December 12, 2022

# WSU sleep researchers say Santa at risk for crashing sleigh over North America due to fatigue

By Christina VerHeul, Elson S. Floyd College of Medicine

SPOKANE, Wash. – Santa's all-nighter to deliver holiday presents around the world could put him at heightened risk for a fatigue-related sleigh crash over North America, according to researchers at the Washington State University Elson S. Floyd College of Medicine and the Perelman School of Medicine at the University of Pennsylvania.

The case study, published in Sleep Health earlier this year, identified the safety impacts of a 23-hour night shift in late December on an overweight, older male seasonal worker and his reindeer-propelled global distribution team, as well as strategies to mitigate the impacts for a safer flight.


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Using 2020 data from Santa's duty schedule and his package delivery route from the North American Aerospace Defense Command (NORAD), researchers pinpointed the window of time within Santa's night shift when high accumulation of wake from hours on duty would coincide with low circadian rhythm. They found that Santa would be at maximum sleepiness over North America, primarily the United States and Mexico, while on his annual route.

"Like other night-shift and extended-duty workers, Santa faces several fatigue-related risks that can greatly impact safety while on the job and, unfortunately, his highest level of risk occurs right as he is delivering packages here in the U.S.," said Hans Van Dongen, co-author of the study, professor in the WSU Elson S. Floyd College of Medicine and director of the WSU Sleep and Performance Research Center. "Out of an abundance of concern for Santa, his reindeer and our communities, we wanted to share this analysis to ensure that every precaution could be taken for a safe flight."

While researchers noted a sleigh crash would be rare, they identified several strategies to reduce Santa's overall risk.

The most powerful countermeasure involves shifting the biological clock by a three-hour phase delay, which would increase alertness during the latter parts of Santa's duty period. This shift could be achieved with the

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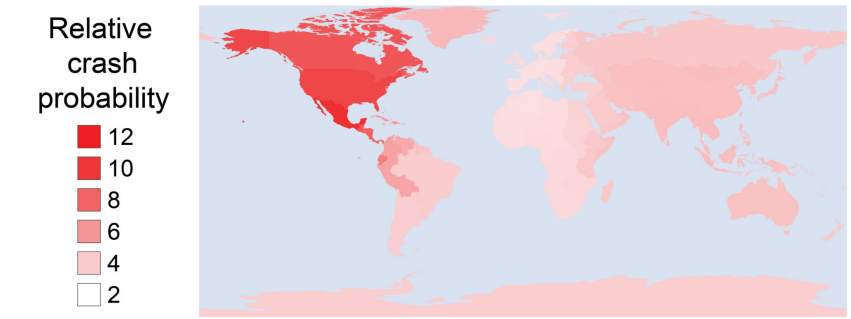
administration of melatonin immediately prior to the start of his journey; however, reindeer would not be able to participate in this method. Alternatively, bright light exposure could be used in the evening to delay the biological clock. While blue light is the most effective, researchers recommended white light due the potential wash-out of blue light against red seasonal worker attire and reindeer noses.



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Additional methods include altering the sleep schedule to 10 hours per day leading up to the extended night shift to eliminate prior sleep debt and protect against sleep deprivation, screening for obesity-related sleep disorders such as sleep apnea, and consuming caffeine.

“Each of these fatigue-reducing countermeasures on their own produces improved alertness, but taken in aggregate, they could significantly reduce sleigh crash probability,” said Mathias Basner, MD, PhD, a professor of Sleep and Chronobiology in the

department of Psychiatry at Penn and lead author of the study. “By Santa, his reindeer, and the team at the North Pole implementing these measures leading up to and on Dec. 24, we would have greater assurance that he could safely perform his gift distribution duties for the duration of his shift.”

Though little research has been done to determine the fatigue-related effects of cookies and milk or hay and water, researchers recommend that Santa and this reindeer refrain from consuming eggnog or other alcoholic beverages that synergistically induce fatigue and general impairment.

“Regardless of your belief in Santa, fatigue-related risks are a real challenge among those who work night-shifts and extended hours whether in package delivery like Santa or in healthcare, retail, hospitality, trucking and other 24/7 operations,” said Van Dongen. “Adopting behaviors and countermeasures to mitigate the effects of sleep loss reduces the risk of fatigue-related accidents, which ultimately creates safer workplaces and communities.”

## Media Contacts


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Following a comprehensive search, Assistant Vice President for Federal Engagement and Advocacy Glynda Becker-Fenter has been named WSU's next vice president of external affairs and government relations.

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By RJ Wolcott, WSU News & Media

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By Scott Weybright, College of Agricultural, Human, and Natural Resource Sciences