Sleep Health: Journal of the National Sleep Foundation 12 (2026) 355–365

Contents lists available at ScienceDirect

Sleep Health: Journal of the National Sleep Foundation

journal homepage: www.sleephealthjournal.org

Adolescent sleep health: Recommendations from the National Sleep Foundation

Natalie D. Dautovich, PhD [a,b,1], Heather E. Gunn, PhD [c,1], Joseph M. Dzierzewski, PhD [a,*], Lauren Hale, PhD [d], Brant Hasler, PhD [e], Jared M. Saletin, PhD [f], Wendy M. Troxel, PhD [g], Imelda S. Wong, PhD [h,i,2], Zackary Brown [o], Mary A. Carskadon, PhD [j], Judith Owens, MD, MPH [k], Rafael Pelayo, MD [l], Kyla L. Wahlstrom, PhD [m], David Gozal, MBA, PhD [n]

[a] National Sleep Foundation, Washington, DC, United States
[b] Department of Psychology, Virginia Commonwealth University, Richmond, Virginia, United States
[c] Department of Psychology, The University of Alabama, Tuscaloosa, Alabama, United States
[d] Program in Public Health and Department of Family, Population, and Preventive Medicine, Stony Brook University, Stony Brook, New York, United States
[e] Psychiatry, Clinical and Translational Science, and Psychology, University of Pittsburgh, Pittsburgh, Pennsylvania, United States
[f] Psychiatry and Human Behavior, Brown University, Providence, Rhode Island, United States
[g] RAND Corporation, Santa Monica, California, United States
[h] Office of the Provincial Health Officer, British Columbia Ministry of Health, Victoria, British Columbia, Canada
[i] Centers for Health, Work and Environment, Colorado School of Public Health, CU Anshutz, Aurora, Colorado, United States
[j] Bradley Hospital, Warren Alpert Medical School of Brown University, East Providence, Rhode Island, United States
[k] Boston Children's Hospital, Boston, Massachusetts, United States
[l] Sleep Medicine Division, Stanford University School of Medicine, Stanford, California, United States
[m] College of Education and Human Development, University of Minnesota, Minneapolis, Minnesota, United States
[n] Office of The Dean and Department of Pediatrics and Biomedical Sciences, Joan C. Edwards School of Medicine, Marshall University, Huntington, West Virginia, United States
[o] Rowan University, Glassboro, New Jersey, United States

ARTICLE INFO

Article history:
Received 26 June 2025
Received in revised form 10 December 2025
Accepted 3 January 2026

Keywords:
Adolescent sleep health
Sleep health equity
Standard time
School start times
Driving
Education

ABSTRACT

Objectives: Adolescent sleep is linked to indices of health and well-being, including academic performance, physical health, mood, and safety. However, biological, psychological, and social changes make it difficult for adolescents to obtain enough quality sleep. As a result, the percentage of adolescents who achieve optimal sleep has steadily diminished for decades. Reversing this trajectory requires a multipronged approach and involvement from numerous stakeholders, including adolescents themselves. To support this need, the National Sleep Foundation sponsored a multidisciplinary Adolescent Sleep Health Conference to identify recommendations to improve adolescent sleep health in the United States and beyond.
Methods: The 2022 Adolescent Sleep Health Conference convened 22 experts (educators, administrators, parents, advocates, researchers, clinicians, and an adolescent representative) to discuss evidence related to adolescent sleep health and its intersections with health, education, athletics, transportation, and the workforce. Final recommendations reflect those generated during the Conference and additional post hoc recommendations informed by extant literature.
Results: Factors influencing adolescent sleep are present at individual, social, and societal levels. Societal factors such as school start times, entering the workforce, driving, and clock changes are linked to adolescent sleep. Improving adolescent sleep health involves integrating developmental science, family, and educational contexts into sleep health recommendations, implementing healthy school start times and

* Corresponding author: Joseph M. Dzierzewski, PhD, National Sleep Foundation. Tel.: +1-703-965-2064.
E-mail address: jdzierzewski@thensf.org (J.M. Dzierzewski).

[1] Natalie D. Dautovich and Heather E. Gunn are co-first authors

[2] This work began while Dr. Imelda Wong was employed at the National Institute for Occupational Safety and Health (NIOSH), Centers for Disease Control and Prevention (CDC). The findings and conclusions in this paper are those of the authors and do not necessarily represent the views of NIOSH, CDC, nor the Office of the Provincial Health Officer, British Columbia Ministry of Health.

https://doi.org/10.1016/j.sleh.2026.01.002

adopting permanent standard time, increasing awareness of the impact on work and driving, and prioritizing sleep health equity.
Conclusions: Policy changes and prioritization across settings can increase the opportunity and likelihood of healthy sleep. Adolescents must be included as contributors to improving sleep health.

What was known
- Healthy sleep is essential for adolescents, supporting physical health, academic achievement, positive mood, and safe driving.
- Many adolescents have insufficient and inconsistent sleep and daytime sleepiness. Delayed circadian rhythms in adolescents often conflict with school and social scheduling.
- Adolescents in underserved communities are disproportionately more likely to have poor sleep health.
- Improving adolescent sleep likely requires change across multiple levels of influence (individual, societal, and policy).

What this study adds
- National Sleep Foundation identified current challenges and proposed solutions to improve adolescent sleep health.
- Novel intervention targets (e.g., permanent standard time) and opportunities to bolster established strategies (e.g., delayed school start times) are examined within a socioecological context.

Background

Healthy adolescent sleep consists of sufficient sleep duration (8-10 hours of sleep each night for most teens),[1] good sleep quality,[2] consistent sleep schedules,[3] satisfying sleep,[4] and healthy sleep behaviors, including appropriate use of electronic devices.[5] These indices are collectively referred to as *sleep health,* a pattern of sleep-wakefulness that focuses on promotion and prevention rather than disease.[4,6,7] Suboptimal sleep health contributes to negative outcomes during adolescence, including poor physical health, low academic achievement, depressed mood, and increased risk for motor vehicle crashes.[8,9] Moreover, problems with sleep health, such as difficulties with sleep initiation and maintenance and insufficient duration during childhood and adolescence, predict sleep disturbances[10] and other downstream negative outcomes for health[11] and well-being[12] into adulthood (see Shochat et al, Owens et al, and Short et al for comprehensive reviews of cross-sectional and prospective consequences of poor sleep health).[13-15] Overwhelming data linking poor adolescent sleep to poor outcomes has made sleep health a growing public health concern and a key focus of many health initiatives targeting adolescents.[16]

Insufficient sleep, irregular and inconsistent sleep timing, and daytime sleepiness are components of sleep health that are especially salient during adolescence and appear to be getting worse. For example, from 1991-2012, U.S. teens showed a steady decline in sleep duration.[17] This decline has continued due to media use and screen time,[18] with only 20% of adolescents polled in 2024 indicating that they get the recommended amount of sleep each night.[19] Bedtimes tend to get later at the onset of adolescence and continue to delay throughout adolescence, which restricts sleep opportunity.[20] Delayed timing combined with early school start times further contributes to *social jet lag*, a chronic misalignment between one's circadian rhythm and external obligations. For example, adolescents worldwide wake about 2 hours later on nonschool days.[20] Circadian misalignment and insufficient sleep then contribute to chronic daytime sleepiness. Behavioral indicators of daytime sleepiness, such as falling asleep without intending to, have high prevalence—20%-40% of adolescents worldwide.[20] As with other age groups, sleep health is unequally distributed in adolescents. Adolescents in historically underserved communities are more likely to have poor sleep health[17] and are at higher risk for associated negative outcomes.[21]

In principle, improving sleep health during adolescence could modify the trajectories of their mental and physical health, well-being, and safety. However, interactions among individual, social, and societal contexts present unique challenges for this population and the need for guidance. To this end, the following is a report of the National Sleep Foundation (NSF)'s 2022 Adolescent Sleep Health Conference, a meeting that convened a multidisciplinary panel of experts to consider a multitude of contextual factors across levels of developmental and social influence (policy, educator, family, and adolescent behaviors) that can influence adolescent sleep health. The purpose of this report is to describe multilevel factors contributing to sleep health, and related sleep disorders where applicable, during adolescence, provide recommendations and practical action items to minimize challenges, and promote sleep health and sleep health equity in adolescents. For each level of influence on adolescent sleep health (individual, community, family, and social, and societal), we present contextual factors first, followed by corresponding recommendations and action items. A complete summary of all recommendations and action items is provided in Table 1.

Methods

To develop relevant recommendations from the Adolescent Sleep Health Conference, NSF followed a modified NIH State of the Science approach, including: (1) a review of the literature prepared by experts and stakeholders; (2) presentations by these experts and stakeholders; (3) questions and statements from invited conference attendees; (4) discussion and deliberation; and (5) follow-up literature review and synthesis. Specifically, NSF convened 17 experts in sleep health and associated areas and 5 stakeholders (Appendix A) to partake in the Adolescent Sleep Health Conference. Each speaker presented on their area of expertise. Conference participants joined moderated breakout sessions on focused topics within two designated discussion periods. All topics, presentations, and breakout discussions were recorded and then reviewed and summarized by the presenters or manuscript authors (ND and HEG). Manuscript authors (ND, HEG, and JD) then completed a targeted, in-depth review of the adolescent sleep literature based on the Conference topics and discussion and the authors (ND, HEG, and JD) developed comprehensive recommendations based on this review. All conference participants then had the opportunity to review and comment on the manuscript (including recommendations) and co-

Table 1
Summary of recommendations and action items by level of influence

Level	Recommendation	Action items
Individual		
	Create daily schedules that intentionally align with adolescents' delayed circadian rhythms by allowing for later evening wind-down periods and later morning wake times.	Educate adolescents and parents on the biological shift in adolescent sleep-wake patterns. Promote healthy scheduling of extracurricular and work activities to optimize adolescents' circadian needs. Encourage families to set consistent sleep schedules, even on weekends, to minimize sleep debt and social jet lag.
	Plan for the recommended sleep duration each night to promote teens' general health and wellness (9-11 h for 6- to 13- year-olds, 8-10 h for teenagers, and 7-9 h for 18- to 25-year- olds[1]).	Develop educational campaigns emphasizing the importance of sufficient sleep duration for adolescent sleep health and specifying the upper ranges for younger adolescents and lower ranges for older adolescents/young adults.
	Avoid substance use because of the known effects on adolescent development and sleep and continue research into effective interventions.	Increase awareness of the bidirectional relationship between substance use and poor sleep. Research the effects of cannabis, nicotine, and multisubstances on circadian functioning and sleep; develop and evaluate effective interventions.
	Minimize activating technology and screen use at night within one hour of target bedtime and throughout the night.	Target risk of rumination at bedtime, which can be exacerbated by social media use and lead to poor sleep. Develop alternative nighttime relaxation activities to replace screen use.
	Consider within-group differences across the adolescent age span and differing vulnerabilities (e.g., ADHD or ASD diagnoses) when researching and promoting adolescent sleep.	Personalize sleep health interventions based on developmental stage and individual needs. Partner with health professionals to address sleep issues alongside other cognitive and emotional challenges.
Community, family, and social		
	Leverage schools as key sleep influencers, both within schools and at a policy level (e.g., see Societal-level recommendations).	Provide guidance to schools on appropriate sleep health recommendations (e.g., like nutrition and exercise campaigns). Revise policies on tardiness and classroom sleepiness to optimize intervention instead of disciplinary action. Make online assignments due no later than 10 PM to minimize late nights. Consider timing of assignments/tests in the early afternoon or afternoon vs. morning to maximize circadian alertness.
	Engage healthcare providers in sleep health promotion and sleep screening.	Assess sleep health at well checkups, physicals, and dentist visits. Healthcare providers should address common sleep misconceptions, such as reliance on over-the-counter sleep aids and melatonin.
	Enhance family education on sleep health and family interactions to promote security necessary for sleep.	Educate families on healthy sleep behaviors. Educate families about recognizing atypical sleep behaviors (e.g., snoring, waking up tired). Educate families about screen use and healthy screen strategies, for example, tech-free zones, device curfews, or reducing (rather than eliminating) evening screen time. Consider how family dynamics, including mismatches between adolescent and parental sleep patterns, may contribute to sleep issues. Consider sleep promotion as an opportunity to enhance warm and moderately structured parenting styles to strengthen parent-adolescent relationships and ultimately enhance adolescent emotional security.
Societal		
	Implement appropriate school start times in middle and high schools (8:30 or later); *Identify* appropriate elementary start times.	Educate parents, teachers, and administrators on the benefits of later school start times for adolescent health and academic performance. Engage school boards and policymakers to support 8:30 AM or later start times. Fund and support studies exploring the impact of start times on younger students, particularly in marginalized communities. Overcome barriers to implementation: develop informational campaigns addressing common concerns, work with legislators to propose policies mandating later school start times at the state and federal levels, and identify funding sources and strategic partnerships to offset potential initial costs of changing school schedules.
	Adopt permanent standard time.	Advance policy efforts for promoting permanent standard time through advocacy and education. Continue to strengthen the evidence-base for the benefits of permanent standard time for adolescents.
	Promote sleep's role in adolescents' work performance and driving safety with uniform regulations for work times.	Partner with businesses to create workplace policies that prioritize sleep health (e.g., avoiding late-night shifts for teens). Develop employer-led sleep education programs to enhance teen worker productivity and safety. Collaborate with insurance companies to offer premium reductions or rewards for teens who participate in sleep improvement programs. Integrate drowsy driving prevention into driver's education programs. Strengthen graduated licensing laws to limit late-night driving and increase awareness of sleep-related driving risks.
	Advance sleep health equity.	Develop community-based, culturally responsive sleep health interventions. Provide multilingual resources and culturally relevant sleep education materials. Support community-driven initiatives that improve overall well-being, such as safe housing and mental health services, which indirectly impact sleep health. Target school districts in low-income areas for early implementation of sleep-focused policies. Offer free or low-cost sleep health workshops and resources in schools and community centers. Vulnerable adolescents interface with multiple systems (e.g., juvenile justice system; alternative schools; substance use treatment facilities). Residential facilities can modify the environment to reduce harm to sleep and could potentially optimize sleep health.

(*continued on next page*)

Table 1 (*continued*)

Level	Recommendation	Action items
	Engage youth and student stakeholders across all sleep health initiatives.	Engage youth in the design and implementation of sleep health initiatives (e.g., invite to board meetings, hearings, and have student advisory councils) and provide leadership training for students interested in advocating for better sleep policies. Foster peer-led sleep advocacy programs to increase adolescent engagement. Consider adolescents' priorities in sleep messaging campaigns (e.g., performance outcomes, mood). Partner with influencers and youth organizations to spread awareness on platforms popular among adolescents.

author the manuscript. The manuscript was then revised based on feedback and circulated for final approval. The listed co-authors responded to the initial inquiry and agreed to review, comment, and co-author the manuscript. Except where noted, cited studies and literature include adolescents, broadly defined, 10-24 years of age. The starting age is consistent with the beginning of puberty for many children, while the upper limit reflects an expanded, modern view between adolescence and young adulthood.[22] The literature informed recommendations are focused on adolescents who are still living at home and attending elementary, middle, or high school.

Contextual factors and recommendations for adolescent sleep health

Individual contextual factors

Developmental considerations

Adolescents are a heterogeneous group, with the period of "functional adolescence" spanning ages 10-24 years old.[22] This developmental period encompasses significant physiological and psychosocial developments that can differ depending on the stage of adolescence. For instance, the experiences of a 10-year-old are vastly different from those of a 20-year-old. During adolescence, pubertal changes affect the circadian rhythm, making it easier for teens to stay up late and harder for them to wake up early.[23] This delayed circadian clock in adolescence often conflicts with societal schedules, such as school start times, athletics, and work commitments, which are typically aligned with an "adult" circadian schedule.[24] This "perfect storm" leads to delayed bedtimes and irregular sleep timing (akin to chronic jet lag), and in turn, persistent sleep debt among adolescents.[25]

In addition to the physiological changes in adolescence, psychosocial changes occur with the onset of puberty. In particular during this period of development, adolescents become more sensitive to status and respect and averse to embarrassment, humiliation, or disrespect.[26] Relatedly, adolescents desire to be valued socially, contribute or "matter" in a larger sense, and seek meaning and purpose.[27] This heightened sensitivity to status is related to adolescent sleep health through two mechanisms. First, failure to honor this sensitivity to status and respect can sabotage behavioral health interventions,[28] such as those targeting sleep. For example, sleep advice interpreted as lecturing or nagging could diminish autonomy and the need for adolescents to feel competent. Second, this increased sensitivity also makes adolescents more vulnerable to the negative effects of social comparisons prevalent in social media, which can impact sleep quality.[29] In fact, a separate NSF expert panel reached consensus that both general screen use and the content of screen use (e.g., through social media) before sleep impairs sleep health in adolescents.[5] Bedtime emerges as a particularly vulnerable period, where adolescents who can otherwise distract themselves during the day may struggle with negative thoughts and worries at night, hindering their ability to fall asleep. Interventions are needed to mitigate this negative cognitive activity at night, such as avoiding triggering and activating content through reduced screen use (e.g., especially more interactive use such as social media).[5,30]

Barriers to effectively implementing interventions at the individual level can derive from a lack of youth engagement and rules and mandates that limit adolescent autonomy. During adolescence, the need for autonomy increases, as well as the need for adaptive approaches from parents and larger institutions.[31] Lack of student engagement and partnership can occur because of a disconnect between the mission of an organization (e.g., schools) and student interests, developmentally inappropriate communication to youth, lack of community-building within adolescent communities, lack of consideration of the adolescent perspectives on sleep health, and a lack of democratic decision-making related to sleep health. Thus, family and community efforts to effect sustainable sleep health changes during the adolescent stage of development likely require more collaboration and engagement than in younger stages of development.[32]

Neurodevelopmental and -biological considerations

Adolescent development also brings about other challenges that interface with sleep problems at an individual level. For example, neurodevelopmental disorders, such as learning disorders, Attention-Deficit/Hyperactivity Disorder (ADHD), and Autism Spectrum Disorders (ASD) can exacerbate sleep problems. Similar to adults, adolescents show demonstrable deterioration in vigilance, memory, and mood as sleep duration decreases.[33] For adolescents with ADHD, sleep difficulties are commonplace and ADHD or associated sequelae may make them more susceptible to sleep loss.[34] Even when adolescents with ADHD are not sleep-deprived per se, their daily waking behaviors are consistent with a functionally sleep-deprived brain state.[35] Moreover, sleep loss may impact adolescent brain function more severely in youth with more advanced ADHD symptoms.[36] Conversely, sleep that contains adequate slow-wave and REM sleep can benefit memory and other waking behaviors in children with ADHD.[37] Sleep disturbances are also commonplace in adolescents with ASD, manifesting as delayed sleep onset, reduced sleep duration, and frequent awakenings.[38] Non-pharmacological interventions, including psychobehavioral strategies, physical activity programs, and somatosensory approaches, show potential for improving sleep outcomes in this population.[38] Thus, sleep impacts, and is impacted by, neurodevelopmental disorders. Moreover, normative sleep changes during adolescence could impact the trajectory and severity of neurodevelopmental disorders.[39]

Substance use also increases during adolescence. As with neurodevelopmental disorders, there is a bidirectional relationship between substance use and sleep problems. Experimental and prospective studies indicate that alcohol, caffeine, and nicotine disrupt sleep, while the effects of cannabis on sleep are less well-understood.[40,41] Alcohol and caffeine also disrupt circadian rhythms, most consistently resulting in circadian delays.[42–44] On the other hand, sleep and circadian characteristics predict risk for use and problems with alcohol, cannabis, and nicotine/tobacco.[45–49] Patterns of sleep and circadian risk factors vary by substance type, as well as

the developmental stage (middle/high school age vs. post high school age), and sex/gender of the adolescent.[46] A range of mechanisms are plausible for explaining sleep and circadian-related risk for substance use in adolescents.[50–53] These include: (1) a positive reinforcement pathway, whereby changes in sleep timing or circadian misalignment increase reward-seeking or sensitivity to substances, and (2) a negative reinforcement pathway, where insufficient sleep or insomnia leads adolescents to use substances to cope with sleep difficulties or anxiety.[45] Although sleep/circadian-focused interventions show promise for preventing or reducing substance use by adolescents because they have less associated stigma than traditional drug and alcohol prevention/treatment, more research is needed to establish their effectiveness.[54–56]

Individual-level recommendations and action items

1. Create daily schedules that intentionally align with adolescents' delayed circadian rhythms by allowing for later evening wind-down periods and later morning wake times.
2. Plan for the recommended sleep duration each night to promote teens' general health and wellness (9-11 hours for 6- to 13-year-olds, 8-10 hours for teenagers, and 7-9 hours for 18- to 25-year-olds[1]).
3. Avoid substance use because of the known effects on adolescent development and sleep and continue research into effective interventions.
4. Minimize activating technology and screen use at night starting within 1 hour of target bedtime and continuing through the night.
5. Consider within-group differences across the adolescent age span and differing vulnerabilities (e.g., ADHD or ASD diagnoses) when researching and promoting adolescent sleep.

Rationale for accommodating both the shifting timing of adolescent circadian clocks and their sleep needs

Supporting adolescent sleep health requires both education and intentional planning to address two key factors: the biological shift in circadian timing that occurs during adolescence and the increasing social and academic demands that compete with sleep. Adolescents need sufficient opportunities to meet their age-appropriate sleep requirements: 9-11 hours for 6- to 13-year-olds, 8-10 hours for teenagers, and 7-9 hours for 18- to 25-year-olds.[1]

Both adolescents and parents need to be educated about the natural delay in sleep-wake patterns during adolescence, which makes it harder for them to fall asleep early at night and wake up early in the morning feeling alert. Beyond increasing awareness, concrete steps are needed to adjust schedules and priorities. For example, evening commitments such as after-school work, extracurricular activities, and homework may push bedtime later than is healthy, reducing total sleep time. Likewise, early morning activities before school can cut into the natural sleep period.

Education should also emphasize the value of maintaining consistent sleep schedules, even on weekends. Although sleeping in may seem like a way to compensate for lost sleep during the week, it often leads to social jet lag, making it harder to wake up and function during the week.

Rationale for avoiding substance use and continue research into effective interventions

Transitioning into adolescence is also associated with increased substance use, which both influences sleep *and* is influenced by sleep. The effects of multisubstance use and individual differences (age, biological sex, gender identity, race, and ethnic identity) on sleep need to be better understood to guide interventions on the link between sleep and substance use.

Rationale for minimizing activating screen use before, during, and after bedtime

The NSF expert consensus panel on screen use found that the content of screen-based activities can particularly impair adolescent sleep health. Because adolescents are vulnerable to rumination and heightened sensitivity to social media, limiting screen use before, during, and after bedtime is recommended.[57] Adolescents may benefit from interventions such as savoring, which is the practice of reflecting on positive memories or emotions to mitigate heightened vigilance.[58]

Rationale for considering within-group differences and differing vulnerabilities

As adolescents are a heterogeneous group, promoting sleep health will likely vary by age and by level of vulnerability to sleep disruptions (e.g., ADHD or ASD diagnoses).[36] Enhancing sleep health in adolescents will require consideration of relevant developmental processes (e.g., puberty) and social contexts (e.g., peers, school) to optimize sleep in order to meet the recommended sleep duration guidelines. Partnerships between sleep specialists and adolescent providers can help to facilitate novel approaches to accommodate idiographic presentations.

Community, family, and social contextual factors

Teachers and school administrators

Educators who interact with adolescents in their day-to-day lives also can influence adolescents' sleep health. Inadequate sleep frequently interfaces with the school system and can be obvious to teachers (e.g., falling asleep in class). Tardiness and sleeping in school can signal problems with sleep and commonly result in disciplinary actions (e.g., removal from class); but these incidents may be opportunities to start conversations, investigate sleep habits and environments, and offer different sleep health strategies. Parents often look to the education system for answers, and educators may be among the first sources of information about the impact of poor sleep on children. Educators favor dissemination of sleep information to school communities.[59] However, unlike curricula or programs supporting nutrition or exercise, often there is little guidance and limited time for schools to help students and families achieve better sleep health.

Family context

The family influence on adolescent sleep health can occur through a few mechanisms. First, the physical presence of parents and siblings can have unintended effects that disrupt sleep. These include differing bed and wake times across family members,[60] ambient noise (e.g., other family members snoring), nighttime habits that can interfere with sleep, and the possibility that family members' presence may also serve as zeitgebers (cues that entrain biological rhythms).[61] Next, the presence of family members can also influence interpersonal and emotional security, which, in turn, affects sleep.[62] For example, parental support is linked to longer sleep duration in adolescents, while abusive and chaotic households can dampen emotional security that is necessary for sleep health.[63,64] Emotional insecurity mediates associations between family risk (i.e., marital conflict) and *children's* sleep problems[65]; it is possible that emotional insecurity functions similarly for adolescent youth. Since family members' sleep behaviors are influenced by emotional bonds and the shared living space, good sleep health and predominately healthy relationships among family members could facilitate good adolescent sleep.[66] On the other hand, insufficient sleep, irregular sleep patterns, or sleep disorders (e.g., shift work, apnea) in even one family member can negatively impact an adolescent's sleep.

Community, family, and other social-level recommendations and action items

1. Leverage schools as key sleep influencers, both within schools and at a policy level (e.g., see Societal-level recommendations).
2. Engage healthcare providers in sleep health promotion and sleep screening.
3. Enhance family education on sleep health and family interactions to promote security necessary for sleep.

Rationale for utilizing school and healthcare systems as primary sources of information and intervention

In addition to directly increasing opportunity for more sleep with later start times, the school system has an indirect influence by being a source of guidance for students and families. Most youth interact with the school system more than any other institution. Moreover, as with other health behaviors (e.g., obesity and fitness), the school setting can be an effective catalyst for change.[67,68] Educators need guidance on sharing information about sleep health and could follow effective models for sharing information about nutrition and exercise. Another target for sleep health interventions in the school system includes tardiness and sleepiness as a potential point of intervention for healthy sleep vs. as a disciplinary issue. For example, daytime sleepiness could serve as a catalyst for initiating a discussion with parents about sleep health education instead of as a behavioral disciplinary problem. Handouts and infographics could be useful for framing tardiness as a typical developmental issue rather than self-discipline issue. Also, assignments could be timed to maximize circadian alertness later in the day, homework load could be modified to leave enough opportunities for sleep (e.g., more active and interactive learning in classroom instead of at home), and online submission deadlines could be earlier in the evening. Lastly, pediatricians and dentists are other community providers with frequent contact with adolescents and families. These professionals can promote healthy sleep practices and screen for sleep-disordered breathing as well as other sleep issues in youth and address common sleep misperceptions (e.g., the use of over-the-counter sleep aids and melatonin).

Rationale for engaging healthcare providers and families in promoting sleep health

Families need more education on adolescent sleep behaviors and when to seek medical attention. Snoring, waking up tired, or "growing pains" should be understood as atypical and as potential opportunities to prevent future sleep disorders. Families and providers should also consider the family context for adolescent sleep health and how parental sleep history and mismatches between adolescent and parent sleep timing and needs may contribute to sleep issues. Effective and sustainable sleep health promotion efforts at the household level (i.e., reduced screen time) that are culturally sensitive are also needed. For example, there is consensus that screen use, and screen content (including interactivity, engaging features of social media, and emotionally stimulating images) in particular, impairs sleep among adolescents.[5] A focus on *reducing* evening screen time (before, during, and after bedtime), as opposed to eliminating screen time, could be an effective strategy for adolescents.[57] Finally, regardless of the target behavior (e.g., reducing screen time, encouraging consistent sleep timing), interventions and sleep promotion programs are an opportunity to increase emotional security (warmth and moderate structure) that is necessary for good sleep.[32]

Societal contextual factors

School start times

The impact of school start times on adolescent sleep is well-documented[69] and has gained significant attention in public policy. In nationally representative samples of various neighborhood and family context determinants, school start times have the largest effect on adolescent sleep, as indicated by time in bed.[70] While about 70% of teens report needing to be present for the start of school prior to 8:30 AM,[16,19] age-appropriate school start times (8:30 AM or later) facilitate sleep opportunities that align better with the natural biological shifts toward delayed sleep and wake times during adolescence.[71]

Results from numerous studies demonstrate favorable outcomes associated with later start times, including increased morning sleep, which is better suited to teens' circadian rhythm.[72–74] In an NSF study of American teens, students who start school at 8:30 AM or later said they are more satisfied with the amount of sleep they get on school nights, as compared with students who start school before 8:30 AM.[19] In the same study, students who start school before 8:30 AM had higher levels of depressive symptoms than teens who start school later. However, delaying high school start times to align better with adolescent sleep (e.g., shifting from 7:30 AM to 8:30 AM start) can be challenging for communities to implement, beginning with insufficient knowledge among stakeholders (parents, students, teachers, community leaders, and professionals) about sleep during adolescence. Other challenges include resistance to change, initial implementation costs, and concerns about accommodating other school activities (sports, extracurriculars, etc.). Compelling evidence demonstrates that barriers such as costs and negative community impacts can be overcome. For example, one economic simulation suggests that delaying school start times could contribute $83 billion to the U.S. economy within a decade due to decreased car accidents and increased human capital.[75] More sleep could also lead to higher academic performance, which results in better contributions to the economy via higher-paying jobs.[75] High school athletics is a commonly cited barrier, but in one case example, a 30-minute delayed school start in one large school district only led to a 15-minute delay in practices and games, and most of the stakeholders (especially students) were ultimately satisfied with the changes.[76] In this same district, delayed start time also paralleled a reduction in sports-related concussions despite high rates of participation. Delayed school start times can also positively influence sleep in other stakeholders. Delayed start times led to 20+ more minutes of sleep for high school teachers in one district[77] and in another district, more parents reported sufficient sleep after start time delays.[78]

Permanent standard time and daylight-saving time

As with early school start times, daylight-saving time (DST) is harmful to adolescent sleep, during the "spring forward" adjustment, throughout the entire period in DST, and during periods of permanent daylight-saving time. Delayed exposure to sunlight, a powerful zeitgeber, risks further exacerbating the misalignment between adolescents' internal clock and the light-dark cycle.[79,80] For example, adolescents living in permanent DST in the Russian Federation had more social jet lag and higher rates of poor mood during winter.[81] The yearly transition to DST is also associated with sleep loss (~32 minutes on weeknights) and decreased cognitive performance.[82] It is unlikely that sleep and performance recover during the DST period. For example, before adopting daylight-saving time statewide, adolescents in DST regions of Indiana had poorer SAT scores compared with adolescents in permanent standard time regions of the same state.[83] Many studies also show an increase in vehicle and pedestrian accidents following the transition to DST (e.g.,[84]). The extent to which adolescents specifically contribute to the higher accident rates is unknown, but given that they are prone to more sleepiness[85] and sleep loss[82] following the shift to DST, it is reasonable to expect that accident rates also rise for adolescents.

Workforce

Adolescence often coincides with entering the workforce. In fact, adolescents and young adults comprise 13% of the workforce.[86] Employment is associated with many positive outcomes such as

increased autonomy and skills.[87,88] However, entering the workforce also introduces additional demands on time that could conflict with an adolescent's circadian clock to disrupt sleep. Policies on the number of hours permissible and when adolescents can work vary state-to-state and by industry, which can lead to disparate levels of protection.[89,90] Even as labor laws aim to protect against work-related injuries, these injuries are common among adolescents, where insufficient sleep further contributes to their risk for occupational injury.[91] Employment also potentially impacts sleep health by reducing the number of hours available for sleep.[92,93]

Transportation and traffic safety

In the United States, with adolescence comes the introduction of driving privileges, which brings about additional crash and injury risk to teens. Insufficient sleep increases the risk of unsafe driving behaviors and crashes that can impact teen drivers and others on the road. Motor vehicle crashes are the leading cause of death for adolescents of driving age[94] and 16- to 17-year-olds are more likely to have car crashes than 30- to 50-year-old drivers.[95] In fact, population data from NSF found that approximately 1 in 6 teen drivers, those who have gotten their license within 2 years, have driven while so tired that they had a hard time keeping their eyes open.[9] Circadian factors coupled with school commuting play a large role in teen crashes, with about half of crashes occurring in early morning hours or late at night.[96] When asked, most teens said school and work demands were the main reasons they do not get the sleep they need to drive alert.[9] These demands limit sleep opportunity that is necessary for alert driving, as teens ages 14-17 years require 8-10 hours of sleep per night.[1] Early school start times are another factor contributing to reduced sleep opportunity that indirectly affects driving. In fact, crash rates declined by more than 16% after one county delayed school start times.[97] Notably, it is important to understand other contributors to teen driving crashes, since a large proportion occurs on weekends, possibly due to increased likelihood of passengers and nighttime driving, which both significantly increase crash risk in teens.[98]

Inequity in sleep

Sleep health issues become more prevalent across all youth during adolescence; however, research across all age groups shows that the degree of sleep health disruptions is not equal across race, ethnicity, and social status.[99-101] For example, low socioeconomic status (SES) is linked to later bedtimes, less sleep, and more irregular sleep patterns among young adolescent youth.[102] Low neighborhood safety is also linked to components of poor sleep health.[103] Black youth have shorter sleep durations, more napping, and more sleep fragmentation compared with White youth and Hispanic youth have shorter sleep compared with non-Hispanic youth.[104] In short, racial, ethnic, and SES disparities in sleep health are well-documented.[104]

Improving disparities likely requires change to top-down, "upstream" policy-level strategies (e.g., later school start times, community-based interventions).[104] However, the impact of policy-level interventions on vulnerable groups is largely unknown. For example, two recent meta-analyses of school start times and sleep have had insufficient data to examine outcomes by race, ethnicity, and income or SES.[105,106] Two studies with a diverse cohort of teens found that later start times were associated with better sleep health, though typical weekday sleep duration still fell short of 8 hours per night.[107,108] It is also important to evaluate the potential for differential benefits of later school start times. For example, in a study of school start times and mental health, only students from high SES backgrounds had a reduction in depression symptoms following the implementation of later start time.[109] Thus, in addition to implementing later start times, other social, community, and individual strategies to address poor sleep health across disadvantaged youth should also be considered.

To that end, stress is a notable contributor to sleep health disparities in adolescence. The frequency and intensity of stress adolescents experience is not the same across groups and can contribute to different levels of sleep disruption. For example, Black youth and youth from low SES families have more stress and stressful life events.[110] Moreover, exposure to race-related discrimination, one salient source of stress, is linked to adverse health outcomes[111] and poor sleep.[112] Achieving adolescent sleep health equity likely requires addressing three unique sources of stress-related inequity.[113] First, *community and family resources* are strongly predictive of better outcomes and lower stress. Lower parental income, wealth, and resources are associated with more adolescent stress.[114] Adolescents with lower community or family financial support have greater exposure to violence and historical trauma.[115] Second, *institutions and systems* such as schools, health care, and child protective and juvenile justice systems can mitigate or exacerbate stress.[116,117] For example, juvenile detention facilities often maintain a "24-hour" day with lights on during the sleep period and restricted exposure to natural light, which is incompatible with adolescent sleep biology.[118] Marginalized youth are also over-represented in these institutional sources of stress and dysregulation.[119,120] Finally, *bias, stigma, and discrimination* from educators,[121] healthcare professionals,[122] and other authorities[123] contribute to differential treatment that increases stress and the associated likelihood of sleep problems among marginalized youth.[124]

Societal-level recommendations and action items

1. *Implement* appropriate school start times in middle and high schools (8:30 or later); *Identify* appropriate elementary start times.
2. Adopt permanent standard time.
3. Promote sleep's role in adolescents' work performance and driving safety with uniform regulations for work times.
4. Advance sleep health equity.
5. Engage youth and student stakeholders across all sleep health initiatives.

Rationale for implementing healthy adolescent school start times

Recommendations to start middle and high school at 8:30 or later are supported by a large literature.[71] Recommendations are less clear for elementary schools and additional studies with student populations from low SES families and marginalized groups are necessary. To ensure equitable implementation across communities, state and federal legislation may be required. California[125] is a recent example of legislature that requires later start times at the state level. Concerted effort is also required to address barriers to later school start time implementation, including increasing stakeholder knowledge about sleep health in adolescence and targeting concerns about initial costs, effects on other school meal programs and other activities, and general resistance to change.

Rationale for adopting permanent standard time

Beyond school start time, advocacy for permanent standard time is particularly critical for adolescents. Given the overwhelming evidence that DST is harmful for sleep and associated with detrimental outcomes across *all* ages, the position of the National Sleep Foundation,[126] is to adopt permanent standard time.

Rationale for emphasizing the benefits of work performance and driving safety with healthy sleep

Entering the workforce introduces opportunities for increased risk associated with poor sleep but also introduces opportunities for societal interventions. Encouraging collaboration between parents, employers, and insurers can address sleep-related challenges impacting performance and safety on the job. This can include joint

initiatives, resource-sharing, and coordinated efforts to promote better sleep health. For example, teen workers and their employers can benefit from programs highlighting the connection between adequate sleep and enhanced performance.

In the context of driving, insurers can play a pivotal role by offering reduced premiums or rewards for participating in sleep health promotion programs, incentivizing getting enough sleep to drive alert.[9] On the other hand, the risks associated with drowsy driving need to be elevated. Many teen crashes happen at night, and as such, there is some success with graduated licensing programs that restrict late-night driving. However, there are many exceptions, including for school. A collaborative, multistakeholder approach is necessary to address sleep-related issues with both adolescent work and driving activities.

Rationale for advancing adolescent sleep health equity

To promote sleep health equity across adolescents, societal and contextual environments must be addressed.[127] Later school start times are one policy/community-level change that could reduce inequity.[125] Other action items include creating community-based culturally responsive interventions to promote healthy sleep, ensuring interventions are implemented in historically underserved or marginalized adolescent groups. Furthermore, sleep disparities can be addressed by mitigating systemic contributions to higher stress in adolescents who come from historically marginalized communities. For instance, policies and programs that invest in communities reduce inequity in communities (i.e., SNAP [Supplemental Nutrition Assistance Program]) and could reduce financial burden and subsequent stress on teens to help improve sleep.[113] Vulnerable adolescents also interface with multiple systems (e.g., juvenile justice system, alternative schools, and substance use treatment facilities). Residential facilities can modify the environment to reduce harm to sleep and could potentially optimize sleep health. These examples highlight ways that higher-level policy decisions can have downstream effects on children's health and promote sleep health equity.

Rationale for involving youth and student stakeholders in all initiatives

The need to involve youth and student stakeholders is essential. Youth and student stakeholders are critical to sleep health research and promotion.[128] Lack of engagement in sleep health promotion efforts can occur when student interests are not prioritized.[129] But a sense of urgency and connectedness to healthy sleep among adolescents may be possible by establishing and engaging peer groups or youth committees and reaching students where they are (e.g., social media) to illustrate the costs and benefits of sleep health. There is already evidence that students are invested in obtaining more sleep and would like a role in their day-to-day scheduling. For example, high school student-led efforts to delay high school start times in one district were successful[130] and their approach is consistent with a developmental approach that prioritizes adolescent autonomy and self-determination.[28]

Limitations and future directions

Many experts and stakeholders convened at the NSF Adolescent Sleep Health Conference and represented diverse perspectives and expertise on adolescent sleep health. The format was intentional and led to discussion and consideration of lesser-known challenges that limit opportunities for optimal sleep health in adolescents and opportunities for sleep health promotions across various institutions that adolescents encounter. Continued involvement of experts and stakeholders will help identify new areas for promotional efforts. For example, the physical environment including bedrooms, housing, neighborhoods, and built environment all impact adolescent sleep health.[131] Mitigating the negative impact of environments not conducive to sleep should be explored. Individual health behaviors, such as exercise and nutrition, were also not discussed at the Conference and are not explicitly included in these recommendations but certainly impact sleep health and sleep-related behaviors. Lastly, although one adolescent stakeholder participated in the Conference and reviewed and approved the recommendations, more adolescent representation is optimal. Future initiatives should prioritize broader inclusion of adolescent stakeholders.

Conclusions

The NSF's Adolescent Sleep Health Conference convened multiple key stakeholders across disciplines to consider contextual factors across levels of developmental and social influence that can impact adolescent sleep health. Several opportunities for sleep health promotion were identified across individual (i.e., targeting rumination and respecting need to be valued), social (i.e., consider family context and schools as a source of guidance), and societal levels (i.e., policies on school start times) that could improve sleep health among adolescents. The collective input from educators, sleep experts, policy experts, youth, and physicians during this conference bolsters the underlying messaging: reversing the trajectory of suboptimal sleep health will require multistakeholder approaches, with the adolescent as the prominent stakeholder.

Author contributions

All authors materially contributed to the preparation of this article. Each author participated in the Adolescent Sleep Health Conference, contributed to the review of the literature, or was involved in drafting or revising the paper. All authors have read and approved the final version of the article.

Funding

None.

Declaration of Generative AI and AI-assisted technologies in the writing process

None.

Data availability

None.

Declaration of conflicts of interest

Dr Dzierzewski reports personal fees from Apnimed, outside the submitted work. Dr Dautovich reports personal fees from National Sleep Foundation. Dr Gunn reports grants from Eunice K. Shriver National Institute of Child and Human Development during paper preparation. Dr Hale reports personal fees from National Sleep Foundation, personal fees from Children and Screens Institute, personal fees from Idorsia. Dr Saletin reports grants from National Institute of Mental Health, grants from Eunice K. Shriver National Institute of Child and Human Development, and grants from National Institute of General Medical Sciences, during the conduct of the study. The remaining authors do not have anything to disclose. Given their roles as Sleep Health associate editors or editorial board members, Jared Saletin, Judith Owens, Wendy Troxel, Lauren Hale, Heather Gunn, and Natalie Dautovich had no involvement in the peer review of this article and have no access to information regarding its peer review. Full responsibility for the editorial process for this article was delegated to another journal editor. Joseph M. Dzierzewski is employed by the National Sleep Foundation. He had

no involvement in the peer review of this article and no access to information regarding its peer review.

Acknowledgments

The authors acknowledge the contributions from all the speakers and participants for their expertise and for their insightful perspectives on adolescent sleep.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.sleh.2026.01.002.

References

1. Hirshkowitz M, Whiton K, Albert SM, et al. National Sleep Foundation's sleep time duration recommendations: methodology and results summary. *Sleep Health J Natl Sleep Found.* 2015;1(1):40–43. https://doi.org/10.1016/j.sleh.2014.12.010
2. Ohayon M, Wickwire EM, Hirshkowitz M, et al. National Sleep Foundation's sleep quality recommendations: first report. *Sleep Health.* 2017;3(1):6–19. https://doi.org/10.1016/j.sleh.2016.11.006
3. Sletten TL, Weaver MD, Foster RG, et al. The importance of sleep regularity: a consensus statement of the National Sleep Foundation sleep timing and variability panel. *Sleep Health J Natl Sleep Found.* 2023;9(6):801–820. https://doi.org/10.1016/j.sleh.2023.07.016
4. Buysse DJ. Sleep health: can we define it? Does It matter? Published online January 1 *Sleep*. 2014. https://doi.org/10.5665/sleep.3298
5. Hartstein LE, Mathew GM, Reichenberger DA, et al. The impact of screen use on sleep health across the lifespan: a Nation al Sleep Foundation consensus statement. *Sleep Health J Natl Sleep Found.* 2024;10(4):373–384. https://doi.org/10.1016/j.sleh.2024.05.001
6. Meltzer LJ, Williamson AA, Mindell JA. Pediatric sleep health: it matters, and so does how we define it. *Sleep Med Rev.* 2021;57:101425. https://doi.org/10.1016/j.smrv.2021.101425
7. Knutson KL, Phelan J, Paskow MJ, et al. The National Sleep Foundation's Sleep Health Index. *Sleep Health.* 2017;3(4):234–240. https://doi.org/10.1016/j.sleh.2017.05.011
8. Shochat T, Cohen-Zion M, Tzischinsky O. Functional consequences of inadequate sleep in adolescents: a systematic review. *Sleep Med Rev.* 2014;18(1):75–87. https://doi.org/10.1016/j.smrv.2013.03.005
9. National Sleep Foundation. National Sleep Foundation's 2023 Drowsy Driving Survey - Risk Starts Early for Teen Drivers; 2023. Available at: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.thensf.org/wp-content/uploads/2023/11/NSF-2023-Drowsy-Driving-Survey-Report.pdf. Accessed July 17, 2024.
10. Dregan A, Armstrong D. Adolescence sleep disturbances as predictors of adulthood sleep disturbances–a cohort study. *J Adolesc Health.* 2010;46(5):482–487. https://doi.org/10.1016/j.jadohealth.2009.11.197
11. Ames ME, Leadbeater BJ, MacDonald SWS. Health behavior changes in adolescence and young adulthood: implications for cardiometabolic risk. *Health Psychol.* 2018;37(2):103–113. https://doi.org/10.1037/hea0000560
12. Gregory AM, Caspi A, Eley TC, Moffitt TE, O'Connor TG, Poulton R. Prospective longitudinal associations between persistent sleep problems in childhood and anxiety and depression disorders in adulthood. *J Abnorm Child Psychol.* 2005;33(2):157–163. https://doi.org/10.1007/s10802-005-1824-0
13. Shochat T, Cohen-Zion M, Tzischinsky O. Functional consequences of inadequate sleep in adolescents: a systemat ic review. *Sleep Med Rev.* 2014;18(1):75–87. https://doi.org/10.1016/j.smrv.2013.03.005
14. Owens J, Adolescent Sleep Working Group, Committee on Adolescence, et al. Insufficient sleep in adolescents and young adults: an update on causes and consequences. *Pediatrics.* 2014;134(3):e921–e932. https://doi.org/10.1542/peds.2014-1696
15. Short MA, Booth SA, Omar O, Ostlundh L, Arora T. The relationship between sleep duration and mood in adolescents: a systematic review and meta-analysis. *Sleep Med Rev.* 2020;52:101311. https://doi.org/10.1016/j.smrv.2020.101311
16. Healthy People 2020. Department of Health and Human Services, Office of Dease Prevention and Health Promotion.
17. Keyes KM, Maslowsky J, Hamilton A, Schulenberg J. The great sleep recession: changes in sleep duration among US adolescents, 1991-2012. *Pediatrics.* 2015;135(3):460–468. https://doi.org/10.1542/peds.2014-2707
18. Twenge JM, Krizan Z, Hisler G. Decreases in self-reported sleep duration among U.S. adolescents 2009-2015 and association with new media screen time. *Sleep Med.* 2017;39:47–53. https://doi.org/10.1016/j.sleep.2017.08.013
19. National Sleep Foundation. Sleep in America® Poll 2024; 2024. Available at: https://www.thensf.org/sleep-in-america-polls/. Accessed January 20, 2025..
20. Gradisar M, Gardner G, Dohnt H. Recent worldwide sleep patterns and problems during adolescence: a review and meta-analysis of age, region, and sleep. *Sleep Med.* 2011;12(2):110–118. https://doi.org/10.1016/j.sleep.2010.11.008
21. Jackson CL. Determinants of racial/ethnic disparities in disordered sleep and obesity. *Sleep Health.* 2017;3(5):401–415. https://doi.org/10.1016/j.sleh.2017.08.001
22. Sawyer SM, Azzopardi PS, Wickremarathne D, Patton GC. The age of adolescence. *Lancet Child Adolesc Health.* 2018;2(3):223–228. https://doi.org/10.1016/S2352-4642(18)30022-1
23. *Adolescent Sleep Patterns: Biological, Social, and Psychological Influences*. Cambridge, UK: Cambridge University Press; 2002: xvii, 297. doi:10.1017/CBO9780511499999.
24. Crowley SJ, Acebo C, Carskadon MA. Sleep, circadian rhythms, and delayed phase in adolescence. *Sleep Med.* 2007;8(6):602–612. https://doi.org/10.1016/j.sleep.2006.12.002
25. Hansen M, Janssen I, Schiff A, Zee PC, Dubocovich ML. The impact of school daily schedule on adolescent sleep. *Pediatrics.* 2005;115(6):1555–1561. https://doi.org/10.1542/peds.2004-1649
26. Dahl RE, Allen NB, Wilbrecht L, Suleiman AB. Importance of investing in adolescence from a developmental science perspective. *Nature.* 2018;554(7693):441–450. https://doi.org/10.1038/nature25770
27. Fuligni AJ. The need to contribute during adolescence. *Perspect Psychol Sci.* 2019;14(3):331–343. https://doi.org/10.1177/1745691618805437
28. Yeager DS, Dahl RE, Dweck CS. Why interventions to influence adolescent behavior often fail but could succeed. *Perspect Psychol Sci.* 2018;13(1):101–122. https://doi.org/10.1177/1745691617722620
29. Vernon L, Barber BL, Modecki KL. Adolescent problematic social networking and school experiences: the mediating effects of sleep disruptions and sleep quality. *Cyberpsychol Behav Soc Netw.* 2015;18(7):386–392. https://doi.org/10.1089/cyber.2015.0107
30. McMakin DL, Ricketts EJ, Forbes EE, et al. Anxiety treatment and targeted sleep enhancement to address sleep disturbance in pre/early adolescents with anxiety. *J Clin Child Adolesc Psychol.* 2019;48(sup 1):S284–S297. https://doi.org/10.1080/15374416.2018.1463534
31. Beveridge RM, Berg CA. Parent-adolescent collaboration: an interpersonal model for understanding optimal interactions. *Clin Child Fam Psychol Rev.* 2007;10(1):25–52. https://doi.org/10.1007/s10567-006-0015-z
32. Ewing EL, Mackaronis JE, Poole EM, Critchfield KL, Gunn HE. An interpersonal and meta-analytic approach to parenting behaviors and adolescent sleep. *Clin Child Fam Psychol Rev.* 2024;27(4):1088–1112. https://doi.org/10.1007/s10567-024-00504-4
33. Lo JCY, Koa TB, Ong JL, Gooley JJ, Chee MWL. Staying vigilant during recurrent sleep restriction: dose-response effects of time-in-bed and benefits of daytime napping. *Sleep.* 2022;45(4):zsac023. https://doi.org/10.1093/sleep/zsac023
34. Lunsford-Avery JR, Krystal AD, Kollins SH. Sleep disturbances in adolescents with ADHD: a systematic review and framework for future research. *Clin Psychol Rev.* 2016;50:159–174. https://doi.org/10.1016/j.cpr.2016.10.004
35. Saletin JM, Jackvony S, Rodriguez KA, Dickstein DP. A coordinate-based meta-analysis comparing brain activation between attention deficit hyperactivity disorder and total sleep deprivation. *Sleep.* 2019;42(3):zsy251. https://doi.org/10.1093/sleep/zsy251
36. Saletin JM, Mason GM, de Queiroz Campos G, et al. Preliminary evidence of brain and behavioral consequences of sleep loss in children and their association with ADHD traits. Published online April 19 *Sleep*. 2025:zsaf097. https://doi.org/10.1093/sleep/zsaf097
37. Prehn-Kristensen A, Molzow I, Munz M, et al. Sleep restores daytime deficits in procedural memory in children with attention-deficit/hyperactivity disorder. *Res Dev Disabil.* 2011;32(6):2480–2488. https://doi.org/10.1016/j.ridd.2011.06.021
38. Vargas C, Paoletti D, De Stasio S, Berenguer C. Sleep disturbances in autistic children and adolescents: a systematic review and meta-analysis of randomized controlled trials. *Autism.* 2025;29(7):1661–1673. https://doi.org/10.1177/13623613251319391
39. Lunsford-Avery JR, Krystal AD, Kollins SH. Sleep disturbances in adolescents with ADHD: a systematic review and f ramework for future research. *Clin Psychol Rev.* 2016;50:159–174. https://doi.org/10.1016/j.cpr.2016.10.004
40. Graupensperger S, Fairlie AM, Vitiello MV, et al. Daily-level effects of alcohol, marijuana, and simultaneous use on young adults' perceived sleep health. *Sleep.* 2021;44(12):zsab187. https://doi.org/10.1093/sleep/zsab187
41. Babson KA, Bonn-Miller MO. Sleep disturbances: implications for cannabis use, cannabis use cessation, and cannabis use treatment. *Curr Addict Rep.* 2014;1(2):109–114. https://doi.org/10.1007/s40429-014-0016-9
42. Meyrel M, Rolland B, Geoffroy PA. Alterations in circadian rhythms following alcohol use: a systematic review. *Prog Neuropsychopharmacol Biol Psychiatry.* 2020;99:109831. https://doi.org/10.1016/j.pnpbp.2019.109831
43. Burke TM, Markwald RR, McHill AW, et al. Effects of caffeine on the human circadian clock in vivo and in vitro. 305ra146 *Sci Transl Med.* 2015;7(305) https://doi.org/10.1126/scitranslmed.aac5125
44. Reichert CF, Veitz S, Bühler M, et al. Wide awake at bedtime? Effects of caffeine on sleep and circadian timing in male adolescents - a randomized crossover trial. *Biochem Pharmacol.* 2021;191:114283. https://doi.org/10.1016/j.bcp.2020.114283
45. Hasler BP, Pedersen SL. Sleep and circadian risk factors for alcohol problems: a brief overview and proposed mechanisms. *Curr Opin Psychol.* 2020;34:57–62. https://doi.org/10.1016/j.copsyc.2019.09.005
46. Hasler BP, Graves JL, Wallace ML, et al. Self-reported sleep and circadian characteristics predict alcohol and cannabis use: a longitudinal analysis of the National Consortium on Alcohol and Neurodevelopment in Adolescence Study. *Alcohol Clin Exp Res.* 2022;46(5):848–860. https://doi.org/10.1111/acer.14808
47. Troxel WM, Rodriguez A, Seelam R, et al. Longitudinal associations of sleep problems with alcohol and cannabis use from adolescence to emerging adulthood. *Sleep.* 2021;44(10):zsab102. https://doi.org/10.1093/sleep/zsab102
48. Haynie DL, Lewin D, Luk JW, et al. Beyond sleep duration: bidirectional associations among chronotype, social jetlag, and drinking behaviors in a

longitudinal sample of US high school students. zsx202 *Sleep.* 2018;41(2) https://doi.org/10.1093/sleep/zsx202
49. Miller MB, Janssen T, Jackson KM. The prospective association between sleep and initiation of substance use in young adolescents. *J Adolesc Health.* 2017;60(2):154–160. https://doi.org/10.1016/j.jadohealth.2016.08.019
50. Goodhines PA, Gellis LA, Kim J, Fucito LM, Park A. Self-medication for sleep in college students: concurrent and prospective associations with sleep and alcohol behavior. *Behav Sleep Med.* 2019;17(3):327–341. https://doi.org/10.1080/15402002.2017.1357119
51. Terry-McElrath YM, O'Malley PM, Johnston LD. Energy drinks, soft drinks, and substance use among US secondary school students. *J Addict Med.* 2014;8(1):6–13. https://doi.org/10.1097/01.ADM.0000435322.07020.53
52. Taylor DJ, Bramoweth AD. Patterns and consequences of inadequate sleep in college students: substance use and motor vehicle accidents. *J Adolesc Health.* 2010;46(6):610–612. https://doi.org/10.1016/j.jadohealth.2009.12.010
53. Drazdowski TK, Kliewer WL, Marzell M. College students' using marijuana to sleep relates to frequency, problematic use, and sleep problems. *J Am Coll Health.* 2021;69(1):103–112. https://doi.org/10.1080/07448481.2019.1656634
54. Fucito LM, DeMartini KS, Hanrahan TH, Whittemore R, Yaggi HK, Redeker NS. Perceptions of heavy-drinking college students about a sleep and alcohol health intervention. *Behav Sleep Med.* 2015;13(5):395–411. https://doi.org/10.1080/15402002.2014.919919
55. Hasler B, Buysse D, Ngari W, Franzen P. 0821 Successful sleep extension and phase advance in adolescents in response to a pilot sleep/circadian manipulation. *Sleep.* 2019;42:A329–A330. https://doi.org/10.1093/sleep/zsz067.819
56. Boergers J, Gable CJ, Owens JA. Later school start time is associated with improved sleep and daytime functioning in adolescents. *J Dev Behav Pediatr.* 2014;35(1):11–17. https://doi.org/10.1097/DBP.0000000000000018
57. Hale L, Guan S. Screen time and sleep among school-aged children and adolescents: a systematic literature review. *Sleep Med Rev.* 2015;21:50–58. https://doi.org/10.1016/j.smrv.2014.07.007
58. Baker AE, McMakin DL. Sleep and neuroaffective development from early to late adolescence. *Annu Rev Dev Psychol.* 2024;6(1):323–350. https://doi.org/10.1146/annurev-devpsych-010923-093914
59. Blunden S, Rigney G. Lessons learned from sleep education in schools: a review of dos and don'ts. *J Clin Sleep Med.* 2015;11(6):671–680. https://doi.org/10.5664/jcsm.4782
60. Gunn HE, Eberhardt KR. Family dynamics in sleep health and hypertension. *Curr Hypertens Rep.* 2019;21(5):39. https://doi.org/10.1007/s11906-019-0944-9
61. Brand S, Gerber M, Hatzinger M, Beck J, Holsboer-Trachsler E. Evidence for similarities between adolescents and parents in sleep patterns. *Sleep Med.* 2009;10(10):1124–1131. https://doi.org/10.1016/j.sleep.2008.12.013
62. Dahl RE, Lewin DS. Pathways to adolescent health sleep regulation and behavior. *J Adolesc Health.* 2002;31(6 suppl):175–184. https://doi.org/10.1016/s1054-139x(02)00506-2
63. Tsai KM, Dahl RE, Irwin MR, et al. The roles of parental support and family stress in adolescent sleep. *Child Dev.* 2018;89(5):1577–1588. https://doi.org/10.1111/cdev.12917
64. Schønning V, Sivertsen B, Hysing M, Dovran A, Askeland KG. Childhood maltreatment and sleep in children and adolescents: a systematic review and meta-analysis. *Sleep Med Rev.* 2022;63:101617. https://doi.org/10.1016/j.smrv.2022.101617
65. El-Sheikh M, Buckhalt JA, Mark Cummings E, Keller P. Sleep disruptions and emotional insecurity are pathways of risk for children. *Child Psychol Psychiatry.* 2007;48(1):88–96. https://doi.org/10.1111/j.1469-7610.2006.01604.x
66. Bai S, Buxton OM, Master L, Hale L. Daily associations between family interaction quality, stress, and objective sleep in adolescents. *Sleep Health.* 2022;8(1):69–72. https://doi.org/10.1016/j.sleh.2021.11.006
67. Gonzalez-Suarez C, Worley A, Grimmer-Somers K, Dones V. School-based interventions on childhood obesity: a meta-analysis. *Am J Prev Med.* 2009;37(5):418–427. https://doi.org/10.1016/j.amepre.2009.07.012
68. Kriemler S, Meyer U, Martin E, van Sluijs EMF, Andersen LB, Martin BW. Effect of school-based interventions on physical activity and fitness in children and adolescents: a review of reviews and systematic update. *Br J Sports Med.* 2011;45(11):923–930. https://doi.org/10.1136/bjsports-2011-090186
69. Minges KE, Redeker NS. Delayed school start times and adolescent sleep: a systematic review of the experimental evidence. *Sleep Med Rev.* 2016;28:86–95. https://doi.org/10.1016/j.smrv.2015.06.002
70. Smith JP, Hardy ST, Hale LE, Gazmararian JA. Racial disparities and sleep among preschool aged children: a systematic review. *Sleep Health.* 2019;5(1):49–57. https://doi.org/10.1016/j.sleh.2018.09.010
71. National Sleep Foundation. Healthy Adolescent School Start Times: A Sleep Health Policy Statement from the National Sleep Foundation; 2022. Available at: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.thensf.org/wp-content/uploads/2021/08/NSF-Sleep-Health-Policy-Statement_School-Start-Times.pdf. Accessed July 17, 2024.
72. Carskadon MA, Wolfson AR, Acebo C, Tzischinsky O, Seifer R. Adolescent sleep patterns, circadian timing, and sleepiness at a transition to early school days. *Sleep.* 1998;21(8):871–881. https://doi.org/10.1093/sleep/21.8.871
73. Koscec Bjelajac A, Bakotic M, Ross B. Weekly alternation of morning and afternoon school start times: implications for sleep and daytime functioning of adolescents. *Sleep.* 2020;43(8):zsaa030. https://doi.org/10.1093/sleep/zsaa030
74. Nahmod NG, Lee S, Master L, Chang AM, Hale L, Buxton OM. Later high school start times associated with longer actigraphic sleep duration in adolescents. *Sleep.* 2018;42(2):zsy212. https://doi.org/10.1093/sleep/zsy212
75. Hafner M, Stepanek M, Troxel WM. The economic implications of later school start times in the United States. *Sleep Health.* 2017;3(6):451–457. https://doi.org/10.1016/j.sleh.2017.08.007
76. Crater P. Adolescent Sleep in Context of School Athletics and Activities; 2022.
77. Wahlstrom KL, Plog AE, McNally J, Meltzer LJ. Impact of changing school start times on teacher sleep health and daytime functioning. *J Sch Health.* 2023;93(2):128–134. https://doi.org/10.1111/josh.13254
78. Meltzer LJ, Wahlstrom KL, Plog AE, McNally J. Impact of changing school start times on parent sleep. *Sleep Health.* 2022;8(1):130–134. https://doi.org/10.1016/j.sleh.2021.08.003
79. Malow BA. It is time to abolish the clock change and adopt permanent standard time in the United States: a Sleep Research Society position statement. *Sleep.* 2022;45(12):zsac236. https://doi.org/10.1093/sleep/zsac236
80. Kim S, Casement MD. Promoting adolescent sleep and circadian function: a narrative review on the importance of daylight access in schools. *Chronobiol Int.* 2024;41(5):725–737. https://doi.org/10.1080/07420528.2024.2341156
81. Borisenkov MF, Tserne TA, Panev AS, et al. Seven-year survey of sleep timing in Russian children and adolescents: chronic 1-h forward transition of social clock is associated with increased social jetlag and winter pattern of mood seasonality. *Biol Rhythm Res.* 2017;48(1):3–12. https://doi.org/10.1080/09291016.2016.1223778
82. Medina D, Ebben M, Milrad S, Atkinson B, Krieger AC. Adverse effects of daylight saving time on adolescents' sleep and vigilance. *J Clin Sleep Med.* 2015;11(08):879–884. https://doi.org/10.5664/jcsm.4938
83. Gasky J, Sagarin J. Detrimental effects of daylight-saving time on SAT scores. *J Neurosci Psychol Econ.* 2011;4(1):44–53.
84. Fritz J, VoPham T, Wright KP, Vetter C. A chronobiological evaluation of the acute effects of daylight saving time on traffic accident risk. *Curr Biol.* 2020;30(4):729–735.e2. https://doi.org/10.1016/j.cub.2019.12.045
85. Schneider AM, Randler C. Daytime sleepiness during transition into daylight saving time in adolescents: are owls higher at risk? *Sleep Med.* 2009;10(9):1047–1050. https://doi.org/10.1016/j.sleep.2008.08.009
86. The Employed Labor Force Query System. US Department of Health and Human Services, CDC, National Institute for Occupational Safety and Health; 2020. Available at: https://wwwn.cdc.gov/Wisards/cps/default.aspx. Accessed January 20, 2025.
87. Usher AM, Breslin C, MacEachen E, et al. Employment and work safety among 12 to 14 year olds: listening to parents. *BMC Public Health.* 2014;14(1):1021. https://doi.org/10.1186/1471-2458-14-1021
88. Mortimer JT. The benefits and risks of adolescent employment. *Prev Res.* 2010;17(2):8–11.
89. State Labor Laws. DOL. May 16, 2025. Available at: https://www.dol.gov/agencies/whd/state. Accessed May 16, 2025.
90. Workers Under 18. DOL. May 16, 2025. Available at: https://www.dol.gov/general/topic/hiring/workersunder18. Accessed May 16, 2025.
91. Breslin C, Koehoorn M, Smith P, Manno M. Age related differences in work injuries and permanent impairment: a comparison of workers' compensation claims among adolescents, young adults, and adults. e10-e10 *Occup Environ Med.* 2003;60(9) https://doi.org/10.1136/oem.60.9.e10
92. Teixeira LR, Fischer FM, Lowden A. Sleep deprivation of working adolescents—a hidden work hazard. *Scand J Work Environ Health.* 2006;32(4):328–330.
93. Teixeira LR, Fischer Frida Marina, de Andrade Miriam Mendonça Morato, Louzada Fernando Mazzili, Nagai R. Sleep patterns of day-working, evening high-schooled adolescents of São Paulo, Brazil. *Chronobiol Int.* 2004;21(2):239–252. https://doi.org/10.1081/CBI-120037808
94.. National Vital Statistics System. National Center for Health Statistics wisqars.cdc.gov/fatal-leading
95. Tefft B. Rates of Motor Vehicle Crashes, Injuries, and Deaths in Relation to Driver Age, United States, 2014–2015. AAA Foundation for Traffic Safety.
96. Owens J, Dingus T, Guo F, et al. Prevalence of Drowsy Driving Crashes: Estimates from a Large-Scale Naturalistic Driving Study (Research Brief). AAA Foundation for Traffic Safety; 2018.
97. Danner F, Phillips B. Adolescent sleep, school start times, and teen motor vehicle crashes. *J Clin Sleep Med.* 2008;4(6):533–535.
98. Doherty ST, Andrey JC, MacGregor C. The situational risks of young drivers: the influence of passengers, time of day and day of week on accident rates. *Accid Anal Prev.* 1998;30(1):45–52. https://doi.org/10.1016/S0001-4575(97)00060-2
99. Etindele Sosso FA, Holmes SD, Weinstein AA. Influence of socioeconomic status on objective sleep measurement: a systematic review and meta-analysis of actigraphy studies. *Sleep Health.* 2021;7(4):417–428. https://doi.org/10.1016/j.sleh.2021.05.005
100. Johnson DA, Jackson CL, Williams NJ, Alcántara C. Are sleep patterns influenced by race/ethnicity - a marker of relative advantage or disadvantage? Evidence to date. *Nat Sci Sleep.* 2019;11:79–95. https://doi.org/10.2147/NSS.S169312
101. Grandner MA, Williams NJ, Knutson KL, Roberts D, Jean-Louis G. Sleep disparity, race/ethnicity, and socioeconomic position. *Sleep Med.* 2016;18:7–18. https://doi.org/10.1016/j.sleep.2015.01.020
102. Marco CA, Wolfson AR, Sparling M, Azuaje A. Family socioeconomic status and sleep patterns of young adolescents. *Behav Sleep Med.* 2011;10(1):70–80. https://doi.org/10.1080/15402002.2012.636298
103. Zeringue MM, Saini EK, Fuller-Rowell TE, Hinnant JB, El-Sheikh M. Neighborhood environment and adolescent sleep: the role of family socioeconomic status. *Sleep Med.* 2023;109:40–49. https://doi.org/10.1016/j.sleep.2023.06.014
104. Guglielmo D, Gazmararian JA, Chung J, Rogers AE, Hale L. Racial/ethnic sleep disparities in US school-aged children and adolescents: a review of the literature. *Sleep Health.* 2018;4(1):68–80. https://doi.org/10.1016/j.sleh.2017.09.005

105. Bowers JM, Moyer A. Effects of school start time on students' sleep duration, daytime sleepiness, and attendance: a meta-analysis. *Sleep Health.* 2017;3(6):423–431. https://doi.org/10.1016/j.sleh.2017.08.004
106. Yip T, Wang Y, Xie M, Ip PS, Fowle J, Buckhalt J. School start times, sleep, and youth outcomes: a meta-analysis. *Pediatrics.* 2022;149(6):e2021054068. https://doi.org/10.1542/peds.2021-054068
107. Nahmod NG, Lee S, Master L, Chang AM, Hale L, Buxton OM. Later high school start times associated with longer actigraphic sleep duration in adolescents. *Sleep.* 2018;42(2):zsy212. https://doi.org/10.1093/sleep/zsy212
108. Nahmod NG, Lee S, Buxton OM, Chang AM, Hale L. High school start times after 8:30 am are associated with later wake times and longer time in bed among teens in a national urban cohort study. *Sleep Health.* 2017;3(6):444–450. https://doi.org/10.1016/j.sleh.2017.09.004
109. Peltz JS, Buckhalt JA. Equal benefits? An examination of the potential consequences of later school start times for adolescents and their mental health. *J Sch Health.* 2022;92(3):309–315. https://doi.org/10.1111/josh.13127
110. Dowd JB, Palermo T, Chyu L, Adam E, McDade TW. Race/ethnic and socioeconomic differences in stress and immune function in The National Longitudinal Study of Adolescent Health. *Soc Sci Med.* 2014;115:49–55. https://doi.org/10.1016/j.socscimed.2014.06.011
111. Cave L, Cooper MN, Zubrick SR, Shepherd CCJ. Racial discrimination and child and adolescent health in longitudinal studies: a systematic review. *Soc Sci Med.* 2020;250:112864. https://doi.org/10.1016/j.socscimed.2020.112864
112. Yip T, Cheon YM, Wang Y, Cham H, Tryon W, El-Sheikh M. Racial disparities in sleep: associations with discrimination among ethnic/racial minority adolescents. *Child Dev.* 2020;91(3):914–931. https://doi.org/10.1111/cdev.13234
113. Hughes AJ, Gunn H, Siengsukon C, et al. Eliminating sleep health disparities and achieving health equity: seven areas for action in the Behavioral Sleep Medicine Community. *Behav Sleep Med.* 2023;21(5):633–645. https://doi.org/10.1080/15402002.2022.2149523
114. Brenner AB, Zimmerman MA, Bauermeister JA, Caldwell CH. Neighborhood context and perceptions of stress over time: an ecological model of neighborhood stressors and intrapersonal and interpersonal resources. *Am J Community Psychol.* 2013;51(3-4):544–556. https://doi.org/10.1007/s10464-013-9571-9
115. Andrews AR, Jobe-Shields L, López CM, et al. Polyvictimization, income, and ethnic differences in trauma-related mental health during adolescence. *Soc Psychiatry Psychiatr Epidemiol.* 2015;50(8):1223–1234. https://doi.org/10.1007/s00127-015-1077-3
116. Barnert ES, Perry R, Morris RE. Juvenile incarceration and health. *Acad Pediatr.* 2016;16(2):99–109. https://doi.org/10.1016/j.acap.2015.09.004
117. Henderson DX, DeCuir-Gunby J, Gill V. "It really takes a village": a socio-ecological model of resilience for prevention among economically disadvantaged ethnic minority youth. *J Prim Prev.* 2016;37(5):469–485. https://doi.org/10.1007/s10935-016-0446-3
118. Adornetti JP, Woodard KN, Nogales JM, et al. Sleep and circadian health in juvenile justice systems: a descriptive analysis. *Sleep Health.* 2023;9(6):876–881. https://doi.org/10.1016/j.sleh.2023.08.009
119. Elias M. The School-to-Prison Pipeline ⁞ Learning for Justice. January 11, 2013. Available at: https://www.learningforjustice.org/magazine/spring-2013/the-school-to-prison-pipeline⟩. Accessed December 10, 2024.
120. Jonnson MR, Bird BM, Li SMY, Viljoen JL. The prevalence of sexual and gender minority youth in the justice system: a systematic review and meta-analysis. *Crim Justice Behav.* 2019;46(7):999–1019. https://doi.org/10.1177/0093854819848803
121. Downey DB, Pribesh S. When race matters: teachers' evaluations of students' classroom behavior. *Sociol Educ.* 2004;77(4):267–282. https://doi.org/10.1177/003804070407700401
122. Goyal MK, Kuppermann N, Cleary SD, Teach SJ, Chamberlain JM. Racial disparities in pain management of children with appendicitis in emergency departments. *JAMA Pediatr.* 2015;169(11):996–1002. https://doi.org/10.1001/jamapediatrics.2015.1915
123. Brislin SJ, Choi M, Perkins ER, et al. Racial bias in school discipline and police contact: evidence from the Adolescent Brain Cognitive Development Social Development (ABCD-SD) Study. *J Am Acad Child Adolesc Psychiatry.* 2024;63(12):1225–1238. https://doi.org/10.1016/j.jaac.2024.01.018
124. Benner AD, Wang Y, Shen Y, Boyle AE, Polk R, Cheng YP. Racial/ethnic discrimination and well-being during adolescence: a meta-analytic review. *Am Psychol.* 2018;73(7):855–883. https://doi.org/10.1037/amp0000204
125. Ziporyn TD, Owens JA, Wahlstrom KL, et al. Adolescent sleep health and school start times: setting the research agenda for California and beyond. A research summit summary. *Sleep Health.* 2022;8(1):11–22. https://doi.org/10.1016/j.sleh.2021.10.008
126. Permanent Standard Time: A Position Statement from the National Sleep Foundation. National Sleep Foundation; 2021. Available at: https://www.thensf.org/wp-content/uploads/2024/03/NSF-Position-on-Permanent-Standard-Time_Final_.pdf. Accessed January 20, 2025.
127. Hale L, Troxel W, Buysse DJ. Sleep health: an opportunity for public health to address health equity. *Annu Rev Public Health.* 2020;41:81–99. https://doi.org/10.1146/annurev-publhealth-040119-094412
128. Levenson JC, Ford HA, Reyes ZMD, et al. Designing adolescent sleep interventions with stakeholder input. *Sleep Health.* 2021;7(5):581–587. https://doi.org/10.1016/j.sleh.2021.07.007
129. Vandendriessche A, Verloigne M, Boets L, et al. Psychosocial factors related to sleep in adolescents and their willingness to participate in the development of a healthy sleep intervention: a focus group study. *BMC Public Health.* 2022;22(1):1876. https://doi.org/10.1186/s12889-022-14278-3
130. Success for All - UCF School Start Time Initiative; 2018. Available at: https://www.youtube.com/watch?v=On3MLVfwZKU. Accessed May 16, 2025.
131. Mayne SL, Mitchell JA, Virudachalam S, Fiks AG, Williamson AA. Neighborhood environments and sleep among children and adolescents: a systematic review. *Sleep Med Rev.* 2021;57:101465. https://doi.org/10.1016/j.smrv.2021.101465