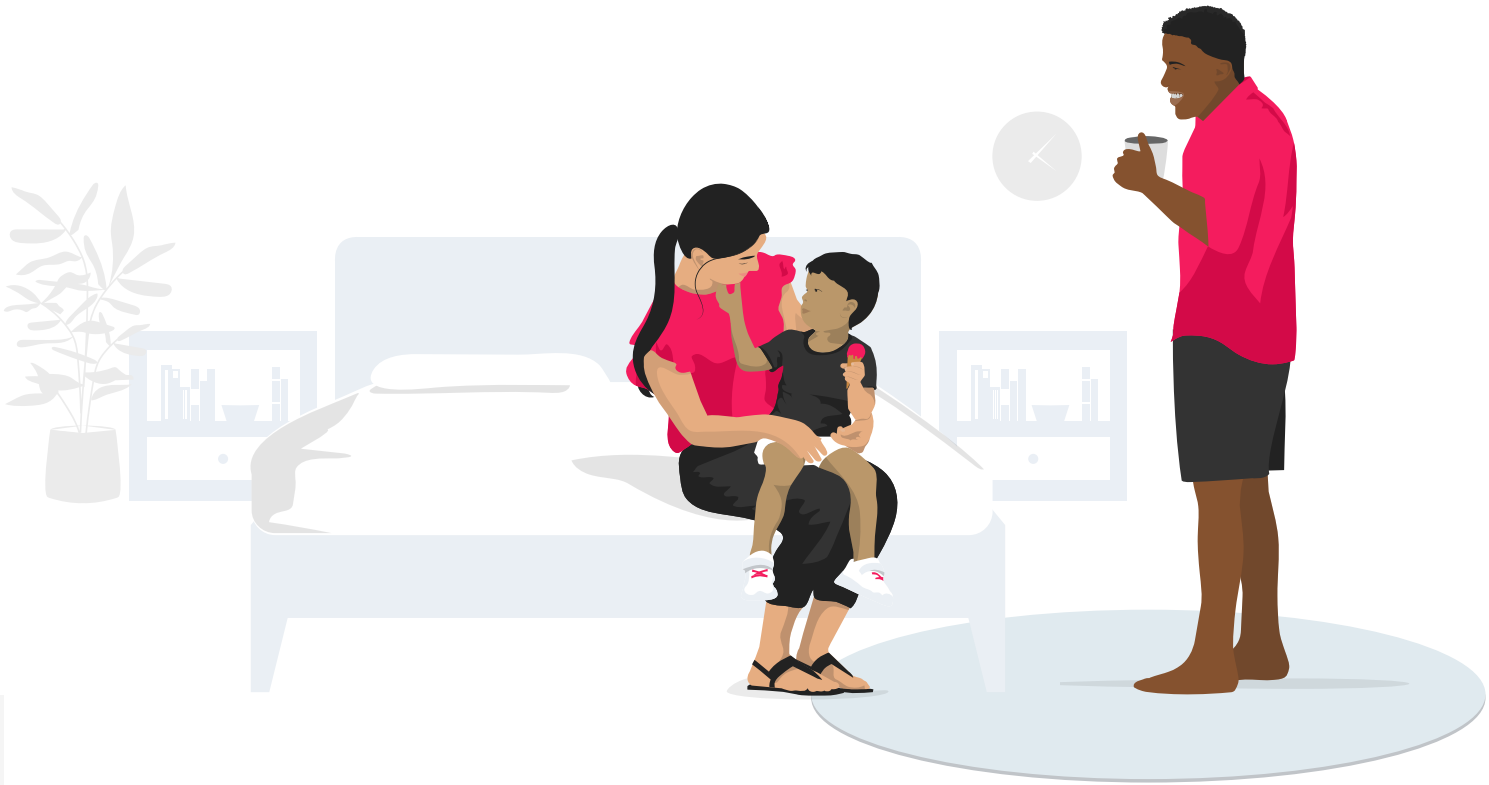
Vitality Research Institute

Building healthy sleep habits

The next frontier in prevention



In collaboration with

LSE THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

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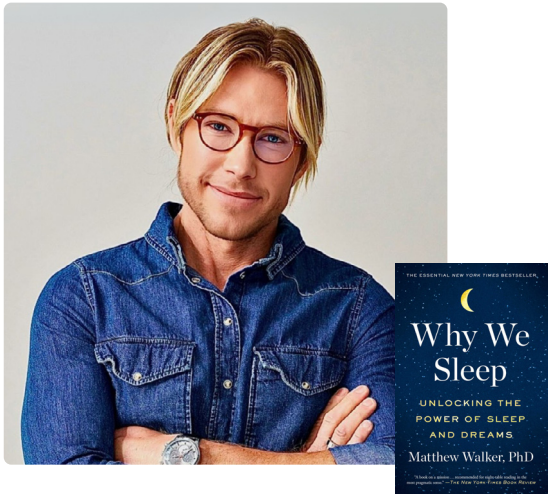
A message from Dr Matthew Walker



"Sleep is the most effective way to rest our mind and body each day. There is no organ system in the body, or any operation in our mind, that isn't enhanced by good sleep and impaired by poor sleep. Sleep influences everything from cardiovascular and metabolic function to mental well-being. Regular, sufficient sleep, seven to eight hours per night, with consistent bed and wake times, is not only restorative but also preventative. By incentivising healthy sleep habits, Discovery and Vitality are taking a science-backed step towards improving long-term health and reducing the risk of chronic disease. I am thrilled to be partnering with Discovery and Vitality on this journey to empower their members with better sleep health."

Dr Matthew Walker
Professor of neuroscience and psychology at the University of California, Berkeley, and the founder and director of the Center for Human Sleep Science.

Executive summary

Vitality's unique dataset provides new insights into the effects of poor sleep

Drawing on more than 47 million nights of tracked sleep, Vitality's research shows that healthy sleep patterns predict lower risks of hospitalisation and mortality. Short or irregular sleep raises the likelihood of serious illness; regular rest protects against it.

Better sleep improves health, longevity, and productivity

Having healthy sleep habits can add up to four additional years of life, and with them, a higher quality of health throughout; save up to USD $287 per person per year on healthcare costs through lower hospital admissions alone; and reduce productivity loss due to absence and presenteeism by up to six days per year.

One in three adults don't get enough sleep

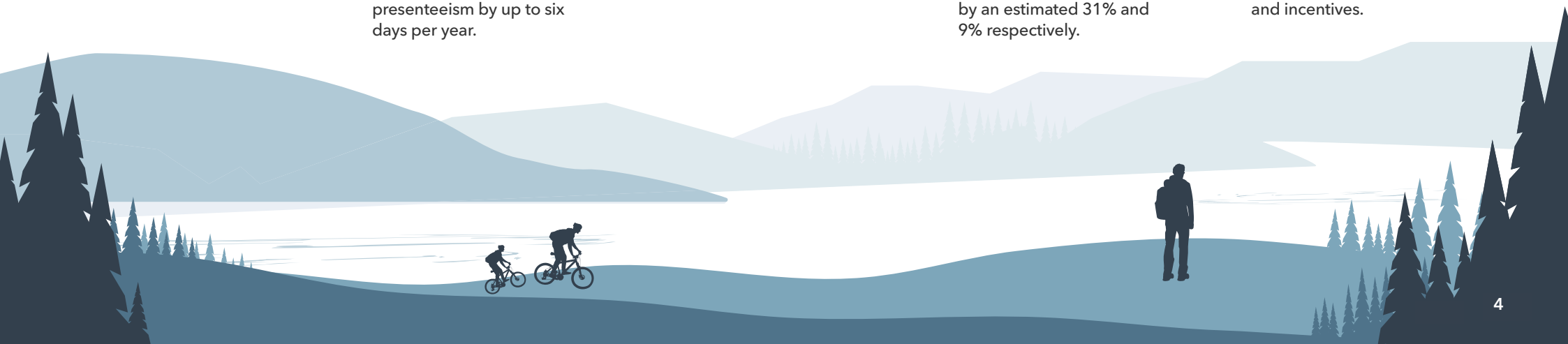
Insufficient and irregular sleep is one of the world's most common – and underestimated – health risks. Chronic sleep loss raises the likelihood of heart disease, diabetes, depression, and early death, while eroding focus, mood and productivity.

Bedtime consistency is a strong predictor of sleep-related risk

Vitality's data shows that while getting enough sleep is important for good health, consistency of bedtime is an even stronger predictor of sleep-related risk. Falling asleep consistently within a one-hour bedtime window lowers mortality risk and in-hospital admissions by an estimated 31% and 9% respectively.

Sleep is frequently a behaviour that can be improved

For many people, poor sleep stems not from disorder but routine. Like exercise or diet, it is a behaviour that can be measured, practised, and improved. Recognising this reframes sleep from a passive state to an active behaviour – one that can be shaped through cues, feedback, and incentives.



Technology makes sleep measurable and habit formation easier

Advances in wearables now make it possible to monitor sleep duration, regularity, and quality at scale. Real-time feedback helps people recognise patterns, set goals, and adjust routines, turning awareness into action. Consistent tracking supports the small, repeated behaviours that build lasting sleep habits.

Sleep habits must be actively maintained to optimise its benefits

Vitality's sleep records show that sleep habits tend to persist over time; however, both improvement and deterioration are possible. Sustaining healthy sleep requires consistency of behaviour and measurement, supported by feedback and incentives.

A new 7–1 rule turns complex science into simple actions

Promoting an easy-to-understand heuristic – seven hours of sleep, commencing within a one-hour window of an established bedtime – aligns circadian rhythms, promotes recovery, and builds automaticity. In this way, duration and consistency form the foundations of healthy sleep patterns.

Sleep is the next frontier of prevention

Integrating sleep into wellness, insurance, and policy frameworks offers measurable returns. An actionable heuristic, coupled with incentives, digital tools, and supportive environments can make good sleep the easy default. Insurers are uniquely positioned to deliver behaviour change in sleep patterns at scale.

Dr Katie Tryon
Deputy CEO at VitalityHealth UK

"Sleep has traditionally been viewed through a clinical lens, often associated with disorders rather than everyday behaviours. We believe that reframing sleep as an active, health-promoting behaviour, similar to physical activity, shifts the prevailing perception from something passive, inactive, or even lazy to a behaviour that is measurable, improvable, and essential to overall wellbeing. Evidence shows that small, consistent changes can deliver meaningful improvements in sleep quality. Through Vitality AI, we're leveraging these insights to incentivise healthier sleep habits, demonstrating how behavioural nudges can translate into better health outcomes for individuals and society."

Why sleep, why now?

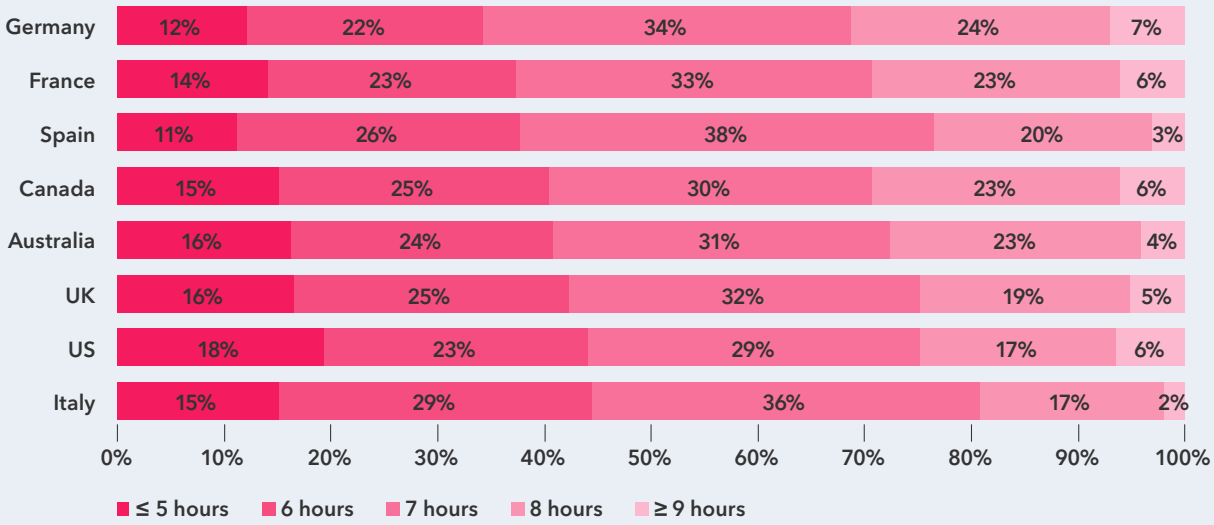
Sleep is the single most time consuming activity of human life, yet it is curiously undervalued or taken for granted. Hours and the quality of time spent asleep underpin our physical and mental health, and shape our productivity, the quality of our leisure time, and social participation. When too little rest becomes a habit, it can raise healthcare needs and costs, while too much variability in sleeping patterns erodes wellbeing, disrupts our ability to self-regulate, and can even contribute to social tension or conflict. Both duration and variability are influenced by individual decisions and the broader environment in which we live. Despite this, sleep still lacks the policy urgency accorded to diet or exercise.

Recent evidence shows why attention is overdue. Although the average amount of sleep has not changed dramatically over the last decades, the share of U.S adults sleeping six hours or less a night rose from 22% in 1985 to 29% in 2012, a jump of more than 30%. By 2025, the *Sleep in America Poll* found that six in ten adults reported inadequate rest; four in ten struggled to fall asleep at least three nights a week; and almost half had trouble staying asleep – a striking indicator of widespread sleep issues. On top of that, variability in sleep duration has widened: the standard deviation of nightly sleep grew from about 90 minutes in the mid-1960s to over two hours by 2017, showing a growing divergence in consistency of nightly sleep.

Cross-country differences are significant. A recent YouGov survey showed lowest average sleep duration in Italy and the US, with Germans and the French sleeping the most. A comparison of more than 220,000 Oura Ring users with 50 million data points from 35 countries showed people in Asia sleeping the least and having the most variable sleep times, followed by North America. People in Europe slept more and had the greatest variability in sleep-wake schedules (a phenomenon called “social jetlag”).

Who gets 7+ hours?

Proportion of people by amount of sleep



Note: Sorted in descending order by % of residents sleeping more than 6 hours on average.
Source: YouGov Surveys December 2023. Available at https://business.yougov.com/content/48914-how-long-do-most-people-sleep-globally-and-which-regions-feel-most-sleep-deprived-2024

Disruptors are everywhere. Parenting young children erodes sleep – mothers lose almost ten minutes of rest for each additional waking episode; light exposure matters – Americans living west of time-zone borders, with later sunsets, sleep 19 minutes less on average for each additional hour of evening light; and digital temptations have become pervasive – German data show that broadband access cuts nightly rest by 25 minutes. Blue light, endless scrolling, and always-on connectivity have made late nights the norm.

The message is stark: sleep has become more variable in quantity and quality, and more disrupted – yet its role in health, productivity, and wellbeing is undeniable.

What counts as enough sleep?

Scientists have debated the appropriate amount of sleep for decades. The consensus is clear: most adults need seven to nine hours a night for optimal health. Fewer than six hours raises the risk of cardiovascular disease, obesity, diabetes, depression, and premature death. More than nine, when habitual, is also linked to higher morbidity – often a marker of underlying illness rather than restorative rest.

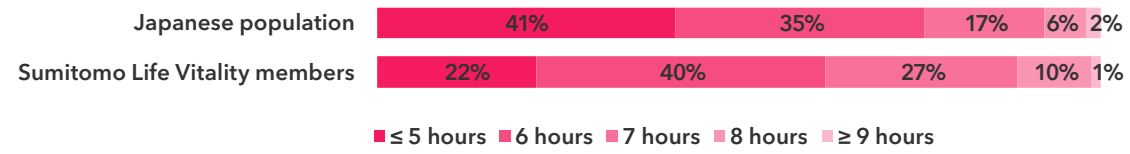
Age matters. Teenagers require more than adults – around eight to ten hours. Younger children need between nine and thirteen hours, and infants can sleep twelve to sixteen hours a day. At the other end of life, older adults still benefit from seven to eight hours, though sleep often becomes lighter and more fragmented.

A simple rule of thumb: if you wake feeling alert and can sustain concentration without heavy reliance on caffeine, you are probably getting enough. If not, chances are you are sleep deprived.

In Japan, better habits are translating into better sleep

Sumitomo Life, one of Japan's leading insurers, offers the Vitality Programme* to reward members for living healthier lives. The results are striking. Among more than 1.4 million members, reports of inadequate sleep are significantly lower than in the general Japanese population. By encouraging regular activity, balanced nutrition and better rest, the programme is helping to reshape daily habits – and, over time, to build measurable improvements in health outcomes.

Proportion of people by amount of sleep



Note: Data from 1,410,222 Sumitomo Life Vitality members and the official Japanese sleep statistics obtained from https://seikatsusyukanbyo.com/statistics/2024/010828.php

*Vitality is an incentive-based behavioural health programme built on a simple idea: reward people for doing the things that keep them healthy. Members earn points for healthy actions – undergoing health checks, exercising, or joining community events such as parkrun – which translate into tangible rewards like payments towards Apple Watch, and discounts on cinema tickets and coffee vouchers (varying by market). The approach makes prevention practical and motivating, turning small choices into lasting habits. By aligning incentives with wellbeing, the programme aims to help people live healthier, longer lives.

We sleep less than we think we do

Most people misjudge their own rest. Surveys show adults claim seven to eight hours of nightly sleep, yet devices trim that by half an hour or more. The gap reflects behaviour as much as psychology: people equate time in bed with time asleep, and memory tends to smooth over wakefulness.

Biases vary. Older adults and women tend to overestimate their sleep, often overlooking brief awakenings, while lower-income groups are more likely to underestimate theirs due to coping with noisy environments and irregular work schedules. Cultural patterns exist too: Japanese adults appear to sleep longer in surveys than wearables suggest, while Southern Europeans look short-sleeping if siestas are ignored. Disorders twist perception too: insomniacs tend to underestimate, while sleep apnoea patients tend to overestimate their sleep.

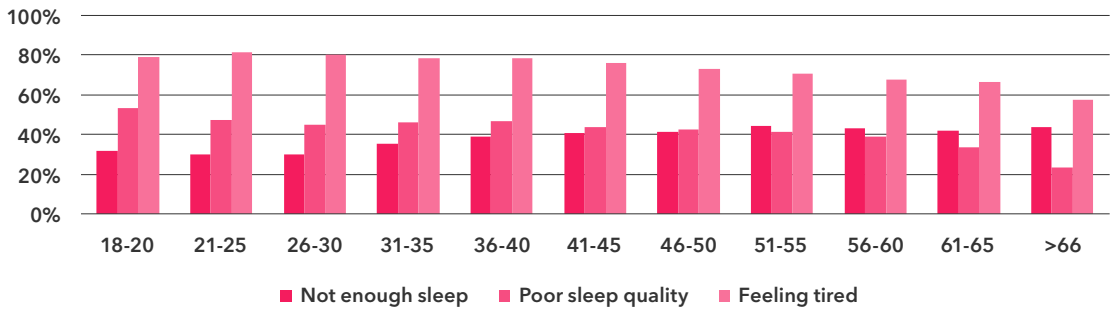
Sleep is not the only habit we misjudge. Ask people how much exercise they get, and most will paint a rosier picture than reality. Self-reports consistently overshoot objective measures by 20–50%. In one large study, more than half of adults who claimed to meet weekly activity targets were found by accelerometers to fall short. The reasons echo those for sleep. People mistake *time spent moving for time at recommended intensity*, just as they conflate *time in bed with time asleep*.

This gap matters for habit formation. People who believe they are sleeping enough are less likely to change routines. Devices are starting to close the awareness gap – in doing so, they reveal that much of the world is running on less sleep than it thinks.

Sleepwalking to work

Britain's Healthiest Workplace, a survey of nearly 200,000 employees run by Vitality since 2014, shows that the problem is not only sleep length, but sleep quality too – around four in ten respondents reported concerns about the quality of their rest. Patterns vary with age: sleep duration tends to shrink as we get older, but self-reported quality improves. What is consistent is the impact. Those who sleep too little, or sleep poorly, are far more likely to feel tired during the day – an erosion of energy that undermines health, mood, and productivity.

Prevalence of sleep issues and fatigue among UK workers (by age group)



Note: Percentage of respondents. "Not enough sleep" defined as sleeping less than 7 hours per night, "Poor sleep quality" defined as having problems with quality of sleep, and "Feeling tired" defined as feeling tired or fatigued at least once per week.

The modern assault on sleep

Sleep is under siege from the modern world. The most obvious culprit is the digital economy: devices extend time awake and flood eyes with blue light that delays the production of melatonin, while digital platforms are engineered for attention capture, exploiting reward loops that encourage one more scroll and one more episode. Surveys confirm the effect, with adolescents and adults who spend more time on screens more likely to cut sleep short. Large-scale studies, such as those conducted by the National Sleep Foundation and the Pew Research Center, show that increased exposure to smartphones, tablets, and computers is associated with later bedtimes, shorter sleep duration, and poorer sleep quality. The cognitive and emotional stimulation from social media, gaming, or streaming can keep the brain in a state of alertness, making it harder to unwind. In a world where devices are constant companions, self-regulation alone is rarely enough.

Culture compounds the problem. In many industries, the "always-on" workplace is celebrated, with long hours being worn as badges of honour. This undervaluing of rest feeds into present and optimism bias: people trade sleep for productivity, believing they will catch up later, when in fact irregular patterns worsen circadian disruption and raise health risks. The strain is greater as populations age. Older adults naturally sleep more lightly and wake more often, yet are expected to maintain the same pace as younger colleagues. Add the rising burden of mental health conditions – anxiety, depression, burnout – all of which erode sleep, and the cycle is vicious.

These pressures make building healthy routines especially difficult. Unlike exercise, where repetition alone often suffices, sleep requires alignment of both timing and duration. Behavioural biases – present bias, optimism bias, projection bias – are amplified by these cultural and technological forces. The challenge, then, is not simply clinical but behavioural: to find ways of making good sleep visible, repeatable, and reinforced in daily life. Only by turning sleep into a healthy habit can modern society begin to reverse its erosion.

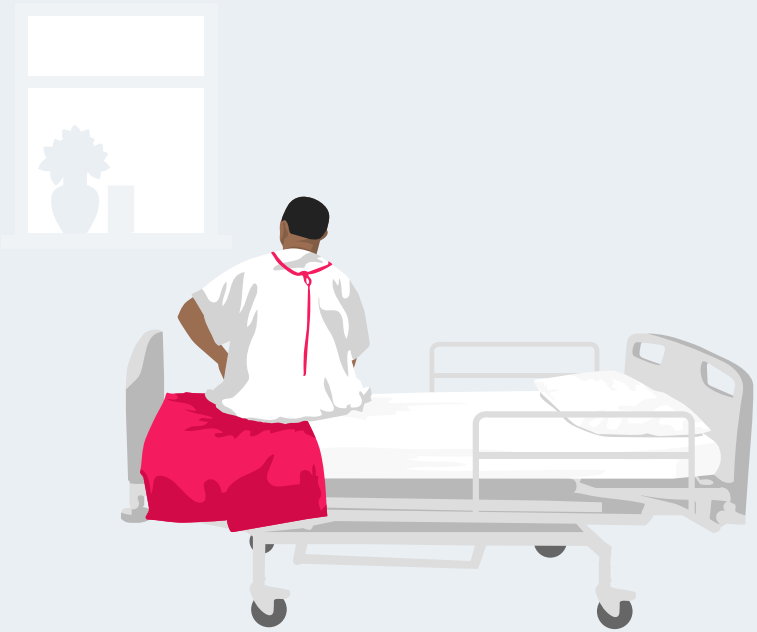
Challenges to good sleep

Blue light	In our wired age, the glow of screens is the modern hearth, yet it keeps us awake by tricking the brain into thinking it is still daytime and suppressing the melatonin that normally heralds sleep. **Recommendation:** Put away electronic devices at least an hour before bed or use a blue light filter to allow your body to wind down.
24/7 grind	The boundary between work and leisure has frayed as e-mails chase us into the evening and notifications buzz at our bedside, leaving cortisol levels high and relaxation elusive. **Recommendation:** Set firm limits on after hours work and turn off push notifications to give your mind a chance to stand down and be more productive the following day.
Late-night fuel	An evening caffeine hit or sugar rush may seem harmless, but stimulants linger and fragment sleep, ensuring that the deepest, most restorative stages of sleep are never reached. **Recommendation:** Avoid coffee, sugary snacks and alcohol for several hours before bedtime to improve the quality of your rest.
Unpredictable clock	The body's internal clock thrives on routine, yet sleeping in at weekends or following an erratic schedule confuses the circadian rhythm, leaving us groggy on Monday and wide eyed on Sunday night. **Recommendation:** Keep a consistent sleep-wake schedule, even on weekends, to train your body to expect rest at the same time each night.
Racing mind	Bed can easily become a venue for anxiety and rumination, with worries replaying on a loop and the nervous system refusing to power down when it should. **Recommendation:** Develop a wind down ritual – such as reading, breathing exercises or jotting down concerns – to quiet your mind before turning in.

Sleep matters

Sleep is moving from the sidelines to the centre of health. Rising rates of depression and anxiety, an ageing workforce more prone to fragmented nights, and the escalating costs of chronic disease have converged into what many call a public health crisis. Insurers, once focused on protection, are shifting towards prevention – helping people manage risk factors before they turn into claims. Poor sleep belongs squarely in this frame. It is not only a determinant of physical health, mental wellbeing, and productivity, but also a behaviour that is amenable to change. Measured properly and reinforced with the right incentives, sleep can be shaped into a healthy habit, offering benefits to individuals, employers, and health systems alike.

> "Insurers, once focused on protection, are shifting towards prevention."



How sleep shapes health and productivity

Domain	Mechanisms	Outcomes	Bi-directional effects
Physical health	Cardiovascular regulation (blood pressure, arterial stiffness); metabolic hormones (leptin, ghrelin, insulin sensitivity); immune responses (inflammation, infection resistance)	↑ Risk of heart disease, obesity, diabetes, infections, cancer; ↑ Mortality (U-shaped curve)	Illnesses (hypertension, obesity, diabetes, chronic pain) fragment and reduce sleep, worsening outcomes
Mental health	Neurotransmitter balance; emotional regulation; memory consolidation; stress response	↑ Risk of depression, anxiety, irritability, poor cognition and learning	Psychiatric disorders (depression, anxiety, PTSD) disturb sleep; insomnia is both a symptom and risk factor
Productivity	Attention; reaction time; decision-making; creativity; engagement; burnout; turnover	↓ Performance, ↑ Absence and presenteeism, workplace errors, accidents; GDP losses up to 2%	Job stress, long hours and shift work erode sleep

Physical health

Sleep is a biological necessity, not a negotiable luxury. Adults who habitually sleep fewer than six hours a night face a 20% higher risk of premature death compared with those who sleep seven to eight. Cardiovascular disease is a leading pathway: short or fragmented sleep raises blood pressure, stiffens arteries and increases the likelihood of stroke and heart attack. Mortality risk is not linear but U-shaped, with both very short and very long sleep linked to worse outcomes.

Metabolic health also unravels without sufficient rest. Sleep restriction disrupts the hormones that regulate appetite, leaving people hungrier and less satisfied after eating. Laboratory studies show that just one week of curtailed sleep can impair glucose control to a degree resembling pre-diabetes. The immune system suffers in parallel. People who sleep fewer than seven hours a night are nearly three times more likely to contract a cold after viral exposure compared with those who get eight hours. Chronic short sleep is also linked to systemic inflammation, raising longer-term risks for cancer and cardiovascular disease.

Crucially, the relationship runs both ways. Illnesses such as hypertension, obesity, and diabetes make restorative sleep harder to obtain, creating a feedback loop of ill health. This reciprocity explains why sleep is increasingly recognised as a foundation of health, alongside exercise and diet. The American Heart Association has added sleep to its "Life's Essential 8," a list of core health behaviours, underscoring that without sufficient rest, other pillars of prevention cannot reach their full potential.

> "Adults who habitually sleep fewer than six hours a night face a 20% higher risk of premature death compared with those who sleep seven to eight."

The slow burn of sleeplessness

The detrimental effects of poor sleep accumulate over time. Analysis of both Vitality data and evidence from the literature show a clear progression from short-term impairments and risk drivers to long-term chronic disease:

1 Night	Increased accident risk.
1 Week	Increased hunger hormones.
1 Month	Impaired glucose regulation and increased blood pressure.
6 Months	Impaired immunity and hypertension risk, impaired memory and focus
2 Years	Substantially increased risk for obesity, cardiovascular disease, cancer, and mental health disorders.

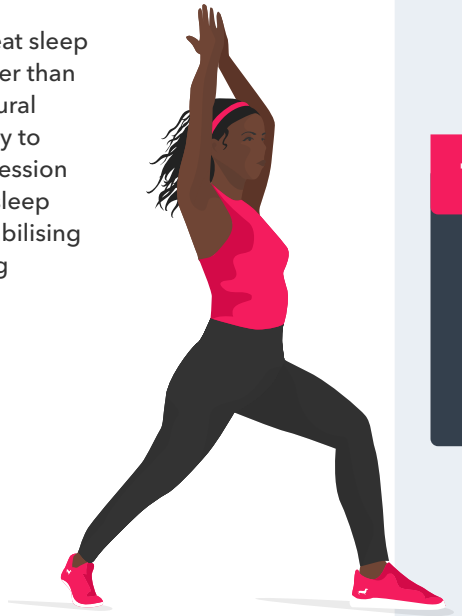
Mental health

Sleep and mental health are tightly bound. Short or fragmented sleep doubles the risk of developing depression, while even modest sleep restriction leaves people irritable, anxious, and less able to regulate their emotions. The less people sleep, the thinner their psychological defences become.

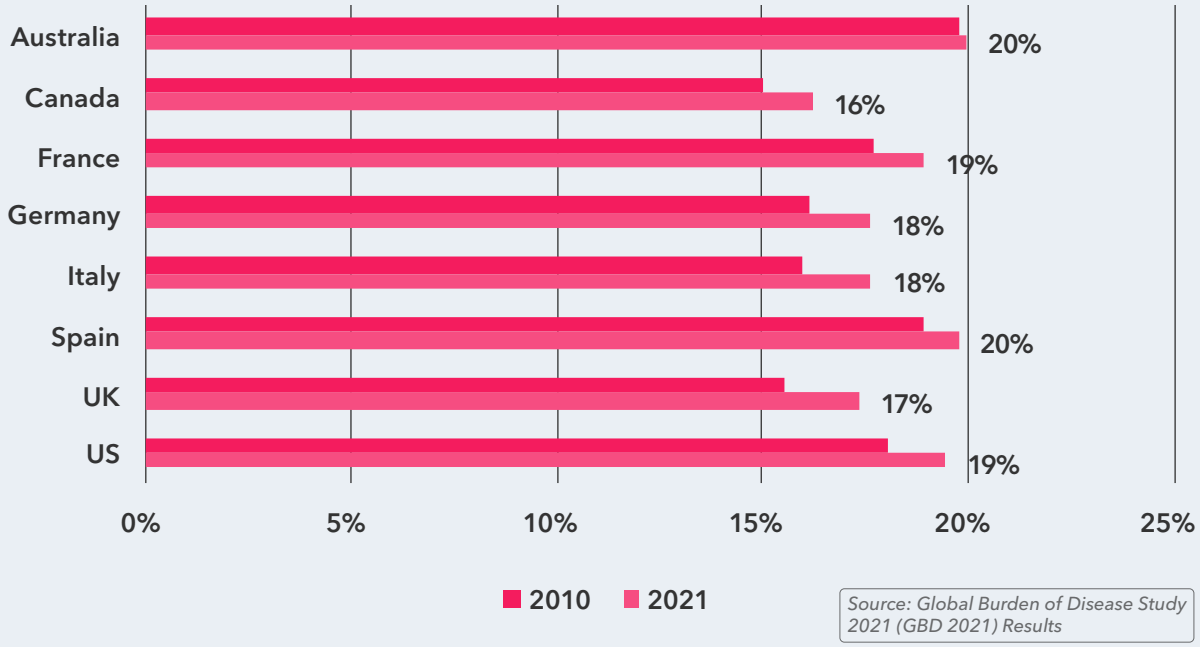
Cognition is equally vulnerable. A single night of curtailed rest slows reaction times, weakens attention, and erodes memory, while extended restriction produces impairments comparable to alcohol intoxication. Sleep is also when the brain consolidates memories and recalibrates neural networks. Cut that process short, and the result is not only forgetfulness but also reduced creativity and poorer problem solving.

The causality, though, is not one-way. Depression, anxiety, and post-traumatic stress disorder often manifest in disturbed sleep such as difficulty nodding off, early morning waking, and restless nights. Insomnia is now recognised as both a symptom of, and a risk factor for, psychiatric illness. This creates a vicious cycle in which poor sleep worsens mental health, which in turn further undermines sleep.

This reciprocity has led researchers to treat sleep as a foundation of mental wellbeing rather than a secondary concern. Cognitive behavioural therapy for insomnia is now used not only to improve sleep itself but to alleviate depression and anxiety. Much like exercise, regular sleep routines act as emotional scaffolding: stabilising mood, building resilience, and protecting against psychological distress.



Prevalence of mental disorders



Source: Global Burden of Disease Study 2021 (GBD 2021) Results

The scale of the mental health challenge

In 2021, more than one billion people – around 14% of the global population – were believed to be living with a mental disorder. In richer countries the share was closer to one in five, and rising. Anxiety and depression accounted for over two-thirds of these conditions. Women were diagnosed slightly more often than men (14.8% vs 13.0% globally), with prevalence peaking in midlife (40-49 years). A 2024 study by Yale and Columbia universities put the annual cost of mental ill-health in the United States at over $280 billion.

Productivity

Sleep is also an economic input. Workers who get fewer than six hours a night are more likely to miss work, underperform when present, and suffer workplace accidents. RAND Europe estimates that insufficient sleep costs economies up to 2% of GDP through absenteeism, presenteeism and reduced output. In industries such as transport, healthcare and manufacturing, fatigue has direct safety implications, raising the likelihood of costly mistakes.

The cognitive toll and impact on mental health explains much of this. Attention drifts, errors multiply, and decision-making falters with poor sleep. Yet because fatigue accumulates gradually, workers often underestimate the extent of their impairment, and optimism bias persuades them they can "push through," even as performance deteriorates. Similarly, improved mental health, including reductions in negative emotions and stress, enhance people's productivity.

The relationship is circular. Stressful jobs, long hours and "always-on" workplace cultures make sleep harder to obtain, while poor sleep worsens stress and burnout. Shift work compounds the problem, disrupting circadian rhythms and raising risks of accidents and chronic disease. Left unaddressed, the cycle erodes both productivity and health.

Seen in this light, good sleep is not an indulgence. Just as firms now promote exercise and nutrition programmes to reduce costs and boost morale, they have reason to treat sleep as a behavioural investment too. Consistent rest sharpens concentration, reduces mistakes, and strengthens resilience. Well-slept workers are, in the long run, more productive ones.

"Improved mental health from better sleep, including reductions in negative emotions and stress, enhance people's productivity."

The cost of poor sleep to the global economy

Poor sleep is not just a personal burden, it is an economic one too. A study by RAND Europe in 2016 estimated that insufficient sleep costs a selected group of advanced economies (the UK, US, Germany, and Japan) the equivalent of 2% of GDP a year – equivalent to $660 billion in 2015, or nearly $900 billion in today's prices.

The loss comes mainly through productivity. Data from Vitality's Britain's Healthiest Workplace survey show that workers who sleep fewer than six hours a night experience 2.4 percentage points more productivity loss from absenteeism and presenteeism than those who get seven to nine hours. For those with six to seven hours, the penalty is smaller but still significant, at 1.5 percentage points. Put differently, those with the worst sleep habits forfeit the equivalent of six working days a year, while those slightly under-slept workers lose nearly four. Scaled up to the level of the economies, the impact is striking; RAND estimated that short sleep accounts for more than 1.2 million lost workdays annually in the United States, 600,000 in Japan, and 200,000 each in Germany and the United Kingdom.

Lower productivity today translates into weaker growth tomorrow. Poor sleep also undermines learning in schools and reduces the accumulation of human capital, compounding the long-term economic cost. The arithmetic is clear – sleep is not merely a health issue but a macroeconomic one, eroding both present output and future prosperity.

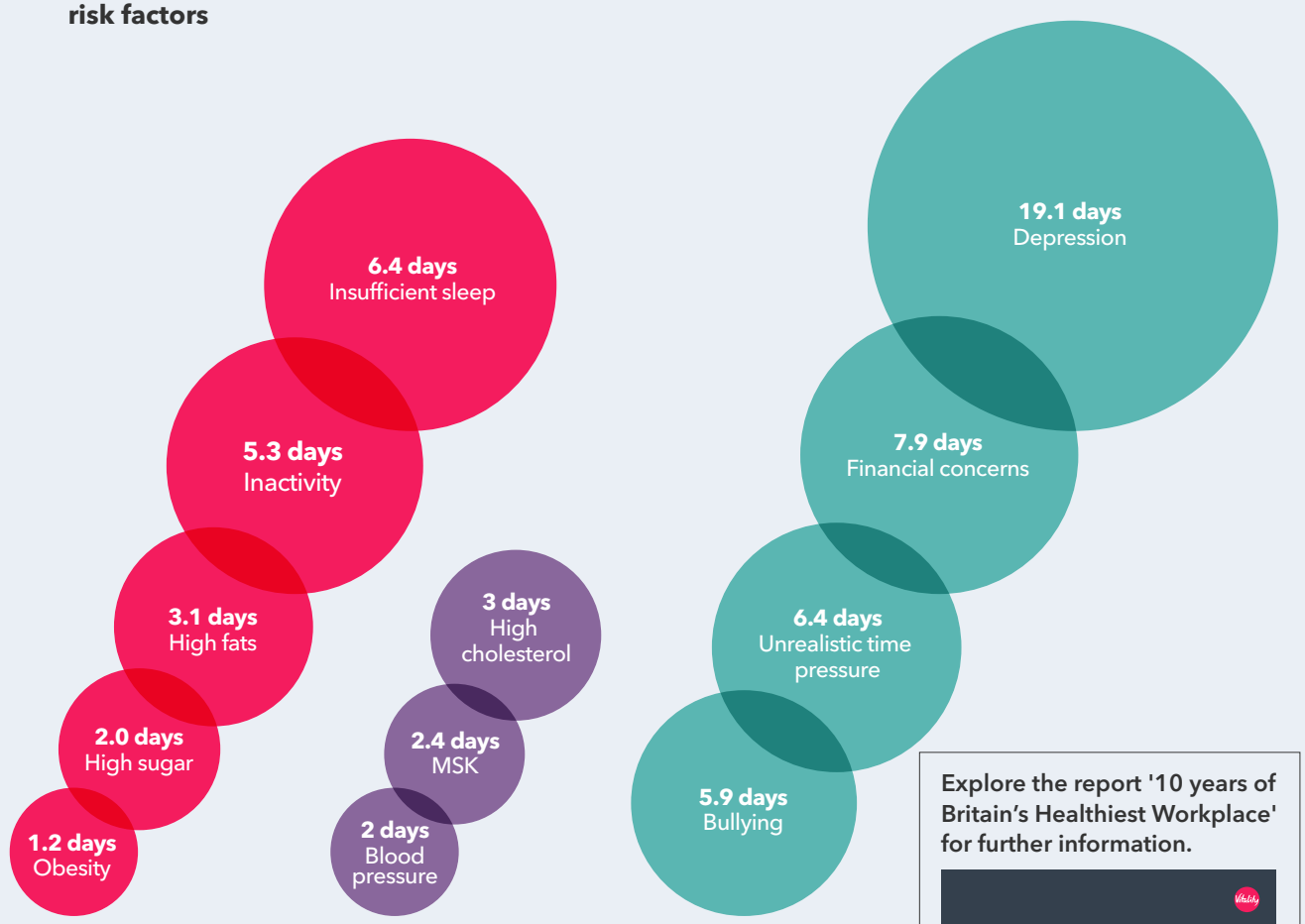
Sleep, exercise and diet – three pillars of productivity

Data from Britain's Healthiest Workplace show that sleep sits alongside psychosocial risks as one of the strongest predictors of productivity loss. Among the ten leading determinants of presenteeism, insufficient sleep ranks fifth – just behind psychological distress, financial worries, and chronic health problems, and ahead of other lifestyle factors like exercise and diet.

The numbers are striking. Workers who regularly sleep too little lose the equivalent of 6.4 productive days a year through absence and presenteeism, almost as many as those affected by financial strain or unrealistic time pressures. But this loss is reversible: employees who increase their nightly rest from four to seven hours recover over five productive days annually.

The data also reinforces a simple truth: sleep, movement, and nutrition are interdependent. Poor sleep undermines energy and willpower, making exercise and healthy eating harder; inactivity and poor diet, in turn, erode sleep quality. Interventions that address these behaviours together – rather than in isolation – deliver the largest returns in wellbeing and workplace performance.

Number of lost productive days through absence and presenteeism (per employee per year) attributable to specific risk factors



Explore the report '10 years of Britain's Healthiest Workplace' for further information.

Source: Britain's Healthiest Workplace

Sleep and the science of habits

Habits make our actions more efficient by removing the need for conscious thought. Repeated behaviours in stable contexts become automatic, triggered by cues rather than conscious decision making. Psychologists describe the process as a loop: cue, routine, reward. Studies show that establishing a new health habit – such as exercising – typically takes about two months of repetition before it feels automatic, though the range is wide. Consistency matters more than intensity; miss too many repetitions and the process resets.

This science is most often applied to physical activity or diet, but sleep fits the model neatly. Bedtime and waketime are natural cues. The routine – switching off lights, climbing into bed, rising with an alarm – can be repeated daily in a stable environment. The reward, though less immediate than a post-exercise endorphin rush, is better rest and sharper functioning the next day. Research shows that variability in sleep-wake schedules (social jetlag) undermines health, while regularity is protective against obesity, diabetes, and cardiovascular disease.

Yet sleep has long been cast as a clinical concern, such as insomnia to be diagnosed, or apnoea to be treated. That framing overlooks its behavioural core. For most people, the problem is not pathology, but routine. Reframing sleep in this way shifts the agenda – it makes sleep a behaviour that can be tracked, nudged, and reinforced. Just as step counters made activity quantifiable and repeatable, wearables now do the same for sleep. Modern devices can measure duration within about half an hour of gold-standard polysomnography – accurate enough to help establish habits.

One study shows that app-based sleep education and monitoring, along with personalised text-based sleep coaching, can increase nightly rest by more than 40 minutes and improve sleep quality. Creating positive sleep habits does not mean dismissing clinical disorders, but this approach extends the benefits of good sleep across the population – much like with exercise.

The behavioural biases behind poor sleep

Sleep is undermined by the quirks of human psychology. Chief among them is present bias: the tendency to overvalue immediate rewards at the expense of future benefits. The payoff from sleep – a clearer head, sharper focus, lower disease risk – arrives tomorrow, whereas the lure of one more episode, or another hour of scrolling, is available now. The result is a predictable cycle of bedtime procrastination. Even those who intend to go to bed earlier often trade rest for instant gratification, leading to an intention-behaviour gap.

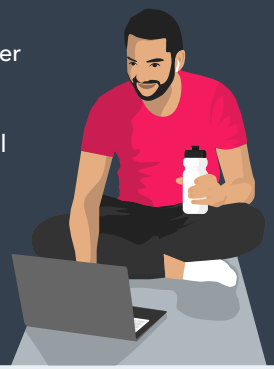
A second distortion is optimism bias, the belief that we are doing better than we are. People overestimate how much they sleep, confusing time in bed with time asleep. Studies consistently show self-reports run thirty to sixty minutes longer than objective measurements. This creates a dangerous illusion of adequacy.

Lastly, projection bias makes us believe that we can catch up lost sleep, essentially borrowing the benefits of future sleep to offset against short sleep today. However, irregular schedules create social jetlag, which worsens circadian misalignment and raises the risks of obesity, diabetes, and cardiovascular disease, even when total hours add up.

Technology amplifies these biases. Digital platforms are built for attention capture, exploiting features such as autoplay and endless scrolling to keep users awake well past their intended bedtime; blue light from screens delays melatonin release, impacting natural circadian rhythms; while social comparison leads individuals to sacrifice rest to remain connected.

Together, these factors show why poor sleep is not simply a matter of weak willpower or lack of knowledge. Education alone cannot solve these problems. Most people already know that sleep is important. Yet advice such as “avoid screens before bed” or “go to bed earlier” often fails because it does not account for these psychological barriers. This is why behavioural interventions, not just education, are required.

Physical activity can serve as a guide – tools are needed that measure sleep objectively, provide immediate feedback, and reward consistency. Just as step counters reframed exercise from intention to habit, wearables and behavioural incentives can help redress the biases that keep the world awake.



Understanding habits

A habit is a behaviour that, through repetition, becomes automatic. Psychologists describe it as a loop: a cue (a time, place, or trigger) prompts a routine (the behaviour itself), which with repetition develops automaticity – the tendency to act without deliberation. Reinforcement strengthens the loop when the behaviour delivers a reward, whether an endorphin rush after a run or the ease of drifting off after a regular bedtime.

Habits differ from conscious choices. They are faster, require less effort, and often persist even when motivation wanes. Research shows it takes, on average, about two months of consistent repetition for a new behaviour to feel automatic, though the range is wide – from a few weeks to nearly a year depending on the task. What matters most is not intensity but consistency: miss too many repetitions and the loop weakens.

"What matters most is not intensity but consistency: miss too many repetitions and the loop weakens."

How persistent are sleep habits?

Internal analysis of over 47 million sleep records from 105,000 Vitality members shows that sleep habits are remarkably stable – but not fixed. Improvement is possible, particularly among those who engage actively with the Vitality Programme. Among members with poor sleep, as determined by Vitality's proprietary Sleep Score, 44% improved to Medium or Good Sleep Score bands within a year. Yet progress is reversible: around 38% of those with good sleep saw their scores deteriorate over the same period.

The lesson is clear – healthy sleep, like fitness, requires continual reinforcement. Without active engagement, feedback, and incentives, even the best routines fade – turning gains that could be sustained into opportunities that are lost.

		Year 2		
	Average Sleep Score	Good	Medium	Poor
Year 1	Good	62%	36%	2%
	Medium	9%	80%	11%
	Poor	1%	43%	56%

From the lab to the wrist: the evolution of sleep measurement

For decades, sleep was measured in clinics, under observation, wired to machines. Polysomnography – tracking brain waves, muscle activity, eye movements, and breathing – remains the gold standard. But it is costly, invasive, and hardly suited to building daily routines. A handful of nights in a lab can diagnose disorders, but they reveal little about the rhythms and irregularities of everyday life.

Enter the consumer device. Accelerometers in fitness trackers first offered crude estimates of sleep by detecting stillness. Newer generations of devices combine motion with heart-rate variability, pulse oximetry and even skin temperature to improve accuracy. Accuracy has improved: Validation studies suggest popular wearables can estimate total sleep time within about ±30 minutes of polysomnography and do reasonably well at identifying sleep versus wake (results vary by manufacturer and device model). But they remain less reliable at distinguishing between lighter and deeper stages of sleep. For clinicians, that is a limitation, but for building habits, it is not. What matters for habits is regularity – bedtime, waketime, and total duration – which trackers capture well.

For those without wearable devices, smartphones can be an easily-accessible alternative: sleep apps use the phone's microphone to pick up breathing and movement from which sleep cycles can be inferred. Beds are another option: smart mattresses and mattress toppers embed pressure sensors or thermal monitors to track rest. Even bedside devices, from smart speakers to dedicated sleep monitors, now promise nightly reports with comparable accuracy to wearables, making sleep monitoring easier than ever.

The benefits are obvious. Devices make sleep measurable and visible at scale. They allow feedback, nudges, and streaks, giving sleep the same behavioural scaffolding that turned steps into daily goals. The risks are equally clear, being an over-interpretation of imperfect data, and anxiety from nightly sleep scores. But as with physical activity, the ability to measure is the first step in turning behaviour into habit.

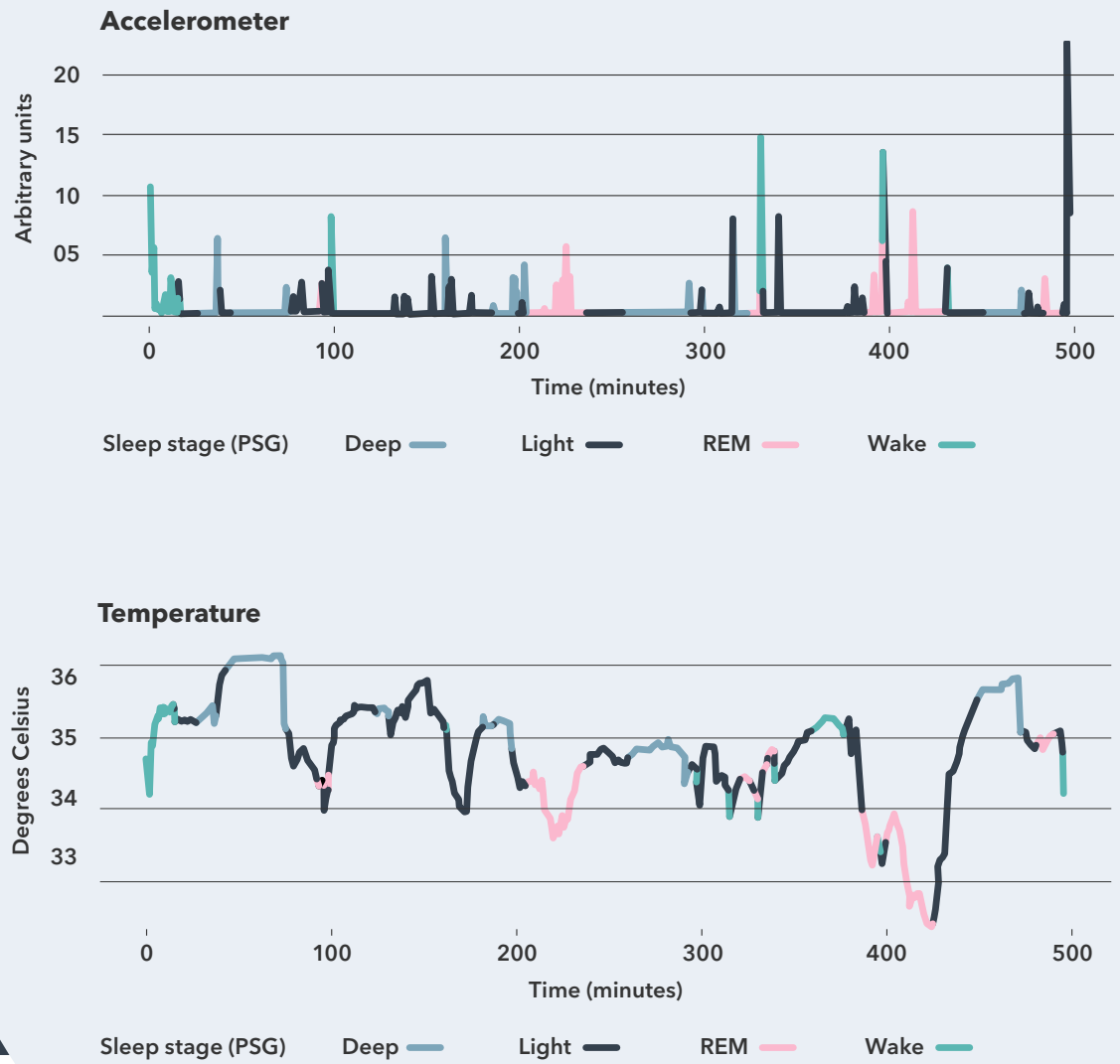
How do smart devices track sleep?

At the heart of most sleep trackers is the accelerometer, a motion sensor that detects shifts in position and stillness. When the wrist or body is motionless for long stretches, algorithms flag sleep; bursts of movement suggest wakefulness or light sleep. But movement alone is noisy – reading in bed or watching television can look like slumber. To refine the signal, modern wearables fuse motion data with readings from optical heart-rate monitors. As people drift into sleep, heart rate falls and heart-rate variability (the beat-to-beat variation) increases, providing a physiological fingerprint of deeper rest (see the charts for a sample view of the association between sleep stages and body metrics). Pulse oximetry adds another layer, detecting dips in blood oxygen that may indicate disrupted breathing, while skin temperature helps track circadian rhythm shifts and the body's cooling during the night.

Smart mattresses and toppers embed pressure sensors or thermal grids that detect tossing, turning and respiration, while mobile apps rely on microphones and phone accelerometers to pick up movement and sound patterns such as snoring. Bedside gadgets add another layer, bouncing radar or ultrasound waves to measure breathing and subtle body movements without physical contact.

These data streams are then compared to characteristic patterns: a sustained drop in movement, a fall in heart rate, and stabilisation of temperature may be tagged as deep sleep; sporadic motion with elevated heart rate could signal lighter stages.

Sample data patterns and associated sleep stages



Lessons from physical activity: the impact of devices and a simple heuristic

Few health behaviours have been reframed as successfully as exercise. The arrival of step counters turned invisible effort into visible feedback, translating activity into a daily number. The now-ubiquitous "10,000-steps" target – originally a marketing slogan – built on that. It worked because it functioned as a heuristic: simple, memorable, and easy to operationalise. Evidence now suggests the health payoff begins well below that number (often around 7,000 steps/day), but the wider lesson remains – clarity beats precision when it comes to habit formation.

However, measurement and heuristics alone were not sufficient to sustainably change behaviour. Behavioural design in the form of progress bars, reminders, and badges closed the loop between behaviour and awareness. Behavioural science built on this: nudges prompted small actions at the right moment; streaks created momentum; and social comparison encouraged people to keep up. Reviews of consumer wearables confirm that devices alone do little, but paired with feedback and behavioural cues, they nudge people towards consistent activity.

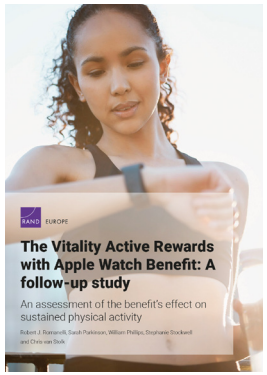
Taken together, these lessons point a way forward for sleep. Just as the 10,000-step rule and step counters helped build awareness and action around physical activity, sleep too can be reframed as a daily behaviour that is measurable, and which can be changed. By pairing simple goals with reliable tracking, the path is opened for healthier, more regular sleep habits to take root.

But creating healthy sleep habits is more complex than creating a regular exercise routine. Sleep is governed by circadian rhythms – biological clocks that demand not just quantity, but timing too. Shifting bedtimes or sleeping in at weekends produces social jetlag, leaving the body misaligned with its biological clock. Around two-thirds of adults vary their sleep by more than an hour between weekdays and weekends, and the costs show up in metabolic and cardiovascular risks. Unlike exercise, lost sleep cannot be easily made up without side effects: oversleeping on Sundays only makes Mondays worse.

Vitality's success in changing people's habits

Turning good intentions into routines is the objective of a behaviour change programme. Vitality's Active Rewards with Apple Watch benefit demonstrated how to do this at scale. By tying Apple Watch loan repayments to weekly activity targets, the programme reframed exercise into digestible weekly targets.

Each week brought a simple choice: meet your goals and pay less, or miss them and pay more. The structure drew on behavioural science – loss aversion to sharpen motivation; weekly cadence to stabilise cues; and real-time feedback to keep people on track.



See 'The Vitality Active Rewards with Apple Watch Benefit: A follow-up study' by RAND Europe

The effect was sizeable:
According to an independent analysis by RAND Europe, participants logged roughly a third more active days each month, with the largest boosts among those least active before. A follow-up study by RAND confirmed the changes stuck: even after the initial excitement waned, activity remained 20–40% higher than baseline, and more of it was vigorous. Incentives, when designed well, can engineer repetition.

The behavioural hurdles that affect sleep are also significant barriers to habit formation. Exercise offers immediate reinforcement; sleep does not – its rewards are delayed until morning, and perception biases cloud them further. Most people overestimate their sleep, mistaking time in bed for time asleep. This optimism dulls urgency to change. And while society praises productivity, it rarely celebrates rest. Long hours at work are worn as badges of honour; and late-night connectivity is expected.

In practice, sleep requires stronger scaffolding than exercise – consistent cues, protected routines, and deliberate reinforcement – if habits are to stick.

> "AI tools can highlight irregularities invisible to the user."

How can we measure habits?

Seeing changes in average behaviour (steps per day, hours of sleep per night) is only part of the story. Insurers, employers, and policymakers need to know when repetitions become permanent, sustainable habits. That is why Vitality created Habit Index, a scientifically-derived predictive model of behaviour consistency drawing on millions of Vitality member records. Habit Index identifies when consistent patterns emerge, with most strong habits forming within seven to fifteen weeks. More crucially, the Habit Index links higher habit strength to measurable dividends: lower health risks and gains in life expectancy. People who formed and sustained a habit of doing physical activity three or more times a week, for three years, saw a 27% reduction in their mortality risk, with those aged 65+ reducing mortality risk by 52%.

Explore 'The Vitality Habit Index' report for more information on the science behind healthy habits.

Can AI help us sleep?

Artificial intelligence can be a powerful tool in overcoming behavioural hurdles and creating healthy sleep habits. Starting with data, AI tools can highlight irregularities invisible to the user: shifting bedtimes, shrinking sleep windows, or creeping social jetlag. Identifying these patterns turns vague perceptions into concrete feedback, a first step towards habit.

AI can also deliver personalised recommendations. Just as digital platforms have perfected the art of keeping users awake, similar behavioural techniques could be repurposed to help them switch off. Algorithms can tailor reminders to an individual's routine – flagging consistent bedtimes, adjusting for circadian tendencies, and even detecting when stress or late caffeine intake is likely to erode sleep. Taking this a step forward, AI can become anyone's personal sleep coach.

The key promise of AI is in habit formation. By using feedback loops – cue, routine, reward – AI systems can sustain early repetition until automaticity takes hold. Reinforcement can be immediate: a nightly sleep score, a streak badge, or even financial incentives linked to device data. Used well, AI offers both measurement and motivation: countering present bias with timely cues, optimism bias with accurate tracking, and projection bias with tailored reinforcement that makes clear the cost today of borrowing sleep from tomorrow.

New insights into sleep

Vitality members are encouraged to track their daily activity through an incentive-based health promotion programme. By engaging in healthy lifestyle habits, they can earn a range of weekly, monthly and Status-based Rewards like payments towards Apple Watch, and discounts on cinema tickets and coffee vouchers. The goal is to make healthy living more achievable and motivating, turning small actions into lasting habits that improve health and life expectancy.

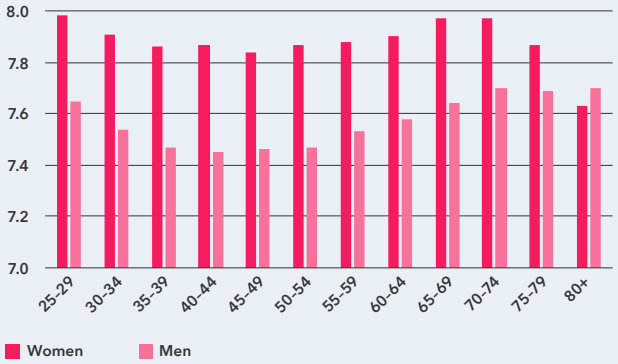
Although sleep has not yet been explicitly rewarded through the Vitality Programme, daily sleep data have been collected in several Vitality markets. Vitality's integrated dataset links real-world sleep patterns to health outcomes and insurance claims across millions of members. It captures not only how long and how well people sleep, but also how those behaviours interact with physical activity, nutrition, and other lifestyle behaviours. Few datasets match its breadth or depth, allowing sleep to be analysed not as an isolated habit, but as part of a measurable ecosystem of health and behaviour.

> "The goal is to make healthy living more achievable and motivating, turning small actions into lasting habits that improve health and life expectancy."

How people really sleep – evaluating the world's largest sleep and insurance dataset

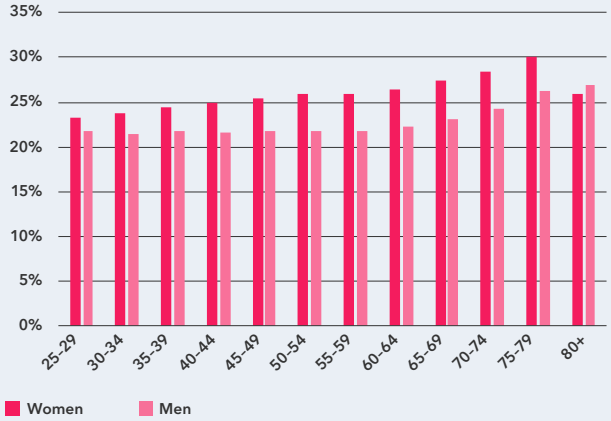
Data from Vitality members reveal familiar patterns – and some unexpected ones. New parents sleep least; the young sleep irregularly; and sleep duration is lower at older ages. Yet sleep quality tells a more subtle story: for women, the share of deep sleep rises steadily through life; for men, it remains flat until the late fifties, then climbs sharply. REM sleep follows an opposite curve, dipping and then rebounding, particularly among women. Together, these patterns suggest that how we sleep changes as much with life stage as with lifestyle.

Sleep duration (hours)

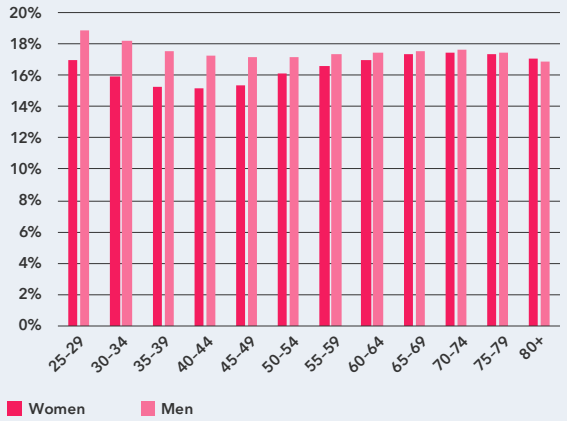


Sleep start deviation from the median (minutes)

Proportion of deep sleep



Proportion of REM sleep



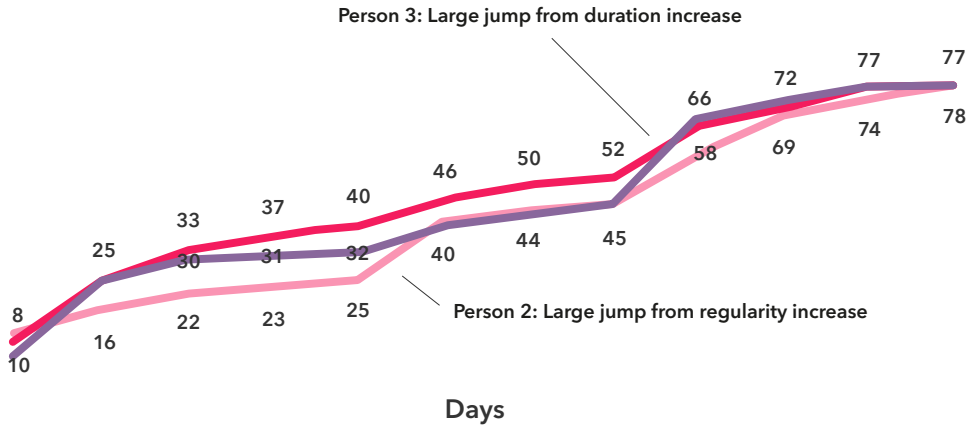
Vitality's dataset – covering more than 47 million nights of recorded sleep – offers an unprecedented view of how rest shapes health. Using a causal machine-learning framework, the analysis examines how sleep duration, regularity, and quality influence long-term outcomes such as hospital admissions and mortality, controlling for factors including age, gender, physical activity, and overall health. To capture these dimensions in a single measure, Vitality developed a proprietary Sleep Score, ranging from 0 to 100. Higher scores reflect patterns of sleep associated with a lower risk of illness and death – making the measure both predictive and actionable.

The Vitality Sleep Score

Vitality has developed a proprietary Sleep Score – a single measure linking nightly rest to long-term health. Built using advanced machine-learning models and tens of millions of data points, it combines information on sleep patterns, personal characteristics, lifestyle actions, and verified health outcomes. The result is a simple, intuitive metric that members can track daily through connected wearables, with one clear target: a score of 100, associated with the lowest risk of adverse health events.

The score reflects four key dimensions of sleep: duration, regularity, deep sleep, and REM sleep. Each is personalised to an individual's age, gender, and lifestyle, meaning two people with identical sleep patterns may receive different scores.

Daily Vitality Sleep Score



Sleep features	1	2	3	4	5	6	7	8	9	10	11	12
Regularity (min)	120	120	120	120	120	90	60	30	30	30	30	30
Quality: Deep (%)	10%	13%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%
Quality: REM (%)	10%	10%	10%	13%	16%	16%	16%	16%	16%	16%	16%	16%
Duration (hrs)	5	5	5	5	5	5	5	6	6.5	7	7.5	7.5

Different people have different scores based on the importance of each factor for each person's health.

As the sleep features improve, the sleep score improves at different rates per person.

Person 2 requires better sleep as he has more chronic conditions.

- Female, 36 years, no health issues
- Male, 44 years, 4 chronic conditions
- Male, 69 years, no health issues

To capture habit formation, daily scores are averaged over a rolling ten-week period to create the Sleep Habit Score – a more stable measure that smooths nightly fluctuations and reflects the consistency of behaviour over time. In this way, Vitality translates complex data into a clear behavioural goal: better sleep, sustained regularly.

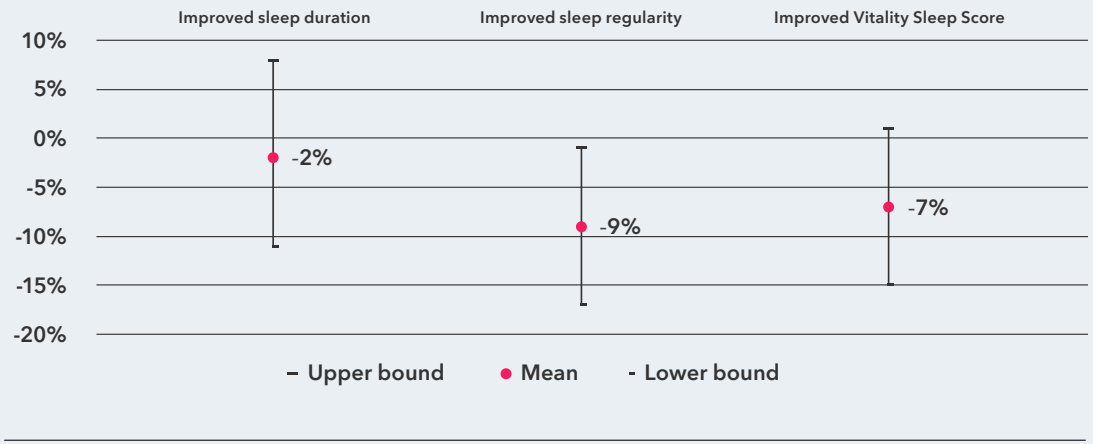
Benefits of better sleep: Healthcare costs

Vitality's analysis shows clear gains from improving sleep across all four metrics – duration, regularity, deep sleep, and REM sleep. Average reductions in hospital admissions range from 2% (for improved sleep duration) to 9% (for improved sleep regularity). Having healthy sleep behaviours, defined as sleeping at least seven hours a night, falling asleep within a one-hour bedtime window, ideally five nights a week, yields a 7% reduction in hospital admissions, as reflected by the improvement in the Vitality Sleep Score.

When applied to current patterns of inadequate sleep, hospitalisation rates, and average cost of admission, the impact is substantial. If the routine were widely adopted, healthcare expenditure could fall by up to an estimated $287 per annum for each person who improves their sleep, reflecting fewer admissions and shorter inpatient stays. These estimates build on the existing literature by extending the beneficial effects of sleep beyond sleep duration to include sleep regularity as well. Better sleep, in other words, is not only restorative – it is cost saving too.

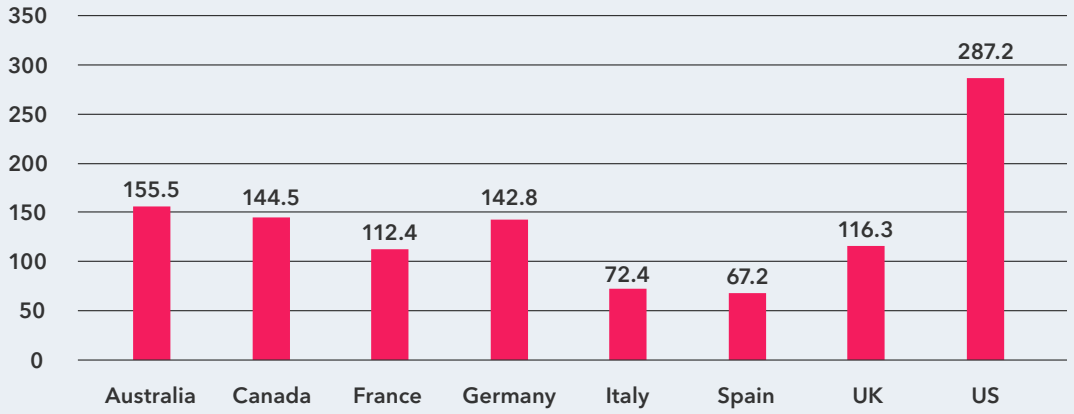
> "Better sleep, in other words, is not only restorative – it is cost saving too."

Estimated improvement in in-hospital admissions



Estimated healthcare savings of improving sleep patterns to follow the 7-1 heuristic

USD per capita per annum



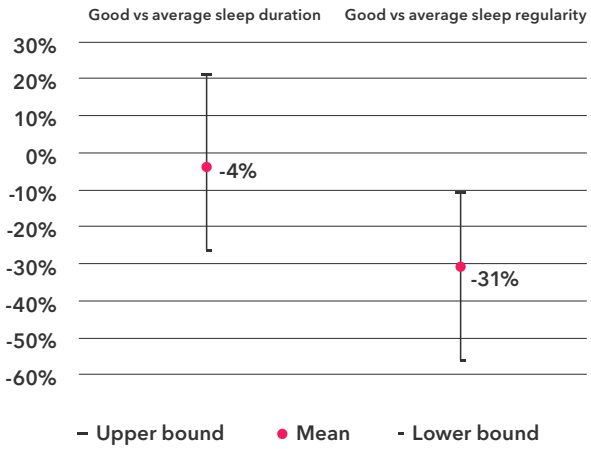
Note: See the Appendix for detailed description of variables.

Benefits of better sleep: Mortality

By comparing Vitality members who died to individuals with similar characteristics who remained alive, we were able to model the increased likelihood of dying. The results are striking. Members with consistently good sleep habits have lower mortality risk, with improvements of roughly 4% for duration and 31% for regularity when analysed separately. On average, a typical person who starts to sleep more than seven hours a night and maintains a regular bedtime may see an estimated 24% reduction in mortality risk compared with those sleeping less than seven hours with irregular sleep onset.

The difference is not just statistical, but tangible. Depending on one's age and baseline life expectancy, which ranges from 76 to 82 years for men, and 81 to 87 for women, across selected markets (Australia, Canada, France, Germany, Italy, Spain, UK, and US), such improvements from better sleep could translate into approximately two to four additional years of life, and with them, a higher quality of health throughout. The earlier in life these habits are formed, the greater the cumulative gain. At the aggregate level, the gains add up quickly; assuming just 25% of poor sleepers adequately improve their sleep, the US alone would see more than 190 million life-years saved. Importantly, the impact on life expectancy is comparable to improving other key biometric and lifestyle indicators, from physical activity and nutrition to BMI and blood pressure.

Estimated improvement in all-cause mortality



Risk factor	Estimated average life expectancy benefit (years)*
Sleep	Up to 4
Physical activity	Up to 6
BMI	Up to 5
Nutrition	Up to 4.5
Blood pressure	Up to 2.3
Blood glucose	Up to 2
Cholesterol	Up to 1.6

*Note: Independent effects of improving sleep to sleeping at least 7 hours with a 1-hour sleep onset window, physical activity from inactive to highly active, poor diet to perfect diet, BMI from 30 to 25 kg/m2, systolic blood pressure from 160 to 125 mmHg, fasting blood glucose from 6.9 to 5.6 mmol/l, and LDL cholesterol from 4 to 2.9 mmol/l. Mortality effects for factors other than sleep calculated using Healthy Futures, Vitality's proprietary algorithm developed in partnership with RAND Europe. See RAND Europe's website for technical information about the calculator.

Case study: A decade of tracking sleep and activity

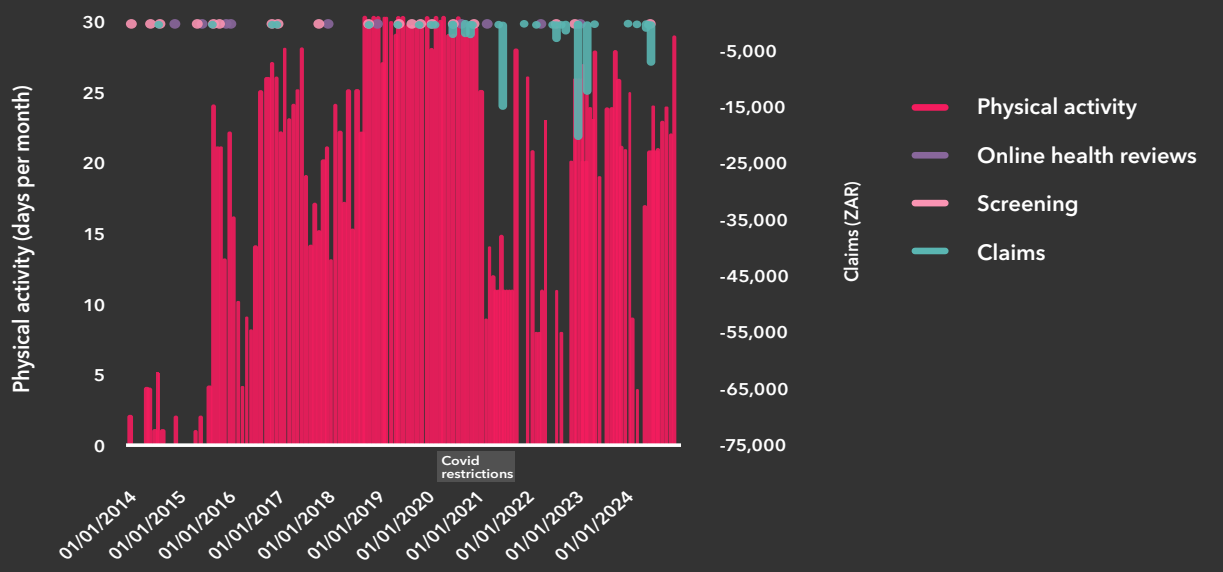
Each dataset tells human stories. Among the 47 million nights of sleep analysed, one example is of a man in his 50s (whom we call Tom here), who illustrates how health behaviours evolve over time. Tom began tracking his physical activity in 2014 and his sleep in 2021.

For years, his record was exemplary. Daily exercise kept his biometrics – body mass index, waist circumference, blood pressure, and cholesterol – within healthy ranges. But in late 2020, amid the upheaval of the COVID-19 pandemic, Tom's self-reported wellbeing declined. His physical activity dropped, sleep worsened, and he was diagnosed with a sleep disorder. The deterioration in his sleep metrics was followed by further worsening of his mental health, overeating, and further health claims. This culminated in a diagnosis of a long-term heart condition in 2023.

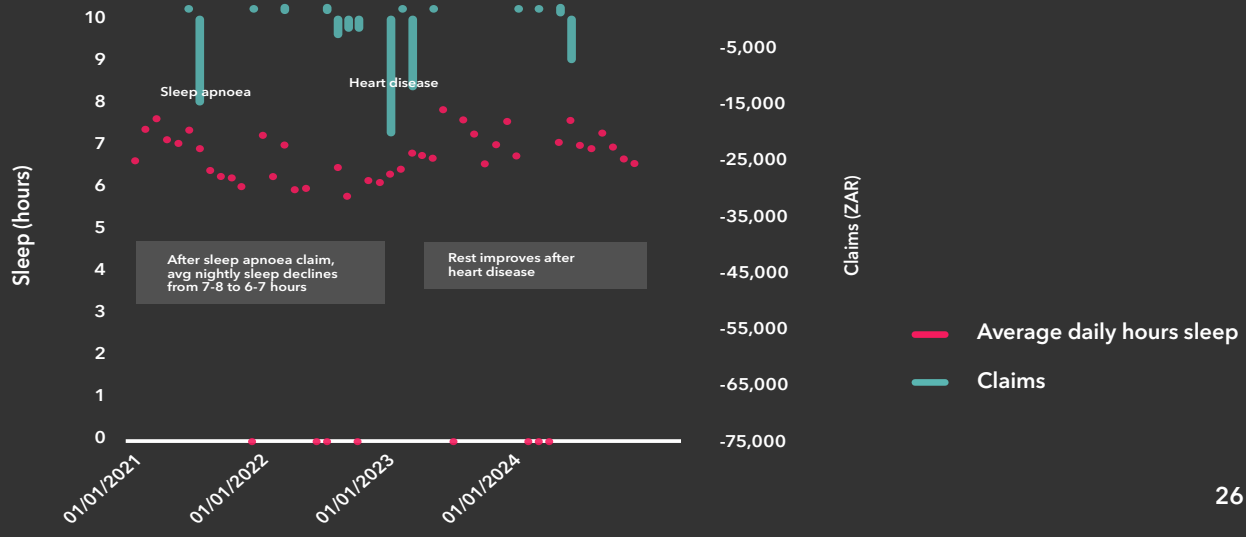
The experience proved a turning point. Supported by feedback from his wearable device and structured health reviews, Tom rebuilt his habits: increasing physical activity, improving sleep, and stabilising his health. Despite now living with two chronic conditions, he has reduced his reliance on medical care and regained a healthier trajectory.

Tom's story captures a broader truth evident across the data: behaviour is dynamic but malleable. When tracked, measured, and reinforced, even disrupted routines can be restored, turning health setbacks into opportunities for recovery.

Exercise, health reviews, screening, claims



Sleep (hours)



7-1: A behavioural framework for better sleep

Public health campaigns succeed when they are simple enough to stick. Exercise had its breakthrough with "10,000 steps," a slogan that was imprecise but memorable, making activity measurable and repeatable. Sleep needs a similar device. In this paper we propose a 7-1 heuristic to distil the science into a simple rule of thumb: aim for seven hours of sleep per night, anchored to a consistent bedtime and falling asleep within a one-hour window (half an hour on either side). And though not part of the slogan, repetition matters: hitting this target at least five nights a week is the cadence that helps habit take hold.

This framing tackles some of the behavioural biases that keep people awake. Present bias – the temptation of another episode or another email – is countered by a clear daily goal that makes the cost of delay tangible. Projection bias, the belief that sleep can be caught up later, is addressed by anchoring bedtime to consistency. Optimism bias, the tendency to overestimate sleep, is corrected by tracking sleep with wearable devices, which shows how often people meet the 7-1 target. By closing the perception gap, the framework turns vague intentions into measurable progress.

The heuristic also builds on lessons from physical activity. Step counts and activity trackers worked because they offered clarity, feedback, and reinforcement. The 7-1 framework does the same: it is simple enough to remember, measurable through consumer devices, and repeatable enough to create automaticity. As studies of habit formation show, behaviours become automatic not by intensity but by early and consistent repetition, usually over a period of two months. By structuring sleep around a stable cue – the bedtime window – 7-1 provides the scaffolding needed for habits to form.

Critically, 7-1 is evidence-based, stemming from decades of sleep research topped by Vitality's novel insights into the effects of poor sleep on the probability of hospital admission and probability of dying. By improving to 7-1, people can achieve significant long-term results in the form of better health and longevity. For those who already sleep well, 7-1 can help to stay focused and maintain the good habits. And sleep quality, which is typically beyond our direct control unlike duration and consistency, is likely to improve as a result too.

What is 7-1?

7-1 is Vitality's evidence-based sleep behaviour rule: sleep 7 hours per day and fall asleep within a 1-hour window around an established bedtime. Aim to achieve the goals at least five times a week to establish a healthy, sustainable habit with long-term positive effects on health and longevity.

Setting the target to five nights per week rather than all seven lowers the perceived barrier to entry, increases self-efficacy, and allows for occasional variability without derailing progress, thereby enhancing long-term adherence. By striking a balance between ambition and attainability, a 5-day sleep consistency target becomes not just realistic, but sustainable; supporting widespread engagement over time.

7-1 and sleep scores

Garmin, Fitbit, Apple Watch, Oura, and a variety of other manufacturers and sleep apps introduced proprietary sleep scores to provide users feedback on their sleep. Like Vitality Sleep Score, the intention is to simplify a range of key indicators into a simple, understandable metric. Yet the price for personalisation and deep insights is high: sleep scores fundamentally require technology to work, as they are too nuanced for people to simply estimate their score for the night.

7-1 aims for the opposite: establishing habits through simplicity of memorable, achievable goals. 7-1 does not replace sleep scores; it complements the feedback they provide.

Scaling impact through consistent adoption of the 7-1 heuristic

Vitality's data suggest that only 10% of individuals have optimal sleep patterns, adhering to the 7–1 sleep heuristic on five or more nights per week. Promoting the adoption of the heuristic in a consistent way therefore presents a significant opportunity. Based on Vitality's modelling, if even one in four poor sleepers were to shift to this sleep pattern, the potential gains would be substantial: reduced healthcare utilisation and costs, improved workplace productivity, and a measurable reduction in premature mortality. Illustrative estimates for a selection of eight countries are outlined right.

Estimated benefits of following the 7-1 heuristic

	Australia	Canada	France	Germany	Italy	Spain	UK	US
Productivity boost (billion USD p.a.)	7.8	10.0	13.1	17.7	11.7	7.1	16.7	133.9
Healthcare savings (billion USD p.a.)	1.0	1.3	1.7	2.7	1.0	0.7	1.8	22.0
Years of life added (millions)	15	23	39	47	33	27	39	191

Case studies

The model sleepers

Some people live as if their body clocks were Swiss made. They go to bed around the same time every night, clock more than seven hours of sleep, and rise refreshed. These model sleepers are often middle-aged adults who have built a disciplined routine, perhaps aided by steady jobs, supportive family structures, and good health. Their reward is a lower risk of disease and depression, as consistent sleep stabilises hormones, strengthens immunity, and helps regulate metabolism, as well as longer life expectancy.

Advice: Simple: stay the course. Life events, ageing, or creeping digital distractions may test their resolve, but the 7-1 heuristic provides a clear guardrail to sustain long-term health.

The rhythm breakers

Some others manage respectable sleep during the week, only to break the pattern at weekends, cutting their nights short, staying out late or glued to screens. Others swing the other way, sleeping far longer than usual to catch up. Both behaviours disrupt the body's natural rhythms. Sleeping too little brings the familiar fogginess and metabolic strain. Oversleeping may feel restorative in the moment but often signals accumulated sleep debt and is linked with higher risks of diseases and depression.

Advice: To fix the social jetlag, smooth out the swings: keep bedtime and wake-time within about an hour of the weekday norm and use naps or quiet rest as safer ways to compensate. In this way, the 7-1 heuristic serves as both compass and corrective.

The intermittent achievers

Many hover in between: some nights they succeed, others they do not. These intermittent achievers might blame workloads, childcare, or stress – or they simply lack motivation or will-power to remain consistent. They may average close to seven hours, but the inconsistency disrupts circadian rhythms. They often feel sluggish, with poor concentration at work, and are prone to mood dips.

Advice: Here, habit-formation matters most. Behavioural science shows that anchoring new routines to existing cues, such as dimming lights at the same time every evening, makes them stick. Follow the 7-1 heuristic to make the target automatic rather than aspirational. Aim for consistency and duration and quality will follow.

The chronically deprived

Finally, there are those who almost never hit the mark. Shift workers, carers, or people juggling multiple jobs often sleep fewer than six hours and at irregular times. Others suffer insomnia, obstructive sleep apnoea, or poor sleep hygiene. These groups face markedly higher risks and may feel there is little hope to improve.

Advice: For those too far from recommended or those with clinical conditions, the 7-1 heuristic is a distant ideal unless structural barriers are addressed. Medical evaluation for sleep disorders, workplace adjustments, and stronger public health support are vital. Aim for small gains whenever possible, adding half an hour per night, aligning bedtime slightly more consistently. These will help to get on the right track and can compound over time into meaningful reductions in health risk.

Policy and market implications

If sleep is a habit, then policy can shape the cues, incentives, and environments that sustain it. The evidence points to three levels of intervention: individual nudges, system-wide design choices, and behavioural spillovers that extend beyond sleep itself. Central to this agenda is the 7–1 heuristic: seven hours of sleep within a one-hour bedtime window. The task is to help people make this routine the norm – not by coercion, but by redesigning choices so that healthier behaviour is easier while opt-outs remain available.

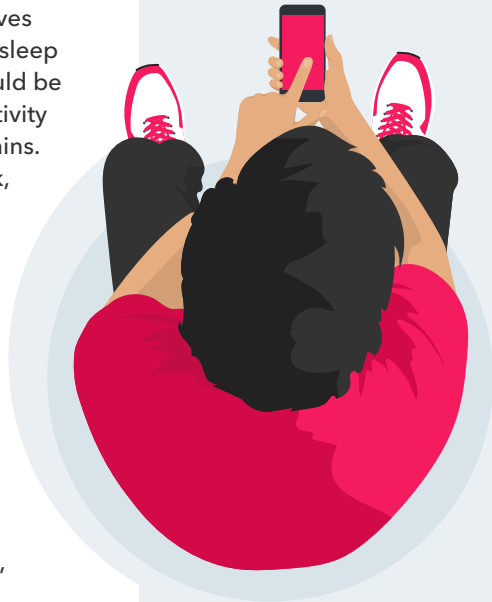
Individual-level interventions
For individuals, the challenge is to counter the behavioural biases – present bias, optimism bias, projection bias – that lead people to trade rest for late-night scrolling or late-night work. Here, digital tools and wearables can help turn the 7–1 framework into a visible and repeatable goal. Apps can issue personalised nudges: reminders to get exposure to sunlight early in the day or to start winding down in the evening; prompts to dim lights; or feedback on bedtime consistency. Consider using music and noise blockers to reduce possible stimulus as well as rosemary and other fragrances that help falling asleep. Sleep scores and streaks can make adherence tangible, reinforcing progress through immediate feedback.

Financial incentives have also shown promise. Randomised trials of subsidised wearables suggest small increases in duration can be achieved when behaviour is tracked and rewarded. These mechanisms mirror what made activity tracking work: clarity of target, measurement, and reinforcement.

System-level interventions
Sleep is shaped as much by environments as by individuals. Structural interventions can normalise the 7–1 heuristic by adjusting the cues people face each night. Examples include policy interventions such as abolishing daylight-saving time, which disrupts circadian rhythms and raises accident risk, and mandating default blue-light filters on devices after dusk; or urban planning measures such as quiet zones and reduced light pollution. Employers also have a role, such as by discouraging late-night emails, adopting predictable shift schedules, and discouraging work-related social events too late into the evening. These are classic "nudge" policies: they make the healthy routine the easier one, while allowing individuals to opt out if they wish.

Behavioural spillovers
The benefits of healthy sleep extend into other habits, and the reverse is also true. Regular exercise improves sleep quality and duration; while alcohol, nicotine and heavy evening meals undermine it. Incentives for activity can therefore deliver spillover gains for sleep, just as sleep improvement can reinforce productivity and mood. Policies should be designed with these interactions in mind: rewarding evening activity rather than late-night drinking, for instance, supports both domains. The key is to embed sleep in a joined-up behavioural framework, recognising that habits cluster and can reinforce one another.

Closing note
Policy has traditionally treated sleep as a clinical issue. The evidence in this paper suggests it is more complex: it is a habit, shaped by environments, incentives, and behaviour. Framing the solution through the 7–1 heuristic provides the clarity that "10,000 steps" once gave to physical activity. Individual nudges, system-wide design, and behavioural spillovers can all be harnessed to reinforce healthy sleep. The task is not to force people into bed, but to make the choice to follow healthy sleep behaviours the easy one – and, over time, the automatic one.



Actions to support healthy sleep

1. **Individuals:**
   Anchor bedtimes within a one-hour window, preferably at least five nights a week.
   Use wearables or apps to track duration, consistency, and regularity of sleep; set wind-down reminders; and reduce blue-light exposure after dusk.

2. **Employers:**
   Build a "right to disconnect" culture. Discourage late-night emails; offer flexible, but predictable, shift schedules; and reward employees who maintain consistent sleep habits.

3. **Schools and universities:**
   Delay start times for adolescents, whose circadian rhythms naturally shift later; and promote morning light exposure to reinforce healthy cycles.

4. **Government and regulators:**
   Abolish daylight-saving time; mandate default blue-light filters on digital devices; and consider urban measures such as quiet zones and reduced night-time light pollution.

5. **Insurers and health systems:**
   Integrate the 7–1 heuristic into wellness programmes. Offer incentives for sleep regularity; subsidise wearables; and embed sleep coaching alongside more traditional coaching for physical activity and nutrition.

Sleep best practices for individuals

Science offers a few simple rules of thumb that make the difference between a good night and a poor one:

- **Keep a regular schedule.**
  Go to bed and wake up at consistent times – even on weekends. Irregular sleep patterns ("social jetlag") increase risks of obesity and cardiovascular disease.
- **Aim for seven to nine hours.**
  Adults who routinely sleep fewer than six hours face higher risks of heart disease, diabetes and early death; more than nine may also carry risks.
- **Control light.**
  Seek bright light in the morning to set circadian rhythms; avoid blue-light exposure from phones and laptops in the hour before bed.
- **Mind substances.**
  Caffeine lingers for up to eight hours; alcohol fragments sleep; and nicotine disrupts sleep quality. All are best avoided in the evening.
- **Create a sleep-friendly environment.**
  A cool, dark, quiet bedroom improves both duration and quality. Noise and light pollution are proven disruptors.

These practices are not glamorous, but they work. The key is repetition: applied consistently, they help turn rest into a routine – measurable, repeatable and, over time, automatic.

Beyond sleep: the web of habits

Sleep is not an isolated pillar of health; it is shaped by what we eat, drink, and worry about just as much as by the glow of our screens. Diet matters: high consumption of ultra-processed foods and sugary drinks correlates with shorter, poorer sleep, while magnesium-rich (e.g., whole wheat, black beans, avocado) and tryptophan-containing foods (e.g., dairy, nuts and seeds, fish, poultry) support melatonin production. Alcohol fragments sleep and caffeine delays sleep onset and reduces deep sleep stages.

Physical activity, body weight, and smoking habits also influence how well we rest. Research consistently shows that those who move more, weigh less, and avoid tobacco tend to sleep longer and better. Conversely, poor sleep can nudge BMI upward, sap motivation for exercise, and even amplify cravings for nicotine, creating a vicious cycle of fatigue and frailty.

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Appendix

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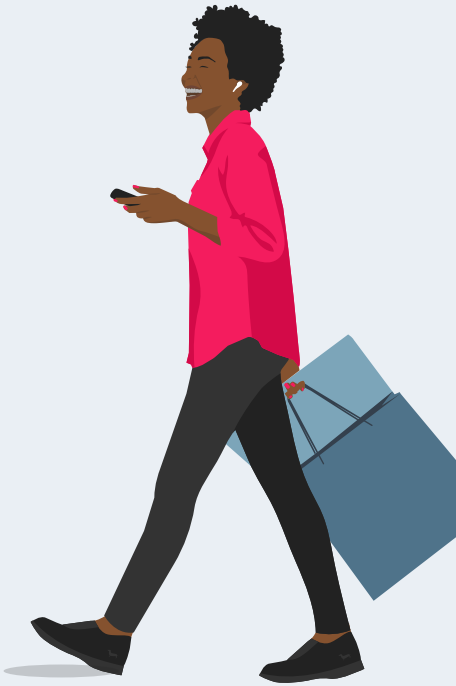


Appendix: Data and methodology

Vitality's sleep research is informed by one of the largest private sector sleep data sets in the world, comprising tens of millions of sleep records collected from wearable devices over multiple years and linking to information on health and life insurance claims, lifestyle behaviours (such as daily physical activity and healthy food purchases), physical health checks, and socio-demographic profile. The analysis presented in this paper is based on data from Vitality's parent company, Discovery, comprising of:

Insurance claims data

Including health claims, clinical resource utilisation, and sleep disorder trends.

Sleep data

Including over 47 million sleep records from 105,000 individuals over a multi-year period, from wearable devices capturing sleep duration (total hours slept per night), regularity (consistency of sleep onset and wake times), and quality (time spent in restorative stages – rapid eye movement (REM) and deep sleep).

Health and wellness data

Including a combination of verified and self-reported biometric information, chronic diseases, lifestyle (physical activity, nutrition).

Socio-demographic data

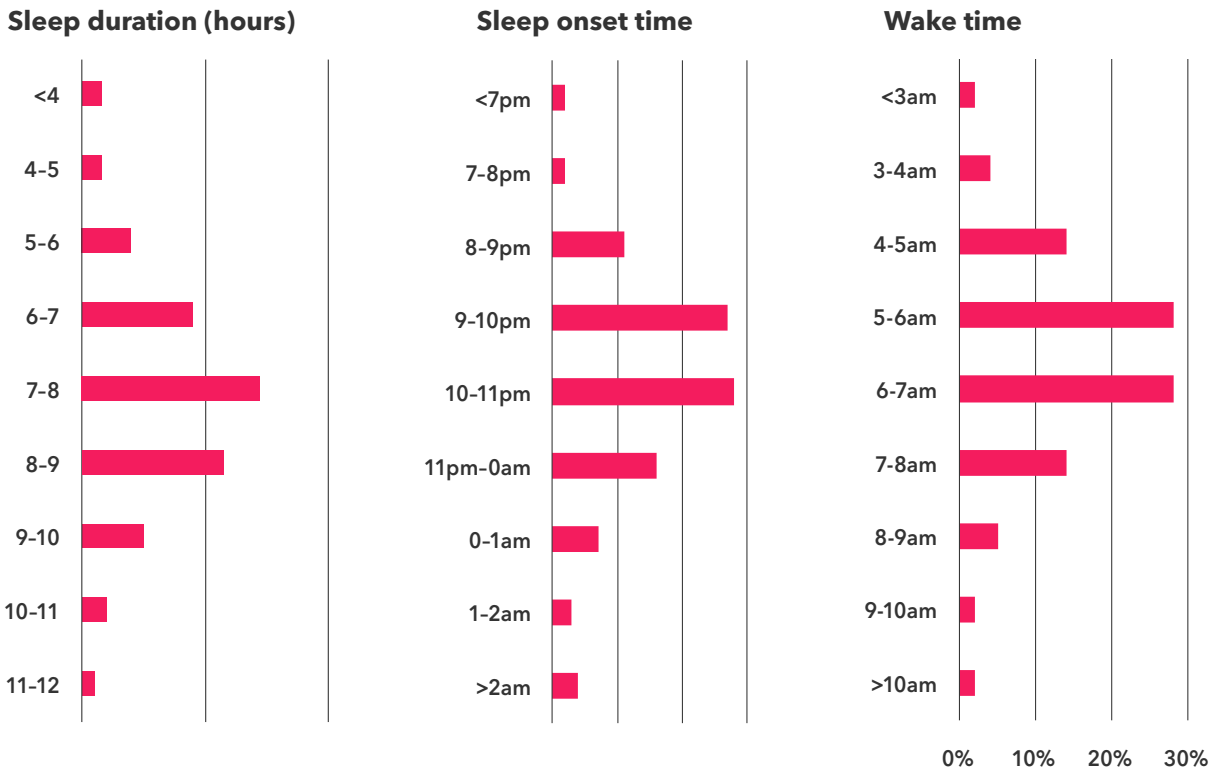
Including age, sex, family status and size, location.

Data has been anonymised and indexed to ensure privacy and analytical integrity. Where applicable, comparisons are adjusted for confounding factors such as age, body mass index (BMI), physical activity levels, and disease burden. Discovery's actuarial and data science teams continuously validate and refine the data, ensuring scientific rigour and real-world relevance.

The final dataset used for the analysis consists of individuals who actively tracked sleep in 2024. Following are baseline descriptive statistics.

Variable	Sample average (standard deviation)
Sex (% male)	59.5%
Age (years)	44.2 (11.8)
Family size	2.8 (1.4)
Chronic conditions (count)	0.52 (0.86)
Sleep duration (hours)	7.72 (0.80)
Sleep consistency (absolute value of differences from median sleep onset)	0.79 (0.27)
Deep sleep (% of total)	28.3% (13.5%)
REM sleep (% of total)	13.1% (7.3%)

Sleep distributions from the dataset used



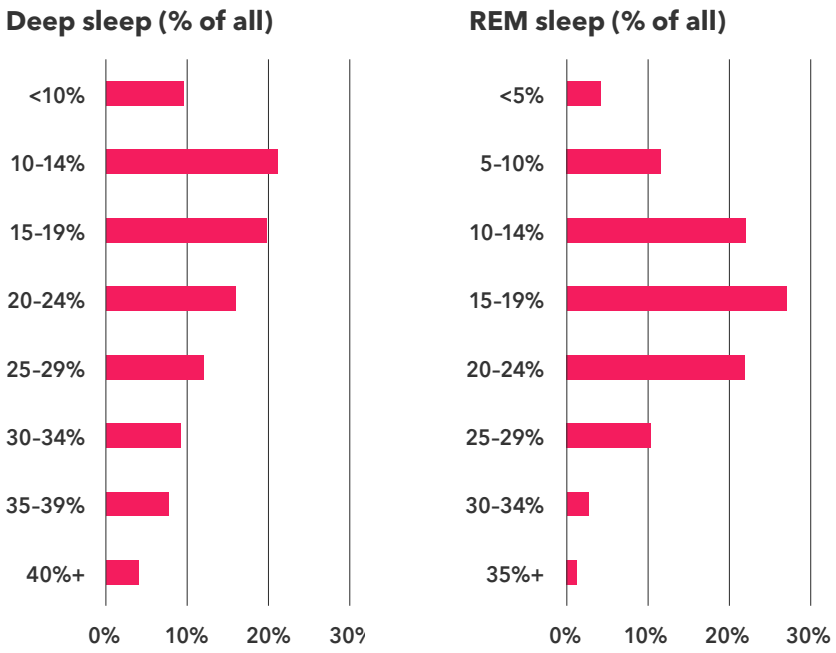
To analyse the independent effect of sleep on in-hospital claims and mortality, a range of causal modelling machine learning models were applied to the observational data. The models integrate causal inference with traditional machine learning approaches to uncover cause-and-effect relationships within data in absence of ex ante randomisation. Statistically, this amounts to synthesizing a pseudo-randomised controlled trial (RCT) model through constructions of counterfactuals that make the newly constructed control and treatment groups comparable, with all relevant confounders included. Two sets of counterfactuals were built for the analysis for robustness check of results:

- **A stochastic risk adjustment model** which used an XGBoost regression to predict the outcome using selected covariates while excluding the intervention variable. This isolates the underlying risk profile of each entity, estimating outcome without treatment. The difference between the observed and predicted outcome represents the estimated treatment effect.

- **A causal X-learner model** which estimates propensities that a member received treatment to better match treated and control units and so estimate the average treatment effect. This quantifies expected change in outcome due to improvement in the intervention variable, adjusted for covariates and treatment assignment bias.

Both methods use underlying causal tree models for prediction and therefore consider non-linear interactions between the variables in the data. The two models showed consistent results; only results from the causal X-learner model are discussed in this paper.

Sleep distributions from the dataset used



> "The difference between the observed and predicted outcome represents the estimated treatment effect."

Variables used in the analysis include sleep metrics, age, gender, physical activity, and general state of health. Risk of hospital admission is represented by value of all in-hospital claims in a given year. Improved sleep duration is defined as increasing average sleep duration from below 7 hours to more than 7 hours per day, improved sleep regularity defined as reducing average variance of sleep onset from median from more than 30 minutes to less than 30 minutes, improved deep sleep defined as increasing proportion of sleep from below 25% to more than 25%, and improved REM sleep defined as increasing proportion of REM sleep from below 20% to more than 20%. Improved Vitality Score combines the four metrics and is defined as reducing the number of nights having a score below 70 from more than 30% to less than 30%.

Among the analysed Vitality members who tracked their sleep at least 5 times per week on average, 16% slept on average less than 7 hours per day. In addition, 19% had more than 60-minute average difference between sleep start times and median sleep onset. These at risk may improve their average in-hospital admission (measured by claims value to the insurer) by 2% and 9%, respectively. We apply these estimates to the average probability of admission, average length of stay and hospital healthcare expenditure as proportion of overall healthcare spending in the analysed countries.