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FORWARD

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Special issue on working hours and fatigue

John Howard MD

Office of the Director, National Institute for Occupational Safety and Health, Washington, District of Columbia, USA

Correspondence: John Howard, MD, 395 E Street SW, Suite 9200, Washington, DC 20201, USA.
Email: jhoward@cdc.gov

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The National Institute for Occupational Safety and Health (NIOSH) was established as a research agency focused on the study of worker safety and health, and on empowering employers and workers to create safe and healthy workplaces. Our mandate is to assure "every man and woman in the Nation safe and healthful working conditions and to preserve our human resources." To help meet this mandate, NIOSH established the National Occupational Research Agenda (NORA), a 3-decades old, extensive partnership program that includes stakeholders from industry, labor, academia, the practitioner community, and other governmental agencies. NORA aims to stimulate innovative research and workplace interventions and over the past 3 decades, it has become a research framework for the Nation and NIOSH.[1]

NORA is an important input into NIOSH Strategic Plan, which contains seven strategic goals targeted at specific health and safety issues facing the U.S. workforce. One of the seven strategic goals is to "promote safe and healthy work design and worker well-being." As such, NIOSH established the Healthy Work Design and Well-Being Program (HWD).[2] This program aims to protect and advance worker safety, health, and well-being by improving the design of work, management practices, and the physical and psychosocial work environment. Working hours, sleep, and fatigue is critical issues for HWD and affect all industry sectors.

While "nonstandard work hours" lacks a standard consensus definition, there is general agreement that it encompasses work outside of the typical "9 a.m. to 5 p.m." work schedule.[3] Such work often requires workers to sleep during normal waking hours and to be awake during normal sleeping hours. This exposure to light at night and changes in sleep behaviors can alter normal biological functioning in humans, which can have adverse health and safety consequences.[4] Working nonstandard shifts can also limit access to healthy food choices and behaviors, like exercise.[5] Studies have shown that nonstandard shift workers are more likely to have unhealthy behaviors (e.g., greater smoking and alcohol intake) higher body mass index, and lower physical activity.[6,7] Long-term exposure to nonstandard shifts has been associated with an increased risk for cardiovascular disease, metabolic syndrome, obesity, adverse reproductive health outcomes, gastrointestinal disorders, diabetes, and psychological disorders, such as depression.[8] In 2010, the International Agency for Research on Cancer classified shiftwork, and most recently in 2020 "night" shift work, as a probable carcinogen to humans.[9,10]

Disruption of sleep, which often accompanies nonstandard work schedules, also has been shown to alter regions in the brain with both short- and long-term effects on cognition.[11,12] This can have cascading effects on decision-making, attention, and concentration, leading to significant negative impacts. Some studies have demonstrated similarities in cognitive and physiological impairment resulting from sleep deprivation with alcohol impairment.[13–15] Other studies have shown that those who work nonstandard schedules are twice as likely to be injured at work (compared to those working only regular daytime schedules), and it can take up to 5 years after quitting shiftwork to regain normal cognitive functioning.[16,17]

Effects of work-related fatigue can extend beyond the workplace. Fatigued workers can pose a public health safety concern when they take to the road. These risks and consequences are so serious that in two states (Arkansas and New Hampshire), drowsy driving resulting in a fatality can be considered negligent or vehicular homicide.[18] Work schedules dictate leisure time and ultimately, behaviors and habits. Nonstandard schedules can be isolating and can affect families and other close relationships. Studies have reported that those working nonstandard shifts report greater work-life and work-family conflict. Shiftwork has been found to increase the probability of separation or divorce, especially for parents working nights.[5]

The host of safety and health concerns associated with nonstandard working hours requires all of us in the field of occupational safety and health to study and understand the contours of the issue better, develop strategies to mitigate the risks, and design effective intervention studies to assist workers and employers in healthy work design.

This special issue of the *American Journal of Industrial Medicine* is the culmination of discussions and work resulting from our NIOSH Working Hours, Sleep and Fatigue Forum held in 2019. It represents the efforts of diverse HWD and NORA partnerships and networks to recognize and address the risks associated with nonstandard work hours, impaired sleep, and fatigue. This collaborative approach identified the most critical issues and available countermeasures in these areas. We also sought to develop new research objectives for addressing those needs. While NIOSH serves as the steward to move this effort forward, this was truly a national effort to identify future directions in addressing these occupational health and safety concerns.

CONFLICT OF INTEREST

The author declares no conflict of interest.

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John Meyer declares that he has no conflict of interest in the review and publication decision regarding this article.

AUTHOR CONTRIBUTIONS

John Howard led all aspects of the manuscript.

ORCID

John Howard https://orcid.org/0000-0002-1875-3516

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