High drowsy driving crash risk on daytime commute after night work

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Most drivers admit to driving while drowsy. Twenty-eight percent of drivers have reported falling asleep while driving within the past year. More than 9.5 million Americans, or 15 percent of the workforce, work

overnight or rotating shifts. Those who commute home after working the night shift may be at high risk for drowsy driving crashes because of disruption to their sleep-wake cycles and insufficient sleep during the night.

New research from Brigham and Women's Hospital (BWH) published by *Proceedings of the National Academy of Sciences* evaluated the daytime driving performance of night shift workers after a night of shift work compared to driving after a night of sleep, and found that 37.5 percent of drivers participating in a test drive after working the night shift were involved in a near-crash event. The same drivers, with sufficient sleep the night before the test, had zero near-crashes. These results demonstrate, for the first time, an increased risk of drowsy driving related motor vehicle crashes, as well as an increase in self-reported and biological measures of drowsiness when operating a real motor vehicle during the daytime following night shift work.

"Drowsy driving is a major-and preventable-public health hazard," said Charles A. Czeisler, PhD, MD, FRCP, chief of the Division of Sleep and Circadian Disorders at BWH, and corresponding author of the study. "These findings help to explain why night shift workers have so many more motor vehicle crashes than day workers, particularly during the commute home. Night shift workers should be advised of the hazards of drowsy driving and seek alternate forms of transportation after night shift work."

In this study, 16 night shift workers completed a pair of 2-hour driving sessions on a closed driving track at the Liberty Mutual Research Institute for Safety. Prior to one of the sessions, participants slept an average of 7.6 hours the previous night, with no night shift work. Prior to the other session, the same participants were tested after working a night shift. The post-sleep and post-night shift drives occurred at approximately the same time of day for each participant. Physiological

measures of drowsiness were collected, including brief micro-sleep episodes as measured by an EEG, and partial eyelid closure with slow eye movements, which are indicative of the transition from wakefulness to sleep. Driving performance was evaluated by measuring near-crash events, drives terminated due to failure to maintain control of the vehicle, and how often drivers weaved in and out of the lane.

Researchers compared the performance of the post-sleep drive to the post-night shift drive and found that during the post-night shift drive:

- Participants showed increased driver drowsiness, deteriorating driving performance and increased risk of near-crashes.
- Over one third of the post night-shift drives required emergency braking maneuvers.
- Almost half of the drives were terminated early because the participants failed to maintain control of the vehicle.
- Sleep-related impairment was evident within the first 15 minutes of driving.
- Participants had a significantly higher rate of lane excursions
- Participants had longer blink duration and increased number of slow eye movements
- Participants showed increased drowsiness, impairment, and crash risk over the duration of the drive
- The risk of micro-sleep episodes - sleep for less than three seconds - increased after driving for greater than 30 minutes.

"Even veteran night shift workers were vulnerable to the risks associated with drowsy driving, and exhibited reactions similar to behaviors observed in drivers with elevated blood alcohol concentrations," said Michael L. Lee, PhD, lead author, and research fellow in the Division of Sleep and Circadian Disorders at BWH. "A short commute for these drivers is shown to be potentially dangerous and the longer the drive, the greater the risk. Education about drowsy driving and its potential hazards

could minimize this risk by prompting shift workers to eliminate or reduce the need to drive after night shift work, and to stop driving when their performance is impaired by drowsiness."

Researchers acknowledge several limitations, including that the length of time awake differed between the post-sleep drive and the post-night shift drive. Drivers in the study were aware of drowsiness and indicators of impaired performance. Additionally, the driving sessions were inherently unlike a real-world commute, conducted on a closed track with members of the study team in the vehicle and with frequent interruptions for assessments.

More information: High risk of near-crash driving events following night-shift work, www.pnas.org/cgi/doi/10.1073/pnas.1510383112

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