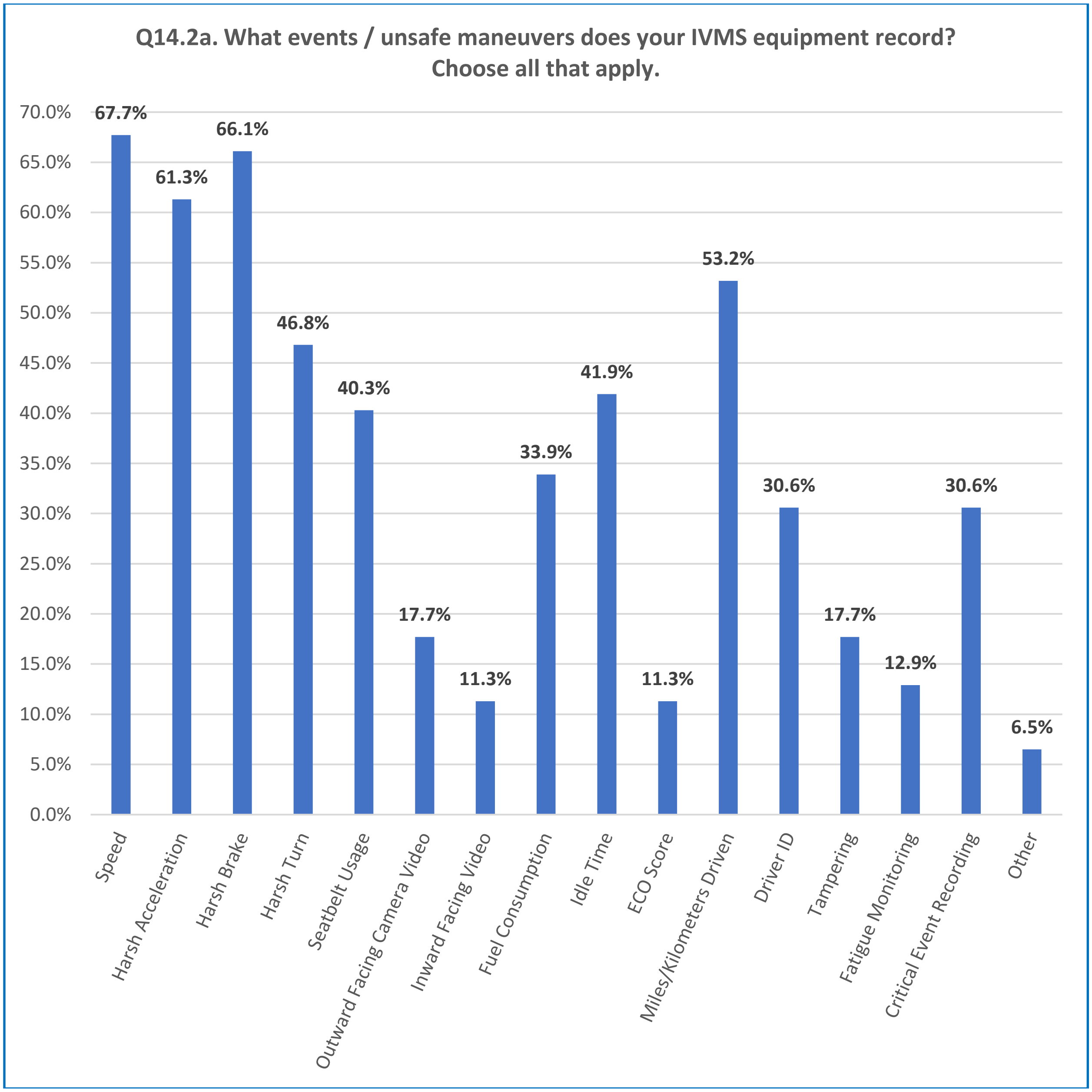

Q13. Which of the following were included in your company's 2022 efforts to address speeding?
80.0%
75.0%
70.0%
65.0%
60.0%
55.0%
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
37.1%
17.7%
69.4%
71.0%
24.2%
75.8%
43.5%
6.5%
1.6%
Written company policies that specify a maximum fleet speed
Technology prevents exceeding a maximum speed
Use IVMS to monitor speeding events, coach drivers as...
Ongoing/periodic driver record checks for speeding violations
Journey management to prevent need to speed
Driver training includes dangers of speeding
Safe speed communication campaigns
Other
Non of these

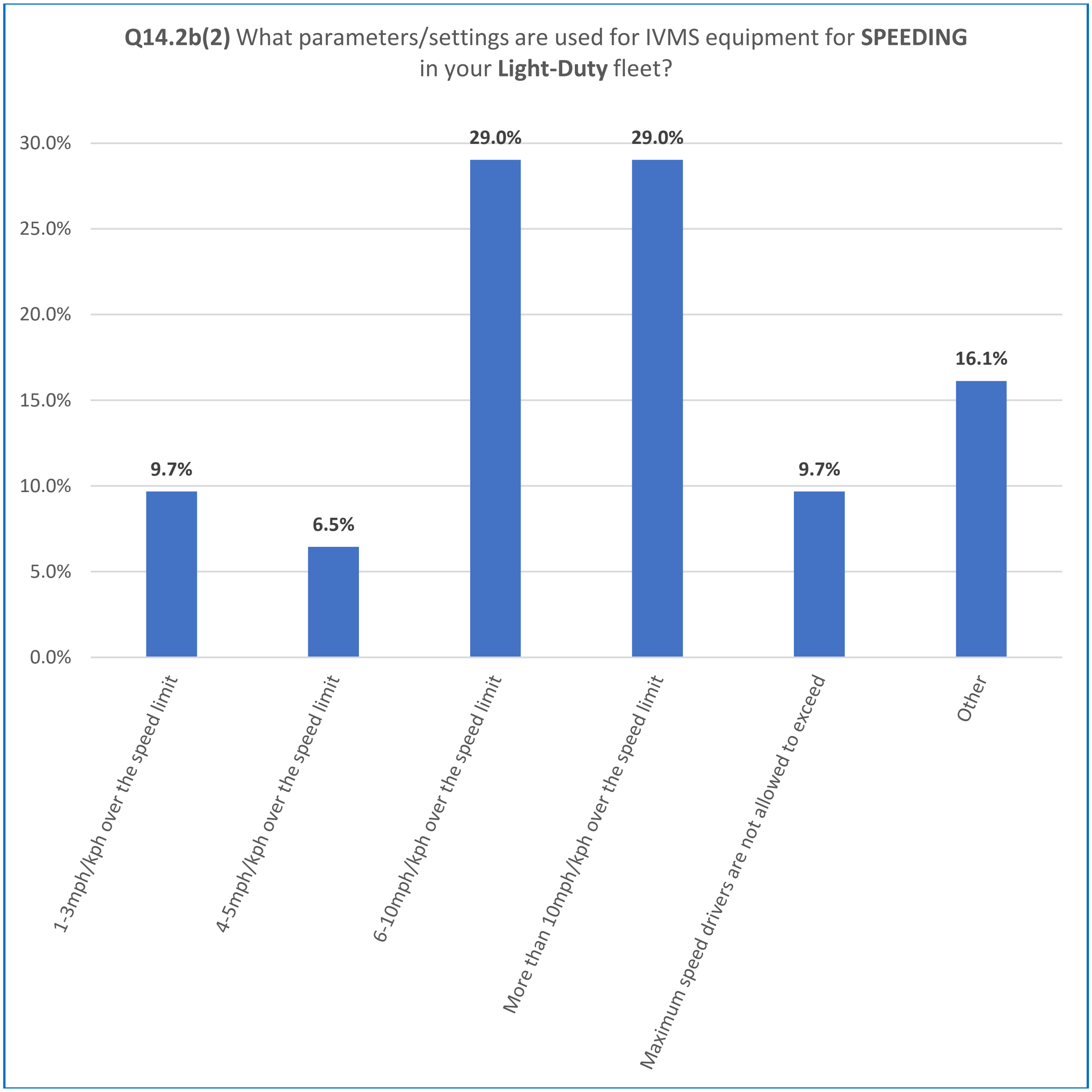

Q14. Many employers use in-vehicle monitoring systems (IVMS) to monitor patterns of individual driving behavior and/or to provide feedback to drivers and management. In 2022, did you use this technology in any part of the fleet for which you submitted met
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
71.0%
25.8%
3.2%
Yes
No
Did not use IVMS this year, planning to use in the future

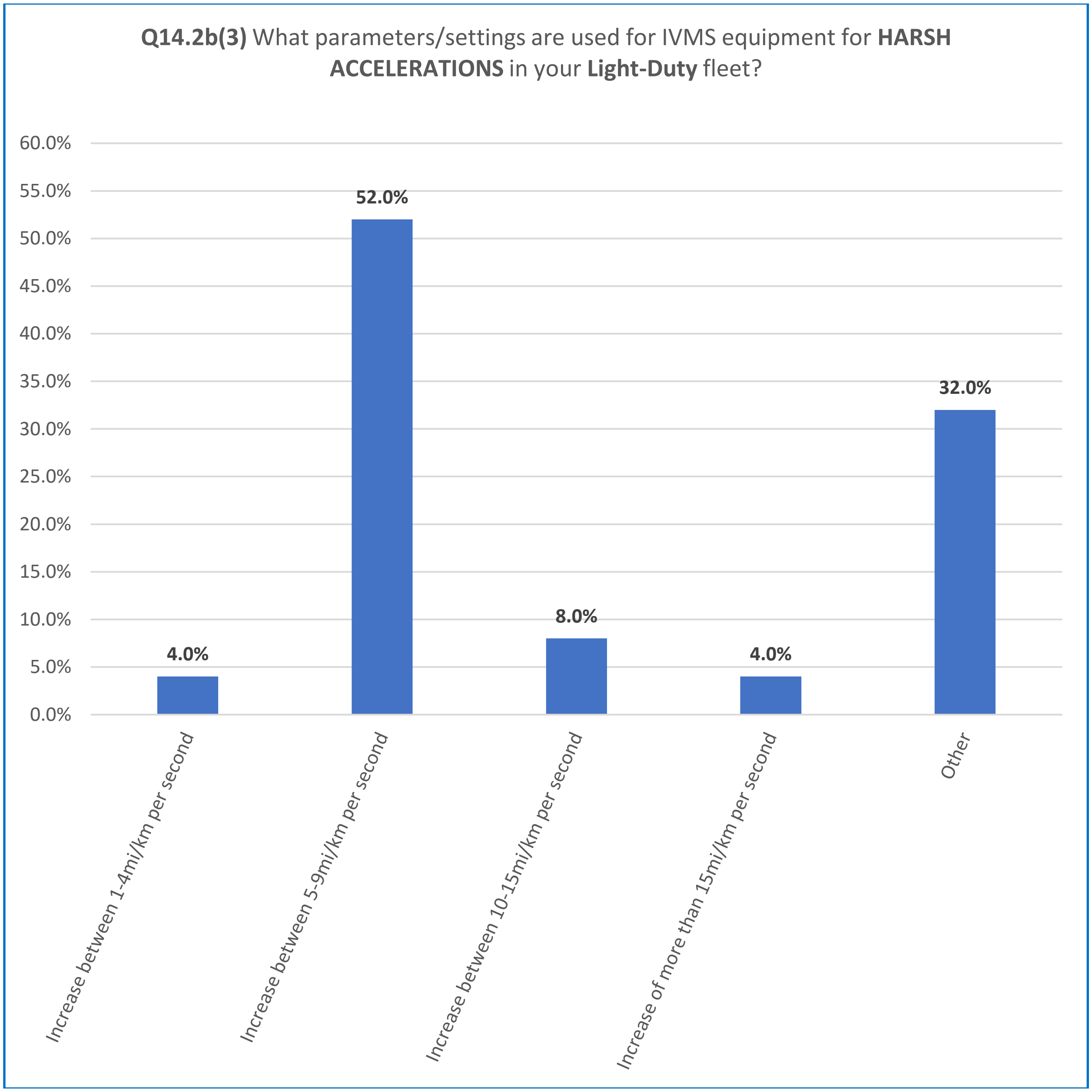

Q14.1. In the fleet for which you submitted metrics to NETS, which of the following best describes the extent of your use of IVMS technology in 2022?
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
4.8%
24.2%
41.9%
We were piloting IVMS in this data year
Past the pilot stage, but IVMS used in LESS THAN 80% of the vehicles
IVMS devices were used in 80% OR MORE of the vehicles

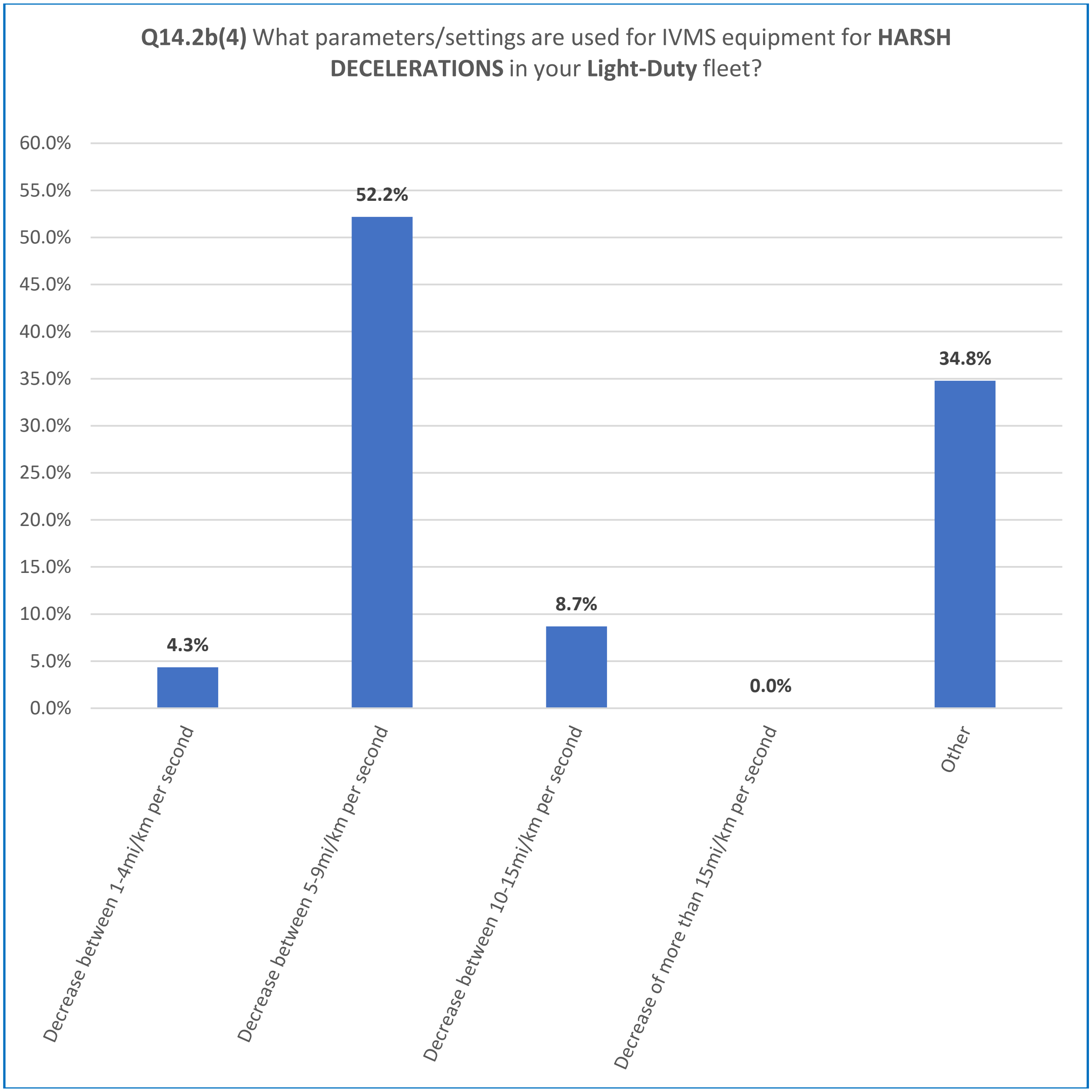

Q14.1a. How long have you been using IVMS in your fleet?
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
3.2%
4.8%
8.1%
8.1%
6.5%
4.8%
3.2%
3.2%
1.6%
17.7%
1 year
2 years
3 years
4 years
5 years
6 years
7 years
8 years
9 years
10…

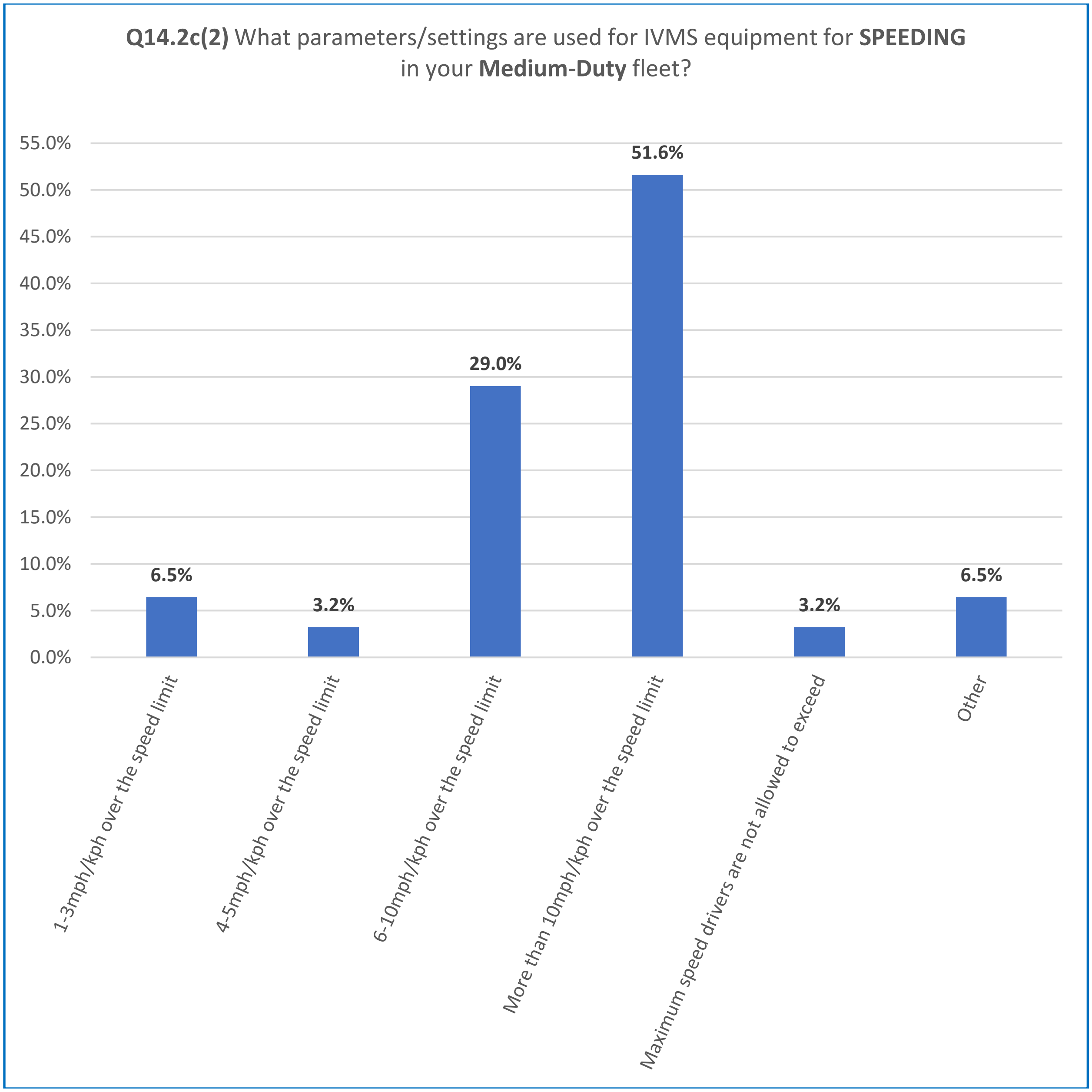

Q14.2. In 2022 what features were included in your in-vehicle monitoring system(s)?
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
33.9%
59.7%
19.4%
12.9%
14.5%
66.1%
12.9%
3.2%
Device that beeps or flashes when a driver performs an unsafe maneuver
Device that records trigger events
Camera(s), recording activity outside the vehicle--the roadway and other vehicles
Camera(s) recording the driver and activity inside the vehicle
Camera(s) that automatically saves film when any trigger event occurs
Metrics that can be made available to the driver and/or other company staff
Non-safety functions such as route planning
I am not certain which type(s) of equipment we use


Q14.2a. What events / unsafe maneuvers does your IVMS equipment record? Choose all that apply.
70.0%
65.0%
60.0%
55.0%
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
67.7%
61.3%
66.1%
46.8%
40.3%
17.7%
11.3%
33.9%
41.9%
11.3%
53.2%
30.6%
17.7%
12.9%
30.6%
6.5%
Speed
Harsh Acceleration
Harsh Brake
Harsh Turn
Seatbelt Usage
Outward Facing Camera Video
Inward Facing Video
Fuel Consumption
Idle Time
ECO Score
Miles/Kilometers Driven
Driver ID
Tampering
Fatigue Monitoring
Critical Event Recording
Other

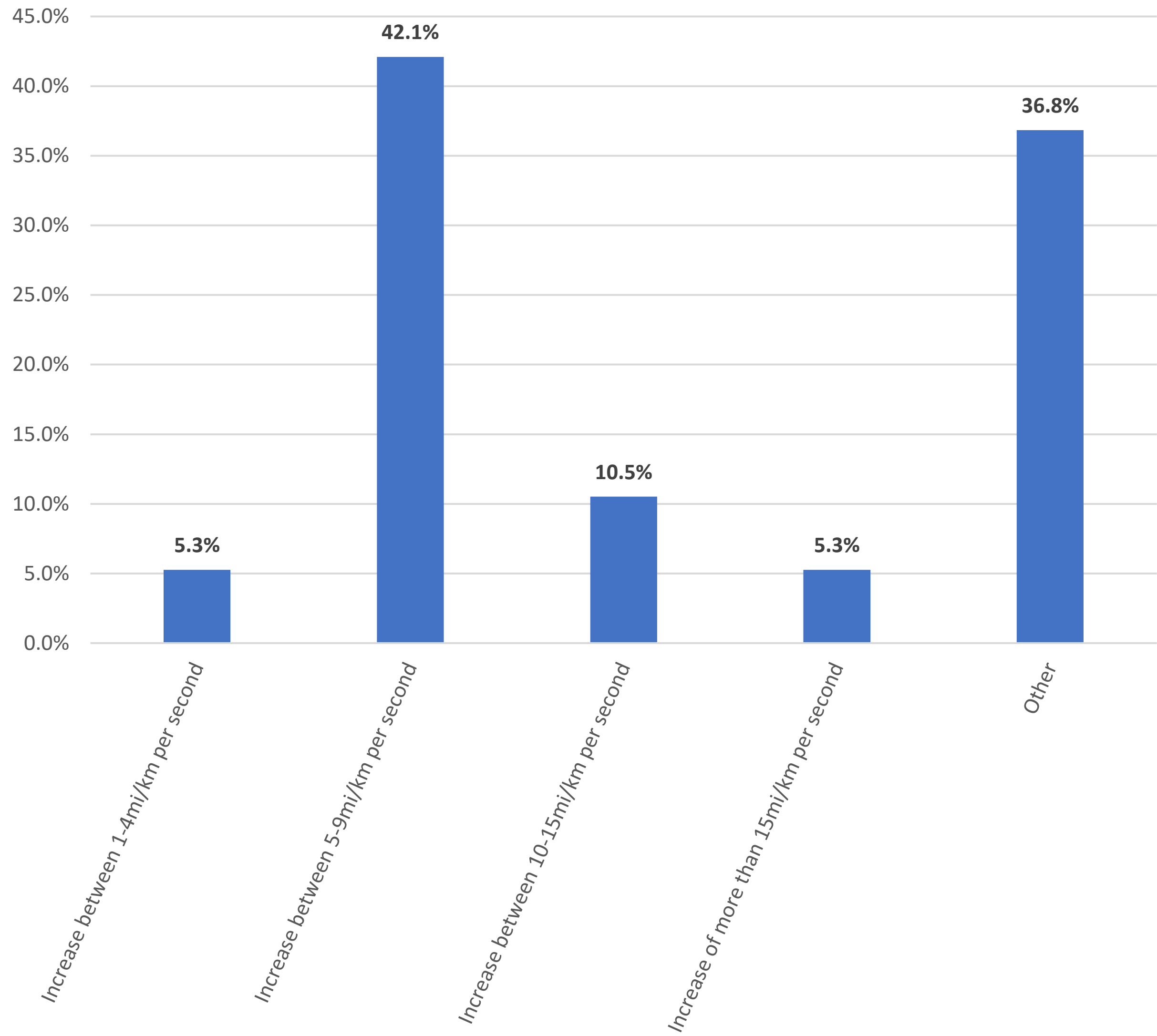

Q14.2b(2) What parameters/settings are used for IVMS equipment for **SPEEDING** in your **Light-Duty** fleet?
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
9.7%
6.5%
29.0%
29.0%
9.7%
16.1%
1-3mph/kph over the speed limit
4-5mph/kph over the speed limit
6-10mph/kph over the speed limit
More than 10mph/kph over the speed limit
Maximum speed drivers are not allowed to exceed
Other

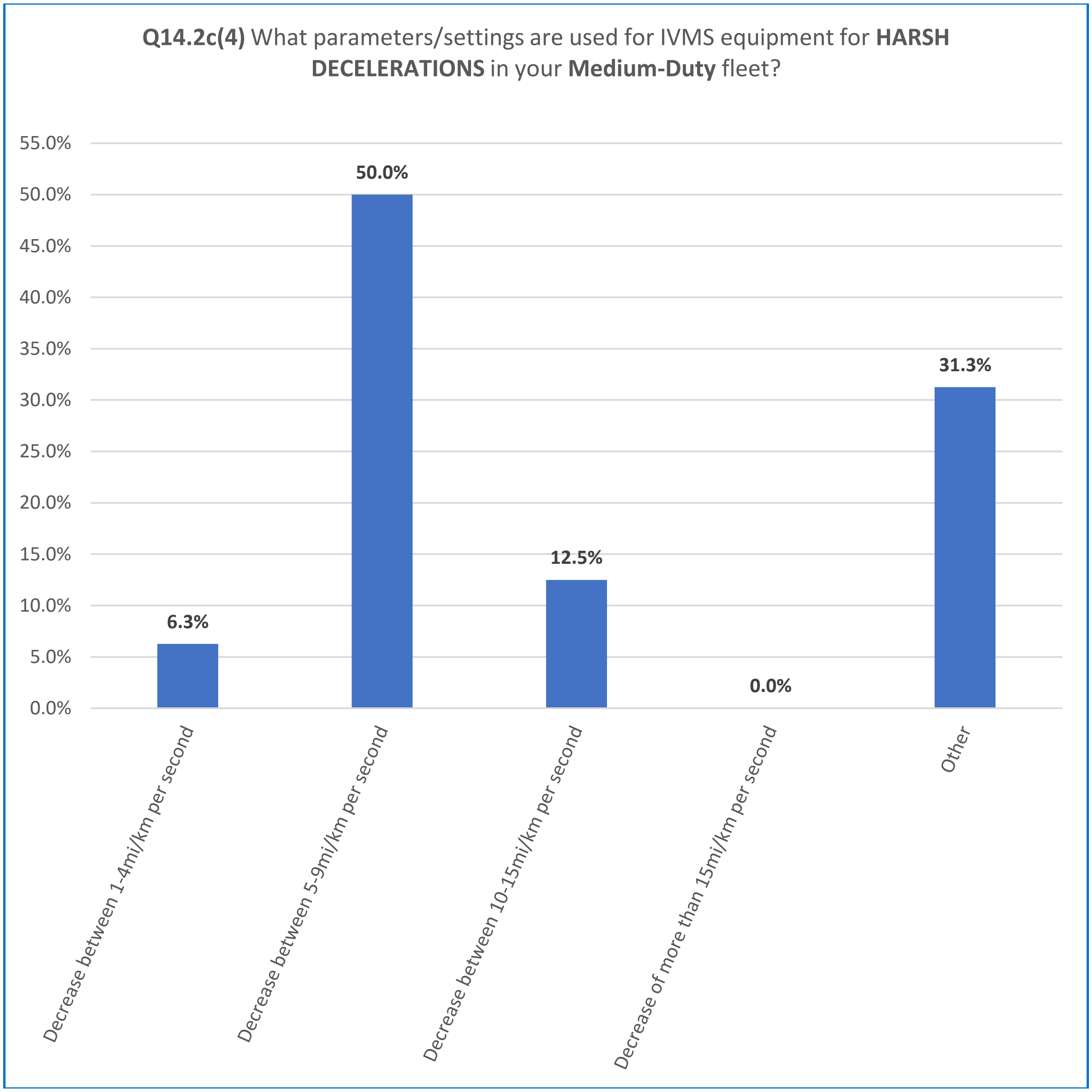

Q14.2b(3) What parameters/settings are used for IVMS equipment for **HARSH ACCELERATIONS** in your **Light-Duty** fleet?
60.0%
55.0%
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
4.0%
52.0%
8.0%
4.0%
32.0%
Increase between 1-4mi/km per second
Increase between 5-9mi/km per second
Increase between 10-15mi/km per second
Increase of more than 15mi/km per second
Other

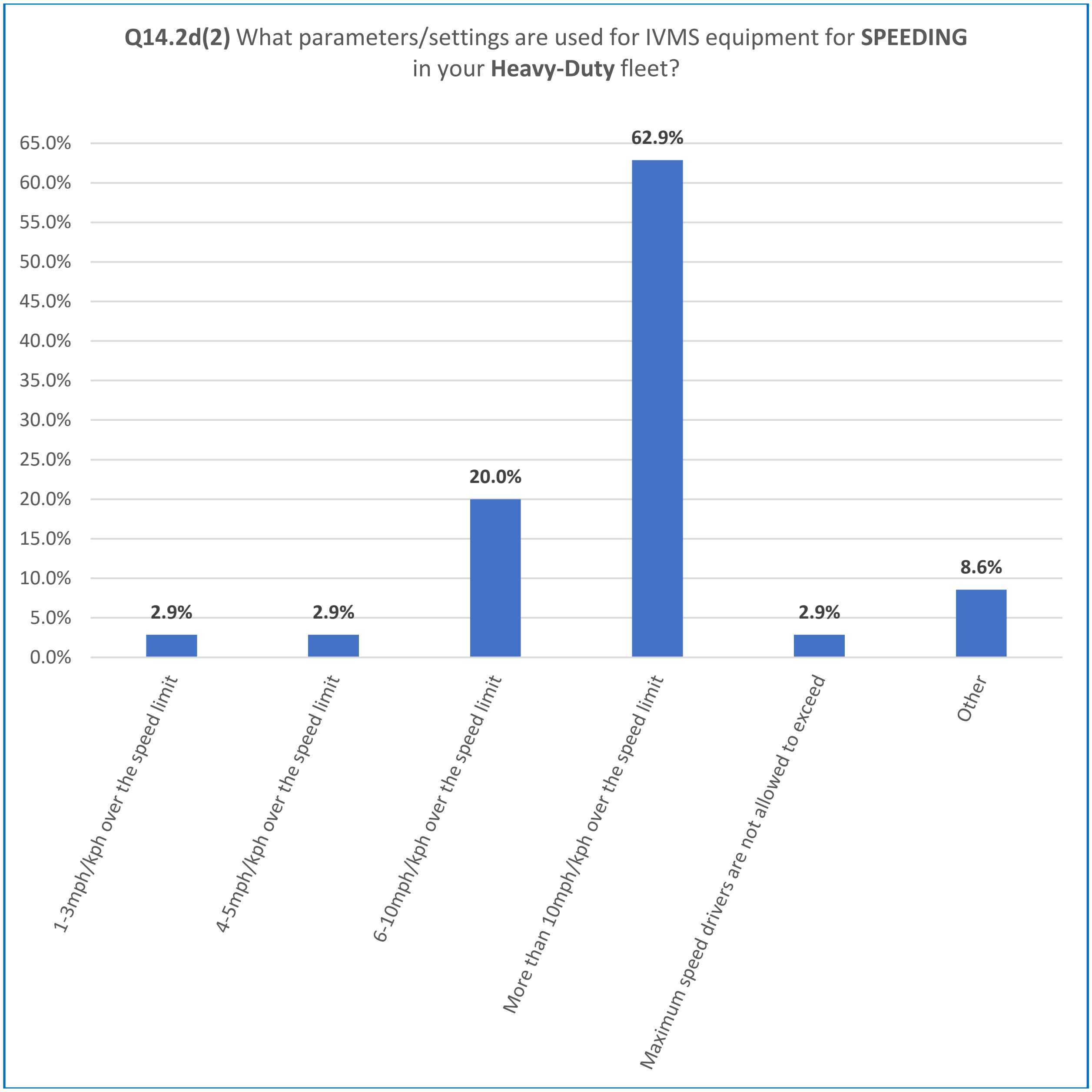

Q14.2b(4) What parameters/settings are used for IVMS equipment for HARSH DECELERATIONS in your Light-Duty fleet?
60.0%
55.0%
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
4.3%
52.2%
8.7%
0.0%
34.8%
Decrease between 1-4mi/km per second
Decrease between 5-9mi/km per second
Decrease between 10-15mi/km per second
Decrease of more than 15mi/km per second
Other

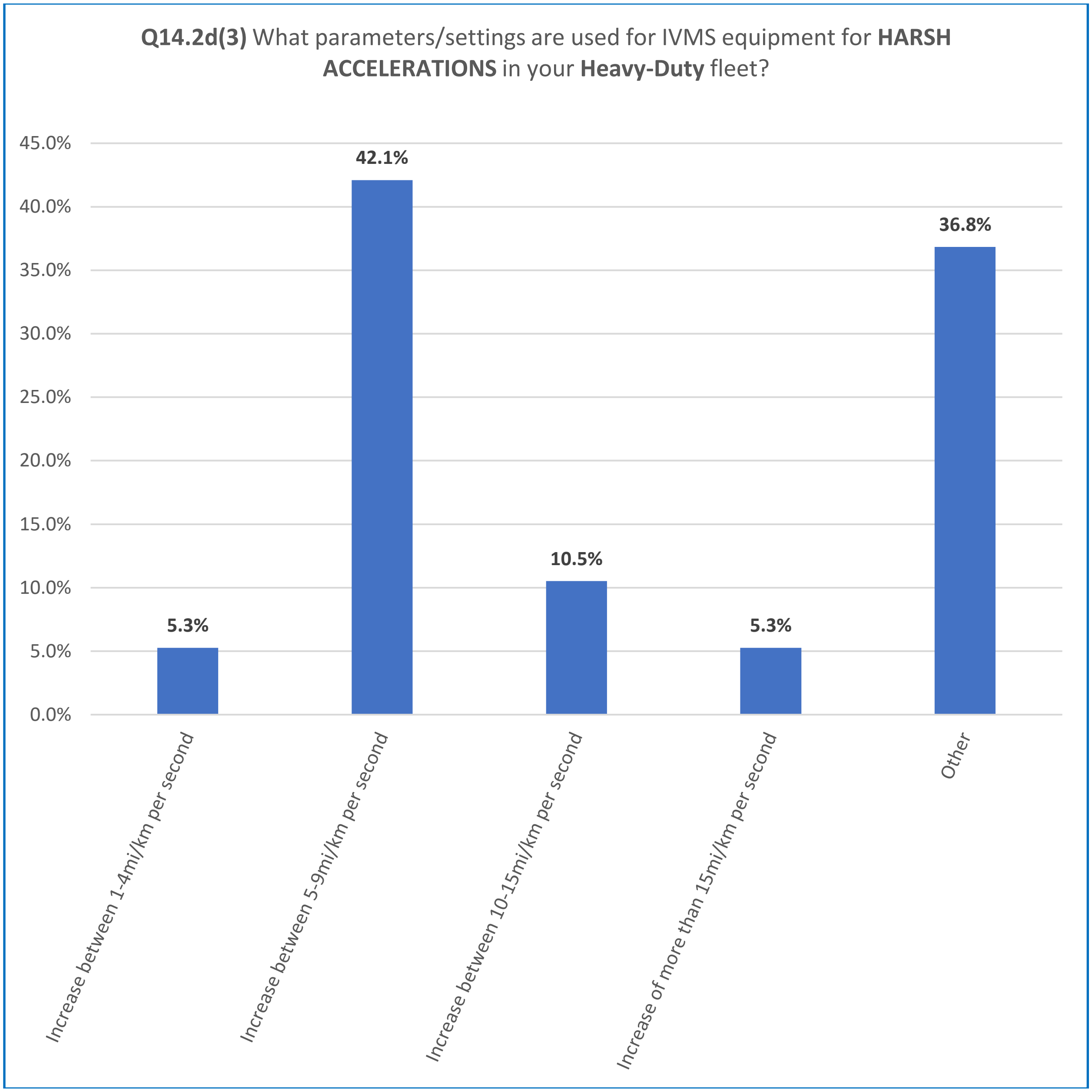

Q14.2c(2) What parameters/settings are used for IVMS equipment for **SPEEDING** in your **Medium-Duty** fleet?
55.0%
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
6.5%
3.2%
29.0%
51.6%
3.2%
6.5%
1-3mph/kph over the speed limit
4-5mph/kph over the speed limit
6-10mph/kph over the speed limit
More than 10mph/kph over the speed limit
Maximum speed drivers are not allowed to exceed
Other

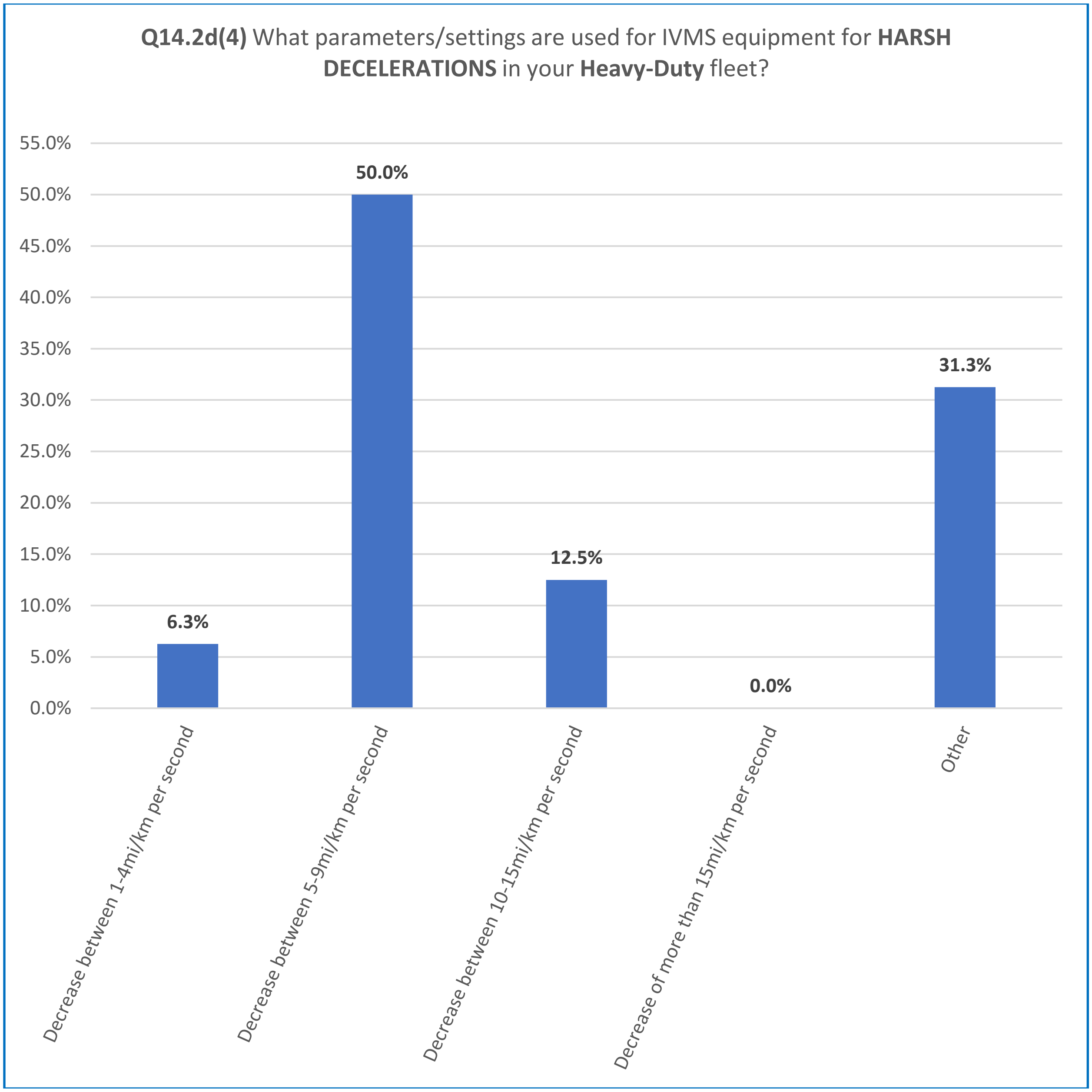
Q14.2c(3) What parameters/settings are used for IVMS equipment for **HARSH ACCELERATIONS** in your **Medium-Duty** fleet?

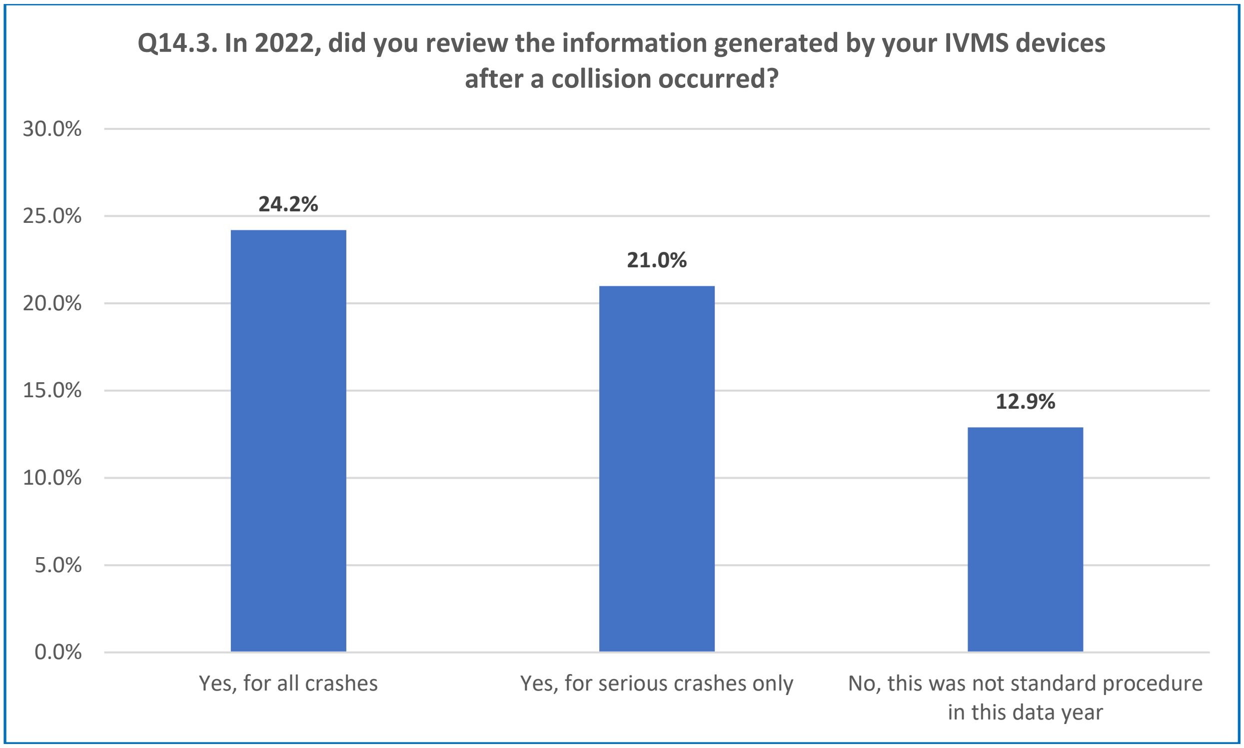


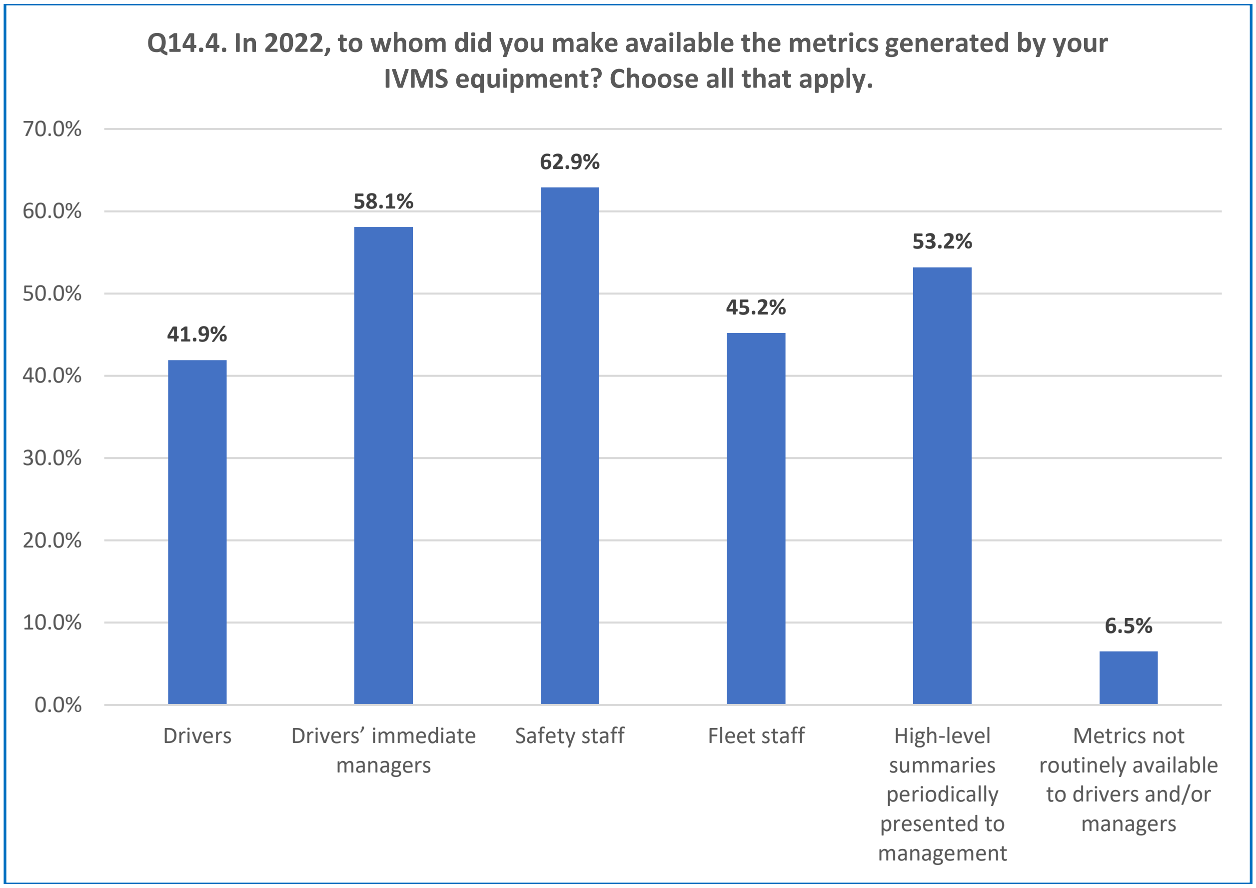

Q14.2c(4) What parameters/settings are used for IVMS equipment for HARSH DECELERATIONS in your Medium-Duty fleet?
55.0%
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
6.3%
50.0%
12.5%
0.0%
31.3%
Decrease between 1-4mi/km per second
Decrease between 5-9mi/km per second
Decrease between 10-15mi/km per second
Decrease of more than 15mi/km per second
Other

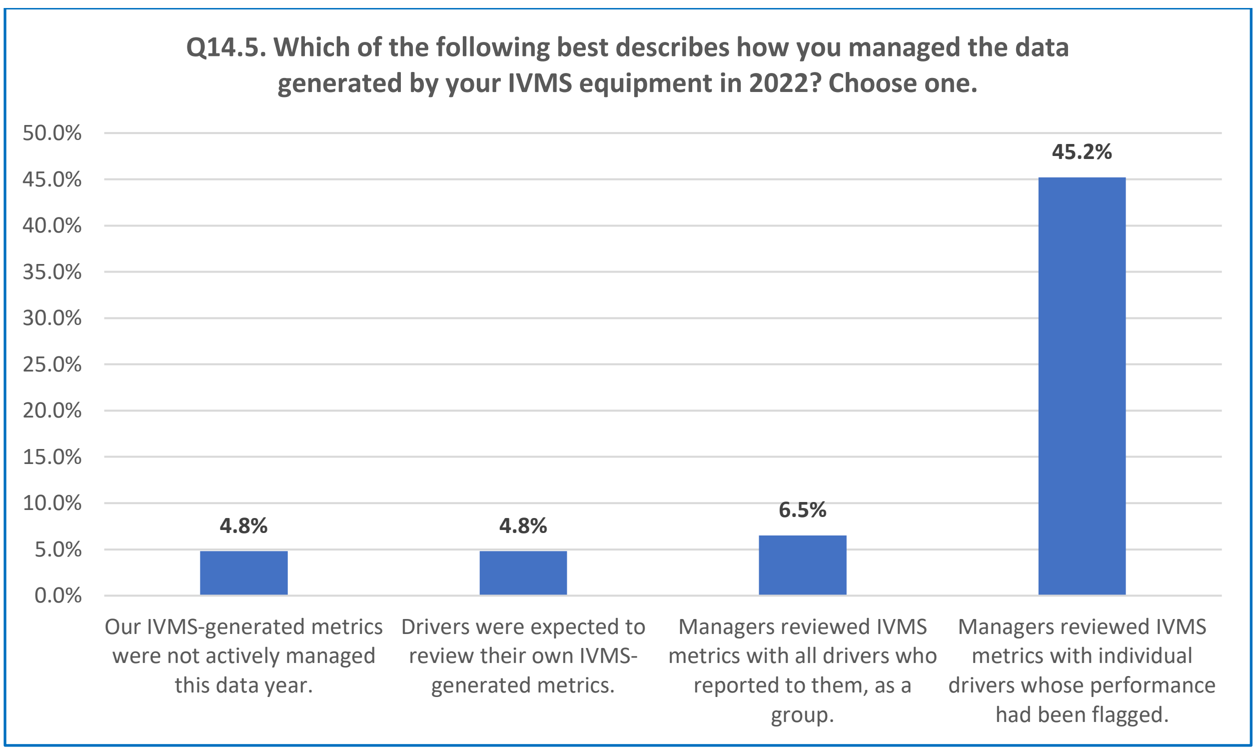

Q14.2d(2) What parameters/settings are used for IVMS equipment for SPEEDING in your Heavy-Duty fleet?
65.0%
60.0%
55.0%
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
2.9%
2.9%
20.0%
62.9%
2.9%
8.6%
1-3mph/kph over the speed limit
4-5mph/kph over the speed limit
6-10mph/kph over the speed limit
More than 10mph/kph over the speed limit
Maximum speed drivers are not allowed to exceed
Other

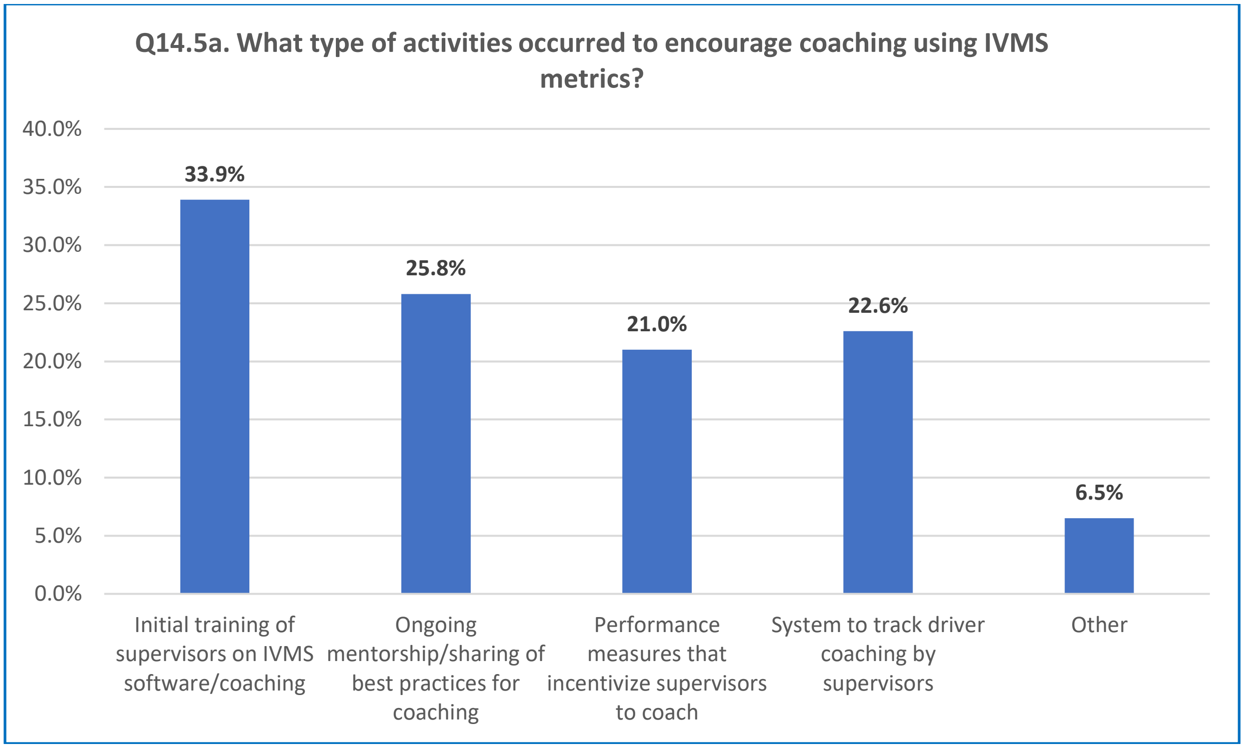

Q14.2d(3) What parameters/settings are used for IVMS equipment for **HARSH ACCELERATIONS** in your **Heavy-Duty** fleet?
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
5.3%
42.1%
10.5%
5.3%
36.8%
Increase between 1-4mi/km per second
Increase between 5-9mi/km per second
Increase between 10-15mi/km per second
Increase of more than 15mi/km per second
Other

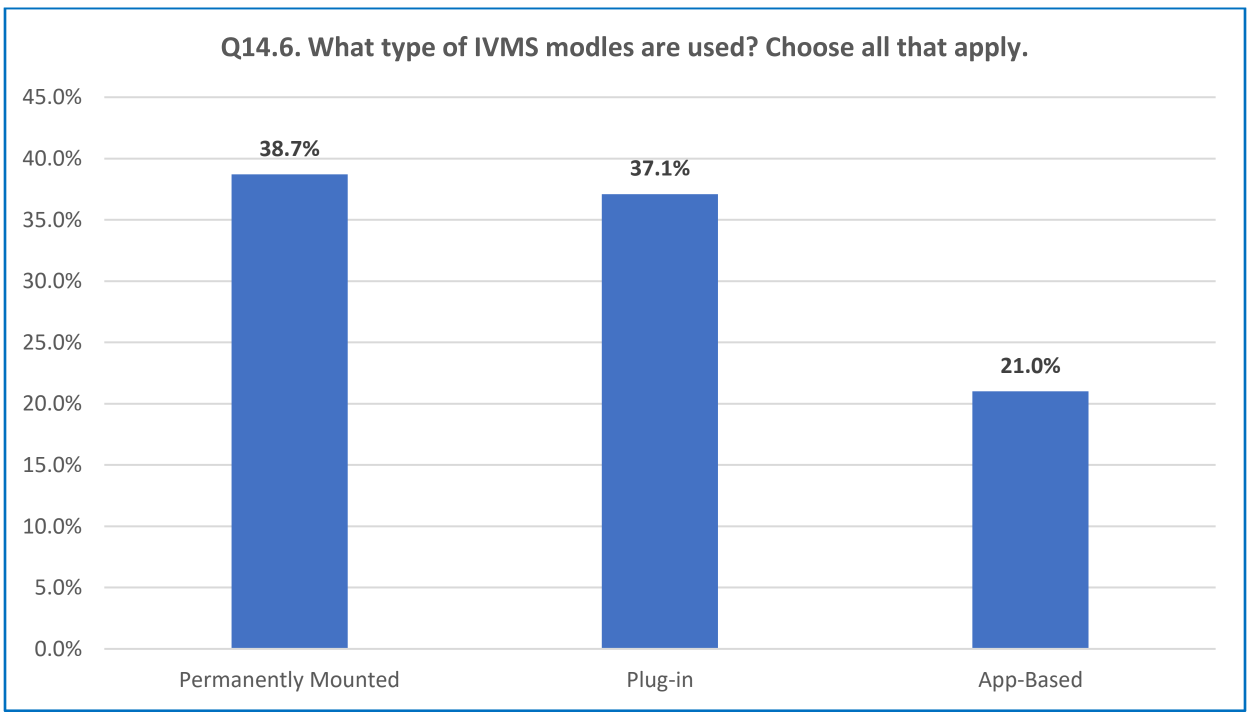

Q14.2d(4) What parameters/settings are used for IVMS equipment for **HARSH DECELERATIONS** in your **Heavy-Duty** fleet?
55.0%
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
6.3%
50.0%
12.5%
0.0%
31.3%
Decrease between 1-4mi/km per second
Decrease between 5-9mi/km per second
Decrease between 10-15mi/km per second
Decrease of more than 15mi/km per second
Other

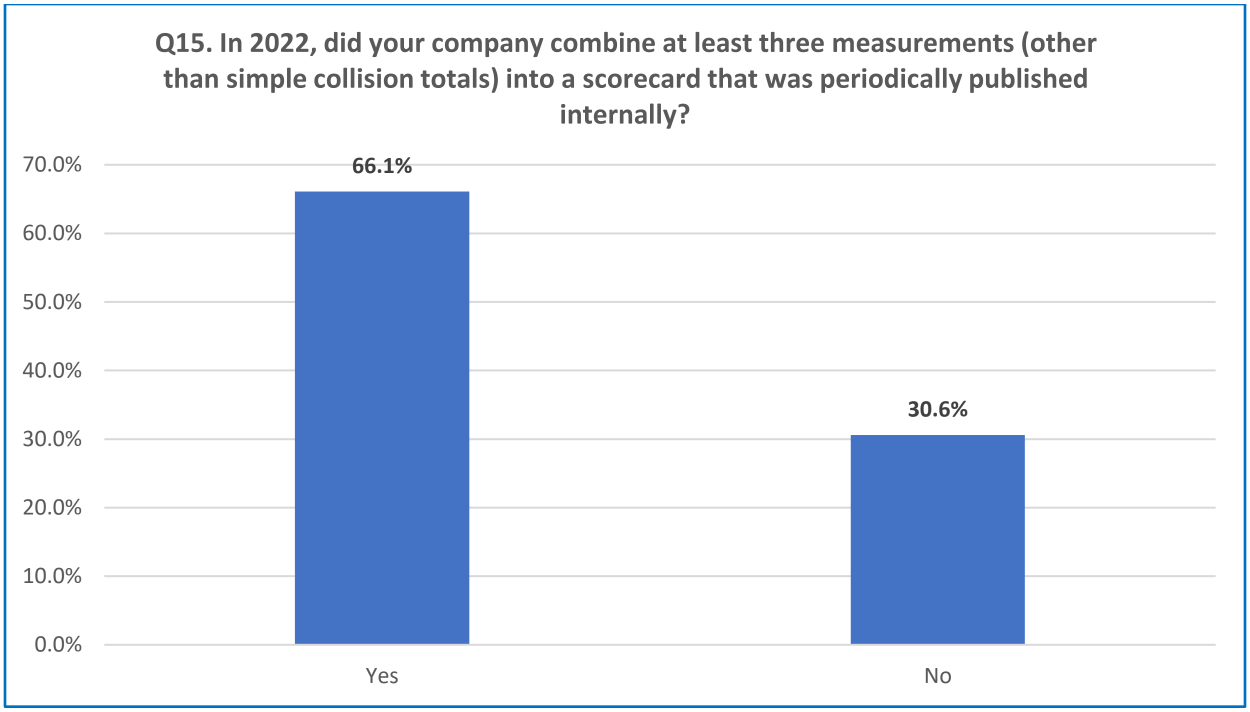

Q14.3. In 2022, did you review the information generated by your IVMS devices after a collision occurred?
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
24.2%
21.0%
12.9%
Yes, for all crashes
Yes, for serious crashes only
No, this was not standard procedure in this data year


Q14.4. In 2022, to whom did you make available the metrics generated by your IVMS equipment? Choose all that apply.
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
41.9%
58.1%
62.9%
45.2%
53.2%
6.5%
Drivers
Drivers' immediate managers
Safety staff
Fleet staff
High-level summaries periodically presented to management
Metrics not routinely available to drivers and/or managers

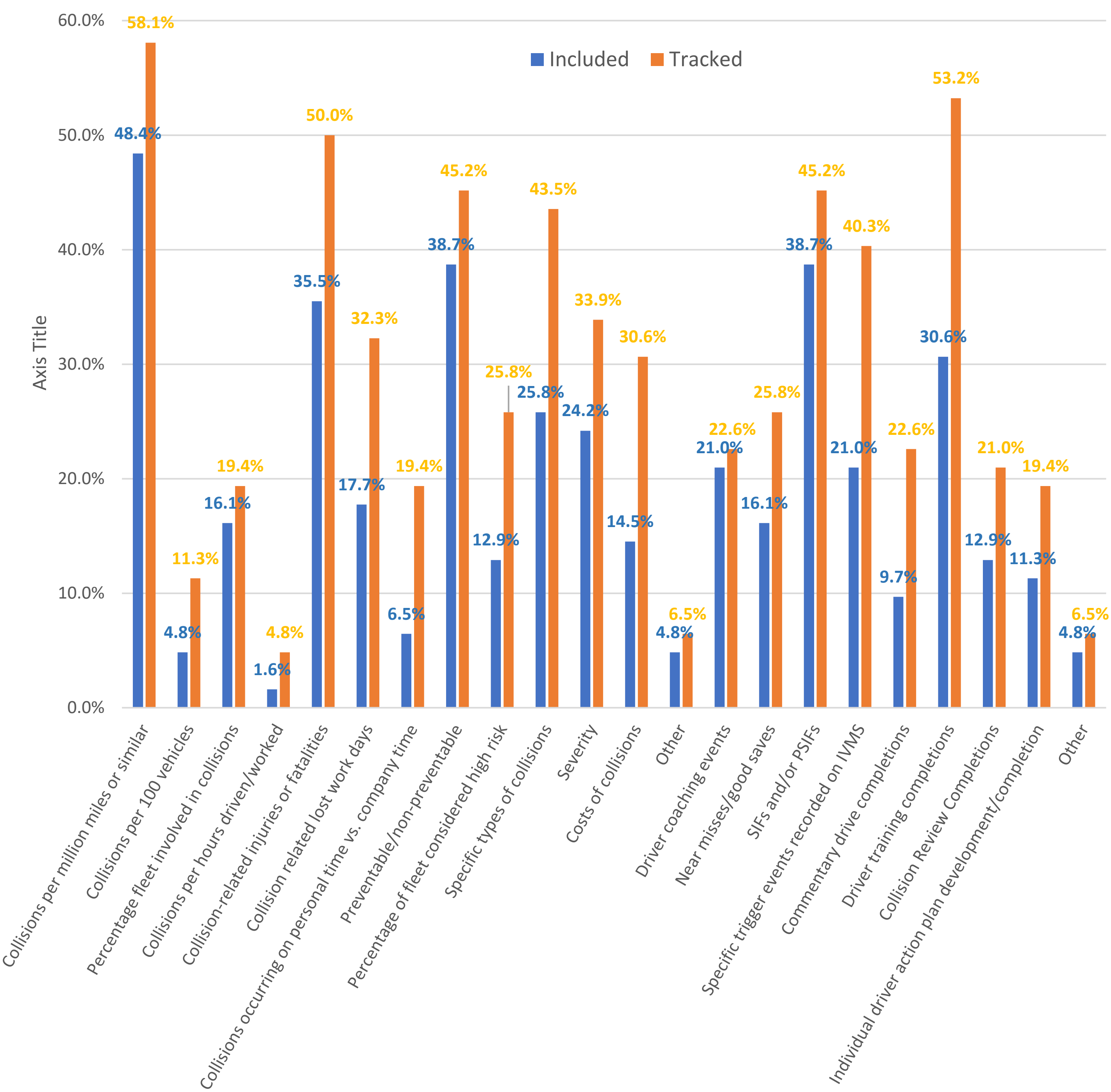

Q14.5. Which of the following best describes how you managed the data generated by your IVMS equipment in 2022? Choose one.
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
4.8%
4.8%
6.5%
45.2%
Our IVMS-generated metrics were not actively managed this data year.
Drivers were expected to review their own IVMS-generated metrics.
Managers reviewed IVMS metrics with all drivers who reported to them, as a group.
Managers reviewed IVMS metrics with individual drivers whose performance had been flagged.

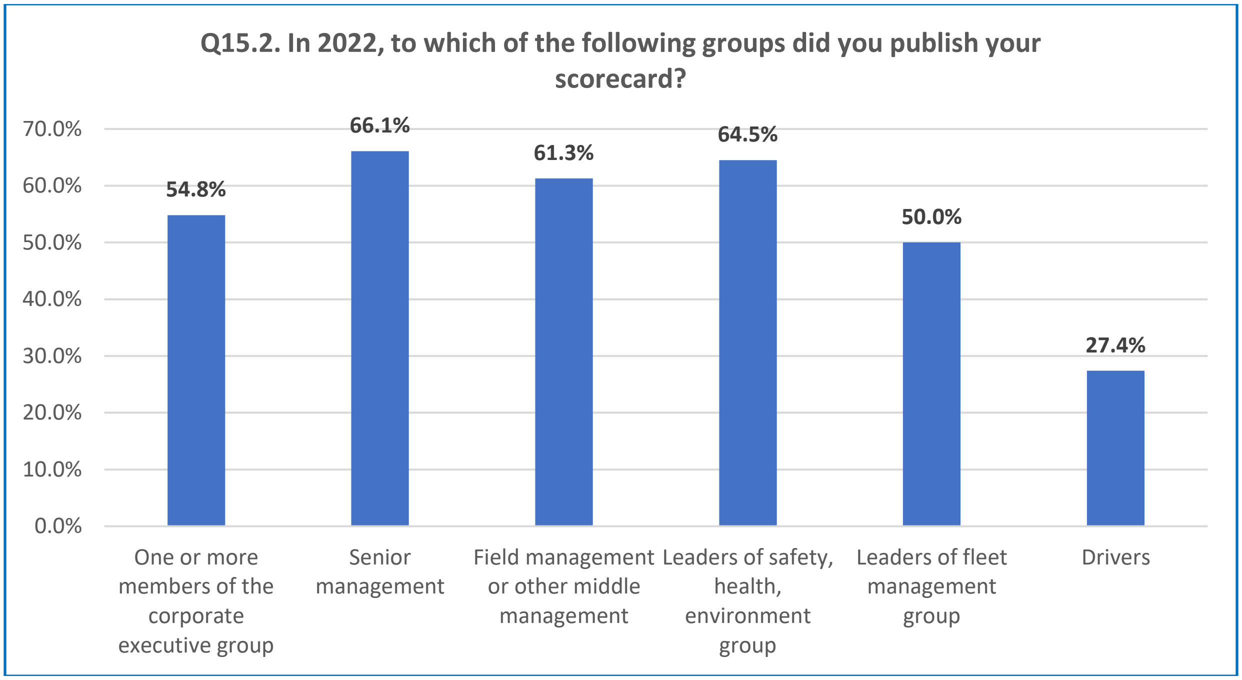

Q14.5a. What type of activities occurred to encourage coaching using IVMS metrics?
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
33.9%
25.8%
21.0%
22.6%
6.5%
Initial training of supervisors on IVMS software/coaching
Ongoing mentorship/sharing of best practices for coaching
Performance measures that incentivize supervisors to coach
System to track driver coaching by supervisors
Other

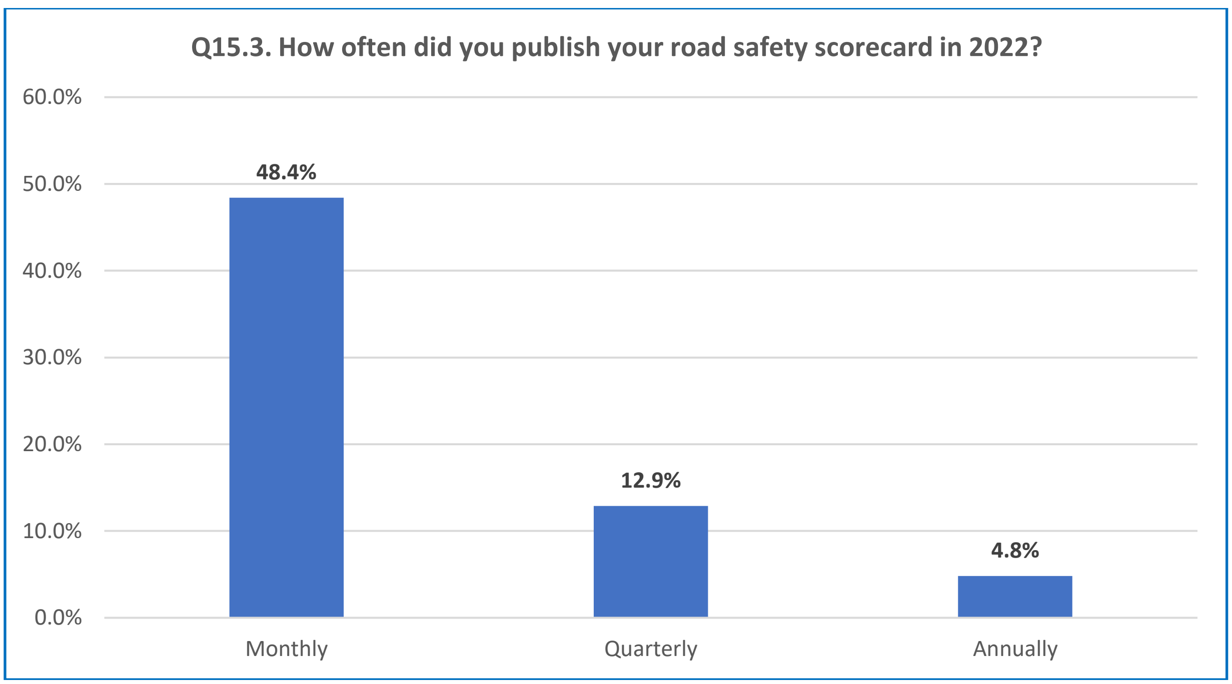

Q14.6. What type of IVMS modles are used? Choose all that apply.
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
38.7%
37.1%
21.0%
Permanently Mounted
Plug-in
App-Based

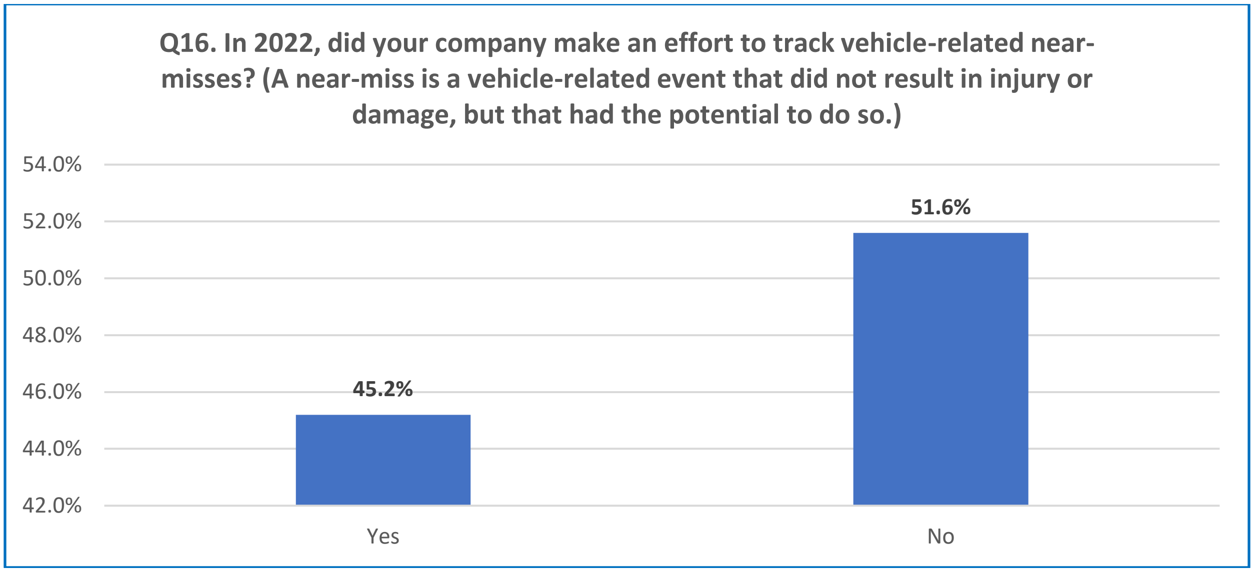

Q15. In 2022, did your company combine at least three measurements (other than simple collision totals) into a scorecard that was periodically published internally?
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
66.1%
30.6%
Yes
No

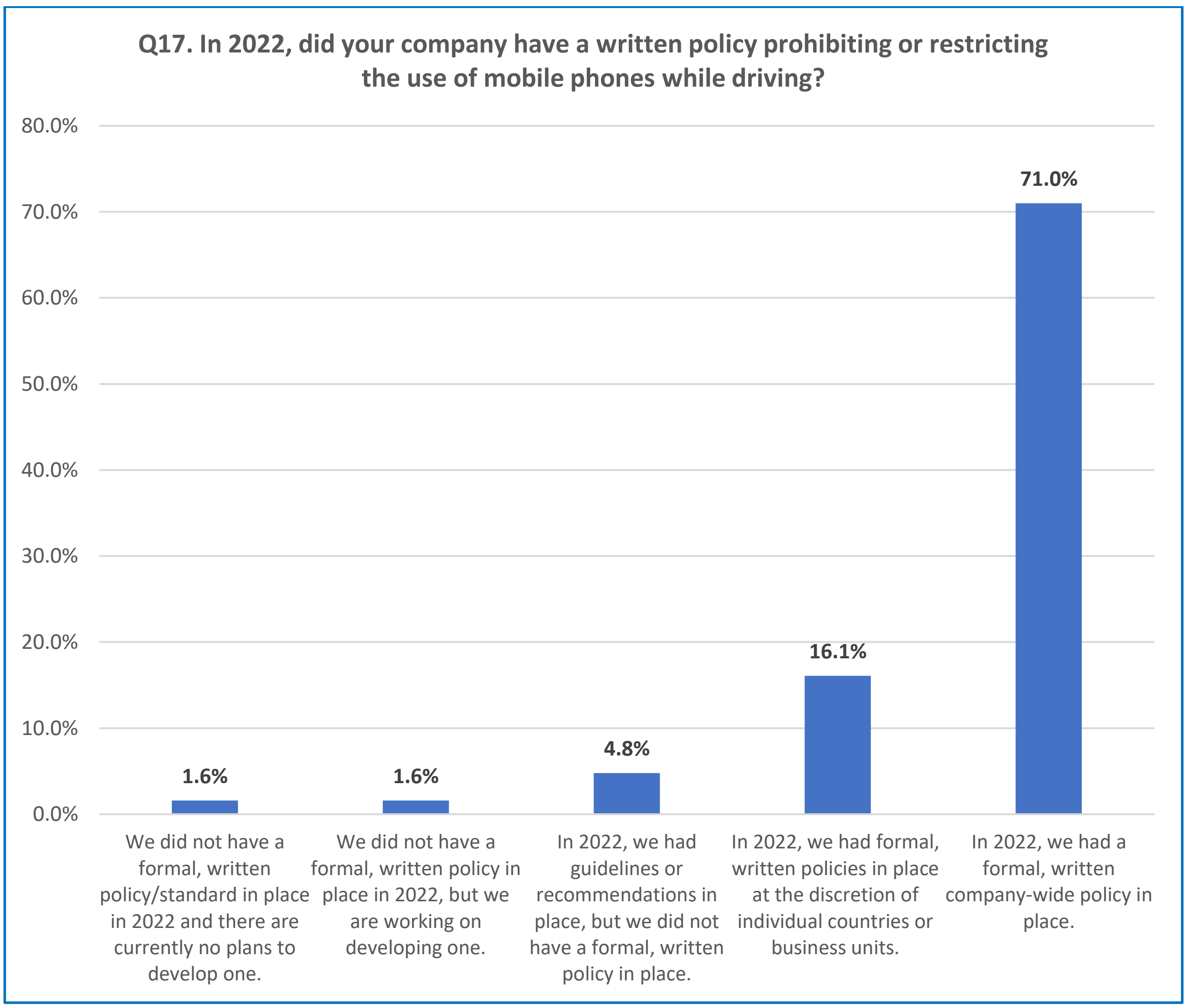
Q15.1 In 2022, which of the following data points were TRACKED in your organization and/or INCLUDED on your road safety scorecard? Choose all that apply.

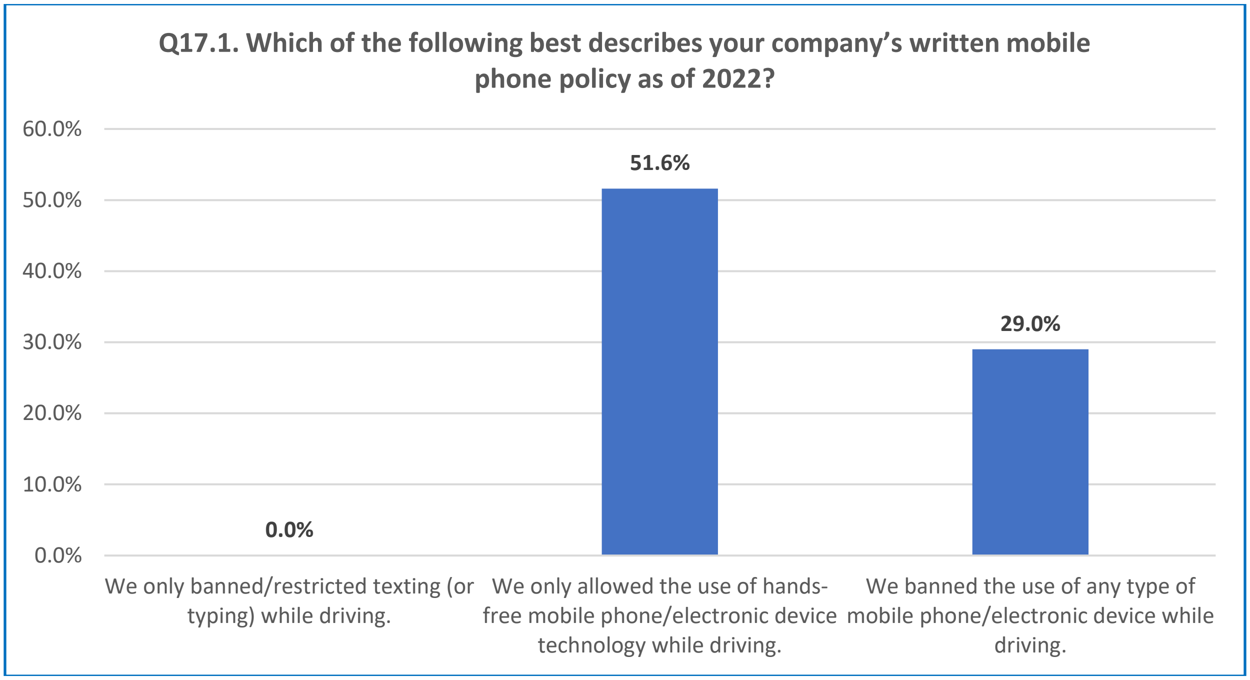


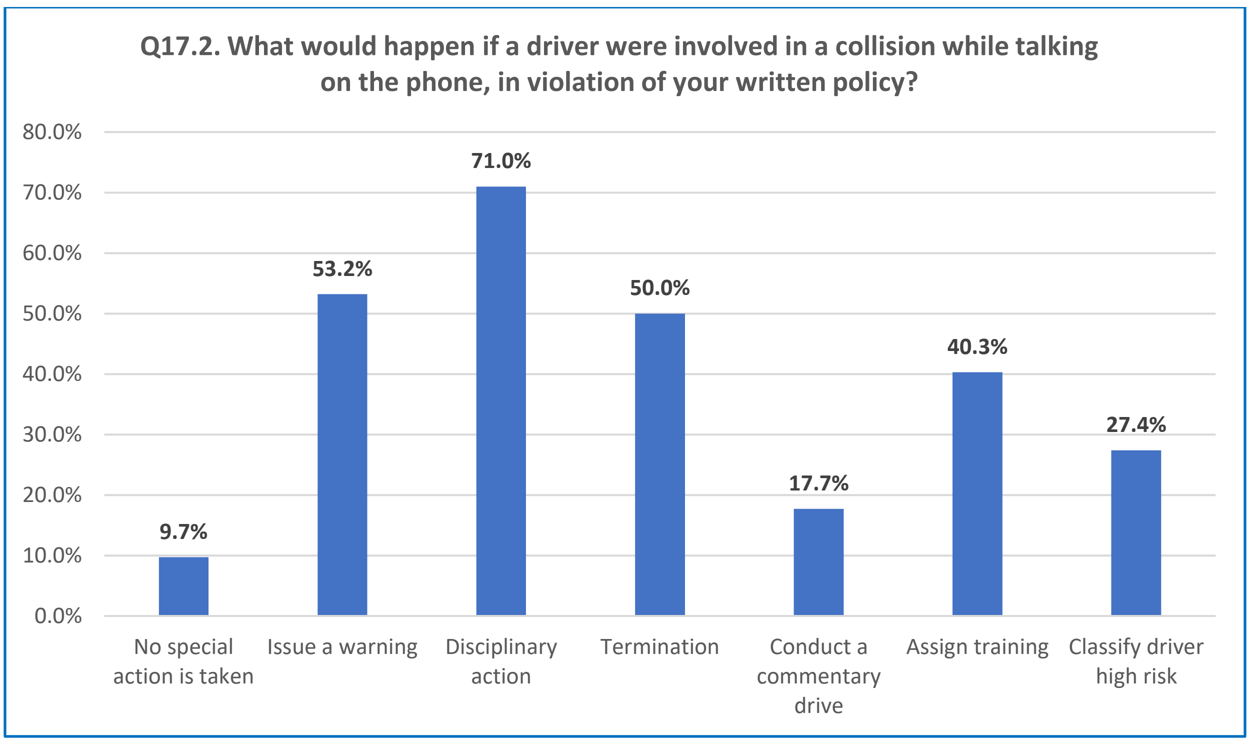

Q15.2. In 2022, to which of the following groups did you publish your scorecard?
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
54.8%
66.1%
61.3%
64.5%
50.0%
27.4%
One or more members of the corporate executive group
Senior management
Field management or other middle management
Leaders of safety, health, environment group
Leaders of fleet management group
Drivers

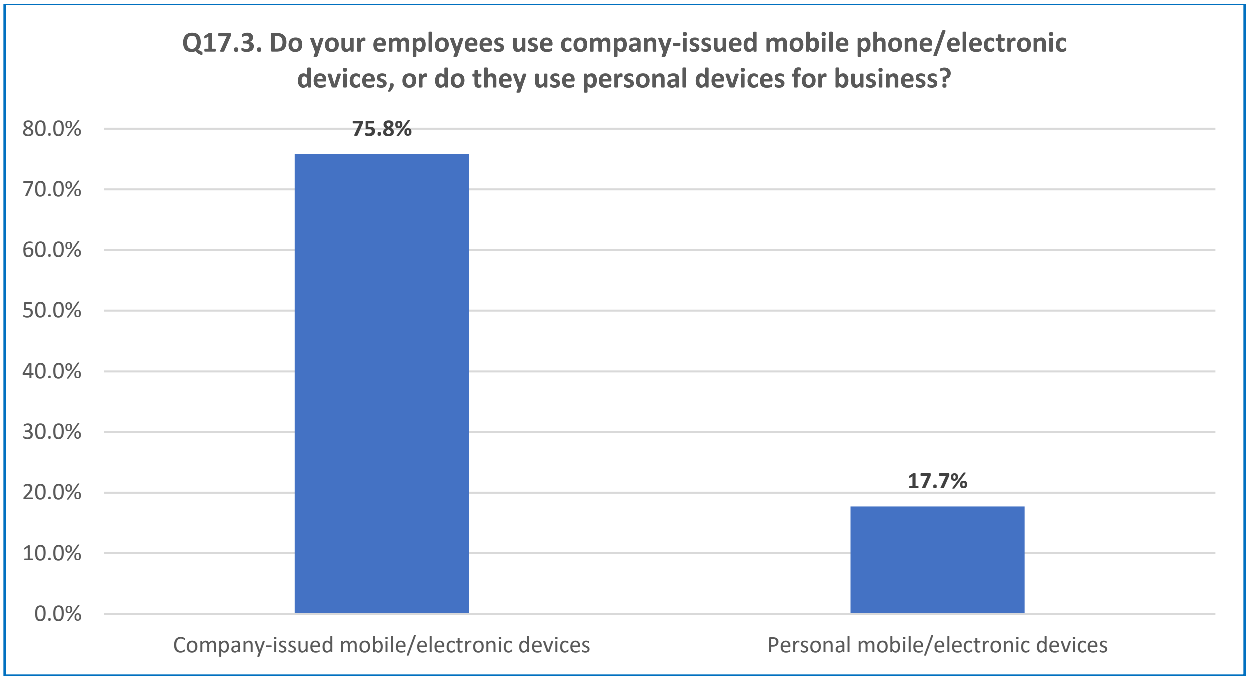

Q15.3. How often did you publish your road safety scorecard in 2022?
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
48.4%
12.9%
4.8%
Monthly
Quarterly
Annually

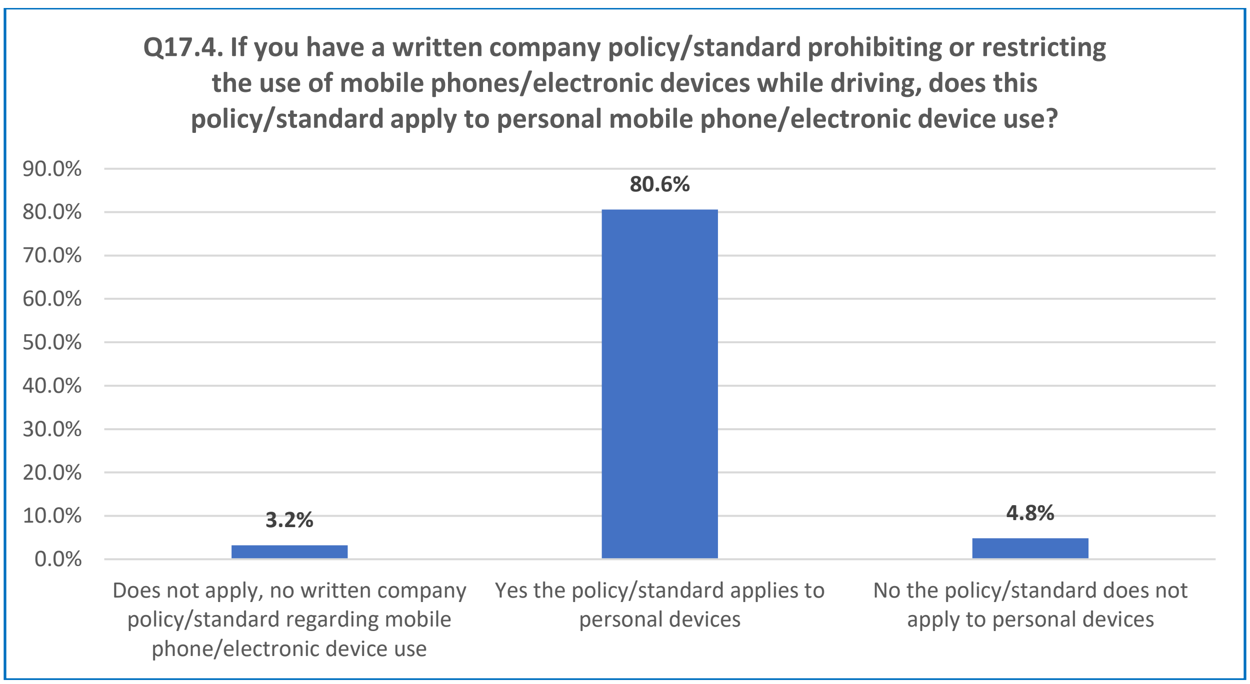

Q16. In 2022, did your company make an effort to track vehicle-related near-misses? (A near-miss is a vehicle-related event that did not result in injury or damage, but that had the potential to do so.)
54.0%
52.0%
50.0%
48.0%
46.0%
44.0%
42.0%
45.2%
51.6%
Yes
No

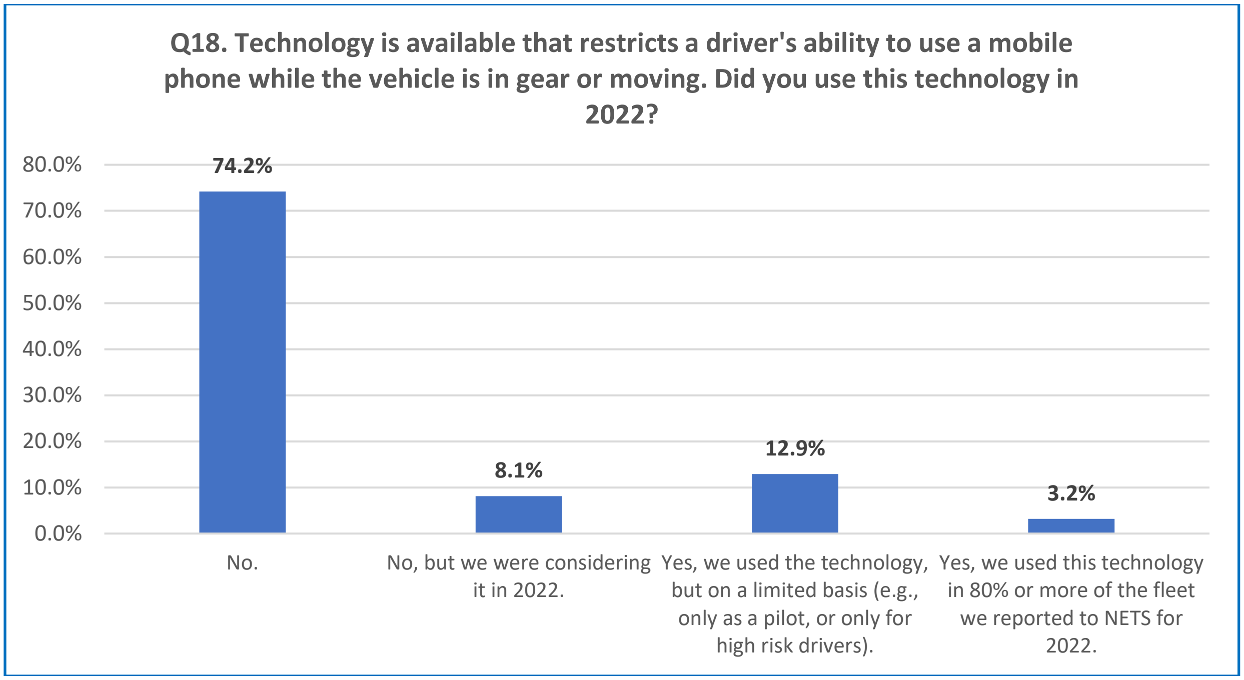

Q17. In 2022, did your company have a written policy prohibiting or restricting the use of mobile phones while driving?
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
1.6%
1.6%
4.8%
16.1%
71.0%
We did not have a formal, written policy/standard in place in 2022 and there are currently no plans to develop one.
We did not have a formal, written policy in place in 2022, but we are working on developing one.
In 2022, we had guidelines or recommendations in place, but we did not have a formal, written policy in place.
In 2022, we had formal, written policies in place at the discretion of individual countries or business units.
In 2022, we had a formal, written company-wide policy in place.

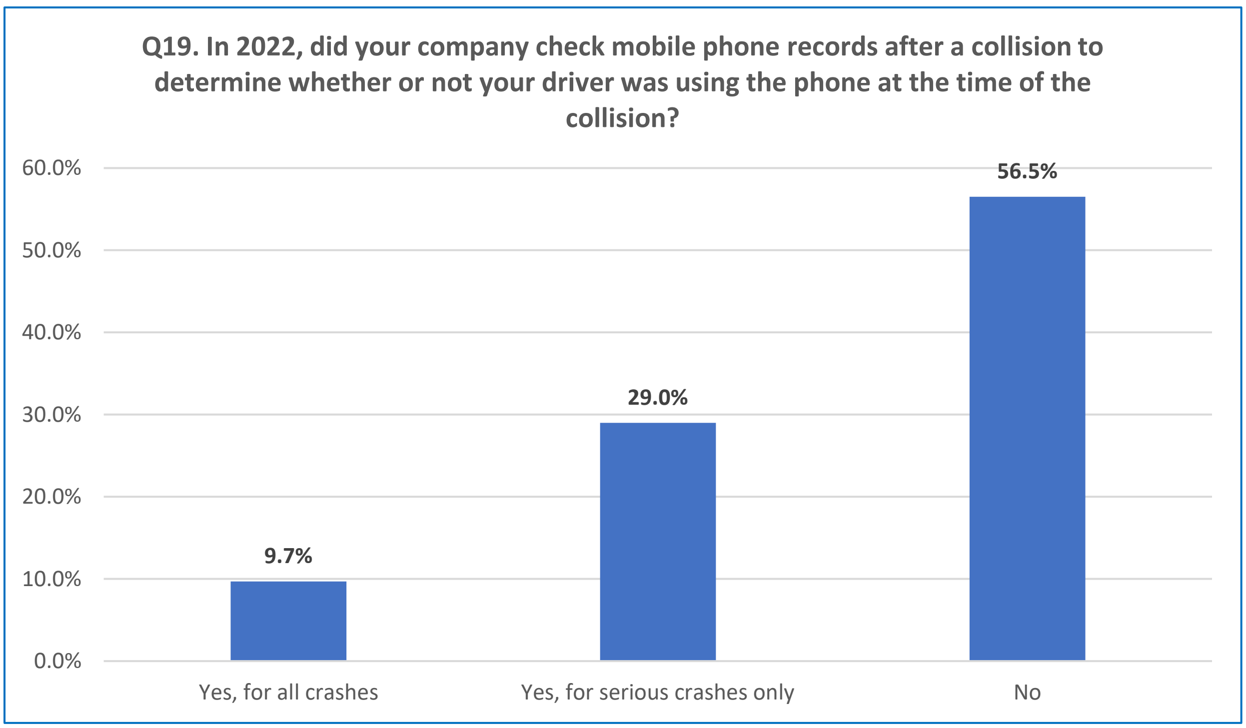

Q17.1. Which of the following best describes your company's written mobile phone policy as of 2022?
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.0%
51.6%
29.0%
We only banned/restricted texting (or typing) while driving.
We only allowed the use of hands-free mobile phone/electronic device technology while driving.
We banned the use of any type of mobile phone/electronic device while driving.

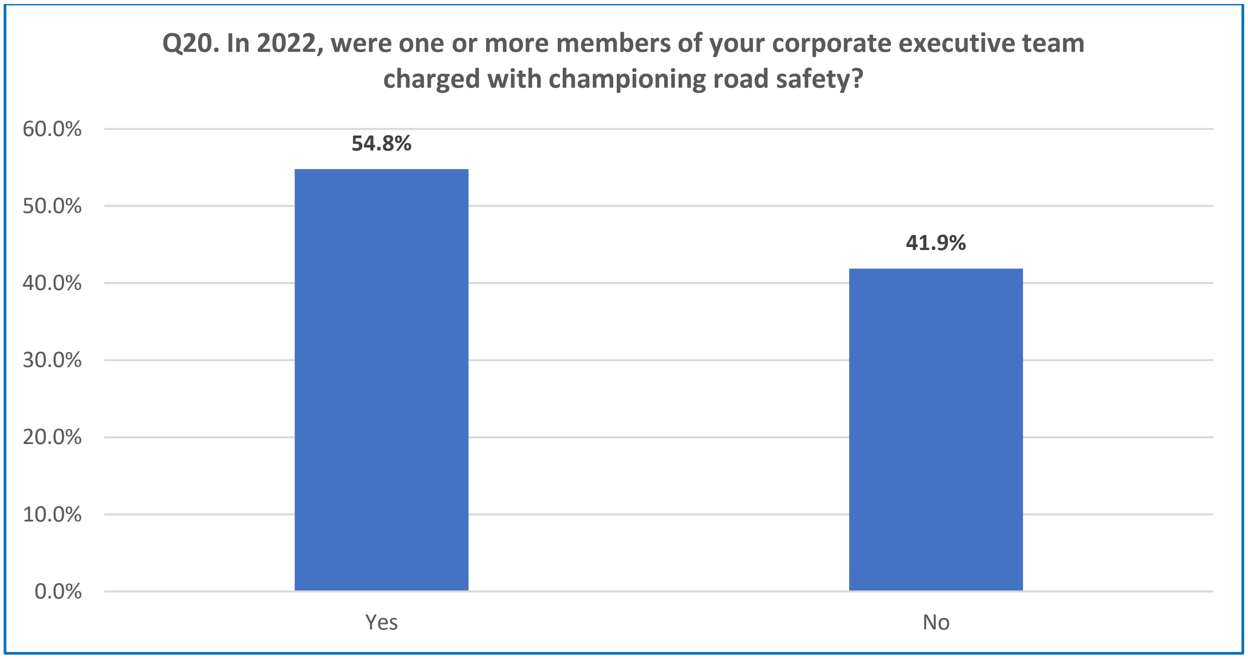

Q17.2. What would happen if a driver were involved in a collision while talking on the phone, in violation of your written policy?
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
9.7%
53.2%
71.0%
50.0%
17.7%
40.3%
27.4%
No special action is taken
Issue a warning
Disciplinary action
Termination
Conduct a commentary drive
Assign training
Classify driver high risk

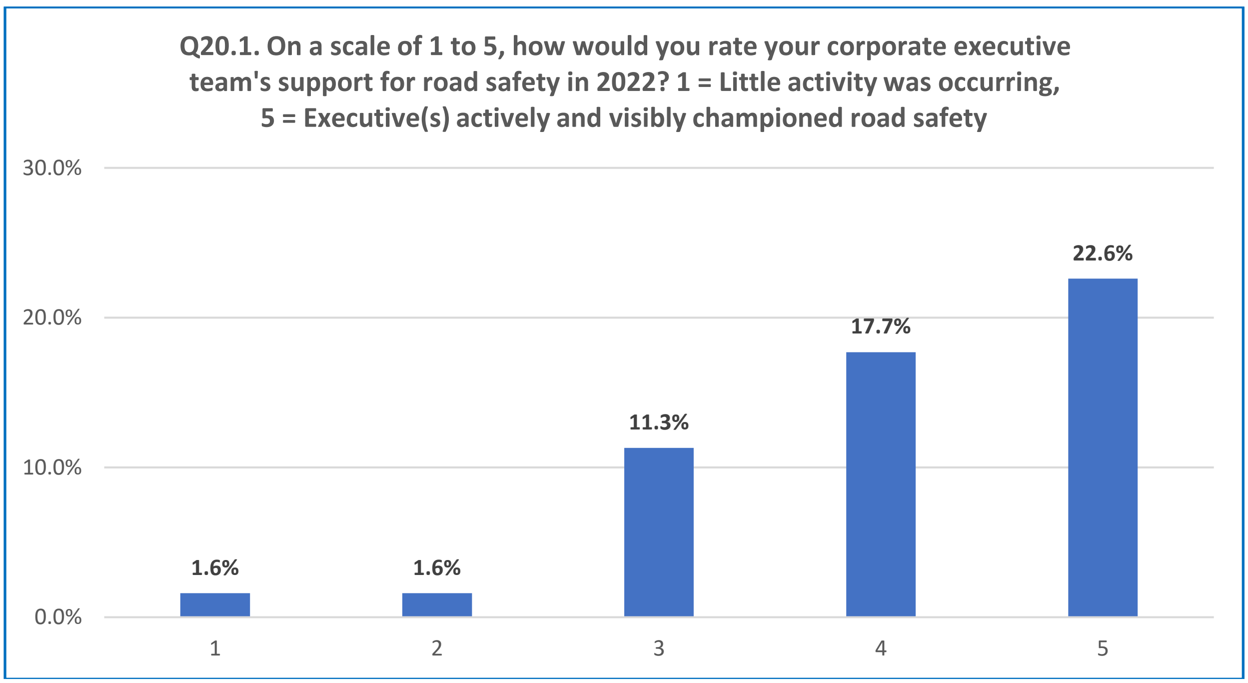

Q17.3. Do your employees use company-issued mobile phone/electronic devices, or do they use personal devices for business?
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
75.8%
17.7%
Company-issued mobile/electronic devices
Personal mobile/electronic devices


Q17.4. If you have a written company policy/standard prohibiting or restricting the use of mobile phones/electronic devices while driving, does this policy/standard apply to personal mobile phone/electronic device use?
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
3.2%
80.6%
4.8%
Does not apply, no written company policy/standard regarding mobile phone/electronic device use
Yes the policy/standard applies to personal devices
No the policy/standard does not apply to personal devices

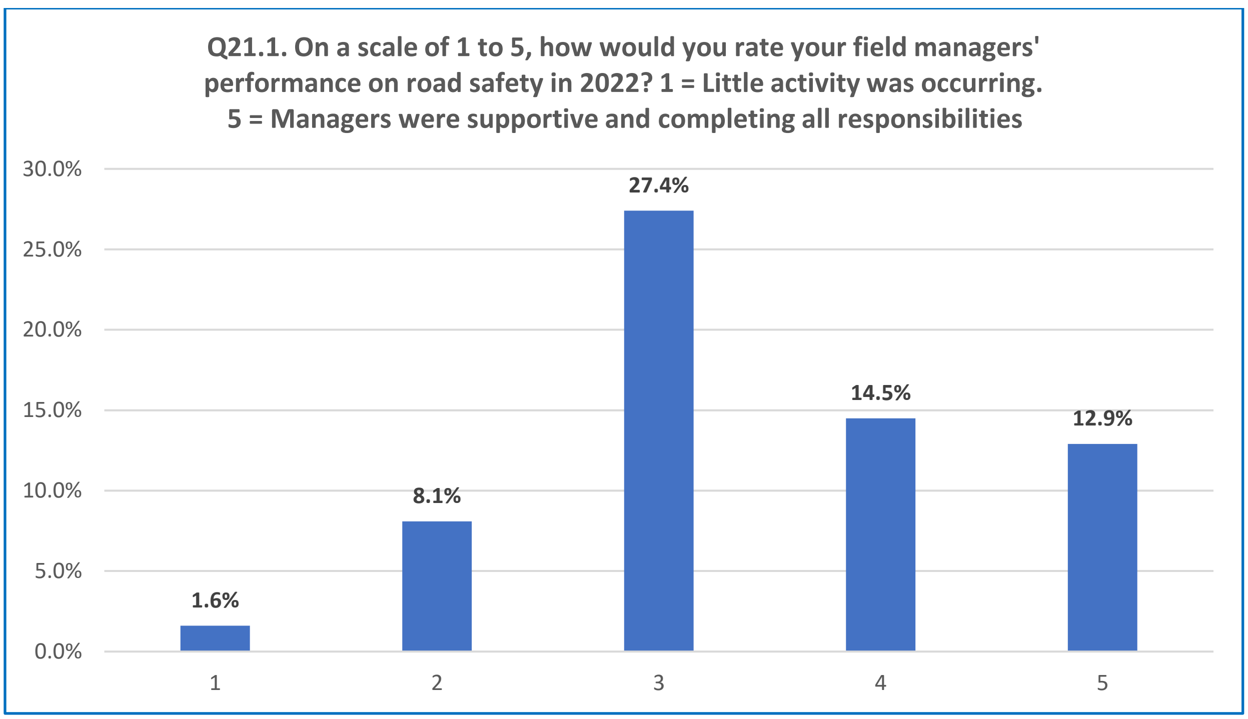

Q18. Technology is available that restricts a driver's ability to use a mobile phone while the vehicle is in gear or moving. Did you use this technology in 2022?
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
74.2%
8.1%
12.9%
3.2%
No.
No, but we were considering it in 2022.
Yes, we used the technology, but on a limited basis (e.g., only as a pilot, or only for high risk drivers).
Yes, we used this technology in 80% or more of the fleet we reported to NETS for 2022.

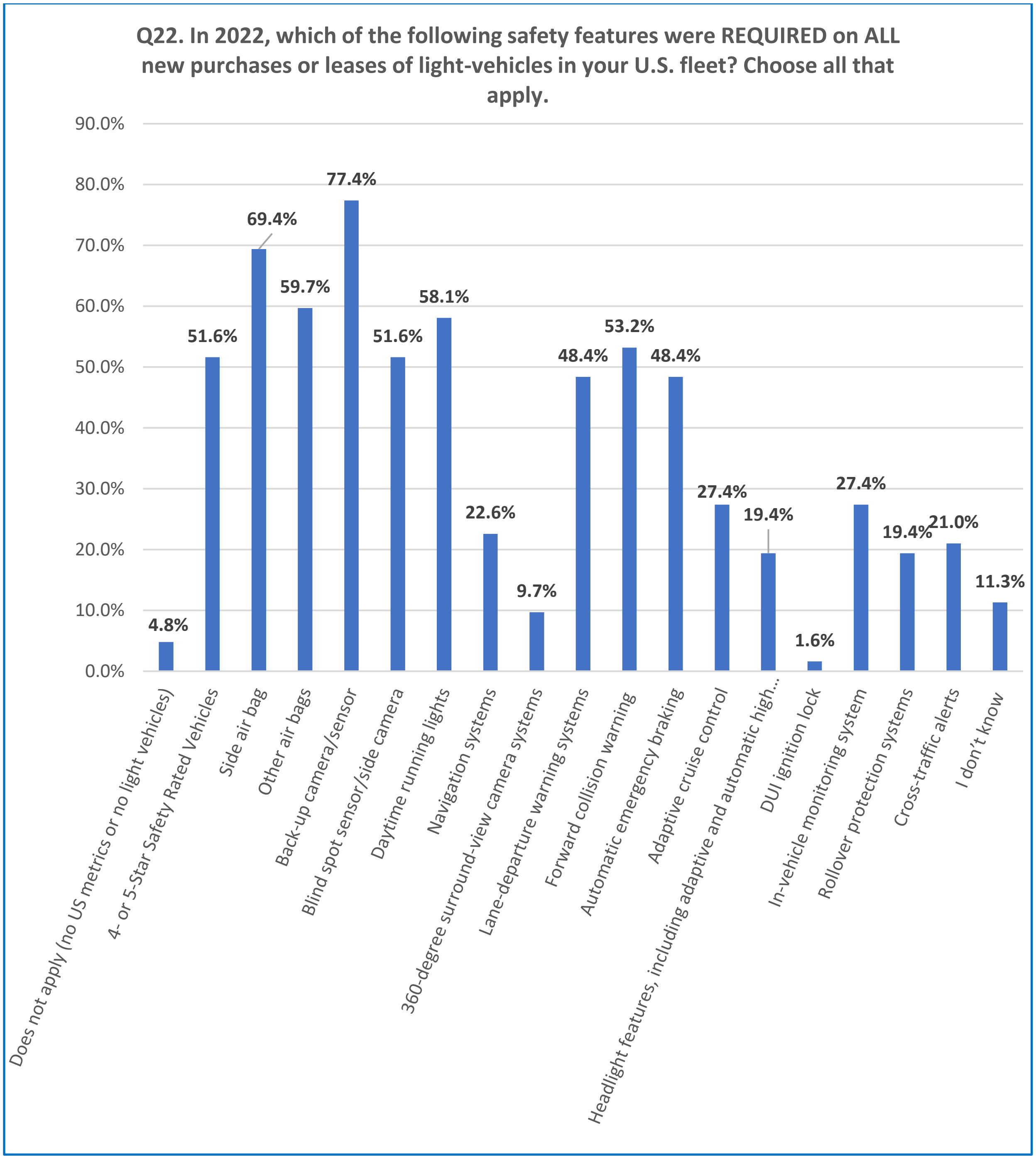

Q19. In 2022, did your company check mobile phone records after a collision to determine whether or not your driver was using the phone at the time of the collision?
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
9.7%
29.0%
56.5%
Yes, for all crashes
Yes, for serious crashes only
No

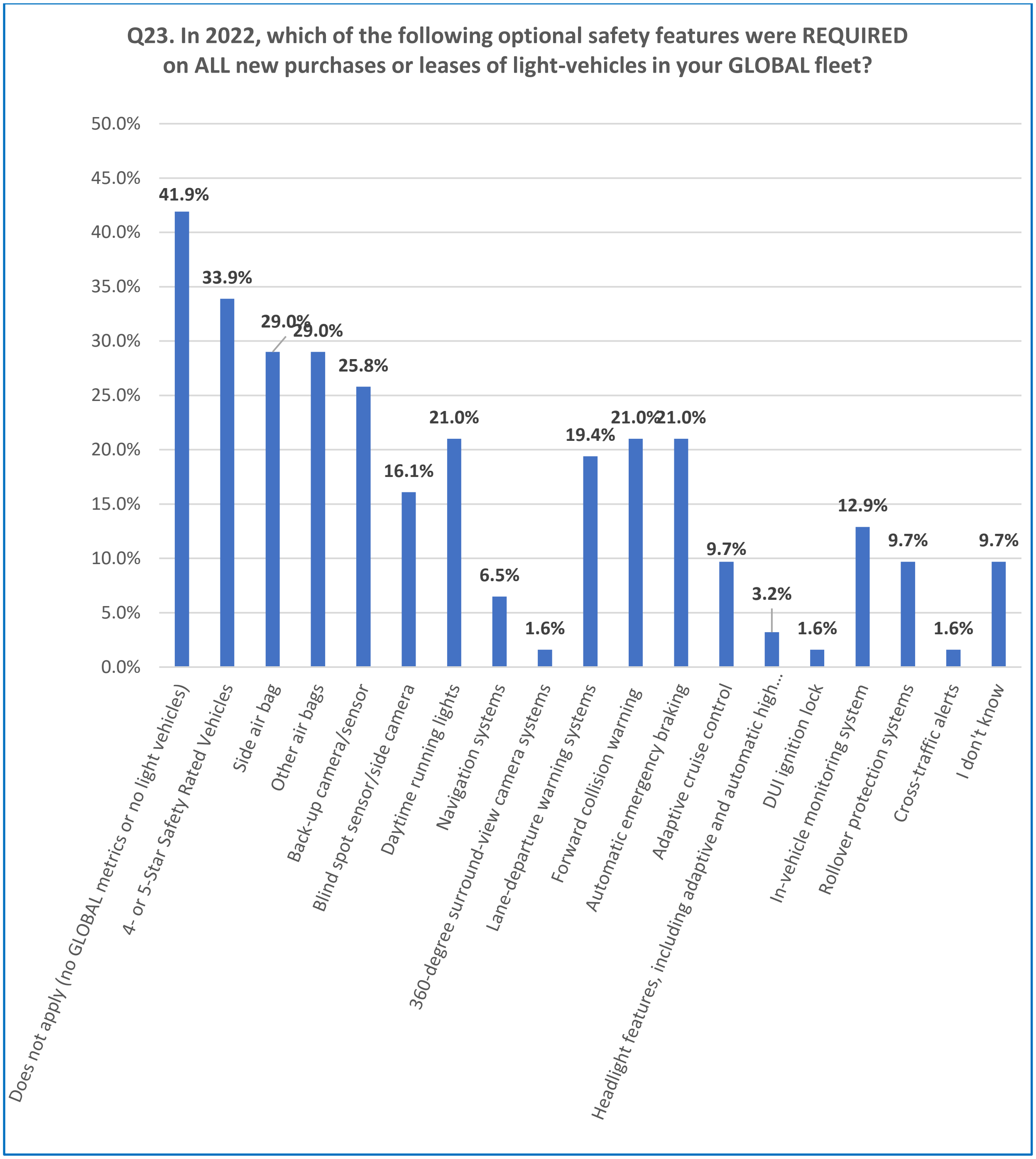

Q20. In 2022, were one or more members of your corporate executive team charged with championing road safety?
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
54.8%
41.9%
Yes
No

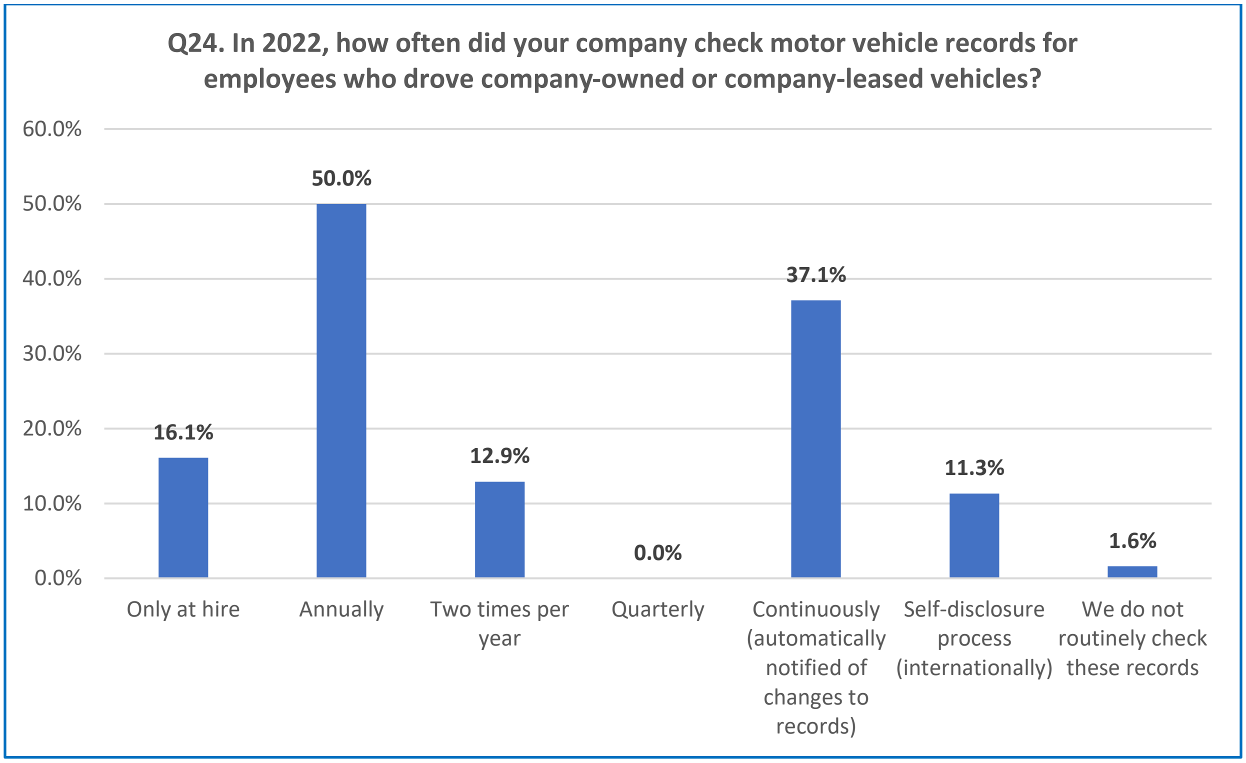

Q20.1. On a scale of 1 to 5, how would you rate your corporate executive team's support for road safety in 2022? 1 = Little activity was occurring, 5 = Executive(s) actively and visibly championed road safety
30.0%
20.0%
10.0%
0.0%
1.6%
1.6%
11.3%
17.7%
22.6%
1
2
3
4
5

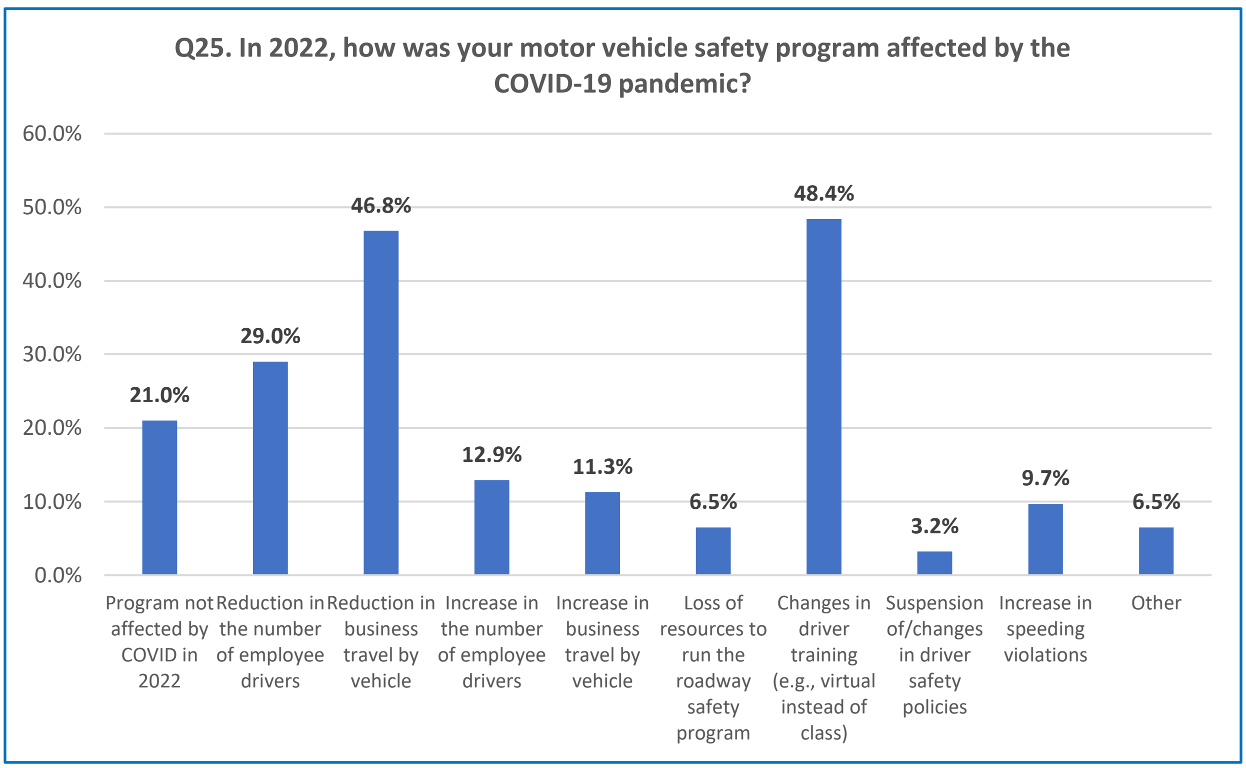

Q21. In 2022, were managers in your field organization assigned clear, specific road safety responsibilities?
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
64.5%
33.9%
Yes
No

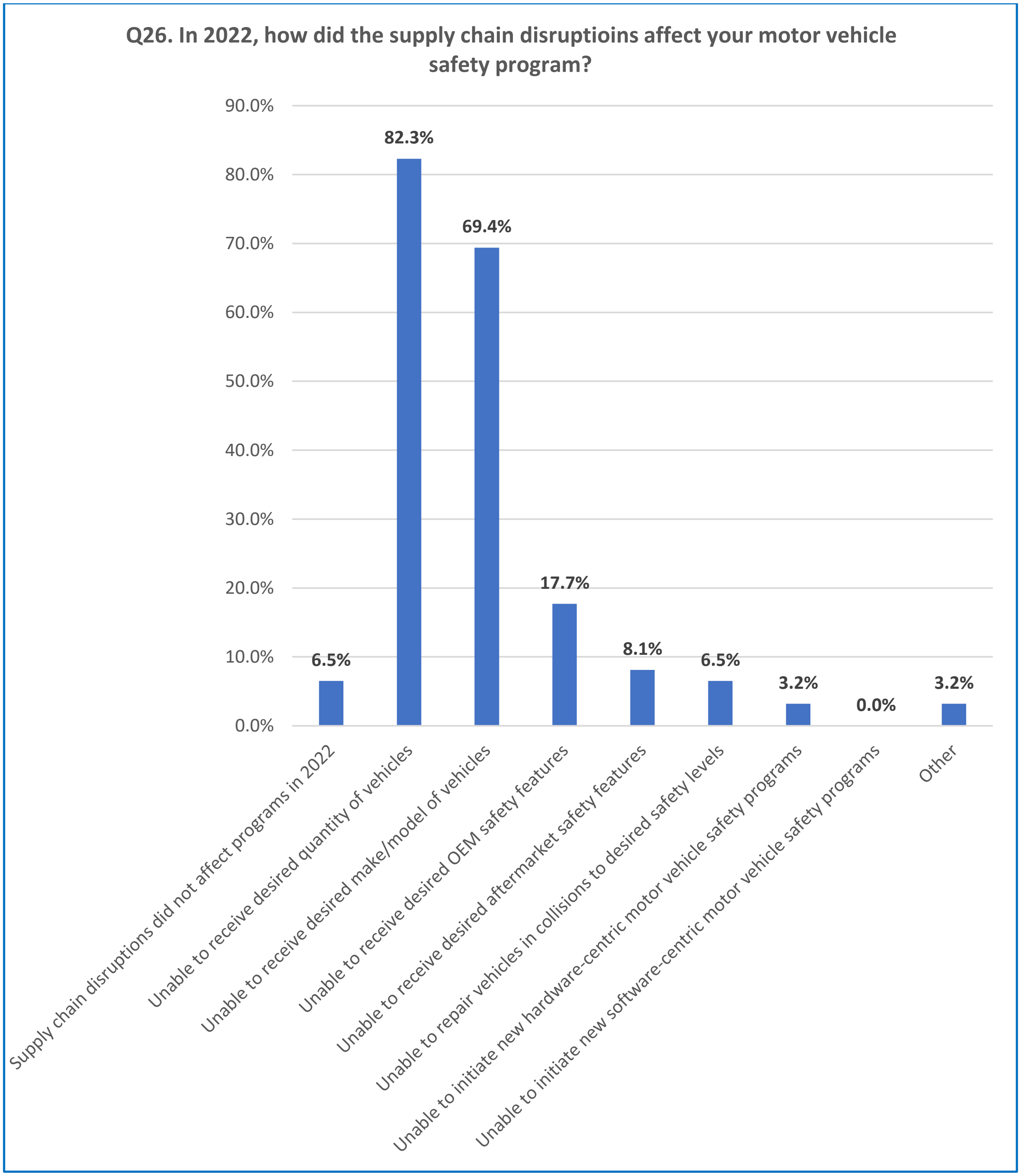

Q21.1. On a scale of 1 to 5, how would you rate your field managers' performance on road safety in 2022? 1 = Little activity was occurring. 5 = Managers were supportive and completing all responsibilities
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
1.6%
8.1%
27.4%
14.5%
12.9%
1
2
3
4
5


Q22. In 2022, which of the following safety features were REQUIRED on ALL new purchases or leases of light-vehicles in your U.S. fleet? Choose all that apply.
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
4.8%
51.6%
69.4%
59.7%
77.4%
51.6%
58.1%
22.6%
9.7%
48.4%
53.2%
48.4%
27.4%
19.4%
1.6%
27.4%
19.4%
21.0%
11.3%
Does not apply (no US metrics or no light vehicles)
4- or 5-Star Safety Rated Vehicles
Side air bag
Other air bags
Back-up camera/sensor
Blind spot sensor/side camera
Daytime running lights
Navigation systems
360-degree surround-view camera systems
Lane-departure warning systems
Forward collision warning
Automatic emergency braking
Adaptive cruise control
Headlight features, including adaptive and automatic high...
DUI ignition lock
In-vehicle monitoring system
Rollover protection systems
Cross-traffic alerts
I don't know

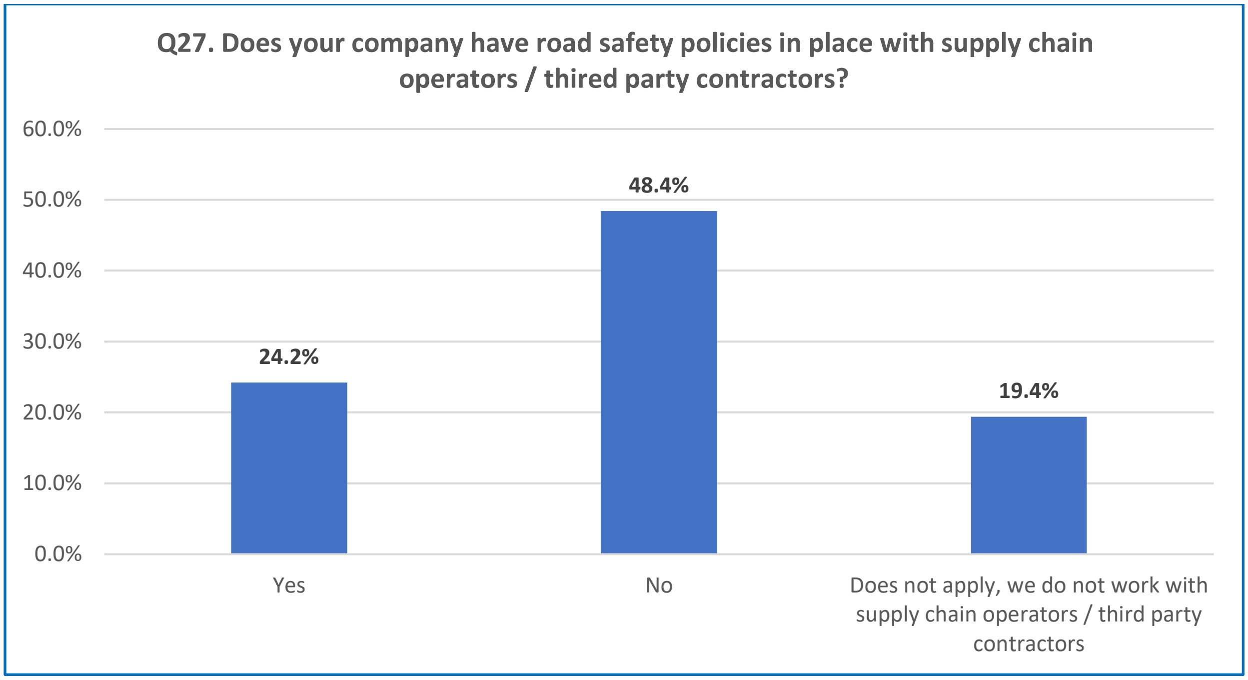

Q23. In 2022, which of the following optional safety features were REQUIRED on ALL new purchases or leases of light-vehicles in your GLOBAL fleet?
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
41.9%
33.9%
29.0%
29.0%
25.8%
16.1%
21.0%
6.5%
1.6%
19.4%
21.0%
21.0%
9.7%
3.2%
1.6%
12.9%
9.7%
1.6%
9.7%
Does not apply (no GLOBAL metrics or no light vehicles)
4- or 5-Star Safety Rated Vehicles
Side air bag
Other air bags
Back-up camera/sensor
Blind spot sensor/side camera
Daytime running lights
Navigation systems
360-degree surround-view camera systems
Lane-departure warning systems
Forward collision warning
Automatic emergency braking
Adaptive cruise control
Headlight features, including adaptive and automatic high...
DUI ignition lock
In-vehicle monitoring system
Rollover protection systems
Cross-traffic alerts
I don't know

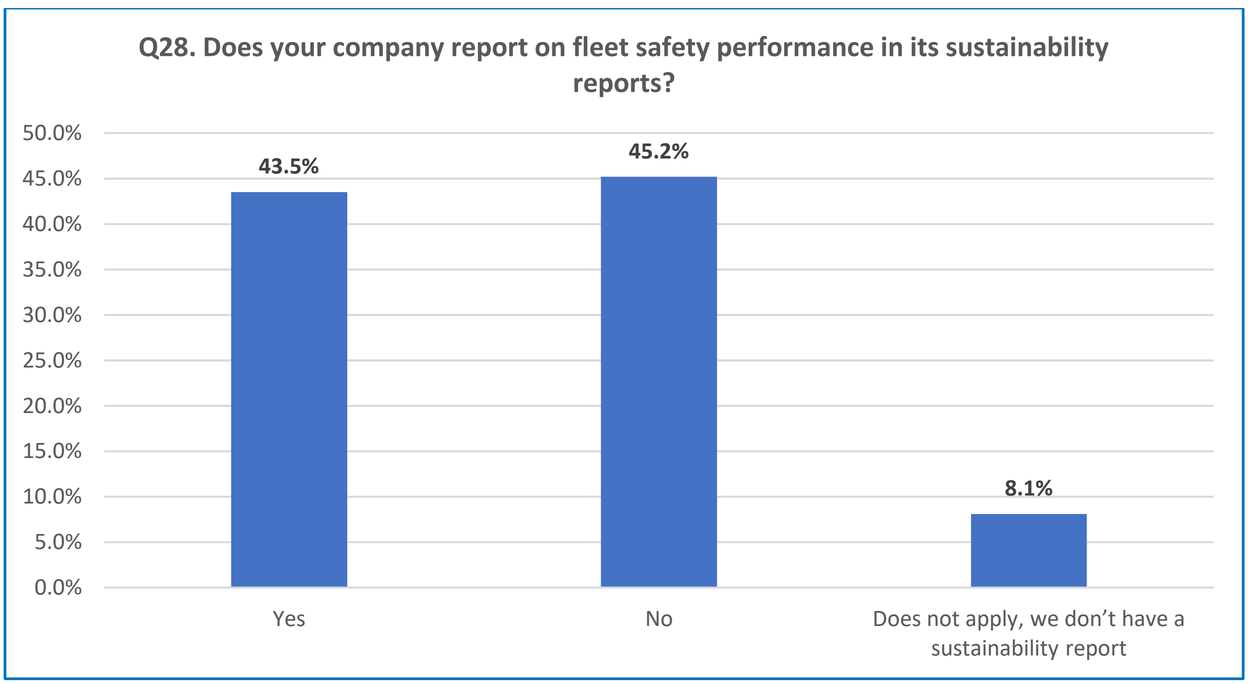

Q24. In 2022, how often did your company check motor vehicle records for employees who drove company-owned or company-leased vehicles?
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
16.1%
50.0%
12.9%
0.0%
37.1%
11.3%
1.6%
Only at hire
Annually
Two times per year
Quarterly
Continuously (automatically notified of changes to records)
Self-disclosure process (internationally)
We do not routinely check these records

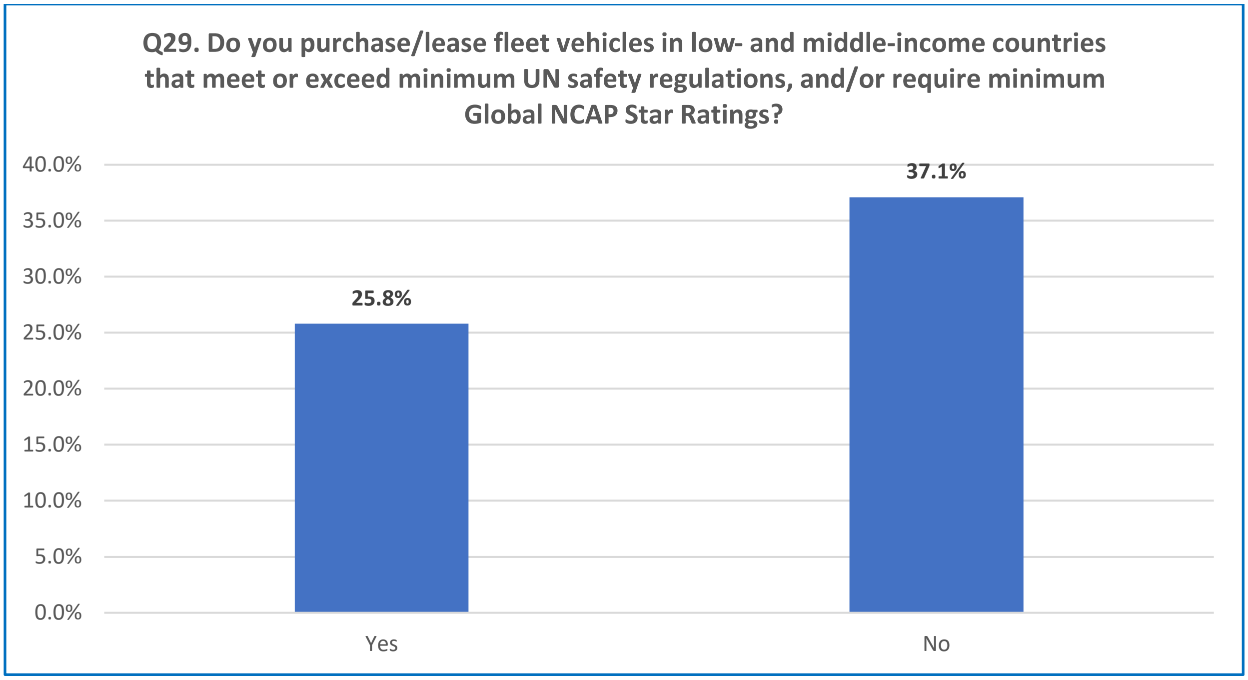

Q25. In 2022, how was your motor vehicle safety program affected by the COVID-19 pandemic?
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
21.0%
29.0%
46.8%
12.9%
11.3%
6.5%
48.4%
3.2%
9.7%
6.5%
Program not affected by COVID in 2022
Reduction in the number of employee drivers
Reduction in business travel by vehicle
Increase in the number of employee drivers
Increase in business travel by vehicle
Loss of resources to run the roadway safety program
Changes in driver training (e.g., virtual instead of class)
Suspension of/changes in driver safety policies
Increase in speeding violations
Other

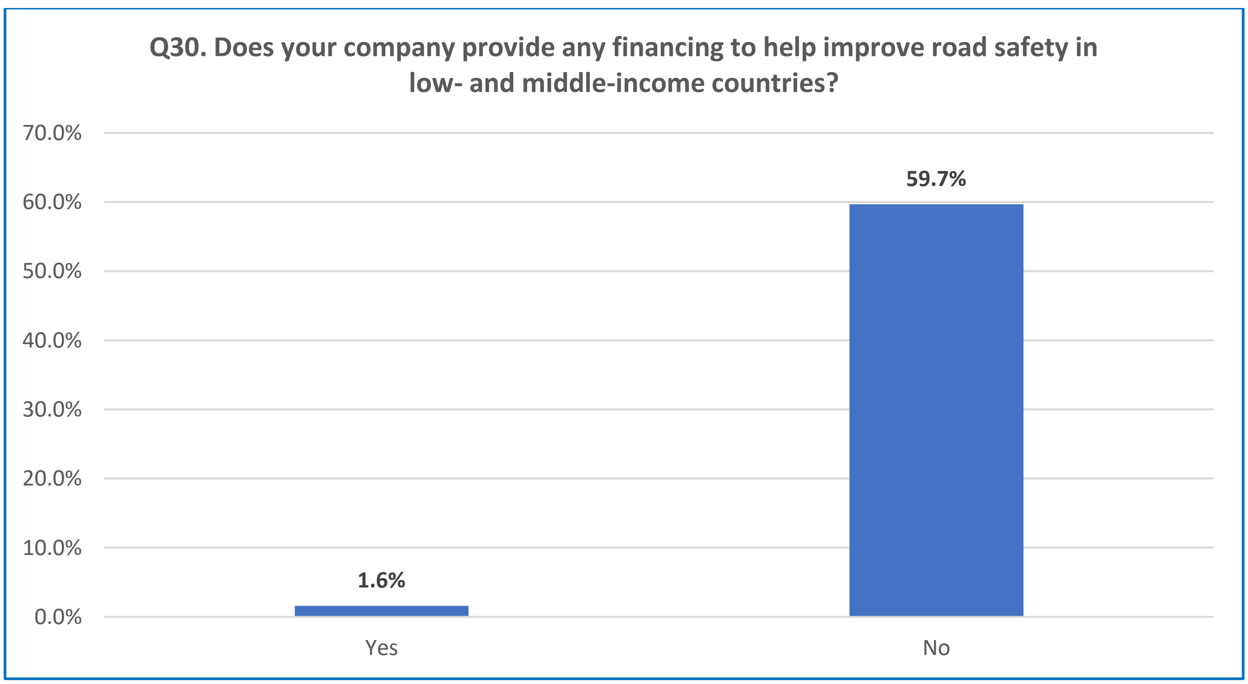


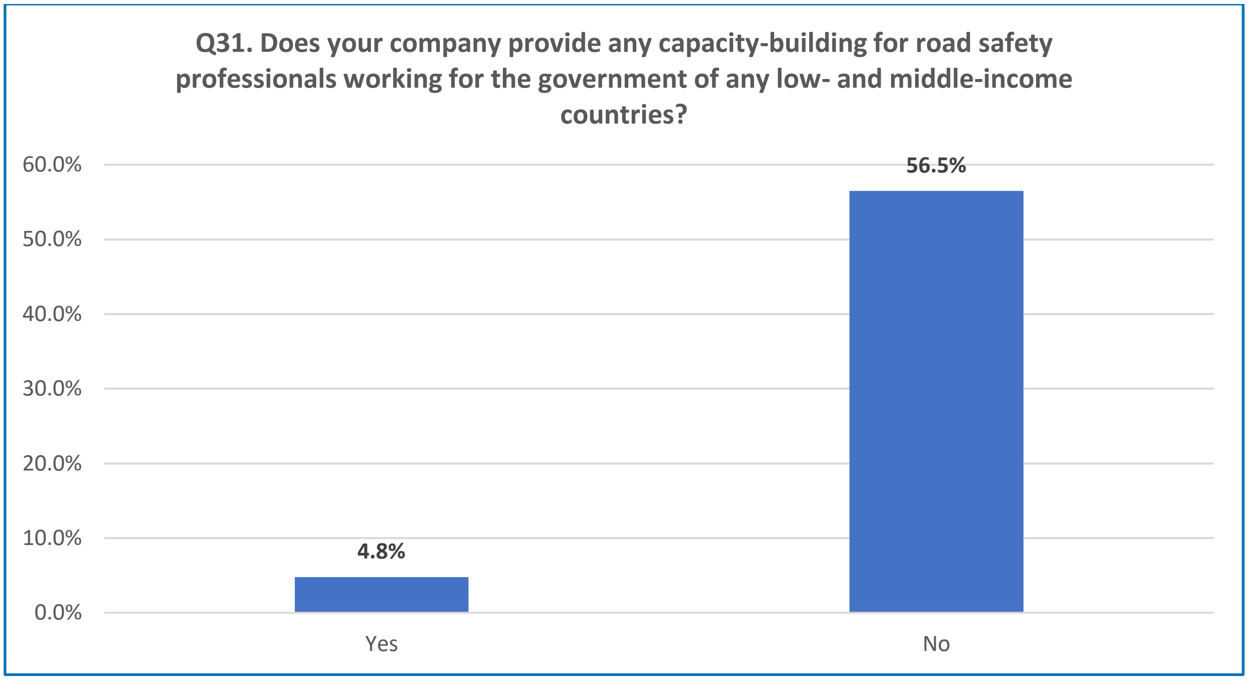
Q26. In 2022, how did the supply chain disruptioins affect your motor vehicle safety program?
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
6.5%
82.3%
69.4%
17.7%
8.1%
6.5%
3.2%
0.0%
3.2%
Supply chain disruptions did not affect programs in 2022
Unable to receive desired quantity of vehicles
Unable to receive desired make/model of vehicles
Unable to receive desired OEM safety features
Unable to receive desired aftermarket safety features
Unable to repair vehicles in collisions to desired safety levels
Unable to initiate new hardware-centric motor vehicle safety programs
Unable to initiate new software-centric motor vehicle safety programs
Other


Q27. Does your company have road safety policies in place with supply chain operators / thired party contractors?
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
24.2%
48.4%
19.4%
Yes
No
Does not apply, we do not work with supply chain operators / third party contractors


Q28. Does your company report on fleet safety performance in its sustainability reports?
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
43.5%
45.2%
8.1%
Yes
No
Does not apply, we don't have a sustainability report


Q29. Do you purchase/lease fleet vehicles in low- and middle-income countries that meet or exceed minimum UN safety regulations, and/or require minimum Global NCAP Star Ratings?
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
25.8%
37.1%
Yes
No


Q30. Does your company provide any financing to help improve road safety in low- and middle-income countries?
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
1.6%
59.7%
Yes
No


Q31. Does your company provide any capacity-building for road safety professionals working for the government of any low- and middle-income countries?
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
4.8%
56.5%
Yes
No

