U.S. Department of Transportation
Federal Motor Carrier Safety Administration

Commercial Motor Vehicle (CMV) Driver Restart Study

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Agenda

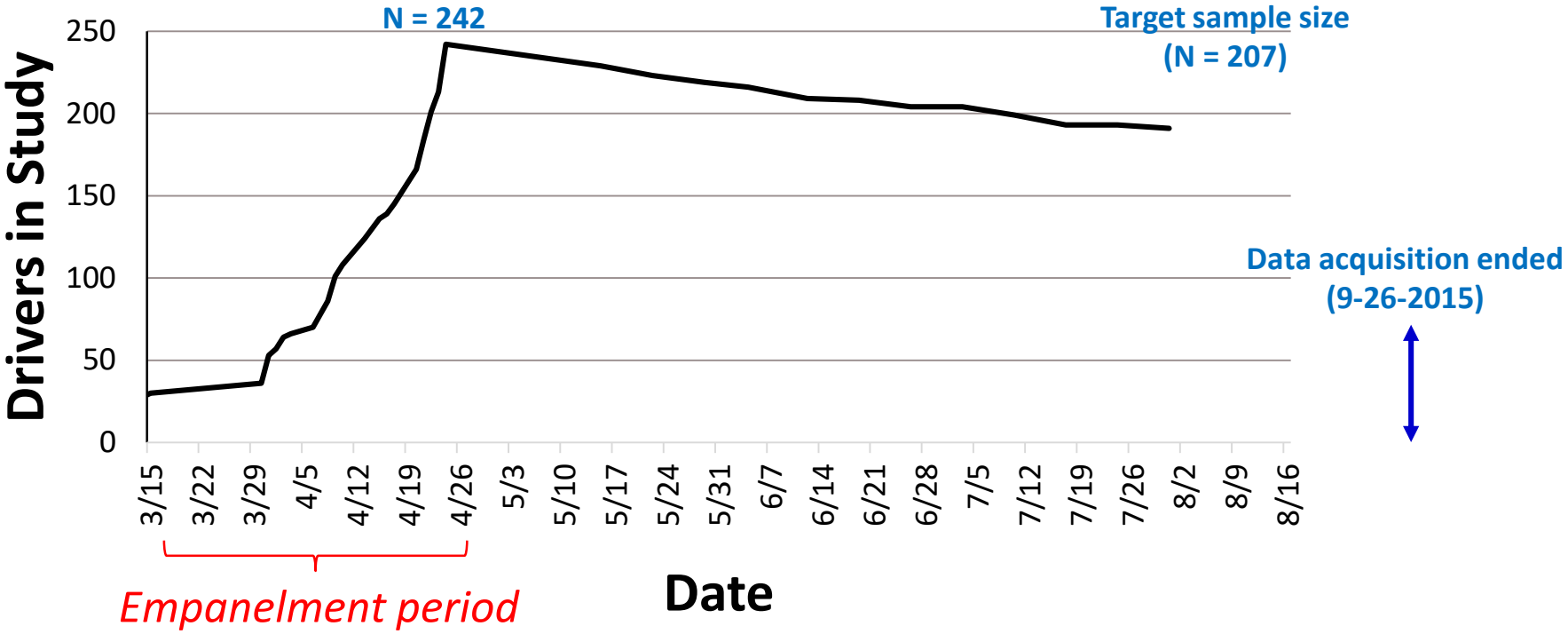
Congress directed USDOT to initiate a naturalistic study of the operational, safety, health, and fatigue impacts of the two restart provisions related to truck drivers' hours of service (HOS).

- Actions Taken to Meet Statutory Requirements
- Results
- Conclusions/Impact on Safety
- Study Data
- Study Limitations

Study Met Statutory Requirements

- Study recruited an appropriate sample of drivers from across the industry.
- Drivers and vehicles were equipped with reliable technology to measure operations, fatigue, and safety performance.
  - Electronic logging device (ELD) data for HOS and driver use of provisions.
  - Alertness tests using the Psychomotor Vigilance Test (PVT) and smartphone data acquisition.
  - Actigraphy data (collected with wrist-worn actigraphy watches).
  - Onboard monitoring system (OBMS) for safety-critical events (SCEs).
- Office of Inspector General (OIG) reviewed and approved the study plan and the study results.

Driver Empanelment and Retention



Driver Empanelment and Retention	
Drivers empaneled into study by May	242
Drivers needed for sample size	207
Drivers who contributed data for analysis	**235**

Drivers Using Each Provision

- Collected data from more than 3,000 driver duty cycles.

Summary of Driver Use of the Restart Provisions	
395.3(c)	**Number Observed**
1-night restarts	455
2-night restarts	1,515
>2-night restarts	1,242
395.3(d)	**Number Observed**
Restarts <168 hours	1,596
Restarts ≥168 hours	1,616

RESULTS

Summary of Results

- Few differences were found among the 1-night and 2-night restart drivers, or between those taking a restart within 168 hours and those taking a restart in more than 168 hours.
- Drivers using the different provisions performed similarly in average daily hours driven, fatigue/alertness tests, sleep hours, and on-the-road safety.
- Schedule flexibility: Provided the option to use different restart provisions, drivers most frequently opted for 2-night or more-than-2-night restarts.
- Sleep is important, as drivers, regardless of restart format used, averaged about 2 hours more sleep per 24-hour period during their restart break than during their work period.

Key Findings for the Examined Domains

Domain	Research Questions	Study Findings
Operational	Do drivers using the 1-night restart provision have longer work hours per day than drivers who use a 2-night or more-than-2-night restart?	Statistically significant difference, but not operationally relevant.
	Do drivers with <168 hours between restarts have longer work hours per day than drivers who have ≥168 hours between restarts?	No difference.
Safety	Do drivers using the 1-night restart provision experience a higher safety critical event (SCE) ratio per 100 instrumented hours than drivers who use a 2-night-or-more restart?	Not higher.
	Do drivers with <168 hours between restarts experience a higher SCE ratio than drivers who have ≥168 hours between restarts?	Not higher.
Fatigue	Do drivers who use the 1-night restart provision have slower psychomotor responses (lower reciprocal reaction times) on the PVT-B than drivers who use a 2-night-or-more restart?	Not slower.
	Do drivers with <168 hours between restarts have slower psychomotor responses (lower reciprocal reaction times) on the PVT-B than drivers with ≥168 hours between restarts?	Not slower.
Health	Do drivers using the 1-night restart provision experience increased perceived stress compared to drivers using a 2-night-or-more restart?	No significant increase.
	Do drivers with <168 hours between restarts experience increased perceived stress compared to drivers with ≥168 hours between restarts?	No significant increase.
	Across all provisions, do drivers sleep more during their restart period than during their duty cycle?	Yes, 2 hours more sleep per night during restart.
	Across all provisions, do drivers experience more stress during their duty cycle as compared to their restart period?	Yes, significantly more stress during duty cycle.

Results: Key Operational Outcomes

Driving vs. Working Hours	Variable/Provision	Mean* Difference
Mean daily driving hours per 24 hours in duty periods	1-night restart	8.2166
	2-night restart	8.0751
	Difference between 1-night restart and 2-night restart	**0.1415**
	<168 hours between restarts	8.0557
	≥168 hours between restarts	8.0576
	Difference between <168 hours and ≥168 hours between restarts	**-0.00197**
Mean daily working hours per 24 hours in duty periods	1-night restart	10.1978
	2-night restart	10.1073
	Difference between 1-night restart and 2-night restart	**0.09047**
	<168 hours between restarts	10.1132
	≥168 hours between restarts	10.0339
	Difference between <168 hours and ≥168 hours between restarts	**0.07926**

*predicted mean

Note: Results displayed are not statistically significant.

Results: Key Safety Outcomes

Measure	Variable/Provision	Mean* Difference
Safety critical events per 100 hours instrumented driving	1-night restart	0.3420
	2-night restart	0.3688
	Difference between 1-night restart and 2-night restart	**-0.07563**
	<168 hours between restarts	0.3589
	≥168 hours between restarts	0.3680
	Difference between <168 hours and ≥168 hours between restarts	**-0.02507**

*predicted mean

Note: Results displayed are not statistically significant.

Results: Key Fatigue Outcomes

Duty Period vs. Restart Period	Variable/Provision	Mean* Difference
Mean PVT-B response speed (in seconds) in duty periods	1-night restart	3.7905
	2-night restart	3.7928
	Difference between 1-night restart and 2-night restart	**-0.00236**
	<168 hours between restarts	3.7839
	≥168 hours between restarts	3.7656
	Difference between <168 hours and ≥168 hours between restarts	**0.01832**
Mean PVT-B response speed (in seconds) in restart periods	1-night restart	3.7778
	2-night restart	3.7673
	Difference between 1-night restart and 2-night restart	**0.01049**
	<168 hours between restarts	3.7580
	≥168 hours between restarts	3.7331
	Difference between <168 hours and ≥168 hours between restarts	**0.02490**

*predicted mean

Notes: PVT response speed ≥3.8 = good performance.
Results displayed are not statistically significant.

Results: Key Health Outcomes – Hours of Sleep

Duty Period vs. Restart Period	Variable/Provision	Mean* Difference
Mean hours of sleep per 24 hours in duty periods	1-night restart	6.4824
	2-night restart	6.5860
	Difference between 1-night restart and 2-night restart	**-0.1036**
	<168 hours between restarts	6.5501
	≥168 hours between restarts	6.5770
	Difference between <168 hours and ≥168 hours between restarts	**-0.02690**
Mean hours of sleep per 24 hours in restart periods	1-night restart	8.8580
	2-night restart	8.8330
	Difference between 1-night restart and 2-night restart	**0.02494**
	<168 hours between restarts	8.5651
	≥168 hours between restarts	8.7095
	Difference between <168 hours and ≥168 hours between restarts	**-0.1445**

*predicted mean

Note: Results displayed are not statistically significant.

Findings Context

Driver Behavior:

- Study found drivers are getting more rest during the restart period.
- Drivers use the flexibility of the various restart configurations.

Fatigue:

- Study findings confirm the need for sleep opportunity during restart periods. HOS regulations are necessary, but not sufficient.
- Need for tools to enforce drivers that go beyond the limits (ELD, etc.).
  - Encourage use of fatigue management programs, such as the North American Fatigue Management Program (NAFMP).

Driver Restart Data

- The 235 drivers participated and 181 driver finished 5 months of data collection; they provided a total of:
  - Drove 140,671 hours.
  - 26,964 days of data: 17,628 duty days; 9,336 restart days.
  - 3,287 restarts for data analyses:
  - 1-night restarts observed = 426.
  - 2-night restarts observed = 1,577.
  - More-than-2-night restarts observed = 1,284.
  - Restarts taken in less than 168 hours = 1,482.
  - Restarts taken in at least 168 hours = 1,592.
  - Completed more than 79,000 PVT-B performance test.
- Public use dataset available at: www.fmcsa.dot.gov/safety/data-and-statistics/cmv-driver-restart-study-public-use-dataset

Study Limitations

- The Act directed FMCSA to “initiate a naturalistic study…. on commercial motor vehicle drivers.”
- It was fully observational without interventions or randomization of participants to different procedures. During the course of their participation, drivers directed their own schedules.
- Like other research methods, naturalistic studies can result in participants changing their behavior in a manner they think is desired by the researchers (i.e., demand characteristics), rather than behaving the way they normally would. These studies may also result in people changing behaviors by virtue of their awareness that they are being monitored.
- Finally, naturalistic studies may have a higher number of volunteer participants who feel they can tolerate the monitoring. They may differ in unknown ways from those who do not want to be monitored in a study, and therefore do not volunteer.

Thank You

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