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Working Hours, Sleep, & Fatigue Forum

Abstract for Public Safety (including Wildland Firefighting) Sector

Working Hours and Fatigue in the Public Safety Sector (Extended version)

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Key messages:

1. Work tasks, environments, and cultures differ markedly across public safety sector occupations.
2. Increased risk for injury and chronic disease are common across public safety sector occupations. Fatigue can exacerbate these risks for public safety workers and can pose risk to the public by reducing capability for decision-making and performing work tasks.
3. The stressful nature of work tasks in the public safety sector intensifies the risk for illness and injury associated with work hours, sleep, and fatigue.
4. There are research gaps on effective interventions to reduce risk associated with work hours, sleep, and fatigue in the public safety sector. The depth of existing research and readiness to develop interventions varies across public safety occupations.

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Introduction

The public safety sector includes law enforcement, corrections, fire service, wildland firefighting, and emergency medical services (EMS). Employment reached over 2.7 million in 2017, representing 1.8% of the workforce across the various U.S. industry sectors.[1] Public safety workers are exposed to a variety of workplace hazards that put them at increased risk for acute injuries, workplace violence, chronic disease such as cardiovascular disease and cancer, infectious diseases, and motor-vehicle crashes. Across public safety sector occupations, shiftwork and long work hours are a necessity for 24-hour response to protect and serve the public.[2]

Burden

In 2017, wage earners in the public safety sector were roughly divided as: 55% law enforcement, 20% corrections, 14% firefighters, and 11% EMS, while volunteers comprise a sizeable proportion of fire service, wildland firefighting, and EMS.[3] In 2015, volunteer firefighters made up 70% of all firefighters.[4,5] Shiftwork and long working hours are standard practice in the public safety sector. According to the most recent estimates from the U.S. Bureau of Labor Statistics, the prevalence of working shifts other than a regular daytime shift was 50.6% in protective services (police, firefighters, and guards).[6,7] Rotating shifts and overtime are often required for correctional officers. Most firefighters work long duration shifts, such as 24 or 48 hours. During active fires, wildland firefighters can also work 24-72 hour shifts and may stay on duty up to 14 days straight at an active fire. In a five month period, it was not uncommon for federally employed wildland firefighters to work over 1,000 hours overtime.2 Most in EMS report working long duration shifts (e.g., 12- or 24-hour shifts), more than one-third report having two or more jobs, many report considerable amounts overtime, and half report inadequate recovery time between shifts.[8-14] Long hours, fatigue, and shift work may be linked with on-duty injuries and chronic diseases such as cancer and cardiovascular disease among public safety workers. Fatigue-related errors may also impact the communities and civilians these workers protect and serve.[15-20]

Public safety workers have high rates of both fatal and nonfatal injury, which may be linked with long hours and fatigue. In 2018, 144 law enforcement officers died in the line-of-duty, approximately half were firearm-related and the other half were traffic-related.[21] Assaults and transportation incidents were also leading causes of nonfatal injury for law enforcement officers.[22] In 2017, an estimated 58,835 nonfatal injuries occurred among firefighters. Nearly half of these injuries occurred at the fireground and included strains and sprains (48%); wounds, cuts, bleeding, and bruises (15%); smoke or gas inhalation (7%); and thermal stress (5%).[23] Nonfatal injuries are also prevalent among correctional officers. Between 2005 and 2009, their nonfatal injury rate ranked third only to police officers and security guards.[24] EMS workers are also at an increased risk for nonfatal injury, especially injuries resulting in lost work time.[25,26] Overexertion injuries, transportation-related ambulance crashes, assaults, and falls are leading causes for EMS workers' injuries.[26] While injuries are common across all public safety occupations, risk factors vary significantly based on work tasks and environments.

Among firefighters, falls at the fireground are common and are often caused by physical fatigue due to heavy protective clothing and heat stress.[27] While the role of sleepiness is unclear, at least one large prospective study found that a sleep health program resulted in significantly fewer reported injuries among firefighters.[28] The link between fatigue and injury among wildland firefighters is harder to demonstrate, but epidemiological analyses that show increases in injuries at the end of the day as well as at the end of a fire season may indicate that fatigue is a risk factor for injury.[29-31] Fatigued EMS workers were also at a significant increased risk for injury.[9] Shift duration appears to play a role with shifts less than 24 hours being more favorable than longer shifts.[8] Among law enforcement officers, on-duty injuries increased in relation to an officers' subjective feeling of fatigue.[32] Lab-based studies among law enforcement officers have shown that fatigue and night shift work impair driving performance.[17] Even though law enforcement officers and correctional officers share many risk factors, research linking on-duty injuries and fatigue were not found specifically for corrections.

Chronic disease is a leading cause of morbidity and mortality for public safety workers. Both cancer and cardiovascular disease (CVD) are of high importance. Night shiftwork may increase cancer risk in public safety workers by disrupting circadian rhythms.[33,34] Epidemiological studies have shown that there is an association between firefighting and certain types of cancer and one cohort of urban police officers has had increased cancer mortality.[34-36] More research is needed on cancer risk in other public safety workers such as EMS, wildland firefighters, and corrections as their exposures may also increase their risk for chronic disease.[37] Sudden cardiac death (SCD) is the leading cause of on-duty death among firefighters and one of the leading causes of death for law enforcement officers, wildland firefighters, and correctional officers.[38-45] Preexisting conditions such as coronary artery disease or CVD risk factors (e.g., elevated blood pressure or cholesterol) increase the risk for SCD, but otherwise healthy individuals may also suffer SCD.[46] Research on fire fighters has focused on physiological aspects related to work and risk for future CVD events, such as cardiorespiratory fitness, excessive blood pressure response, and misperception of personal risk.[47-53] Increased risk for SCD among wildland firefighters may be linked to particulate exposures from biomass, vehicle emissions, and dust.[54] CVD risk factors among police officers include undiagnosed or undertreated hypertension, hyperlipidemia, metabolic syndrome, obesity, poor diet, low physical fitness, smoking, and sudden physical demands.[55-60] There are few studies for EMS workers and correctional officers.[61]

Unlike other occupations, these long hours are coupled with high stress due to the nature of public safety work. The work environment includes organizational stressors, physical demands and danger, exposure to human suffering at crime and accident scenes, and a need for psychological vigilance throughout the work shift.[2] Shiftwork may intensify the effects of these exposures and increase anxiety, depression, post-traumatic stress disorder,[62-64] suicidality,[65] sleep disturbances,66 and alcohol use.[67,68] In addition, public safety workers may underreport psychological problems associated with work stressors making them more difficult to address.[69] Another important feature in public safety work that impacts working hours, fatigue,

and stress is urbanicity. Rural public safety workers may have more downtime, but in turn experience longer commutes to service calls. Also, while rural areas may have fewer workers and therefore larger coverage areas; calls for service may be more plentiful and involve hazardous situations in urban locations.[70,71]

Other potential negative effects of long work hours and fatigue may interfere with work performance among public safety workers. Research has shown that fatigue impairs cognitive and motor performance and if severe enough, can mimic alcohol intoxication.[72] This degradation of skills is inextricably linked with reduced reaction time and poorer complex reasoning skills. Previous research shows that odds of a medical error or adverse event are higher among fatigued EMS workers than those who do not report fatigue.[9,73] These findings may extend to firefighters as well who often perform medical duties. Fatigue-related errors can have severe consequences during active wildland fires.[74] Between 2003 and 2006, a total 494 motor-vehicle crashes occurred and in 8% fatigue was listed as the primary cause.[75] During 2000 to 2013, there were 298 wildland firefighter fatalities. Although 26% involved aviation, the role of fatigue is unknown.[76] Among correctional officers, fatigue has been linked with an officer's inability to monitor inmates and remain attentive on the job, impacting overall security.[77] The most abundant research comes from the law enforcement domain where officers with a sleep disorder had a higher probability of making serious administrative errors, falling asleep while driving, making a safety violation, and exhibiting uncontrolled anger toward suspects.[78] Studies have shown that sleepiness is linked with an increased odds of a public complaint, indicating that fatigue affects officers' public encounters.[79]

Need and Impact

Additional research on working hours, sleep, and fatigue is essential to reduce the pervasive risk for illness, injury, and other negative outcomes in public safety sector occupations. Reducing these risks benefits workers most directly, organizations through findings that inform effective practices and help reduce costs, and more broadly, the public at large through a more robust workforce. A fundamental priority across these occupations is to establish and practice strategies to maximize sleep among shift workers because sleep is directly influenced by work schedules and a primary physiological requirement that can have cascading adverse effects when workers are fatigued. Research on risk factors for motor vehicle crashes is well developed and effective interventions and translation are needed to reduce on-duty crashes. There is less research and thus a poorer understanding of the potential harms of shift work and sleep deprivation on long term health and risk of chronic disease.

Priorities for risk mitigation tailored to the unique characteristics of public safety work are needed. Among law enforcement, future research should investigate how to balance optimal shift schedules with staffing issues, community demand, overtime requirements, and secondary employment to maximize safety and performance. The highest priority areas of research among firefighters are determining the prevalence and nature of sleep disorders, identifying effective sleep hygiene interventions to minimize the effects of shift work and circadian rhythm disruption, consideration of fatigue in incident investigations, and the contribution of secondary employment to fatigue. Future research among EMS workers should focus specifically on intra-shift fatigue mitigation strategies (e.g., naps and designated rest), the impact of shift work on safety, and the longer-term impact of shift work on health. Research on wildland firefighters is hampered due to difficulty in specifically identifying these workers in existing data and the complexity of the workforce, and research on correctional officers is scant in general. A comprehensive assessment is needed of existing knowledge as well as research from related occupations to establish specific priorities. Stakeholders including workers, professional organizations, employers, unions, and the research community can contribute to agenda setting for health and safety concerns, pilot testing survey instruments or educational and safety training materials, dissemination of research findings, and developing next steps for research on effective interventions. In particular, stakeholders can contribute to the development of effective methods to translate the results of interventions into the various work climates and environments in the public safety sector.

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