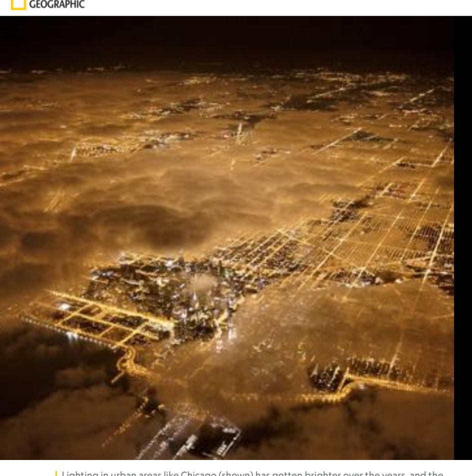


PREMIUM SCIENCE

Light pollution is harming our health

As nights have gotten brighter, the list of health problems linked to artificial lighting has gotten longer, from insomnia to cancer.

By Meryl Davids Landau
September 5, 2024

Lighting in urban areas like Chicago (shown) has gotten brighter over the years, and the gleam from streetlights and store signs can permeate into homes.
PHOTOGRAPH BY JIM RICHARDSON, NAT GEO IMAGE COLLECTION

It was a blip ago in the scheme of human history when people spent their nights in the dark, doing chores by moonlight or the campfire glow or, much later, kerosine lamps. Today, some 80 percent of the world's population experiences high levels of light at night, from bright outdoor bulbs to lamps and screens in the home. Scientists are increasingly recognizing that this excessive light pollution can have severe health consequences, from poor sleep to breast cancer, stroke, and other diseases.

The full scope of the problem and who is most susceptible is not yet clear. What scientists know is that just as artificial light at night disrupts biological processes in wildlife, it similarly interferes with the circadian system in people.

(These fish eggs aren't hatching. The culprit? Light pollution.)

"The majority of human evolution has been bright days, dim evenings, and dark nights, and we've really changed the differential. Some people will be fine with that, but others will not be," says George Brainard, director of the Light Research Program at Thomas Jefferson University in Philadelphia.

Outdoor lighting has increased dramatically over the decades. Well-lit areas have brightened at a rate of more than two percent annually in recent years. Here's what we know about its health impacts and what you and your community can do to avoid them.

How light pollution affects the body

Several mechanisms could explain artificial light's impacts on health. At night, light can trigger insomnia, which is itself a risk for many illnesses. It also reduces the body's production of melatonin, the sleep hormone secreted by the pineal gland in dark conditions that has anti-inflammatory and tumor-inhibiting properties. And it interrupts the daily cycles of the community of microbes living in the intestines.

The eye perceives light through rod and cone cells in the retina, and specialized neurons called retinal ganglion cells that are intrinsically photosensitive. These nerve cells synchronize circadian rhythms, contribute to melatonin's release, and communicate with neurotransmitters throughout the brain.

LEDs are the major problem

Outdoor lighting seeps into homes from streetlights, building security lighting, illuminated billboards, and store signs. In more rural areas, natural gas flares and transportation networks light up the sky. In fact, those areas produce more than 50 percent of the light at night measured by satellites, according to a review of light pollution published this spring.

The other key source of nighttime exposure is indoor lighting, especially the bright screens most people have in their home from computers, tablets, cell phones, televisions, and other devices.

Both types increasingly come from the light-emitting diode bulbs (LEDs) introduced in the early 2000s to reduce energy consumption. Unlike longer-wavelength, amber-light incandescent bulbs, LEDs emit more shorter-wavelength, blue light that can be detrimental to health.

"Watt for watt, blue light gives 10 times the effect of melatonin suppression as red," says Mario Motta, a retired cardiologist who previously served on the American Medical Association's Council of Science and Public Health, a group that first raised the alarm on light pollution more than a decade ago.

The impact of too much light at night is compounded by a lack of sufficient sun exposure during the day, since many people work in windowless offices or factories. "There's a cumulative effect to not getting the proper doses of sunlight and darkness that we would have experienced over millennia as humans," says John Hanifin, a neurologist and associate director of the Jefferson program.

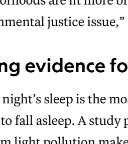
Minority communities are especially at risk, due to the high wattage, outdoor "glare bombs" often placed near homes, says Travis Longcore, an urban ecologist at the University of California, Los Angeles. In a misguided effort to stem crime, these neighborhoods are lit more brightly than white neighborhoods. Excessive lighting "is an environmental justice issue," Longcore says.

Strong evidence for insomnia and cancer

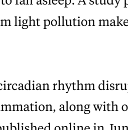
A good night's sleep is the most obvious casualty of excessive light. In brighter rooms, it's harder to fall asleep. A study published in January also found that, among Chinese adults, bedroom light pollution makes sleep more fragmented, contributing to less total sleep time.

These circadian rhythm disruptions can also increase levels of C-reactive protein, a sign of inflammation, along with other inflammatory markers, according to another Chinese study published online in June.

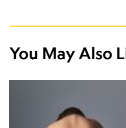
You May Also Like



SCIENCE
How better posture can improve your overall health



SCIENCE
What your biological age can reveal about your health



SCIENCE
Noise pollution harms more than your hearing

Excessive light exposure has also been linked to hormone-sensitive cancers, especially breast, colon, and prostate; epidemiological studies show that people living with the highest levels of light pollution tend to have higher rates of these cancers. Additionally, a 2023 study found that kids living in areas of California with bright outdoor lights were at greater risk for a form of childhood leukemia.

The leukemia finding "joins a growing body of research in epidemiology that associates cancer, even when controlling for other factors, to the outdoor light environment where people live," says Longcore, an author of the study.

Not all epidemiological research supports a cancer link, including a large study in the United Kingdom. This may be because people's exposure to outdoor lighting varies depending on bedroom location and window curtain thickness.

Some people are also more sensitive to light pollution than others. One study found that when participants were exposed to light levels akin to that in the modern home, their melatonin dropped by 50 percent on average, but individuals exhibited more than 50-fold differences in sensitivity.

A wide range of health effects

Some smaller-scale, preliminary research raises the possibility of increased risk for heart disease, diabetes, and depression. A study this spring added ischemic stroke to the list of potential consequences.

Fertility can be impacted too. Men residing in areas with more outdoor light at night have poorer sperm quality, while pregnant women in similar areas may experience higher rates of preterm births.

Additionally, overly bright streetlights create a driving hazard, since they constrict pupils that would otherwise dilate under darker conditions, Motta says. "Blue light scatters much more in the eye than red, and that causes more disability glare," Motta says. This makes it harder to identify people or objects in the road, according to a review article published in *Science* last year.

Turning down the light

After years of inaction, the lighting industry's Illuminating Engineering Society finally joined calls for healthier outdoor lighting in 2020. This means limiting blue wavelengths, using the lowest light level required, and employing bulb shields to more precisely direct rays. Previously, LED bulbs of 4000 Kelvin (a measure of color temperature—the higher, the bluer) were significantly more energy efficient than 3000K, but that's not the case anymore, Motta says.

But not every decision maker has gotten the memo. "The problem is a lot of lighting engineers buy a manual once in their life... They're woefully out of date," Motta says.

In addition to advocating for better lighting in the community, people should ensure their own homes are less bright in the evening by turning off or dimming lights in the home and on porches and yards, the *Science* review advises.

Bulbs with color temperature adjustments provide full-spectrum lighting during daytime and an amber wavelength after dusk. Lancore also advocates turning on all device settings to display warmer tones in the evening, or downloading an app that diminishes blue light even further.

"The idea is you're reducing your dose of the most circadian-stimulating light as you go into your wind-down hours," Lancore says.

Bathrooms lights are especially bright, so throwing the switch during the night means "you are highly likely to suppress the hormone melatonin," Brainard says. He recommends using a night light or newer amber baseboard lighting instead.

Blackout curtains are a must for bedroom windows facing exterior light sources. And don't leave the television on all night, which is also associated with poorer sleep.

(For a good night's rest, block out the light with these sleep masks.)

Some people put a sleep mask on, but others, like Hanifin, find it better to block indicator lights on fans, TVs, air filters, and computers (if your bedroom doubles as a home office).

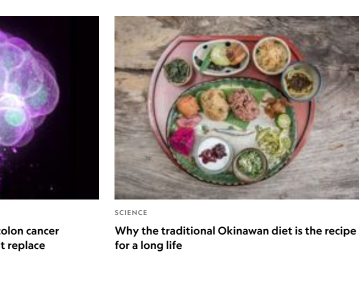
"LEDs are so cheap and prevalent they put a light on everything now, which can produce substantial personal light pollution," says Hanifin, who counts seven in the room he sleeps in. "I use black electrical tape and cover them all up."

Related Topics

LIGHT POLLUTION | HEALTH | CANCER | PUBLIC HEALTH | SLEEP | HEALTH CONDITIONS

You May Also Like

SCIENCE
How living near a railroad can harm your health



SCIENCE
Do increased breast cancer screenings save lives? Doctors can't agree.

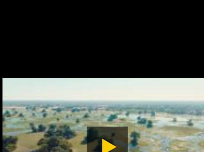
SCIENCE
UTIs are rising fast—and the cause could be in your refrigerator

SCIENCE
The FDA approved the first colon cancer screening blood test. Could it replace colonoscopies?

SCIENCE
Why the traditional Okinawan diet is the recipe for a long life

GO FURTHER

ANIMALS



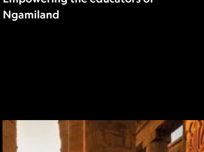
ANIMALS
5 clever animals that treat and prevent their own illnesses

ANIMALS
What would the world look like without mosquitoes?

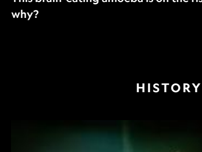
ANIMALS
Social media loves to villainize dolphins. Here's why it's wrong.

ANIMALS
How humpback whales use bubbl tool

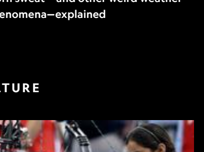
ENVIRONMENT



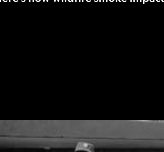
PAID CONTENT
Empowering the educators of Ngamiland



ENVIRONMENT
This brain-eating amoeba is on the rise—why?



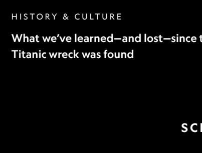
ENVIRONMENT
'Corn sweat'—and other weird weather phenomena—explained



ENVIRONMENT
Here's how wildfire smoke impact

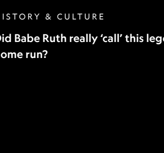
HISTORY & CULTURE

HISTORY & CULTURE
How did ancient Egyptian obelisks end up all over the world?



HISTORY & CULTURE
What we've learned—and lost—since the Titanic wreck was found

HISTORY & CULTURE
A brief history of the Paralympics



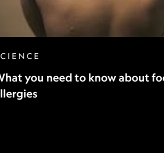
HISTORY & CULTURE
Did Babe Ruth really 'call' this leg home run?

SCIENCE

SCIENCE
Light pollution is harming our health

SCIENCE
Mold is in your kitchen—and in places that might surprise you

SCIENCE
What to know about lice and how it spreads



SCIENCE
What you need to know about fo allergies

TRAVEL

TRAVEL
Here's what an astronaut has to say about space tourism

PAID CONTENT
10 of the best annual events in Amsterdam

TRAVEL
4 of the best food experiences on Scotland's Isle of Skye

TRAVEL
These are the must-see sights of Veneto region

Copyright © 1996-2015 National Geographic Society | Copyright © 2015-2024 National Geographic Partners, LLC. All rights reserved