

Both quantity and quality of sleep affect cardiovascular risk factors in adolescents

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A study from a research team led by a MassGeneral Hospital for Children (MGHfC) physician finds that both the quantity and quality of sleep—the amount of time spent sleeping and the percentage of sleep that is undisturbed—in young adolescents have significant effects on aspects of cardiovascular health such as blood pressure, cholesterol levels and abdominal fat deposition. Their report has been published

online in the journal *Pediatrics*.

"While many studies have associated shorter sleep duration with increased obesity levels in children, few have examined effects on other risk factors—such as blood pressure, blood lipids and glucose metabolism—or examined associations of sleep quality with these outcomes," says Elsie Taveras, MD, MPH, chief of the MGHfC Division of General Academic Pediatrics and senior author of the Pediatrics paper. "An additional strength of our study is that we relied on an objective measurement of sleep, in contrast to subjective reports from parents or children that may be less accurate, and that it is also one of the first to focus on early adolescence—a developmental period with dramatic biological changes in sleep, a high incidence of inadequate sleep and the emergence of cardiovascular risk factors."

The study is the latest report out of Project Viva, a long-term study based at Harvard Pilgrim Health Care Institute of more than 2,000 women and their children who enrolled between 1999 and 2002. Study participants have been followed on a regular basis over the past two decades, with periodic reporting of factors related to the children's development and their physical and mental health. Taveras has led several Project Viva studies examining aspects of sleep—including its impact on body fat and obesity in children and how sleep duration is affected by television viewing.

The current study reports results from 829 now-adolescent study participants who, along with an in-person study visit, had both their [nighttime sleep](#) and daily physical activity measured over 7 to 10 days by actigraphy, which records physical motion by a device worn on the wrist. The participants, who averaged around 13 years in age, also completed written sleep logs. In addition to sleep duration—the amount of time spent asleep during the night—actigraphy also measured sleep efficiency, the percentage of time during the overnight sleep period

actually spent asleep, an indication of the quality and continuity of sleep.

Results showed that the average sleep duration for all participants was 441 minutes or 7.35 hours per day; and only 2.2 percent met or exceeded the recommended average sleep duration for their age group—9 hours per day for ages 11 to 13 and 8 hours per day for those 14 to 17. Sleep duration of less than 7 hours was found in 31 percent of participants, and more than 58 percent had sleep efficiency less than the 85 percent that is considered sufficient for adults.

Both shorter sleep duration and lower sleep efficiency were associated with increased levels of overall and abdominal fat deposition—associations that persisted after adjustments for physical activity, television viewing and consumption of fast foods or sweetened beverages. Longer sleep duration and higher efficiency were associated with reductions in cardiometabolic risk—based on factors such as smaller waist circumference, lower systolic blood pressure and higher HDL cholesterol levels. Most of those associations also persisted after adjusting for the factors noted above.

"Sleep quantity and quality are pillars of health alongside diet and physical activity," says lead and corresponding author Elizabeth Cespedes Feliciano, ScD, ScM formerly at the Harvard Chan School of Public Health and now with the Kaiser Permanente Northern California Division of Research. "Pediatricians should be aware that poor sleep quality—frequent awakenings and not just insufficient duration of sleep—is associated with increased cardiometabolic risk. While several trials have tried to extend the [duration](#) of sleep, few have targeted sleep efficiency and other aspects of [sleep quality](#). We know that exercise improves [sleep efficiency](#) in adults and that screen time decreases it in children, so preventive measures should target those and other factors such as stress, noise and caffeine consumption."

A professor of Pediatrics at HMS, Taveras adds, "Sleep has many dimensions beyond its quantity and quality that may influence cardiometabolic health, including the relationship of sleep timing to other daily activities and whether an individual's circadian clock, the internal sleep/wake schedule, is synchronized with the rhythms of social activities. Those may be particularly important in adolescents—who may have high academic demands or naturally prefer to be active in the evening but need to get up early for school—and will be a focus of our upcoming research."

More information: *Pediatrics* (2018). [DOI: 10.1542/peds.2017-4085](https://doi.org/10.1542/peds.2017-4085)

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