

WHY SLEEP MATTERS

Abstract

For centuries, sleep was considered a passive state of absolute repose of the brain. In 1953, however, the discovery of rapid eye movement (REM) sleep and non-REM (NREM) sleep made it clear that sleep is an active process that is fundamental for healthy brain function.

Even though the relationship between sleep and health is now well-documented and sleep is known to be key to human physical and mental well-being, many people still have the incorrect notion that sleep is a luxury that can be minimized or even skipped in order to accommodate busy lives and endless to-do lists.

Phrases such as “I’ll sleep when I die” or “You snooze, you lose” represent the modern “always on” ethos. This, combined with the push by many cultures toward success at any cost, has led societies around the world to glamorize and celebrate sleep deprivation. Indeed, sleep has come to be treated as a dull chore performed reluctantly and out of obligation, and one that needs to be dispatched with as quickly as possible. This attitude has led to a global sleep deprivation crisis: insufficient sleep is currently acknowledged as a public health epidemic that is often unrecognized, underreported, and has sizable economic costs.

Sleep Deprivation, Sleep Deficiency, Insomnia: Are They All the Same?

Sleep disorders are a group of ailments affecting a sizable segment of the world’s population (approximately 35% to 50% of U.S. adults alone). They compromise sleep and result in fewer objective hours of sleep, lower quality sleep, and potential impacts on both physical and cognitive health.

A formal diagnosis of a sleep disorder is initially based on sleep duration, defined as the total amount of time a person needs to spend asleep in a night to be well-rested. For adults, that amount is between seven and nine hours, and for children and teens, between eight and ten hours.

Being well-rested, however, is more than just how many hours are spent asleep; it also refers to the quality of sleep experienced.

The phrase “sleep deprivation” is generally used to describe voluntarily reduced sleep time. Causes can include work obligations, lifestyle choices (e.g., staying up late to binge-watch a TV series), and poor or inadequate sleep hygiene (e.g., maintaining uncomfortable bedroom temperatures, ingesting caffeine or alcohol close to bedtime, having irregular bedtimes).

The terms “sleep deficiency” and “sleep insufficiency” are used more frequently to refer to medical conditions that can reduce quantity and/or quality of sleep, and keep a person from waking up refreshed.¹ Sleep apnea, for example, is a condition where dozens of nightly awakenings occur due to stoppage of breathing, which compromises both sleep duration and quality. Insomnia disorder, which is defined in the Diagnostic

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and Statistical Manual-5 (DSM-5) as difficulty falling asleep, staying asleep, or early morning awakenings despite the opportunity to get adequate sleep, is another cause of sleep deficiency. Insomnia can result in feeling unrefreshed upon awakening, low energy levels, mood swings, poor quality of life, and impaired work performance, and can ultimately lead to significant psychological distress.²

A third medical condition is narcolepsy, a chronic neurological disorder that affects the brain's ability to control sleep-wake cycles. It is far rarer than insomnia or sleep apnea, affecting approximately one of every 2,000 people, and is characterized by persistent drowsiness and overwhelming urges to sleep (sleep attacks), sometimes called excessive daytime sleepiness (EDS), regardless of how much objective sleep the person may have had. People with narcolepsy can also experience episodes of microsleep, cataplexy, and vivid hallucinations and/or sleep paralysis just before falling asleep or upon awakening. These episodes can occur at any time, which can leave the individual at great risk. If left untreated, narcolepsy can have a substantial effect on daily work and leisure activities and can interfere with cognitive function as well.²²

How Poor Sleep Affects the Body

Sleep plays a fundamental role in the effective functioning of most body systems.³ Both sleep deprivation and insufficient sleep lead to the derailment of bodily systems, which can have serious and far-reaching health effects.

Acute sleep deprivation increases the risk of unintentional errors and accidents as a result of slowed reaction time and risk of microsleeps (sleeps that last from a few to several seconds, during which the individual is unaware of having slept). Individuals who are sleep-deprived are also more likely to struggle in school and work settings or to experience mood changes that may affect personal relationships.

Chronic insufficient sleep can create significant risks to physical and mental health and is known to contribute to a wide range of health problems, such as:

Cardiovascular diseases

Studies have found strong associations between sleep deficiency and cardiovascular diseases (CVDs),⁴ including high blood pressure, coronary heart disease, heart attack, and stroke. Inflammation is a well-established key mechanism in CVD risk and as sleep deprivation is associated with increased inflammation and negative cardiovascular outcomes,⁵ there could be a possible mechanism linking sleep deficiency with CVD.

Hoevenaars-Blom, et al., in a 12-year prospective study of 20,432 healthy men and women in the Netherlands, found that individuals who slept six or fewer hours a night had a 15% higher risk of CVD incidence and a 23% higher risk of coronary heart disease (CHD) incidence compared to people who regularly slept seven to eight hours a night. When sleep quality of the two groups was compared, individuals with shorter sleep durations and poorer subjective sleep had a 63% higher risk of CVD and

79% higher risk of CHD than those who had normal sleep durations and good sleep quality.⁶

Diabetes

The importance of sleep to hormone and glucose metabolism was first documented more than four decades ago. Sleep deprivation alters glucose homeostasis, leading to insulin resistance and increased risk of diabetes. One postulation is that initiation of slow-wave sleep is associated with a decrease in the brain's use of glucose, stimulation of growth hormone release, inhibition of cortisol secretion, decreased sympathetic nervous system activity, and increased vagal tone (which is associated with lower heart rate and increased heart rate variability). All of these correlates of slow-wave sleep affect total body glucose homeostasis; therefore low amounts of slow-wave sleep, which normally occur in aging individuals and in those experiencing sleep disorders, is associated with decreased glucose tolerance.⁷

One study directly tested this hypothesis by selectively suppressing slow-wave sleep in healthy young adults and examining its effects on their glucose tolerance. The amount of slow-wave sleep was reduced by nearly 90% without reducing total sleep duration. Intravenous glucose tolerance tests (GTTs) were performed after two nights of undisturbed sleep and again after three nights of slow-wave sleep suppression. After suppression of slow-wave sleep, GTTs showed insulin sensitivity had decreased by around 25%, dropping to levels reported in aging individuals and in populations at high risk for diabetes.⁷ Additional research continues to support the hypothesis.

It is thus evident that the body's ability to regulate blood sugar is impacted by insufficient sleep, increasing the risk of metabolic conditions.⁸

Obesity

Sufficient epidemiological evidence exists to support a link between sleep loss and obesity. A 2009 study found that people tend to consume more calories and carbohydrates when they do not get enough sleep, due to diminished activity in the brain's appetitive evaluation regions.⁹ This, combined with excess subcortical responsivity in the amygdala, has been shown to result in the selection of foods most capable

of triggering weight gain,¹⁰ and appears to be one of several ways sleep difficulties may be tied to obesity and problems maintaining a healthy weight.

Immunodeficiency

Sleep is a portion of the 24-hour circadian cycle, which affects most living things on Earth and governs biological processes. Many immune functions display prominent cycles that are in synchrony with the light-dark cycle, reflecting the synergistic actions of sleep and circadian rhythms on these functions.¹¹ Prolonged sleep curtailment and its accompanying stress response invoke a persistent production of pro-inflammatory cytokines, best described as chronic low-grade inflammation. This chronic inflammation induces immunodeficiency, as evidenced by studies that show diminished immune response to vaccination against influenza after six days of restricted sleep¹² and enhanced susceptibility to the common cold with poor sleep efficiency.¹³

Pain

Sleep loss has been shown to amplify the brain's pain-sensing regions and to block its natural analgesia centers. Sleep-deprived individuals are therefore at higher risk of developing pain or of feeling as if their pain is worsening.¹⁴ Pain may also cause sleep interruption and curtailment, resulting in a negative cycle of worsening pain and sleep.

Mental health disorders

Sleep and mental health are known to be closely intertwined. Decades of research have shown that sleep disturbances are highly prevalent in mental health disorders and are associated with adverse effects upon cognitive, emotional, and interpersonal functioning. Impaired sleep has strong associations with many, if not all, mental health conditions (MHC), and sleep problems have traditionally been viewed as a consequence of MHC.¹⁵ While this is not contested, evidence also suggests that problems sleeping can contribute to the formation of new MHCs¹⁶ and to the maintenance of existing ones.

Growing evidence also suggests an association between both short and long duration of habitual sleep with adverse health consequences. A recent dose-response meta-analysis of prospective studies provided further evidence that sleep duration that is either too short or too long is associated with higher risk of all-

cause mortality and cardiovascular events, with the lowest risk at approximately seven hours per day of sleep duration. Short and long sleep duration may also share some relevant mechanisms in relation to all-cause mortality and cardiovascular events in that extreme sleep duration on both sides was associated with elevated C-reactive protein. Distinctive mechanisms with their own characteristics, however, may operate at either end of the spectrum, and longer term randomized controlled trials will be needed to determine causality and to elucidate the underlying mechanisms.²³

Impact on Insurance

Sleep deficiency is associated with higher mortality risk and productivity losses at work. Financial and nonfinancial costs associated with inadequate sleep are substantial: the U.S. Centers for Disease Control and Prevention (CDC) estimates that as many as 6,000 deaths in the U.S.

each year are caused by drowsy driving alone.¹⁷ Sleep deficiency has also been calculated to incur hundreds of billions in added U.S. healthcare costs¹⁸ as well as more than \$400 billion in productivity losses per year.¹⁹

Currently, sleep insufficiency is being exacerbated by the COVID-19 pandemic. “Coronasomnia,” the term used, is characterized by symptoms that include an increase in sleep problems since the pandemic’s start as well as anxiety, depression, and stress.

Impaired sleep quality is also associated with the massive increase in screen time throughout the world’s

populations. A 2020 study concluded that sleep quality can be negatively impacted by using mobile phones or tablets for more than eight of every 24 hours, using them for at least 30 minutes after the lights have been turned off for sleep, and keeping the devices within easy reach after bedtime.²⁰

Because of the adverse effects of insufficient or impaired sleep on health, well-being, and productivity, sleep quality may play an important and potentially modifiable role in multiple health conditions as well as risk stratification in the insurance sector.

**Growing evidence suggests
an association between sleep
duration and adverse health
consequences.**

Currently, many wellness programs take sleep quantity and quality into account, but insurers do not routinely use sleep monitoring results as a risk rating factor during underwriting. With the advent of wearables and advances in app technology, however, consumers are increasingly

self-monitoring sleep, which could indicate an opportunity for insurers to start using metrics related to sleep more routinely to stratify risk.

Conclusion

Humans sleep approximately one-third of their lifetimes. The value of sleep, even as a risk stratification factor, is often underrated. Sleep plays a vital role in good health and well-being throughout life and promoting sufficient good quality sleep should become a key focus of the insurance industry. 

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