

FATIGUE

in the Workplace:



Causes & Consequences of Employee Fatigue

Part one of a three-part series

Based on results from the 2017 Employee
Survey on Workplace Fatigue



Table of Contents

What is Fatigue?.....	3
Fatigue Risk Factors – At a Glance	4
Risk Factor: Shift work.....	5
Risk Factor: High-risk hours.....	6
Risk Factor: Demanding jobs.....	7
Risk Factor: Long shifts	7
Risk Factor: Long weeks.....	8
Risk Factor: Sleep loss.....	8
Risk Factor: No rest breaks.....	9
Risk Factor: Quick shift returns.....	9
Risk Factor: Long commute.....	10
Sleep Loss and Workplace Fatigue.....	10
Risk Profiles.....	11
Symptoms of Workplace Fatigue	12-13
Consequences of Workplace Fatigue	14
Decreased Cognitive Performance	15
Microsleeps	16
Increased Safety Risks.....	17
Knowledge Gap.....	17
Conclusions.....	18



WHAT IS FATIGUE?

Fatigue is a debilitating and potentially deadly problem affecting most Americans. Fatigue describes the feelings of tiredness, sleepiness, reduced energy and increased effort needed to perform tasks at a desired level. Many factors can cause fatigue. It can be a result of a poor night's sleep or a product of an employee's schedule.

How do I know if fatigue is affecting my workforce?

Fatigue affects every workforce. While there may not be obvious signs of fatigue in your workforce, everyone is exposed to fatigue and therefore, fatigue is a factor in the workplace. Fatigue decreases a worker's ability to think clearly, make informed decisions, and be a safe and productive worker. A 2014 meta-analysis of 27 observational studies estimated up to 13% of injuries in the workplace could be attributed to fatigue.¹ But fatigue, and risk factors that introduce fatigue are identifiable and manageable.

Causes of workplace fatigue

Fatigue is cumulative and the result of inter-related factors. Sleep loss, time of day, and time on tasks are three of the most common factors. In the workplace, fatigue can be caused by a myriad of factors, such as work schedules, environmental conditions, and job demands. Night shift workers often report reduced alertness due to the night time hours on duty, and tiredness due to difficulty with getting adequate sleep during their daytime hours off.

Risk factors for fatigue

Minimizing and mitigating factors that cause fatigue is one way to control health and safety risks in the workplace. It is important for employers to understand the underlying causes of fatigue in order to identify potential sources of safety risk, and implement appropriate countermeasures to ensure a safe working environment.

ABOUT THE SURVEY

Fatigue in the workplace: Causes and Consequences of Employee Fatigue is the first in a 3-part series of reports produced by the National Safety Council on the prevalence of fatigue in the American workforce. The reports are the results of a probability-based study of 2,010 working adults. The survey sample was balanced according to US Census figures of age, gender, ethnicity and geographic region. Interviews were completed between February 17 to March 3, 2017.



¹Uehli, K., Mehta, A. J., Miedinger, D., Hug, K., Schindler, C., Holsboer-trachsler, E., ... Künzli, N. (2014). Sleep problems and work injuries : A systematic review and meta- analysis. *Sleep Medicine Reviews*, 18(1), 61–73.

9 Fatigue Risk Factors – At a Glance



Shift work

17%

*work a non-day shift.**

Night shifts, early morning shifts, rotating and irregular shifts can contribute to fatigue.

High-risk hours

41%

*must occasionally work at high-risk times.**

Employees who even occasionally work at night or in the early morning are at risk.

Demanding jobs

81%

*have jobs at high risk of fatigue.**

Jobs that require sustained attention, are physically or cognitively demanding can increase risk.

Long shifts

21%

*work long shifts.**

Working 10 or more hours can be physically and mentally exhausting.

Long weeks

22%

*work long weeks.**

Working 50 or more hours a week is tiring.

Sleep loss

43%

*don't get enough sleep.**

Experts agree, seven to nine hours of sleep a day is necessary for optimal health and performance.

No rest breaks

10%

*do not get a rest break.**

Rest breaks mitigate fatigue risk by giving a worker time to recuperate from job demands.

Quick shift returns

14%

*get less than sufficient time off between shifts.**

Employees need at least 12 hours between shifts to recover.

Long commutes

31%

*have long commutes.**

Long commutes decrease the time needed to recover.

*Based on survey responses from 2,010 working adults

Managing fatigue is an important safety measure.

9 Fatigue Risk Factors



59%
of night shift
WORKERS sleep
less than 7 hours
VS.

45%
of day shift
WORKERS



Nearly **half of the shift workers** in the survey reported working the **night or evening shift**

Shift work

17% work a non-day shift.

Shift workers are often the most at risk. A shift worker is anyone who works a non-daytime shift, such as night shift, early morning shift, rotating, or irregular shift.

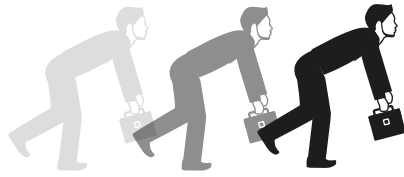
Shift workers are disproportionately affected by fatigue because they often find it difficult to get proper sleep in their time off. Also, working during non-daylight hours increases your risk for circadian rhythm performance deficits, or problems that arise when you work against your natural body clock.

Workers on these shifts often find it difficult to sleep in their off-duty time, usually when the sun is out. Shift workers consistently report shorter sleep duration than non-shift working counterparts. In our study, 59% of night shift workers reported short sleep duration compared to 45% of day workers. Employers who require night shifts for their operation should provide employees with education and resources about the importance of prioritizing sleep.

While night shift workers must fight against their circadian rhythms on every shift, workers on rotating shifts struggle as well. A rotating shift is a work schedule that changes where a worker may be on the night shift for two weeks then a morning shift for two weeks. Rotating shift workers are less likely to adapt to a shift schedule and develop healthy sleep habits. If a rotating shift is necessary, forward rotating shift – day shift to evening shift to night shift- is best.² Backward rotating shifts have been known to increase your risk for circadian rhythm misalignment.

When we work against our own biology, we put ourselves at risk for sleep debt.

²Dall'Ora, C., Ball, J., Recio-Saucedo, A., & Griffiths, P. (2016). Characteristics of shift work and their impact on employee performance and wellbeing: A literature review. *International journal of nursing studies*, 57, 12-27.



High-risk hours

41% work at high-risk times, during the night or in early morning hours.

You don't have to be a shift worker to be at risk for work scheduling-related fatigue. Any worker who is on-the-job, even occasionally, at night (between 9pm and 6am) or in the early morning hours (between 3am and 7am) can be at risk for fatigue. Not only are they working against their natural body clock, but they're likely not getting the proper rest. Sleep debt can accumulate faster than we realize. After ten days of losing two hours of sleep per day, our performance is similar to the effects of skipping an entire day of sleep.³

Demanding jobs

81% have jobs that are demanding or repetitive.

Some jobs are at higher risk for fatigue. Work tasks that require sustained attention for long periods of time, or tasks that are monotonous can contribute to fatigue. Tasks that are repetitive or mentally demanding can also contribute to fatigue. One's working environment, such as hot or cold temperatures, or inadequate lighting, can also induce fatigue.

Employers with operations and job tasks that are more sensitive to fatigue-inducing impairment are encouraged to identify ways to help employees remain focused and alert to perform their job safely. Rest breaks allow time to recuperate from fatigue. Also, varying the types of tasks during a shift can help reduce the accumulation of fatigue.



Minimizing factors that cause fatigue is one way to control health and safety risks in the workplace.

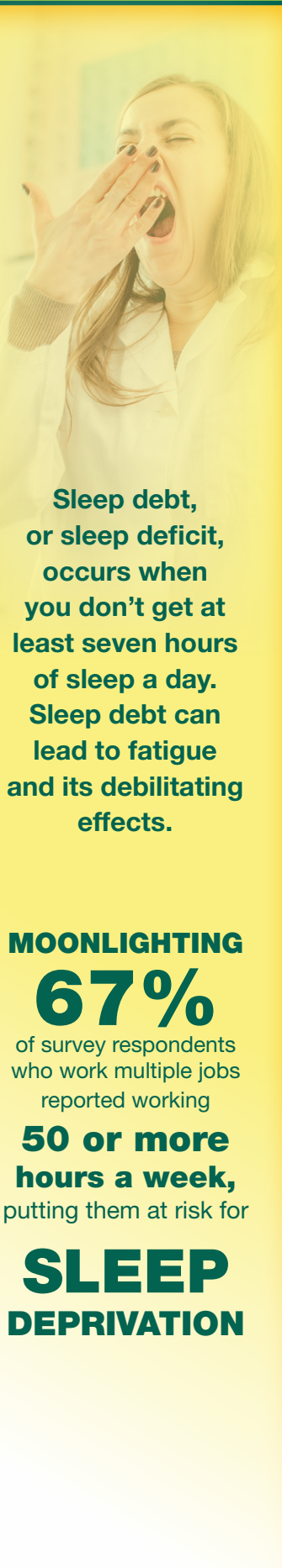
22%

work in a **safety-critical industry.**



³Van Dongen, H. P. A., Maislin, G., Mullington, J. M., & Dinges, D. F. (2003). The cumulative cost of additional wakefulness: dose-response effects on neurobehavioral functions and sleep physiology from chronic sleep restriction and total sleep deprivation. *Sleep*, 2, 117-126.

9 Fatigue Risk Factors



Sleep debt, or sleep deficit, occurs when you don't get at least seven hours of sleep a day. Sleep debt can lead to fatigue and its debilitating effects.

MOONLIGHTING

67%

of survey respondents who work multiple jobs reported working

50 or more hours a week, putting them at risk for

SLEEP DEPRIVATION

Long shifts

21% work 10 hours or more each shift.

While many work scheduling factors can play a role in fatigue and risk, studies consistently show that as shift duration increases, safety risks also increase.⁴ The longer a person is working, the more hours they are awake, the more tired they become and the more likely they are to make safety-critical mistakes.⁵ Not only are long shifts physically and mentally exhausting, they provide less time off to allow the employee to take care of personal and family responsibilities, and get their 7-9 hours of sleep.

Long weeks

22% work long weeks of 50 or more hours.

Working more than 50 hours in a week can mean reduced sleep, long shifts, and/or working numerous consecutive days in a row. Consecutive work days should be limited to 5-7 days to allow employees opportunities to take care of personal responsibilities and minimize building up a sleep debt. Overtime is often one cause of a long work week. Research consistently shows that longer weekly work hours significantly increases work-related injury risk.⁶

⁴Hänecke, K., Tiedemann, S., Nachreiner, F., & Grzech-Šukalo, H. (1998). Accident risk as a function of hour at work and time of day as determined from accident data and exposure models for the German working population. *Scandinavian journal of work, environment & health*, 43-48.

⁵Williamson, A., Lombardi, D. A., Folkard, S., Stutts, J., Courtney, T. K., & Connor, J. L. (2011). The link between fatigue and safety. *Accident Analysis & Prevention*, 43(2), 498-515.

⁶Lombardi, D. A., Folkard, S., Willetts, J. L., & Smith, G. S. (2010). Daily sleep, weekly working hours, and risk of work-related injury: US National Health Interview Survey (2004-2008). *Chronobiology international*, 27(5), 1013-1030.



Sleep loss

43% don't get at least 7 hours of sleep a day.

Optimal levels of sleep vary from person to person but most adults need seven or more hours of sleep daily to function properly. In our 24/7 society, people sacrifice sleep for other activities- such as work or family. But many don't realize just how much sleep affects our job and safety performance. Studies have shown that reduced amounts of sleep increase risk for work-related injury.^{1,6}

Sleep disorders are one of the biggest hurdles to getting enough sleep. Obstructive sleep apnea (a blockage of airflow during sleep) and insomnia (problems falling or staying asleep) are two of the most common sleep disorders that inhibit a person from getting sufficient sleep. Some innovative worksites support screening and treating employees for sleep disorders so they become safer and healthier employees.



Employees with sleep problems are at higher risk of injury¹

No rest breaks

10% do not get a short rest break during their shift.

Rest breaks are an effective way to control fatigue risk because they provide a person with the opportunity to recuperate. Even a short 10-minute break, as asked in our survey, can provide an employee with enough time to recuperate from task-related fatigue acquired during long-duration, monotonous, or demanding work functions.⁷ Rest breaks that allow short naps are even more effective at mitigating fatigue.⁸

Research shows even short rest breaks can reduce risk of work-related injuries.⁷



9 Fatigue Risk Factors



21% of all fatal crashes are because of a drowsy driver – that's 6,400 fatal vehicle crashes a year.¹⁰

Quick shift returns

14% of respondents get less than 12 hours off between shifts.

Recovery time between shifts is essential. Employees need time to commute to and from work, take care of personal responsibilities, care for their families, and sleep. Research shows those with quick shift returns have a higher risk of fatigue and fatigue-related safety incidents.⁹ Employees who get less than 12 hours off between shifts can have trouble sleeping. Quick returns of less than 8 hours should be avoided. In addition to adequate time off between shifts, schedules with weekends, or blocks of consecutive days off, allow employees to obtain recovery sleep periods.

Long commutes

31% of respondents have a long commute of 30 minutes or more.

Employees with long commutes, over 30 minutes, are at risk for developing fatigue. Commuting to and from work adds to a long work day by taking time away from personal responsibilities and recuperation. Long commutes may also increase an employee's risk for drowsy driving.

Drowsy driving and workplace fatigue are related in many ways. Most employees commute to and from work. A long commute can contribute to an employee's level of fatigue before they even arrive for work. Also, many employees become fatigued in the workplace, and it is compounded on their commute and may result in drowsy driving.

⁷Lombardi, D. A., Jin, K., Courtney, T. K., Arlinghaus, A., Folkard, S., Liang, Y., & Perry, M. J. (2014). The effects of rest breaks, work shift start time, and sleep on the onset of severe injury among workers in the People's Republic of China. *Scandinavian journal of work, environment & health*, 40(2), 146-155.

⁸Tucker, P. (2003). The impact of rest breaks upon accident risk, fatigue and performance: a review. *Work & Stress*, 17(2), 123-137.

⁹Barton, J., & Folkard, S. (1993). Advancing versus delaying shift systems. *Ergonomics*, 36(1-3), 59-64.

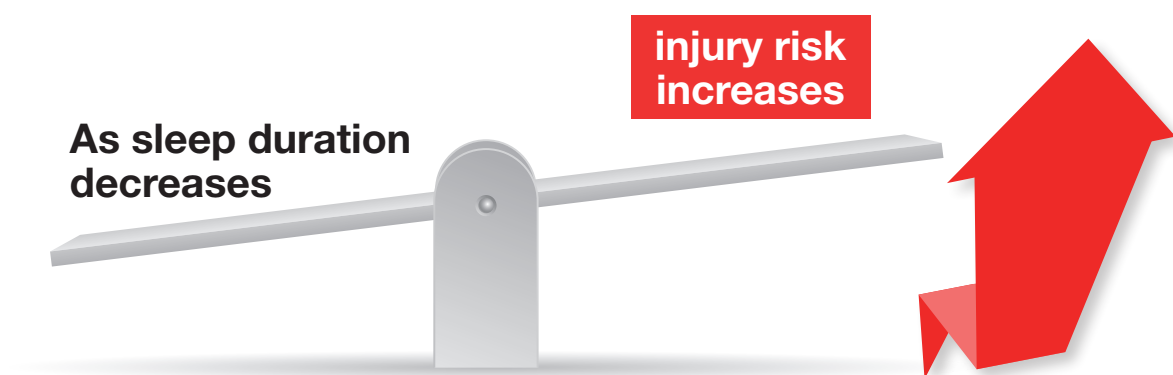
¹⁰Tefft, Brian C. (2014) *Prevalence of Motor Vehicle Crashes Involving Drowsy Drivers*, United States, 2009 – 2013. Washington, DC: AAA Foundation for Traffic Safety.

Sleep Loss and Workplace Fatigue

While fatigue is caused by a myriad of inter-related factors, obtaining recuperative sleep is the best defense against fatigue. Sleep is a basic biological need as necessary as food and water.

Fatigue and sleep are related in two primary ways: the amount of sleep in a 24-hour period, and continuous time awake (or time since you last slept).

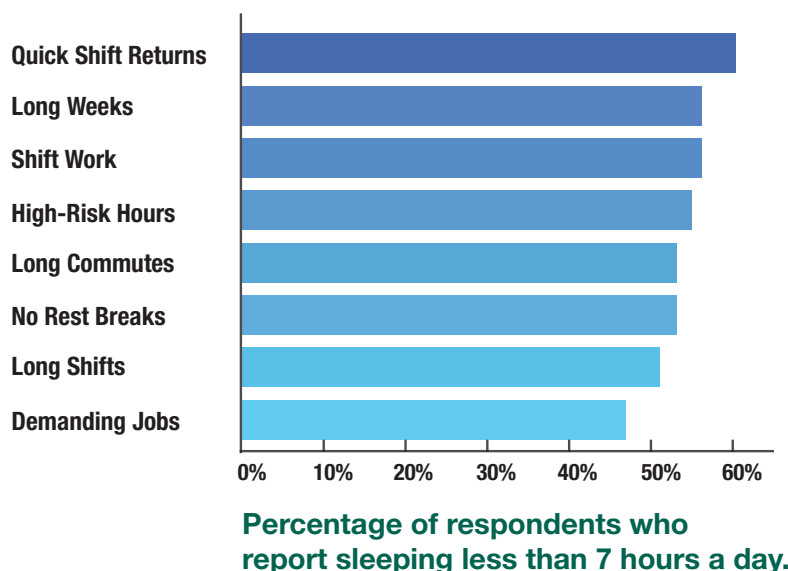
A person needs 7-9 hours of sleep a day to perform at an optimal level. As soon as a person awakes, their body begins to accumulate the need for sleep. With each passing hour, their need for sleep rises. After 16 hours, a person can become too fatigued to perform at a desired level.⁶



How is sleep loss involved in other fatigue risk factors?

Table shows percentage of respondents who reported getting less than 7 hours of sleep, by risk factor.

Employees with quick shift returns, long weeks, and shift workers were most likely to report getting less than 7 hours of sleep.

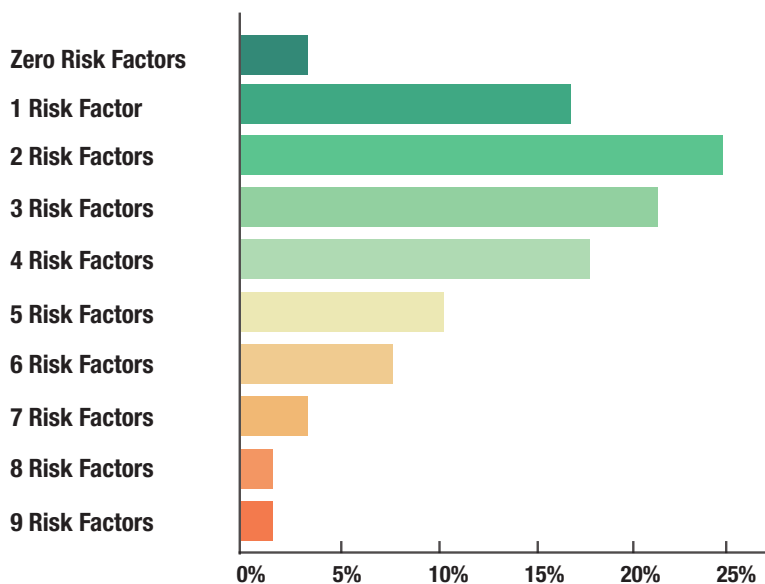


Risk Profile

All workplaces will have some level of fatigue risk, in fact our survey found that nearly every employee has at least one risk factor for fatigue. But many employees have more than one risk factor, and as the number of risk factors increases, fatigue compounds, and so does the risk.

97% had at least one risk factor – when multiple risk factors are present, risk on the job increases

Graph shows the percentage of respondents who reported multiple risk factors:

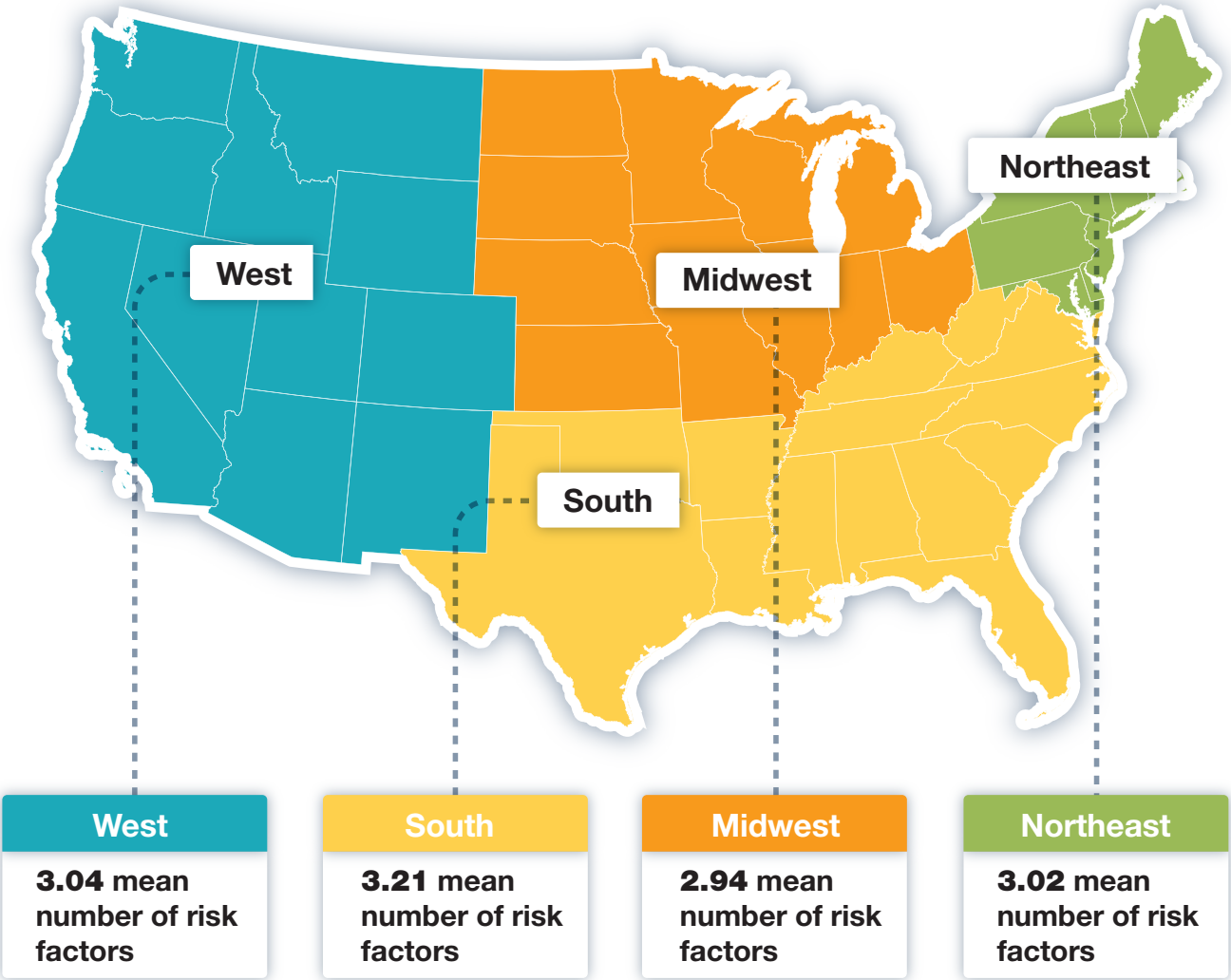


Research estimates...

13% of workplace injuries can be attributed to fatigue.¹

Risk Profile by Region

We found regional trends in employee risk factors. In the United States, the South has the highest mean number of risk factors at 3.21, while the Midwest has the lowest mean number at 2.94 risk factors per survey participant.

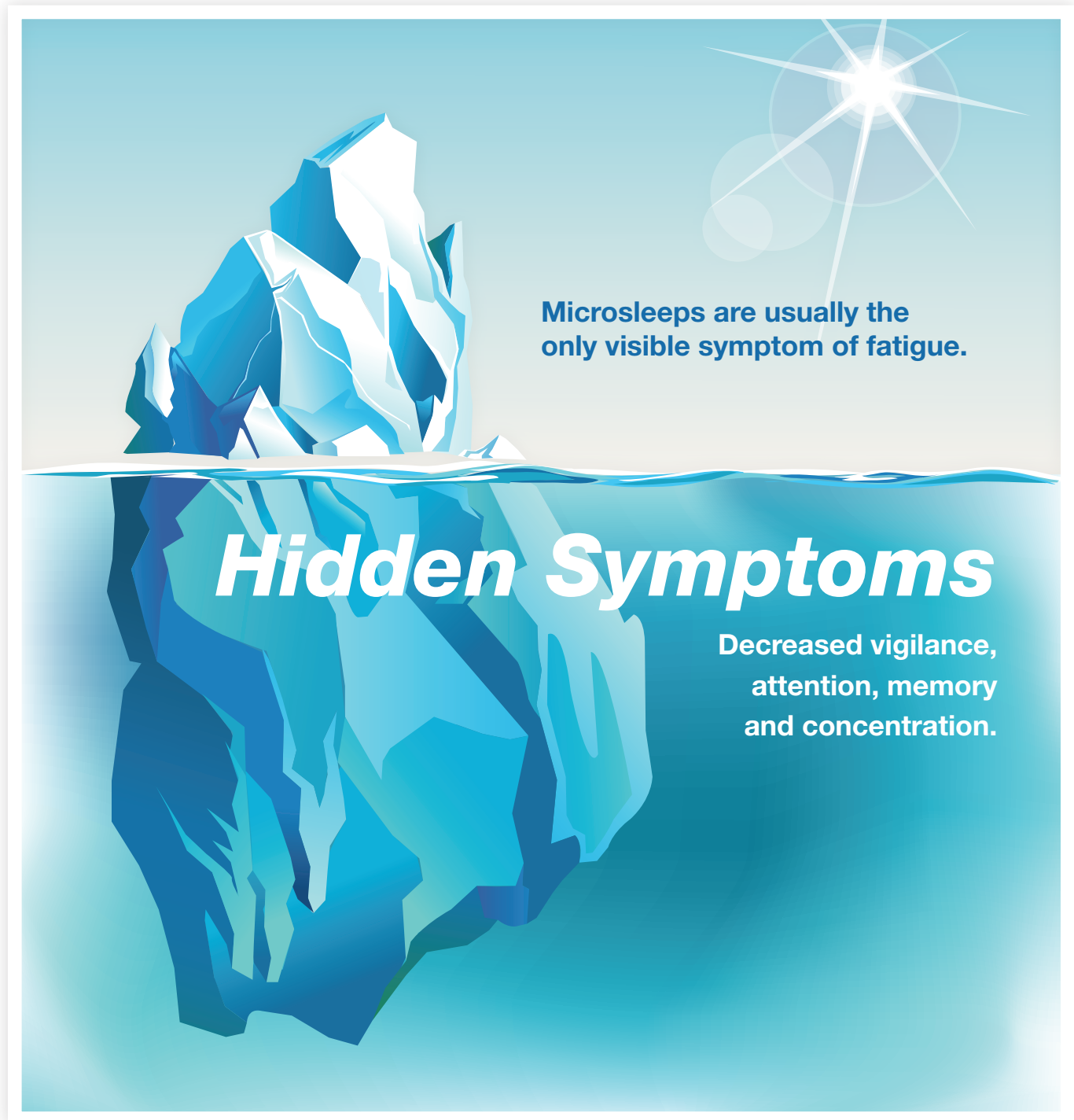


Is my workforce at risk?

The best way to identify fatigue risk in your workforce is to conduct an assessment and include fatigue in incident reporting.

Symptoms of Workplace Fatigue

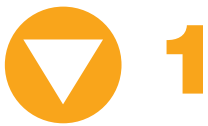
Fatigue has major implications on our basic cognitive functions. We often don't notice our own fatigue, or a co-worker's fatigue, until they are nodding off which is also called a microsleep. But fatigue affects our performance far before we begin nodding off.



Consequences of Workplace Fatigue

In the workplace, fatigue can affect an employee on multiple levels with a range of consequences. Reductions in cognitive performance are usually the first stage in the manifestation of fatigue. Microsleeps are small bursts of sleep, often felt as head nods or drooping eye lids. Microsleeps can be dangerous, especially if a worker is doing a safety critical task– such as driving. Research shows that fatigue impairs an employee’s ability to function properly and puts them at a greater risk of a safety incident.⁶

3 Levels of Fatigue | Severity of Consequences



Decreased Cognitive Performance

Fatigue causes decreases in vigilance, attention, memory, concentration, and a myriad of other cognitive factors.

97% of survey respondents reported decreased cognitive performance



Microsleeps

Nodding off is a common symptom and consequence of fatigue. Microsleeps put employees at serious risk if they’re performing a safety critical task.

47% of survey respondents reported experiencing a microsleep in the past year



Increased Safety Risk

Studies show that fatigued employees are at a higher risk of workplace injuries. Reduced cognitive performance and microsleeps inhibits an employee's ability to perform at a safe level.

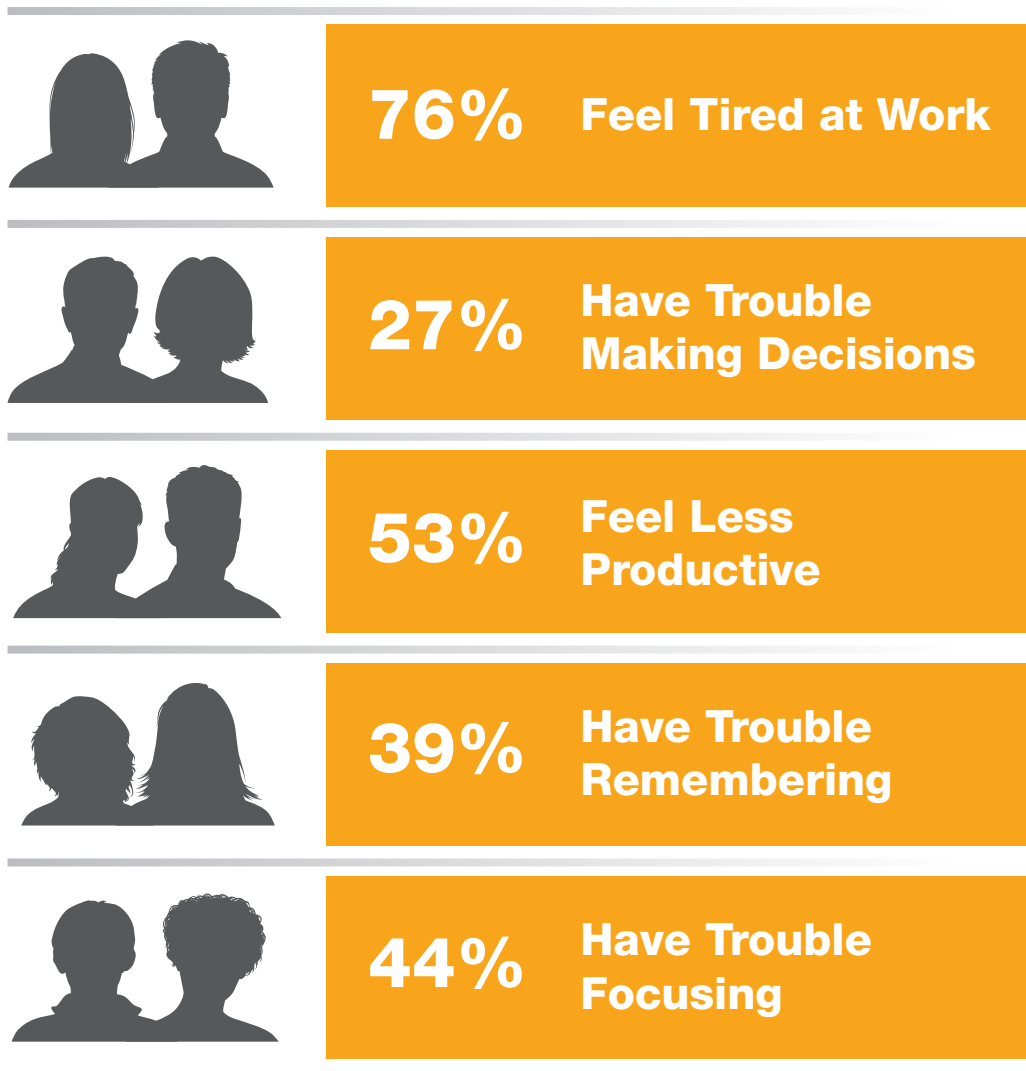
16% of survey respondents reported at least one safety incident due to fatigue



Decreased Cognitive Performance | ▼ 1

People have a hard time determining their level of fatigue. Many of us are already sleep deprived and have normalized fatigue symptoms causing us to miss some of the early warning signs.

In the past month, respondents reported experiencing a variety of early fatigue symptoms.



Can sleep loss mimic alcohol intoxication?

One study found that a person who loses 2 hours of sleep from a normal 8-hour sleep schedule performs similarly to someone who has had 2-3 beers.¹¹



¹¹Roehrs, T., Burduvali, E., Bonahoom, A., Drake, C., & Roth, T. (2003). Ethanol and sleep loss: a "dose" comparison of impairing effects. *Sleep*, 26(8), 981-985

Microsleeps | 2

Microsleeps often involve drooping eyelids and head nods. Microsleeps are usually the first symptom a person notices when they're extremely fatigued. Unfortunately when an employee has become so fatigued they fall asleep, they've likely been performing at a reduced and possibly unsafe capacity.

Percentage of survey respondents that have fallen asleep unintentionally in the past month:



27%
on the job

16%
on the road

41%
off the job

Increased Safety Risk | 3



11% admit to having a crash or a near miss while tired or sleepy

Drowsy driving is very dangerous. In fact, recent research has compared drowsy driving to drunk driving. A person who sleeps 4-5 hours a day has the same crash risk as a person who has a .08 blood alcohol concentration.¹²



3% have experienced a workplace safety incident due to their own fatigue



7% have experienced a workplace safety incident due to a coworker's fatigue



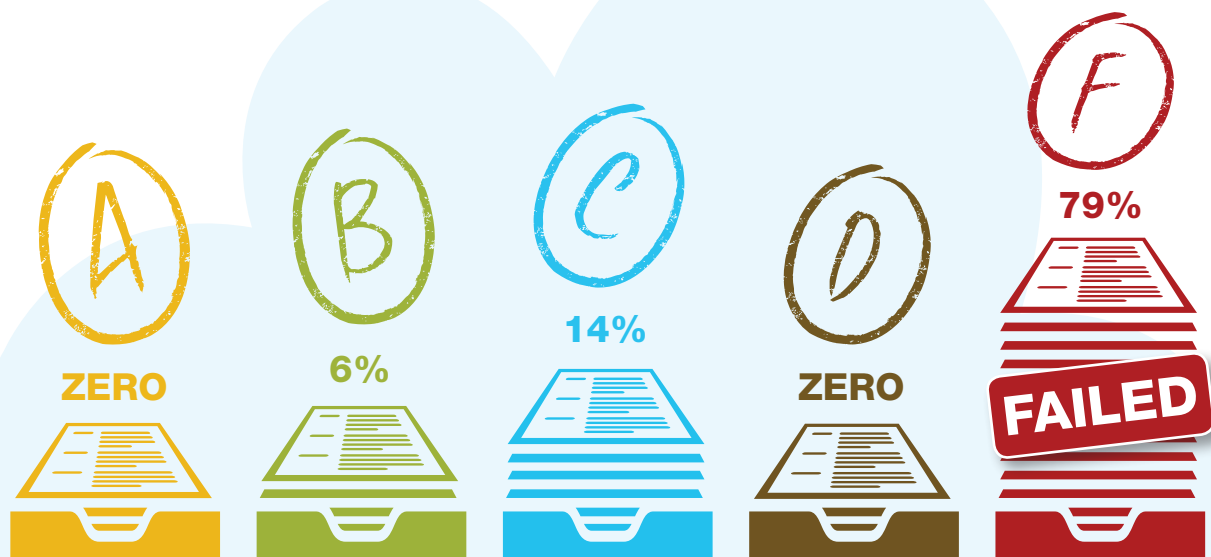
Overall, 16% reported experiencing at least one near miss or safety incident due to fatigue, and some respondents experienced more than one type of fatigue-related event.

¹²Tefft, B. C. (2016). Acute Sleep Deprivation and Risk of Motor Vehicle Crash Involvement. Washington, DC: AAA Foundation for Traffic Safety.

A Serious Knowledge Gap

A survey of respondents about fatigue and its risk factors shows there is a significant knowledge gap about the issue. This risk is also an opportunity for employers to provide education and awareness about fatigue.

What percentage of employees understand fatigue: 20%



94%

of respondents know the recommended amount of daily sleep.

Only 11%

of respondents were able to correctly identify the types of shift work that put employees at risk for fatigue-related incidents.

Only 31%

of respondents were able to identify organizational and environmental workplace factors that can contribute to fatigue.

57%

of respondents believed night shift put employees at risk for fatigue-related accidents.

41%

of respondents believed drivers should take a rest break over 1.5 – 2 hours of driving.

Only 31%

of respondents were able to identify basic facts about obstructive sleep apnea.

Only 7%

correctly identified all of the methods to prevent or reduce drowsy driving.

Only 27%

correctly identified all of the signs of drowsy driving.

64% of respondents incorrectly felt rolling down the windows would prevent drowsy driving

What can you do?

Visit www.nsc.org/fatigue to:

- Continue to learn about the causes and consequences of fatigue
- Take precautionary measures to manage fatigue
- Distribute posters and infographics in your workplace
- Familiarize yourself with the research behind fatigue
- Include fatigue in your 5-minute safety talk
- Share fatigue risk factors in your newsletters and other communications

COMING SOON

Part Two of Fatigue in the Workplace

Risky Employer Practices

「WORKPLACE FATIGUE」

Eliminating Preventable Deaths™



nsc.org/workplacefatigue