FATIGUE

IN THE WORKPLACE:

CAUSES & CONSEQUENCES OF EMPLOYEE FATIGUE

NATIONAL SAFETY COUNCIL®

Part one of a three-part series

Based on results from the 2017 National Employee Survey on Workplace Fatigue

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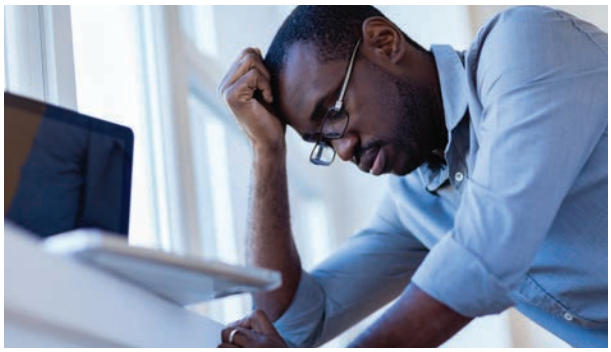
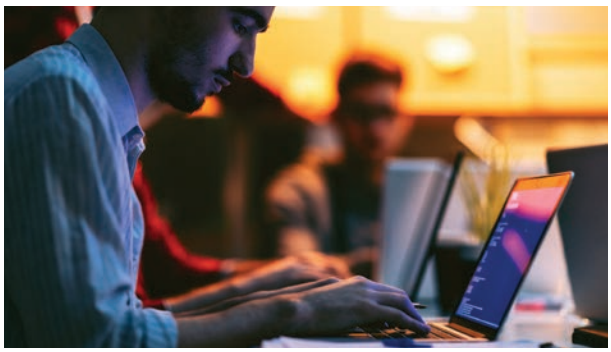




WHAT IS FATIGUE?

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 managable.

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 prevalance 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.

[1]Uehli, 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 available 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.

[2]Dall'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.

[3]Van 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.

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]

[4]Hänecke, 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.

[5]Williamson, 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.

[6]Lombardi, 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 injury[1]

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]

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.

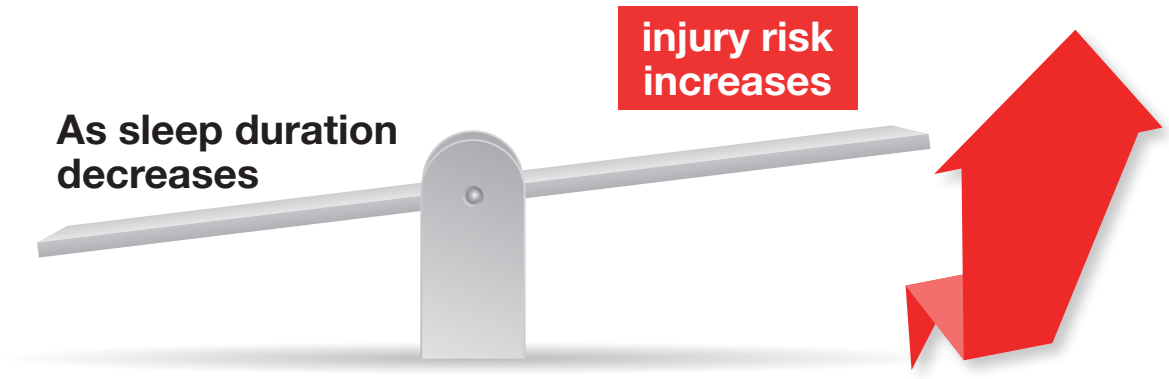
[7]Lombardi, D. A., Jin, K., Courtney, T. K., Arlinghaus, A., Folkard, S., Liang, Y., & Perry, M. J. (2014). The effects of rest breaks, work shift start time, and sleep on the onset of severe injury among workers in the People's Republic of China. Scandinavian journal of work, environment & health, 40(2), 146-155.
[8]Tucker, P. (2003). The impact of rest breaks upon accident risk, fatigue and performance: a review. Work & Stress, 17(2), 123-137.
[9]Barton, J., & Folkard, S. (1993). Advancing versus delaying shift systems. Ergonomics, 36(1-3), 59-64.
[10]Tefft, 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).

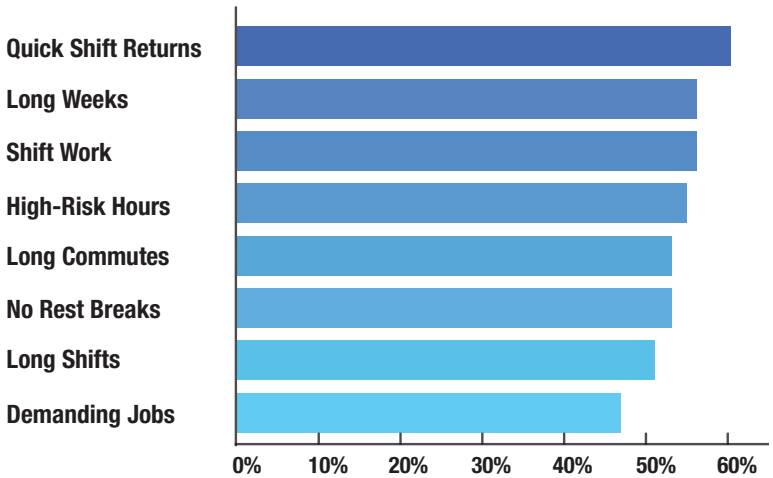
A person needs 7-9 hours of sleep a day to perform at an optimal level. As soon as a person awakes, their body begins to accumulate the need for sleep. With each passing hour, their need for sleep rises. After 16 hours, a person can become too fatigued to perform at a desired level.[13]



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.



Percentage of respondents who report sleeping less than 7 hours a day.

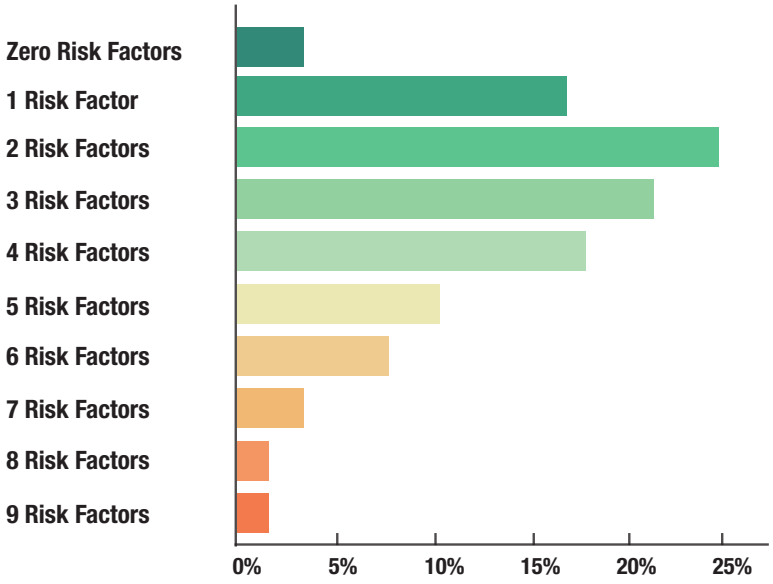
[13]Dawson, D., & Reid, K. (1997). Fatigue, alcohol and performance impairment. *Nature, 388(6639), 235.*

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:

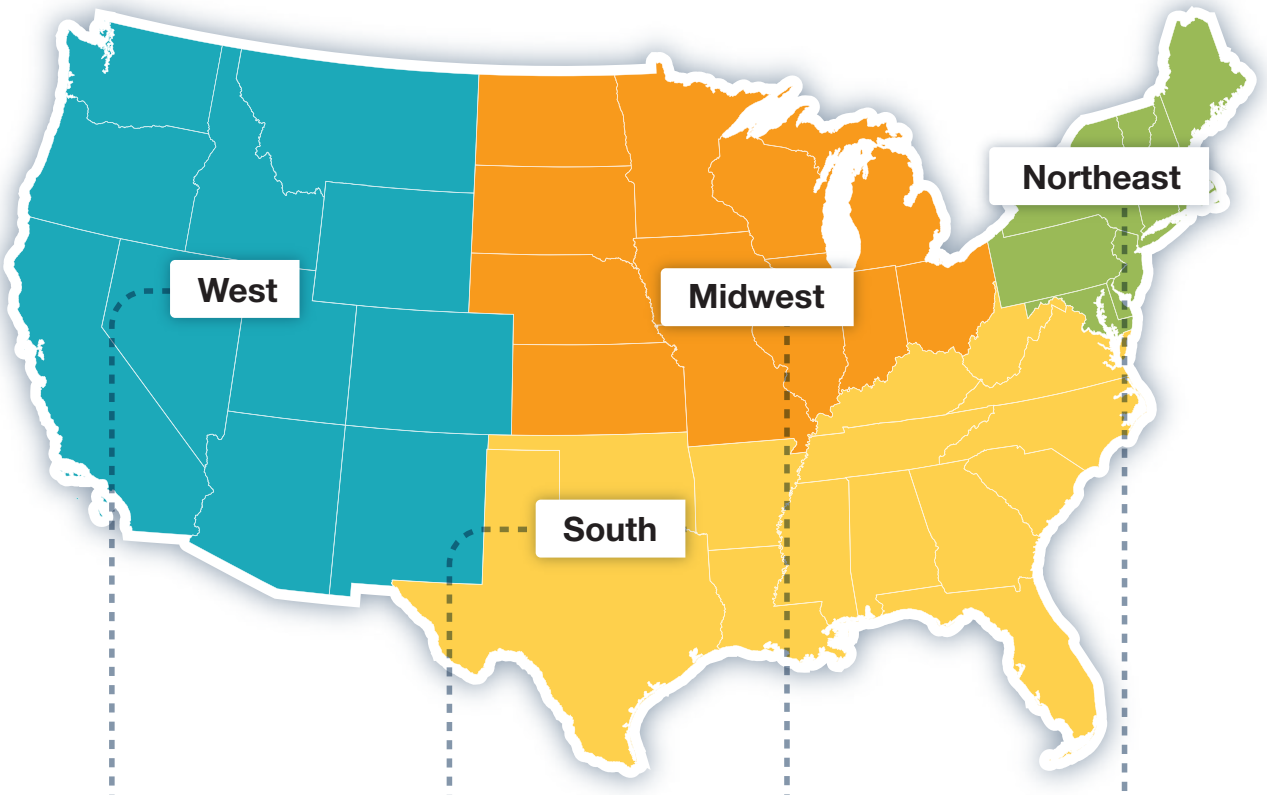


Research estimates...

***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.



West	South	Midwest	Northeast
3.04 mean number of risk factors	**3.21** mean number of risk factors	**2.94** mean number of risk factors	**3.02** mean number of risk factors

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*

1

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

2

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

3

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.

76% Feel Tired at Work

27% Have Trouble Making Decisions

53% Feel Less Productive

39% Have Trouble Remembering

44% Have Trouble Focusing

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]

[11]Roehrs, 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

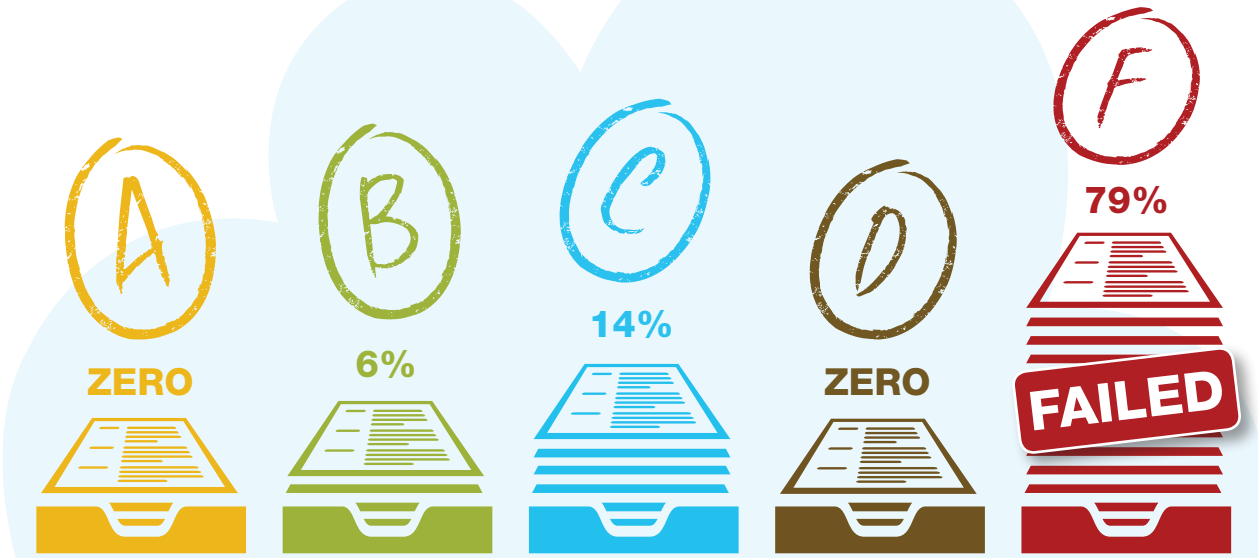
Overall, 16% reported experiencing at least one near miss or safety incident due to fatigue, and some respondents experienced more than one type of fatigue-related event.

[12]Tefft, 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.

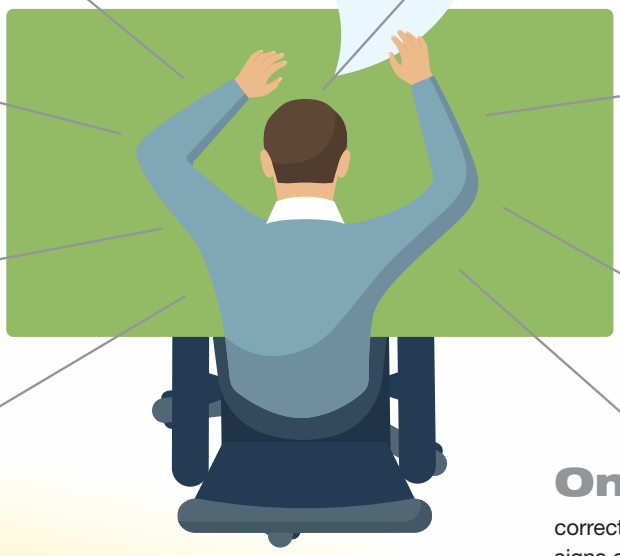
What percentage of employees understand fatigue: 20%



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

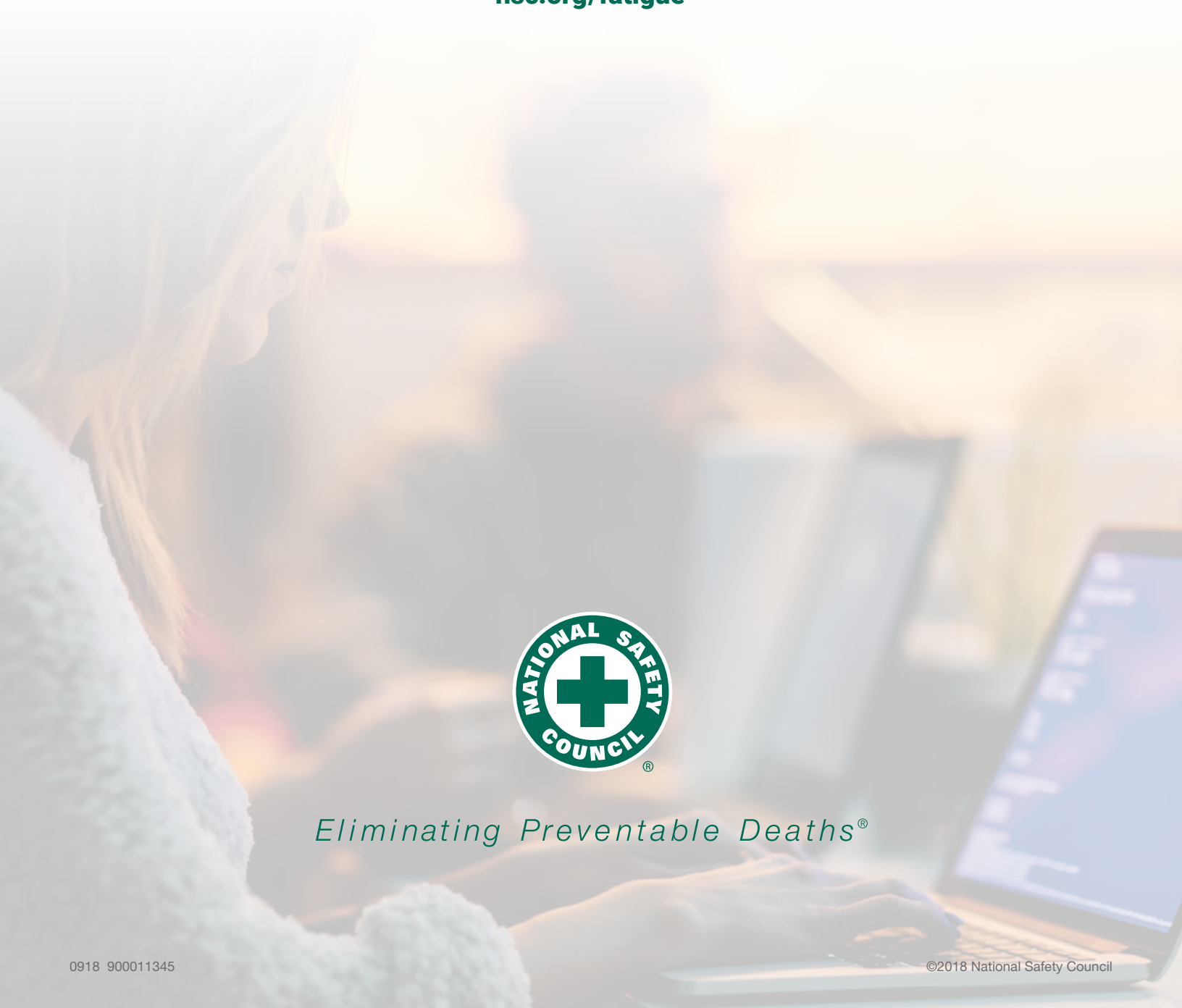
What can you do?

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

WORKPLACE FATIGUE

Learn more and get needed resources at nsc.org/fatigue



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FATIGUE

IN THE WORKPLACE:

RISKY EMPLOYER PRACTICES

Part two of a three-part series

Based on results from the 2017 National Employer Survey on Workplace Fatigue

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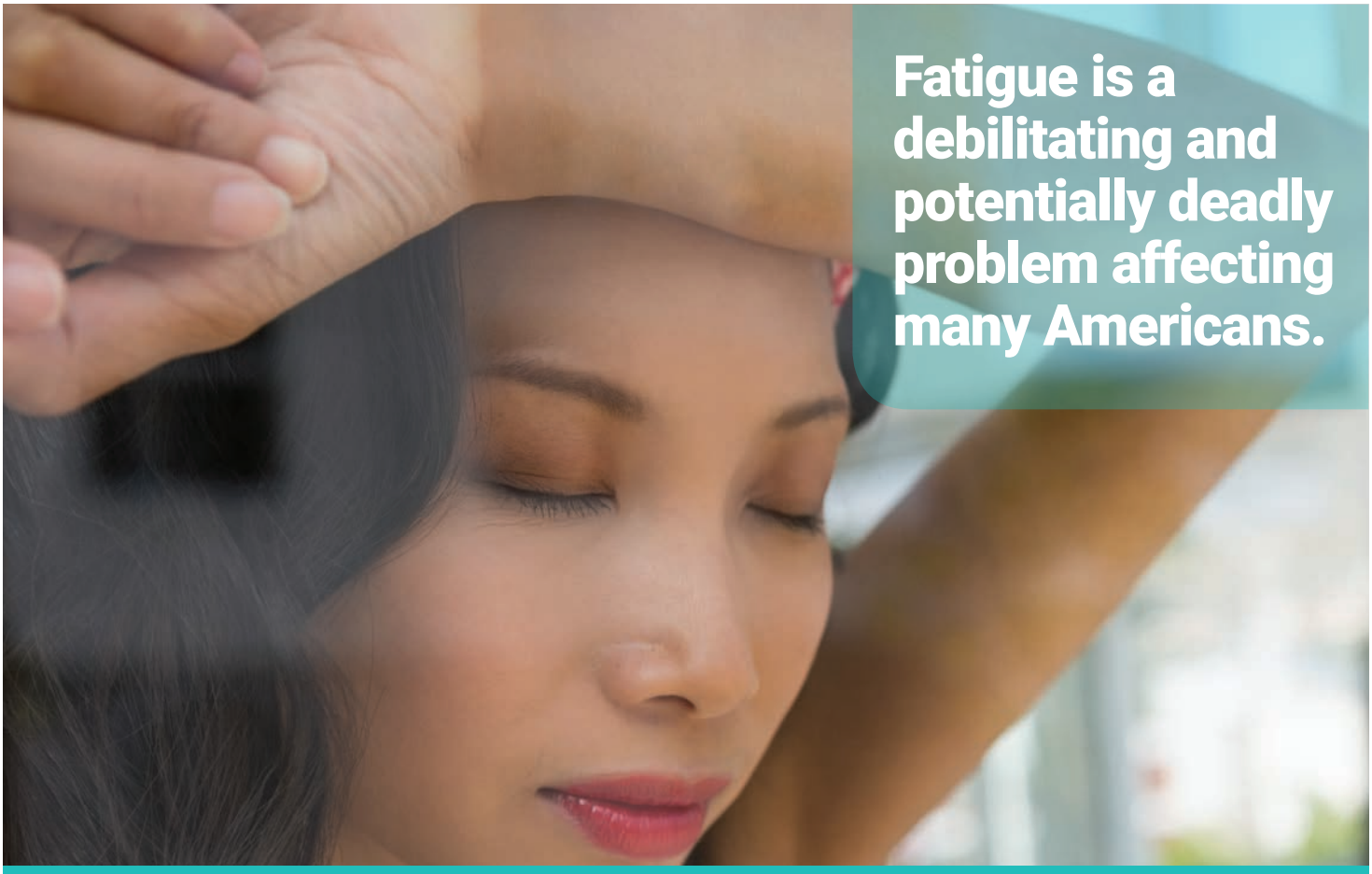
WHAT IS FATIGUE?



The symptoms of fatigue include tiredness, sleepiness, reduced energy and increased effort needed to perform basic tasks. Many factors cause fatigue, the most obvious being sleep loss. However, factors in addition to sleep deprivation can play a role in employees' ability to get proper rest or how much fatigue they experience. Shift schedule, tasks performed and work environment also play a role. As reported in *Fatigue in the Workplace: Causes and Consequences of Employee Fatigue,* nearly every American worker (97%) is at risk for fatigue, and therefore fatigue likely affects every workforce.

About This Report

Fatigue in the Workplace: Risky Employer Practices is the second in a three-part series of reports produced by the National Safety Council on the prevalence of fatigue in the American workforce. This report releases new data from the Employer Survey on Workplace Fatigue conducted in June 2017 with 504 human resources decision makers who are responsible for health, safety and/or shift scheduling.

S M T W T F S

About the National Employee Survey

The current report provides references to the National Employee Survey, with results released in the first part of this three-part series, *Fatigue in the Workplace: Causes and Consequences of Employee Fatigue.* The National Employee Survey are the results of a probability-based study of 2,010 working adults. The survey sample was balanced according to U.S. Census figures of age, gender, ethnicity and geographic region. Interviews were completed February–March 2017.

How is Fatigue Affecting My Workforce?

When employees are fatigued, it decreases their ability to think clearly, make informed decisions and be safe and productive. A 2014 meta-analysis of 27 observational studies estimated up to 13% of injuries in the workplace could be attributed to fatigue.[1] Risk of injury can be reduced by identifying and managing the many factors that contribute to fatigue.

Causes and Consequences

In the workplace, fatigue can be caused by a myriad of factors, such as work schedules, environmental conditions and job demands. Fatigued employees are less productive and more prone to mistakes and missing work. Fatigue also increases the risk of injury and near misses on the job.

Workplace vs. Employee Risk Factors

Fatigue is most commonly caused by not getting enough sleep or working against the body's natural clock. But fatigue can also be accrued in the workplace through risk factors such as long hours or a lack of rest breaks. In the report *Fatigue in the Workplace: Causes and Consequences of Workplace Fatigue,* employee risk factors for fatigue such as sleep loss and commute length were investigated. This report looks at risk factors in the workplace that may contribute to the accumulation of fatigue and put employees at risk.

Managing Fatigue in the Workplace

Identifying factors that cause fatigue and implementing countermeasures to control them are ways to reduce health and safety risks in the workplace. Managing fatigue risk is an important component of any safety management system.

[1]Uehli, 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.

Impact of Fatigue in the Workplace

Fatigue is a safety hazard in the workplace, and it affects productivity as well. Fatigue affects employees' ability to think clearly, slows reaction time, and decreases attention, vigilance, short-term memory, judgment and other functions. Tired employees are less productive (presenteeism) and more likely to miss work (absenteeism). When employees are not thinking clearly, they are more likely to make mistakes that can be costly or even deadly. For more information about the causes and effects of fatigue check out *Tired at Work: How Fatigue Affects Our Bodies* at nsc.org/TiredatWorkReport

90% of employers reported being negatively impacted by fatigue.

NSC FATIGUE Cost Calculator

47% of employers have experienced decreased productivity due to fatigue

50% of employers have had an employee fall asleep on the job

57% of employers report absenteeism due to fatigue

32% of employers report injuries and near misses due to fatigue

Do you know how much fatigue is costing your organization?

Sleep disorders are common, but they often go undiagnosed and untreated. Reduced alertness due to sleep deficiency or untreated sleep disorders contribute to missed workdays, lower productivity, increased health care costs, workplace injuries and motor vehicle crashes.

A typical employer with 1,000 employees can expect to lose more than $1 million each year to fatigue.

Visit nsc.org/TiredatWork to find out how much fatigue is costing your company.

Fatigue-Related Workplace Policies and Practices

Shift Scheduling Practices and Fatigue Risk

Our 24/7 culture of around-the-clock operations requires employees to cover shifts in the night and early morning hours. Manufacturing, transportation and emergency medical services must operate at all hours of the day. Humans are biologically programmed to be asleep at night, making shiftwork a risk factor for fatigue. Fatigue risk also increases when employees work extended hours or overtime.

Shift scheduling can contribute to fatigue, but identifying risky practices and implementing effective scheduling practices can help reduce or manage fatigue risk.

Night shift workers are three times more likely to be injured.

Swaen, G. M. H., Van Amelsvoort, L. G. P. M., Bültmann, U., & Kant, I. J. (2003). Fatigue as a risk factor for being injured in an occupational accident: results from the Maastricht Cohort Study. Occupational and Environmental Medicine, 60 Suppl 1(May), i88–i92.

Scheduling Practices for Employers Using Night Shifts

Employer practice	Risk effect	Percent of employers using this practice
Employees working a night shift immediately before or after a day shift	Increases fatigue risk	51%
No predetermined end time for night shifts	Increases fatigue risk	49%
Limiting the number of consecutive night shifts	Manages fatigue risk	40%
Allowing naps or rest breaks during night shifts	Manages fatigue risk	13%

Night shifts

47% of employers rely on night shifts

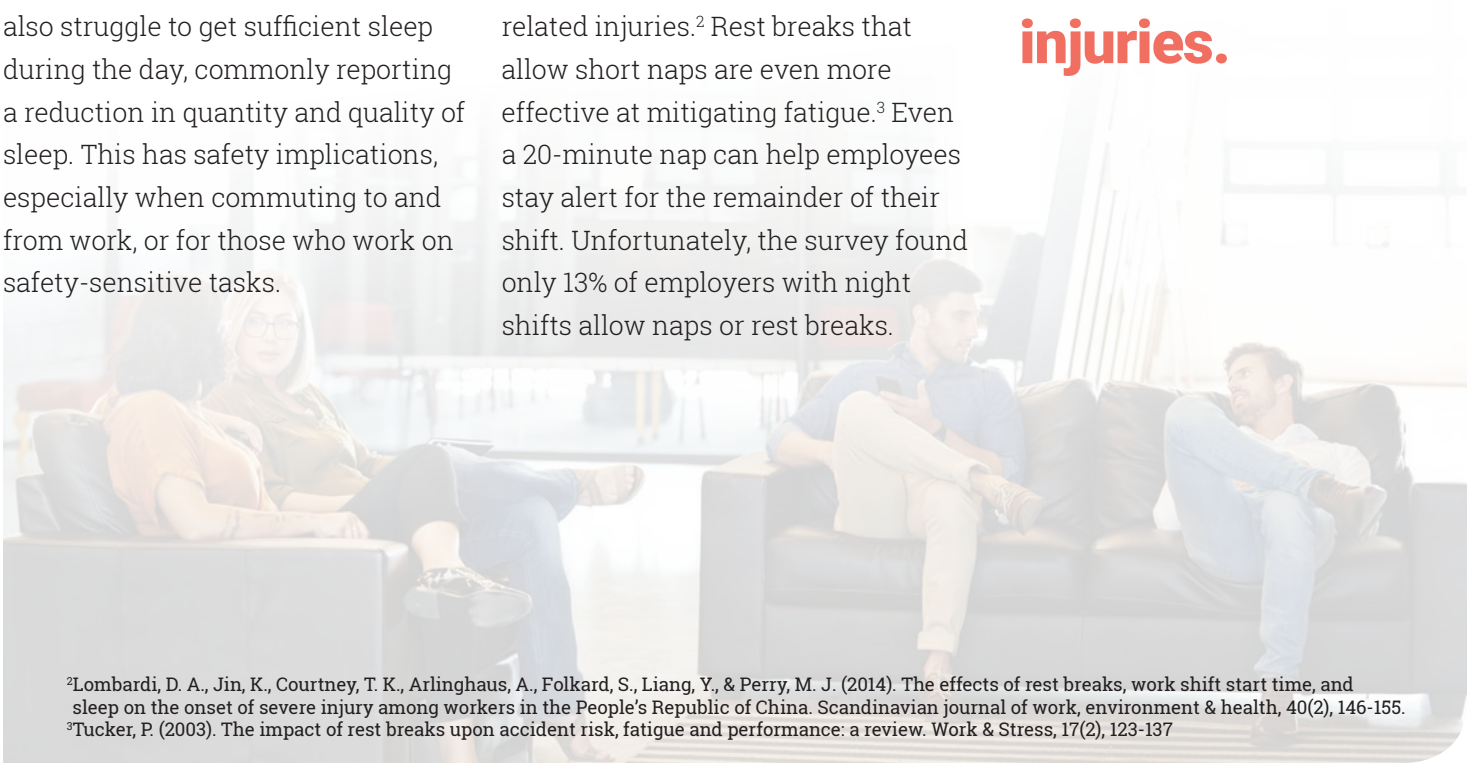
Night shifts carry additional risk for fatigue and fatigue-related safety incidents. Night shift workers must fight against the body's natural clock during these hours, making them less alert on the job. They also struggle to get sufficient sleep during the day, commonly reporting a reduction in quantity and quality of sleep. This has safety implications, especially when commuting to and from work, or for those who work on safety-sensitive tasks.

Does your workplace have rest areas?

60% of employers have no designated area for employees to rest

Rest areas are an effective way for an employee to recuperate from fatigue that develops during a shift. Research shows short-duration rest breaks can reduce risk of work-related injuries.[2] Rest breaks that allow short naps are even more effective at mitigating fatigue.[3] Even a 20-minute nap can help employees stay alert for the remainder of their shift. Unfortunately, the survey found only 13% of employers with night shifts allow naps or rest breaks.

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



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

Overtime

46% use extended hours or overtime

Overtime or shifts with extended hours put a strain on the workforce. Most employers that use overtime rely on it most of the year to cover operations (77%). Employees who work long hours accumulate fatigue throughout the shift, increasing their risk for accident and injury. In fact, one study showed injury risk begins increasing after 8 hours, with a 13% increase on a 10-hour shift and a 30% increase on a 12-hour shift.[4] Long hours also takes away from time to recuperate with sleep. Working long shifts on a regular basis contributes to sleep deprivation which affects health and wellbeing.

Long Hours
The longer the shift, the higher the risk.

Our National Employee Survey found more than half of employees working overtime were not getting enough sleep.

Written policies?

Almost two-thirds of employers (63%) have written policies limiting the number of hours an employee can work.

Managing fatigue through workplace policies and practices

Utilizing best practices in shift scheduling can help reduce the fatigue burden on shift workers.

General shift scheduling practices

- Forward-rotate shifts (day-afternoon-night) and provide at least 12 hours of time off between shifts
- Slowly rotate shifts (for example, two weeks on day shifts, two weeks on night shifts)

Manage the risk of long hours

- Avoid quick shift returns. Ensure employees have enough time off between shifts to allow for commuting, personal responsibilities and at least seven hours of sleep. Ten to twelve-hour shift return minimums should be considered.

Manage the risk of night shifts

- Provide opportunity for recovery rest when an employee rotates on or off of a night shift; a full night's rest is optimal
- End night shifts at a predetermined time to ensure adequate time off for rest; 12 hours off between shifts is optimal
- Limit the number of consecutive night shifts to four nights in a row, and allow ample opportunity for recovery rest
- Allow 30–40 minute naps during night shifts to decrease fatigue burden

[4]Folkard S, Lombardi DA. Modeling the impact of the components of long work hours on injuries and "accidents" American Journal of Industrial Medicine. 2006;49:953–963.

Fatigue & Workplace Safety Culture

Risk Factors for Fatigue in Workplace Safety Culture

Workplace culture is an important element of a safety management system. Culture refers to the attitudes, beliefs, and behaviors within an organization. Organizations with a strong safety culture report fewer injuries than organizations without strong safety cultures.[5]

Is your workforce tired?

74% of employers underestimate the prevalence of fatigue in the workforce

Most employers, 74%, believed only a minority of their workforce was at risk for fatigue. In fact, employers estimated on average that only 30% of their workforce was at risk for fatigue. Findings from our National Employee Survey showed that nearly every employee surveyed, over 2,000 nationwide, indicated at least one risk factor for fatigue. Even more surprising, 80% of employees reported two or more risk factors for fatigue. This demonstrates a lack of awareness among employers on how widespread the risk of fatigue is among the American workforce.

Do you talk about fatigue in the workplace?

73% do not communicate with employees about fatigue

The first step in managing fatigue risks is to have open and honest conversations about fatigue as a workplace hazard. Communicating about fatigue in the workplace increases awareness about the causes of fatigue, and the associated safety and performance risks. Workplaces that do not communicate about fatigue are missing an opportunity to strengthen their safety culture.

Do employees feel comfortable reporting safety concerns due to fatigue?

61% of employers believe employees would not be comfortable admitting they are too tired to perform their job safely

Fatigue can diminish an employee's ability to think clearly, perform optimally, and be a safe and productive worker. Tired employees can put themselves and others at risk. It's important to create a culture where employees feel comfortable telling a supervisor if they feel too tired to do their job safely. The survey found only 27% of employers have formal channels for employees to report feeling fatigued.

Does your workplace see long hours with little sleep as a badge of honor? Or as a safety hazard?

[5]National Institute for Occupational Safety and Health (2011). Stop Sticks Campaign. Access on March 9th, 2018 at https://www.cdc.gov/niosh/stopsticks safetyculture.html

How do employers handle an employee who is struggling with fatigue?

91% of employers believe they can recognize a fatigued employee

What do employers do when an employee repeatedly shows up for work too tired to perform optimally?

- 90% will meet with the employee to understand why
- 74% will review the employee's schedule
- 69% will issue a warning or disciplinary action
- 55% will adjust employees' schedule and/or tasks to accommodate

Disciplining employees for fatigue prevents open and honest communication and can prevent future reporting.

Managing fatigue through workplace safety culture

Many employers are beginning to recognize that long days and overly tasked employees do not produce better results, but instead produce burnout and fatigue, directly affecting employees' health and safety. Understanding that limitation and recognizing fatigue as a hazard in the workplace is the first step to managing the risks.

Communicate about fatigue

- Have an open dialog about fatigue as a workplace safety hazard
- Discuss the importance of sleep health, how to get better sleep, and how to get screened for a sleep disorder
- A 5-minute safety talk is an easy way to start talking about fatigue in the workplace

Rest breaks

- Provide areas for rest breaks
- Encourage employees to take breaks during their shift
- Worksites with night shifts should provide space and opportunities for short naps

Get educated on workplace fatigue and sleep health

- Learn about risk factors for fatigue in the workplace
- Educate employees on how to get better sleep, and how to get assessed for a sleep disorder

Fatigue risk management is a necessary component of an effective safety management system.

Managing Fatigue Through Safety Systems

An effective and comprehensive safety management system should recognize and address fatigue as a potential hazard in the workplace. The best way to identify fatigue risk is to conduct an assessment and include fatigue in incident reporting. Identifying and minimizing factors that cause fatigue allow you to control health and safety risks in the workplace.

Fatigue risk management systems include policies, practices, programs and procedures that incorporate fatigue management into an existing safety management system.

Do Employers Feel Prepared to Manage Fatigue?

Managing fatigue is key to reducing risk of accident or injury. It can be done through a combination of policies, practices, programs and a safety culture that recognizes fatigue as a hazard. Yet, a quarter of employers do not feel prepared to manage fatigue.

One in four employers do not feel prepared to deal with fatigue.

What makes an employer feel prepared?

Having policies and programs in place to combat employee fatigue is the driving force in organizational preparedness. By comparison, the primary reason employers feel unprepared is lack of focus and not having policies in place.

Why do you feel your organization is prepared?

- 22% Policies or programs are in place
- 9% Organization promotes rest
- 8% Safety training
- 8% Limits on hours worked

Why do you feel your organization is not prepared?

- 22% Fatigue is not an organizational focus
- 21% No policies in place
- 11% Unexpected deadlines or emergencies may arise
- 10% No training

What are employers saying?

"Supervisors are taught to watch out for 'overworking' their employees, and offer days off every so often."

"There are no policies in place, and fatigue/worker morale is not talked about much."

"We have always taken the correct measures to ensure that workers are rested and ready for work or they take time off."

"Emergency situations constantly arise, causing overtime with little notice."

Resources for Employers

Explore the first report in this series, *Fatigue in the Workplace: Causes and Consequences of Employee Fatigue* at **nsc.org/FatigueReport**

Learn more about fatigue in the workplace on our resource page at **nsc.org/fatigue**

Calculate the cost of fatigue in your workplace at **nsc.org/TiredatWork**

Learn more and get needed resources at
nsc.org/fatigue

Eliminating Preventable Deaths®

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FATIGUE

IN SAFETY-CRITICAL INDUSTRIES:

IMPACT, RISKS & RECOMMENDATIONS

NATIONAL SAFETY COUNCIL®

Final report of a three-part series

Based on results from the 2017 National Employer and Employee Surveys on Workplace Fatigue

EXECUTIVE SUMMARY

Annual productivity gains are part of many organizational goals. Employees may seek to increase their income by working more hours, and they have family and social obligations after work. Time for recovery rest breaks and restorative sleep seems like a luxury that fewer and fewer people and organizations provide. With all these factors, fatigue is becoming a major concern for U.S. employees and employers.

FATIGUE

The impact of fatigue risk factors must be understood and addressed. Risk factors come from both employees and employers. In addition to the typical feeling of weariness at the end of a workday, fatigue can be caused by sleep disorders, sleep loss, working at night, putting in long hours and more. Fatigue affects employees' ability to think clearly, slows reaction time, decreases attention and vigilance, and impacts short-term memory, judgment and other functions.

The National Safety Council surveyed employers and employees in 2017, gaining insight into the state of fatigue among both populations. In this report, we compare answers for the safety-critical industries of Construction, Manufacturing, Transportation and Utilities to the overall population. In general, we found that safety-critical industries experience equal or higher risk factors and impacts from fatigue. Throughout this report, NSC provides recommendations on actions that employers and employees can take to reduce the effects of fatigue.

There is a serious gap between how employers and employees view fatigue and its impact on their safety. Notably, 93% of all employers feel fatigue is a safety issue, but just 72% of employees agree. This indicates that employees are not good judges of their own fatigue, signaling a need for employers to invest in fatigue risk management systems (FRMS) and empower employees to participate in sleep health programs.

Other notable differences in survey responses from employers and employees in safety-critical industries include:

- 97% of the employers in the Transportation industry feel the impact of fatigue – the highest among all safety-critical industries surveyed. 66% reported decreases in productivity and 45% said they had experienced safety incidents.
- Nearly all—98%—of employers in Manufacturing said it is unsafe to drive while tired, but just 77% of employees in that industry agreed.
- Every Construction industry employee surveyed reported at least one risk factor for fatigue (see page 13). Of those workers, 46% said they work during high-risk hours, and 77% said they have demanding jobs.
- Transportation industry employees who reported at least one risk factor cited long shifts (42%) and sleep loss (48%) as the most common causes of fatigue.

METHODOLOGY

Fatigue in Safety-Critical Industries: Impact, Risks & Recommendations is the last of a three-part series of reports produced by the National Safety Council on the prevalence of fatigue in the American workforce. This report releases new data from the 2017 National Employer and Employee Surveys, and compares selected safety-critical industries to the overall workforce.

Four safety-critical industry subsets were identified in our survey data, and have been compared to all industries in this report:

Industry	Employee participants	Employer participants
Construction	74	51
Manufacturing	209	55
Transportation	94	29
Utilities	29	22
All industries	2,010	504

These four segments were well-sampled in the survey. Safety-critical industries may be at higher risk for fatigue-related incidents and injuries than industries overall. The industries profiled in this report do not necessarily have the most severe fatigue issues, and are not necessarily the industries with the highest number of near misses, injuries or deaths with fatigue as a contributing factor. Data does not exist on which industries have the most fatigue-related incidents. The industries profiled in this report tend to use shiftwork, which carries significant fatigue-related issues.

The National Employer Survey on Workplace Fatigue was conducted in June 2017 with 504 human resources decision makers who were responsible for health, safety and/or shift scheduling. Data from this report was initially released in *Fatigue in the Workplace: Risky Employer Practices*.

This report also references data released in the first report of this series, *Fatigue in the Workplace: Causes & Consequences of Employee Fatigue*, and data subsets that include safety-critical industries. The National Employee Survey data are the results of a probability-based study of 2,010 working adults. The survey sample was balanced according to U.S. Census figures by age, gender, ethnicity and geographic region. Interviews were completed February–March 2017.

All reports in this series can be found at nsc.org/FatigueSurvey

Fatigue Can Have Devastating Consequences

Incidents in safety-critical industries can have serious consequences for employees, the public and employers, so it is essential to address factors that contribute to high injury and fatality rates. As noted in the NSC report *Fatigue in the Workplace: Causes & Consequences of Employee Fatigue,* nearly every American employee (97%) is at risk for fatigue, and fatigue likely affects every workforce.

Safety-critical industries have higher risks because the impact of fatigue is more than just lower productivity. Safety incidents endanger not only the employees involved but all those around them. In addition, increased health care costs, lawsuits, breach-of-contract issues and lost business are just a few of the significant financial costs of fatigue that organizations may experience.

What Is Fatigue?

The symptoms of fatigue include tiredness, sleepiness, reduced energy and increased effort needed to perform basic tasks. Many factors cause fatigue, with the most obvious being sleep loss. However, factors in addition to sleep loss can play a role in employees' ability to get proper rest and how much fatigue they experience. Shift schedules, monotonous tasks, physically demanding work, stress and the work environment are also factors.

Biological risk factors

Sleep loss and untreated sleep disorders are risks that employees bring with them to work. While fatigue is caused by factors that may or may not be within employees' control, obtaining restorative sleep is the best defense against fatigue. Sleep is a basic biological need that is just 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 a person last slept). Adults need seven to nine hours of sleep a day to perform at an optimal level. As soon as people awaken, their bodies begin 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 (Dawson, 1997).

Circadian rhythm—the body clock

Most people's circadian rhythm—also known as the body clock—is on a predictable schedule. Melatonin begins secreting around 9 p.m., and deepest sleep happens around 2 a.m. Melatonin stops secreting around 7 a.m. and peak alertness occurs around 10 a.m. People who must work against their circadian rhythm, such as shift workers, find it difficult to perform during the late-night or early-morning hours and to sleep during daylight hours. Night shift workers frequently report getting less sleep than day shift workers; 59% of night shift employees reported sleeping less than seven hours a day, versus 45% of day shift workers.

The combination of misalignment with the body clock and sleep debt (the difference between needed and actual hours of sleep) has a greater effect on safety-critical industries than industries overall. This may be due to a lack of flexibility in scheduling around seasonal and weather circumstances, such as when Utilities workers are called out during storms.

NEARLY HALF OF EMPLOYEES REPORT FEELING TIRED AT LEAST SOME OF THE TIME DURING THE WORKDAY.

IMPACT OF FATIGUE

Employers and employees agree that fatigue is a legitimate safety issue, but there is a large gap between the number of employers and employees who agree. This could point to differences in perception among employers and employees. Employers have objective ways to measure the effects of fatigue: productivity, absenteeism, safety incidents and injuries. Employees may not feel secure in reporting fatigue, and the company culture might consider fatigue to be a badge of honor. In addition, fatigue affects judgment, and therefore employees may not be capable of accurately judging when their performance is affected by fatigue (Dawson, 1997).

Percentage of those surveyed who agree that fatigue is a safety issue

Industry	Employers	Employees
Construction	98%	75%
Manufacturing	95%	82%
Transportation	100%	73%
Utilities	95%	66%
All industries	93%	72%

Tiredness and Falling Asleep on the Job

High numbers of employees report feeling tired at work and employers report employees falling asleep on the job. Transportation employees have the highest level of feeling tired at work (70%). While the percentage of Utilities employees who feel tired at work is lowest among the profiled industries, nearly 45% report feeling tired at work at least some of the time. Employees in Transportation and Utilities industries may not fall asleep less on the job; they may have more unsupervised hours at work, and therefore a decreased chance of being observed sleeping on the job by their employers.

Tired at work

Industry	Employees report feeling tired at work
Construction	65%
Manufacturing	63%
Transportation	70%
Utilities	45%
All industries	69%

Asleep on the job

Industry	Employers report finding employees asleep on the job
Construction	61%
Manufacturing	55%
Transportation	38%
Utilities	41%
All industries	50%

Note that employers may be reporting a single incident of falling asleep on the job, and these numbers do not necessarily reflect a significant issue or falling asleep at safety-critical times.

Fatigue affects employees' ability to think clearly, slows reaction time, decreases attention and vigilance, and impacts short-term memory, judgment and other functions. Tired employees are less effective (presenteeism) and more likely to miss work (absenteeism), creating a drag on productivity. Importantly for safety-critical industries, fatigued employees are also more likely to make mistakes that cause incidents and injuries. A 2014 meta-analysis of 27 observational studies estimated up to 13% of workplace injuries could be attributed to fatigue, and workers with sleep problems had a 1.62 times higher risk of being injured than those without (Uehli, 2014).

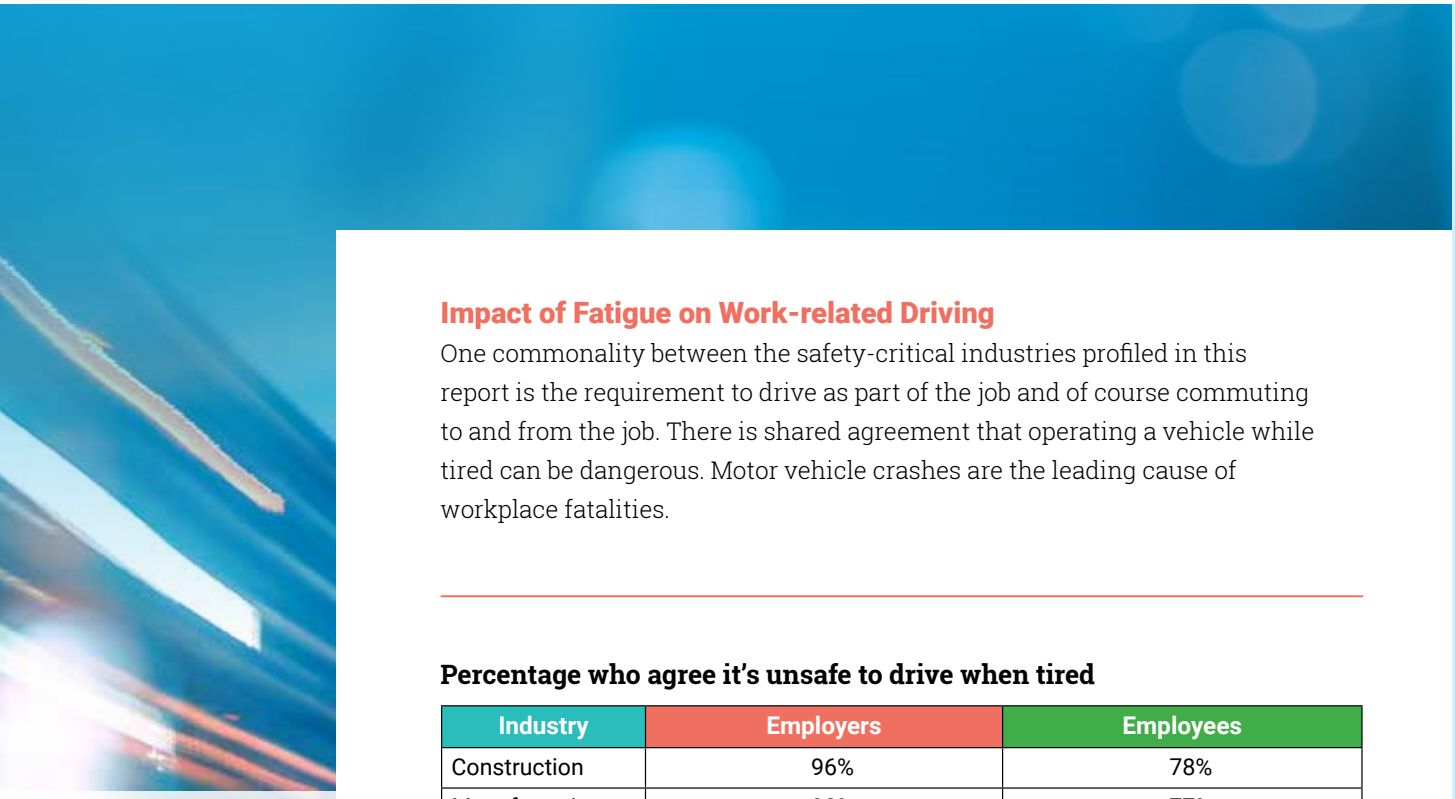
Up to 13% of workplace injuries could be attributed to fatigue.

Employers report the impact of fatigue on their organization

Industry	Feel the impact of fatigue	Experience productivity decreases	Experience safety incidents
Construction	94%	71%	45%
Manufacturing	89%	73%	44%
Transportation	97%	66%	45%
Utilities	91%	64%	41%
All industries	90%	67%	32%

Find out how much fatigue costs your company. Enter four data points and your email address in the **Real Costs of Fatigue Calculator at nsc.org/tiredatwork** to get your customized results.

NSC FATIGUE Cost Calculator



Impact of Fatigue on Work-related Driving

One commonality between the safety-critical industries profiled in this report is the requirement to drive as part of the job and of course commuting to and from the job. There is shared agreement that operating a vehicle while tired can be dangerous. Motor vehicle crashes are the leading cause of workplace fatalities.

Percentage who agree it's unsafe to drive when tired

Industry	Employers	Employees
Construction	96%	78%
Manufacturing	98%	77%
Transportation	97%	77%
Utilities	95%	66%
All industries	94%	80%

One study found that a person who loses two hours of sleep from a normal eight-hour sleep schedule performs similarly to someone who has drunk two to three beers (Roehrs, 2003). Sleep loss and the resultant fatigue should be treated as seriously as drug or alcohol impairment on the job. The discrepancy between employers and employees who agree that fatigued driving is unsafe points to an urgent need to educate employees on this topic.

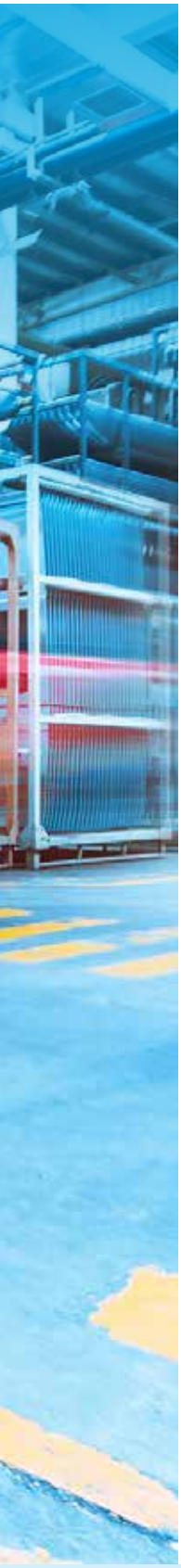
FATIGUE
RISK FACTORS

Workplace Fatigue Risk Factors at a Glance

Shift work: Night shifts, early morning shifts, rotating and irregular shifts disrupt the body clock	**Quick shift returns:** Employees need at least 12 hours between shifts to recover	**Long shifts:** Working 10 or more consecutive hours
Long weeks: Working 50 or more hours a week	**High-risk hours:** Working at night or in the early morning, even infrequently	**Demanding jobs:** Work that requires sustained attention or is physically or cognitively demanding
No rest breaks during shift: Short breaks allow employees to rest and re-energize	**Sleep loss:** Getting less than the necessary seven to nine hours of sleep a day	**Long commutes:** Driving more than 30 minutes each way to work

An in-depth description of these risk factors can be found in the NSC report *Fatigue in the Workplace: Causes & Consequences of Employee Fatigue*.

Nearly every surveyed employee has at least one risk factor for fatigue, and with the exception of Utilities, safety-critical industries report a higher incidence of multiple risk factors than all industries. While a conclusion cannot be drawn in a definable fashion that two or more risk factors multiply risk, it is common sense that the more risk factors individuals have, the higher the probability that their work quality, productivity and safety will be affected. Minimizing factors that cause fatigue and implementing appropriate countermeasures to fatigue are ways to control health and safety risks in the workplace.



Employee-reported number of risk factors by industry

Industry	One risk factor	Two or more risk factors
Construction	100%	92%
Manufacturing	98%	89%
Transportation	99%	94%
Utilities	97%	79%
All industries	97%	80%

Employee-reported risk factors

Risk factor	Construction	Manufacturing	Transportation	Utilities	All industries
Shift work	8%	16%	26%	17%	17%
High-risk hours	46%	45%	64%	45%	41%
Demanding job	77%	86%	86%	83%	81%
Long shifts	27%	30%	42%	28%	21%
Long weeks	28%	28%	32%	24%	22%
Sleep loss	41%	46%	48%	34%	43%
No rest breaks	8%	8%	12%	0%	10%
Quick shift returns	18%	11%	23%	7%	14%
Long commutes	46%	34%	36%	45%	31%

These are just a few of the risk factors that may affect fatigue levels. Other risk factors include age, gender, health and lifestyle choices.

In general, employees in safety-critical industries were more likely to report fatigue risk factors compared to all industries. Of note are the percentage who reported working physically and mentally demanding jobs, working high-risk hours and having long commutes.

When possible, employers can look for ways to structure working days to minimize the number of concurrent fatigue risks. When concurrent fatigue risks are unavoidable, employees should be given additional recovery time.

Sleep disorders

Sleep disorders are a major hurdle to getting enough sleep. Obstructive sleep apnea (OSA, a blockage of airflow during sleep) and insomnia (problems falling or staying asleep) are two of the most common sleep disorders that inhibit people from getting sufficient sleep. Innovative employers support screening and treating employees for sleep disorders so they become safer and healthier employees.

SCHNEIDER

"Lack of sleep is detrimental to any driver, so I believe it is imperative that we as professional drivers are tested for any sleep-related condition that will affect our ability to safely and legally drive on our nation's highways. I started driving for Schneider in 2006 and got my CPAP in 2007. I use my machine every night and even if I nap during the day. My quality of life has improved overall since I started using the CPAP: I feel well rested, have more energy, and generally, am happier. If you think you have any symptoms of sleep apnea, please get tested. It could save your life."

Steven Frey

CASE STUDY

Schneider reaps rewards from treating obstructive sleep apnea

Schneider provides transportation, logistics and intermodal services, so it depends on healthy, alert drivers to move materials around the country efficiently and safely. By developing and implementing an innovative OSA treatment program, Schneider was able to cut health care costs, improve driver retention, and achieve a five-fold reduction in DOT-reportable crashes.

Schneider's occupational health team suspected that drivers who were returning to work after a critical medical event might also have been suffering from untreated OSA. Drivers' personal physicians and biannual DOT screenings often missed the symptoms. The traditional method of diagnosing this condition—an overnight sleep study at a sleep health center—would have been costly for the company and logistically cumbersome for drivers. A new model of screening, testing, diagnosing and monitoring OSA was developed:

- **Screening survey identifies at-risk drivers**
- **Portable testing for at-risk drivers is conducted at home, in their bunk or hotel**
- **Sleep physician analyzes results the next day and immediately informs the driver of the results**
- **Continuous positive airway pressure (CPAP) machine, specifically outfitted to the truck's sleeper berth as needed, is dispensed within 24 hours**
- **Driver is paired with a sleep clinician for assistance in adjusting to the machine**
- **CPAP equipment is covered on employee health care plan as preventive care with no out-of-pocket cost to the driver**

A 2016 study of commercial truck drivers using Schneider's data concluded that treatment for OSA dramatically reduced crash risk. Drivers diagnosed with OSA who used CPAP treatment had crash risks similar to drivers who did not have OSA, while drivers who were diagnosed but did not use CPAP treatment had five times greater preventable crash risk after adjustment for miles driven and driving experience (Burks, 2016).

Schneider's decision to treat drivers diagnosed with OSA saved $400 a month on health plan costs per driver, increased retention, reduced crash risk and decreased DOT-reportable crashes.

Additionally, a review of medical claims under the Schneider health care plan confirmed savings of $300–$400 per driver per month for diagnosed drivers receiving OSA treatment.

Risk Factors Due to Work Schedules

Employers may be able to strategically schedule shifts and shift returns to mitigate fatigue. Forward-rotating shifts (day to afternoon to night) are an easier adjustment for the circadian clock. Employees should ideally stay on shifts for a couple weeks before rotating, allowing them time to adapt to their schedules and develop new routines. However, people working night shifts may have trouble getting restorative sleep, and may find themselves sleep-deprived during their night shift rotation. Limiting the length of night shift rotations, or scheduling no more than four consecutive night shifts with opportunities for nighttime rest during off-duty periods, can help provide opportunities for restorative sleep. It is important to consider on-duty and off-duty hours when scheduling to ensure employees get enough time between shifts to allow for recuperative rest.

Consider on-duty and off-duty hours when scheduling to ensure employees get enough time between shifts to allow for recuperative rest.

In addition, working 10 or more hours a day and 50 or more hours a week increases fatigue risk. However, scheduling eight-hour shifts for no more than five consecutive days is not always possible in safety-critical industries. Work schedules may be affected by storms, natural disasters or seasonal demand. Transportation may be affected by unexpected traffic, road closures or weather conditions. Because these factors may be unpredictable or unscheduled, employers should take care to actively monitor the number of consecutive hours and days worked, and give employees sufficient recovery time.

Job duties may contribute to fatigue

The type of work performed may significantly affect fatigue risk. When workers spend time on a single task for a long duration, it can become monotonous and physically draining, increasing risk of fatigue. This is especially important to address in Manufacturing and Transportation, where higher output may be achieved by keeping employees on a single task with minimal breaks. Manufacturing settings can rotate employees through different tasks to keep them mentally fresh and reduce the chance of repetitive stress injury. Transportation employees should schedule rest breaks for 15 minutes every two hours to relieve visual fatigue and stretch muscles that have been contracted in the same position.

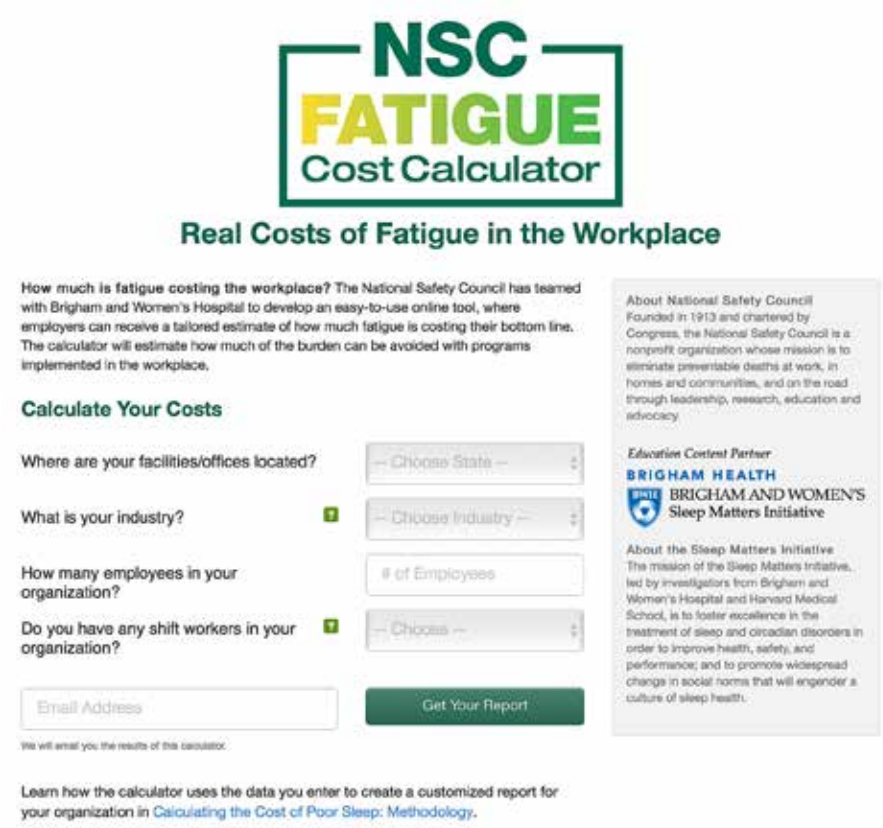
Fatigue also increases with:

- **Low workload tasks** that are unstimulating and monotonous, such as highway driving
- **High workload tasks** that require vigilance, such as assembly line work
- **Repetitive motion tasks** that involve a limited number of muscle groups, such as data entry

For all these situations, rotating tasks and/or scheduling regular rest breaks mitigates fatigue. Employees need to feel comfortable reporting fatigue and asking for a rest break or to be rotated to a different task. In addition, because employees are not good judges of their own fatigue, supervisors need to be alert to signs such as excessive yawning, errors in judgment or other atypical actions, reduced concentration, microsleeps or falling asleep. Supervisors should give employees rest breaks or implement other strategies to reduce fatigue.

Calculating the Cost of Fatigue

As shown in the Schneider case study on page 15, workplace fatigue costs include increased health care plan costs and higher numbers of reportable incidents. Managing workplace fatigue helps the bottom line. Some fatigue risks can be managed for little cost: forward rotating shifts, for example. Other strategies for fatigue management, such as hiring more employees or implementing a sleep disorder screening program, are upfront expenditures that may require budget justification to the leadership. NSC has a resource to help.



The methodology used to create the cost calculator is detailed in *Calculating the Cost of Poor Sleep: Methodology* at nsc.org/tiredatwork.

NSC in collaboration with the Brigham and Women's Hospital Sleep Matters Initiative developed an online fatigue cost calculator that estimates the cost of sleep deficiency for individual businesses. Entering four data points into the calculator—workforce size, industry, location, and shift scheduling practice—generates an estimated dollar cost that helps the organization quantify the cost of fatigue and justify the implementation of a fatigue risk management system (FRMS).

MANAGING FATIGUE

Fatigue is a human factor that affects every workforce, but systems and processes can be put into place to reduce its impact. Many employers are beginning to recognize that long days and overly tasked employees do not produce better results, but instead produce mental and physical burnout, directly affecting employees' health and safety. Recognizing fatigue as a hazard in the workplace is the first step to managing the risks.

Safety Management Systems for Fatigue

An effective and comprehensive safety management system should recognize and address fatigue as a potential hazard in the workplace. The best way to identify fatigue risk is to conduct an assessment and include fatigue factors in incident reporting. Identifying and addressing factors that cause fatigue allow employers to better control health and safety risks in the workplace.

Fatigue risk management systems

Fatigue risk management systems include policies, practices, programs and procedures that incorporate fatigue management into an existing safety management system.

Driver alert systems

Many vehicles are equipped with technologies that alert drivers to potential fatigue. There are several paths to detecting fatigue, ranging from lane departure warning systems to driver-state monitoring systems that detect head position or eyelid movement, to heart-rate monitoring sensors and software. These systems detect when the driver is drifting into another lane, if their eyes are closing too frequently or if they are exhibiting other drowsy driving behaviors, and issue an alert. This technology has the potential to save lives, but it should not be used to allow fatigued drivers to continue driving. It is meant as a warning for drivers to assess their fatigue level and implement fatigue-mitigating behaviors before a crash occurs.

Driving alert systems are not a substitute for proper sleep. They are meant as a warning for drivers to assess their fatigue level and implement fatigue-mitigating behaviors if necessary.

If organizations have these systems in their vehicles, they should also have established policies about how the systems work and the interventions that should take place when alerts do occur. This technology should be used as a part of an overall fatigue risk management system, and should not supplant other worthwhile fatigue management actions.

Download and post this infographic where drivers will see it: nsc.org/drowsygraphic

Workplace culture and communication

Of all recommended changes, workplace culture may be the most difficult to address becaus it requires a change in perspective, not just a change in policy. Disciplining employees for reporting fatigue prevents open and honest communication and can hamper future reporting. Working while fatigued is at best less productive and at worst dangerous for the employee, the organization and the public.

When an organization acknowledges that fatigue is an unacceptable risk factor and decides how to address it, the change must be communicated to employees:

- Have an open dialogue about fatigue as a workplace safety hazard
- Give a 5-minute safety talk about fatigue in the workplace
- Have human resources or a health care representative discuss the importance of sleep health, how to get better sleep, and how to get screened for a sleep disorder

References

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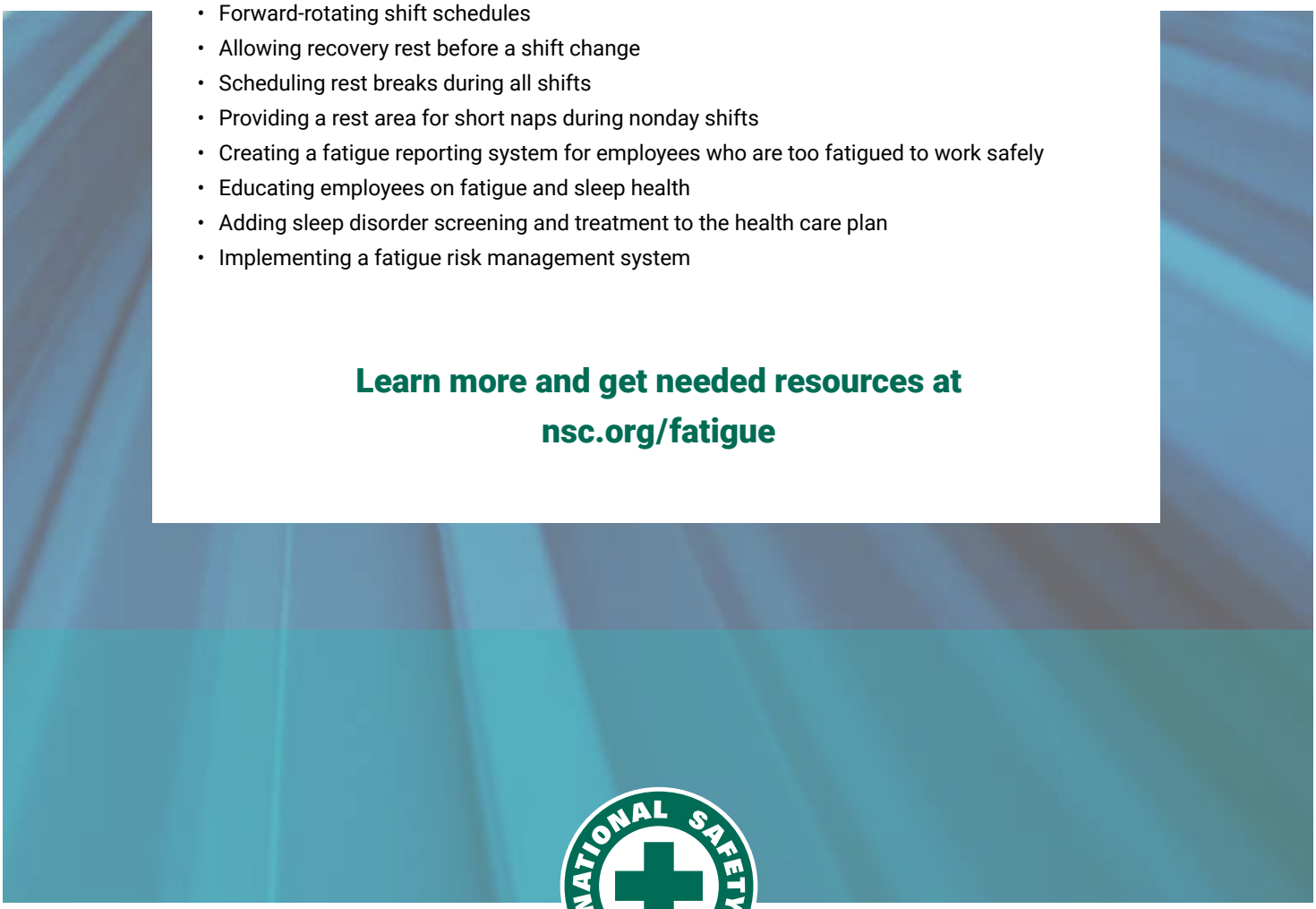
National Safety Council is leading the conversation on workplace fatigue in the U.S.

How many of these fatigue-mitigating changes could your organization embrace?

- Scheduling employees for less than 10 hours a day
- Scheduling employees for less than 50 hours per week
- Scheduling night shift employees for no more than four days in a row
- Forward-rotating shift schedules
- Allowing recovery rest before a shift change
- Scheduling rest breaks during all shifts
- Providing a rest area for short naps during nonday shifts
- Creating a fatigue reporting system for employees who are too fatigued to work safely
- Educating employees on fatigue and sleep health
- Adding sleep disorder screening and treatment to the health care plan
- Implementing a fatigue risk management system



Learn more and get needed resources at nsc.org/fatigue

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