



# Student Health

## School Start Times

Education Commission of the States

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## Later School Start Times in Adolescence: Time for Change

*By Paul Kelley and Clark Lee*

School start times for adolescents in the United States are typically too early to be healthy for this age group. There is significant evidence from the research literature that early starts have serious negative impacts on students.

In particular, early education start times in adolescence cause chronic sleep deprivation, which damages both adolescents' education and health. Fortunately, chronic sleep deprivation is one of the more preventable public health issues facing the nation.

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### Key Takeaways

- 1. Research shows adolescents, driven to later wake/sleep times by their biological clocks, lose as much as an average of 2.7 hours of sleep on school days.***
  - 2. There is virtually unanimous agreement in the research community that later start times in adolescent education would produce a positive change in adolescent learning, health and safety.***
  - 3. Few, if any, educational interventions are so strongly supported by research evidence from so many different disciplines and experts in the field.***
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This briefing paper summarizes the latest research on the subject, explores policy options to address this education and public health issue, and sets forth the recommendation that education start times be adjusted appropriately for U.S. adolescents.

### Two Decades of Research

Adolescence starts with the onset of puberty and ends in the early 20s. During this period, adolescents are driven to later wake/sleep times by their biological clocks. Because education start times do not adjust for this change, early school start times effectively limit sleep in adolescents. Researchers have found that students lose as much as an average of 2.7 hours of sleep on school days.<sup>1</sup> This is why sleep loss in adolescence is greater than at any period in our lives.

Sleep loss associated with early school start times can damage adolescents' learning and health. Later starting times, by contrast, are associated with longer sleep, better learning and reduced health risks. Research from the past 20 years has consistently supported these findings.

Research from a variety of fields on different stages of adolescence consistently shows the positive effects of later starts. Recently, economists looking at existing school data where start times were changed for administrative reasons found similar positive improvements. Research found clear test

## ***The Adolescent Biological Clock***

*Our biological timing systems are determined by genes throughout the body. These timing systems are largely outside our control. A small group of cells, the suprachiasmatic nucleus (SCN), is the master clock in the human brain.*

*The SCN is our circadian (daily) pacemaker, controlling the timing of most 24-hour behavioral and physiological rhythms. These daily rhythms include the sleep-wake cycle, alertness and performance rhythms, hormone production, core body temperature regulation and metabolism. These natural rhythms cannot be trained to suit modern society. Despite all our technologies and timetables, our bodies continue to run on sun time, not clock time.*

*This biological clock changes our sleep patterns from the onset of puberty, slowly moving to later sleep/wake times until 20 or 21 years of age. During our late teens and early 20s, this biologically driven delay in our natural sleep/wake patterns reaches almost three hours. At that point, students in our schools and colleges can be losing two to three hours of sleep every night. This is why education start times requiring waking at 7 a.m. or earlier – which is like adults waking at 4 a.m. every day – cause chronic sleep loss. Losing sleep through the week on this scale leads to poorer academic achievement and increased health risks.*

score gains in middle school students (grades 6 to 8) when they had later start times, and the positive effect in 8<sup>th</sup>-grade scores remained two years later in grade 10.<sup>2</sup> Additional research examined data from the United States Air Force Academy and found that the earlier students had to start classes, the worse they did in those classes.<sup>3</sup> Moreover, the earlier students had their first class, the lower their achievement in all classes taken on the same day. Taken together, these two studies alone involved more than 10,000 students and findings in both studies were consistent over a number of years.

Later school times also are associated with other positive social outcomes. In a Minneapolis School District high schools study of later start times, parents were very positive about the later start time, with 92 percent liking the change. Parents also reported that their children were “easier to live with” and that families had “more conversation time.”<sup>4</sup>

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From our personal experience, we understand that several hours of sleep deprivation over several nights would impact anyone’s alertness and performance. These perceptions are clearly supported by scientific research. Even relatively moderate sleep restriction can seriously impair learning in healthy adolescents. For example, a 2013 study found that subjects restricted to six hours or less sleep per night produced cognitive performance deficits equivalent to up to two nights of total sleep deprivation.<sup>5</sup> Adequate sleep is particularly important in adolescent development. It is also important when adolescents are trying to form long-term memories because key memory processes occur during sleep. These are some of the reasons good sleep improves in-class attention, academic performance and test results in adolescents.

Sleep deprivation not only impacts learning but also increases risks of accidents and injuries and affects hormones and metabolism. Changing to later school start times has been shown to reduce car accidents involving adolescent drivers. There is also clinical evidence that sleep deprivation is a contributing factor to obesity, depressive illness and sleep disorders. Sleep-deprived adolescents (and adults) are more likely to resort to potentially risky behaviors to control sleep that include using sleep medications and depressants (including alcohol) at night and stimulants during the day (including coffee and other highly caffeinated drinks and smoking).

There is clear evidence that sleep deprivation poses health risks for millions of young adults and adolescents. In a study of 1.3 million cases starting from 16 years of age, research found short sleep duration per night was significantly associated with increased health risks.<sup>6</sup> The study concluded that modifications of working environments to allow sufficient sleep were highly desirable.

Given that many adolescents routinely lose more than two hours of sleep a night through early start times, it can be argued that adolescents are a particularly high-risk population for the numerous negative health outcomes associated with chronic sleep deprivation. For example, recent analysis based on July 2006 U.S. Census data estimated that more than 3 million adolescents and adults younger than 24 years of age are Delayed Sleep Phase types (as defined by the International Classification of Sleep Disorders).

There is virtually unanimous agreement in the research community that later start times in adolescent education would produce a positive change in adolescent learning, health and safety. Leading researchers in sleep medicine and sleep neuroscience have frequently called for this change in education start times to improve learning and reduce health risks. Few, if any, educational interventions are so strongly supported by research evidence from so many different disciplines and experts in the field.

## Considering Options for Change

Despite the substantial body of evidence from scientific, medical and education research supporting later school starts, almost all adolescent education in the United States currently has early start times. This leaves states, school districts and other responsible bodies in the untenable position of defending a current practice that has been demonstrated to be detrimental to student learning, health and safety. It seems prudent for these parties to demonstrate a greater awareness of the issues, engage with other stakeholders and consider some of the options for reasonable and appropriate changes.

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There are undoubtedly pragmatic reasons to avoid change. Changing community habits based on conventional wisdom can be difficult and needs to be handled confidently. Current early start times have determined timing of other activities (bus transportation and student athletics, for example) and organizers of these activities may resist change. Although most students (and increasingly parents) would support change, there will remain some who are opposed to it. These are not reasons, however, for stakeholders to avoid considering options for reasonable and appropriate changes to school start times.

There is a major shift in public knowledge and attitudes toward later start times. School districts are increasingly finding themselves compared to districts with later start times, and this has fuelled calls to take action in many communities. Enhancing public knowledge and securing the acknowledgement of key stakeholders on the demonstrated benefits of later school start times may be a prudent approach to keeping the issue in the forefront of the public's conscience. Normal risk management of change, including planning and preparing for implementation, needs to be in place in due course.

Another possible strategy is to simply act decisively to improve public schools by moving to later starts. Altering education times can be legitimately presented as a strategy to both improve learning and reduce health risks. This message, especially the potential reduction of risk for children, can be powerful for families. Indeed, evidence of consultations with families has shown positive responses from families and students once a change to later start times is implemented.

Finally, in an increasingly accountable education environment, a powerful means to increase test scores, reduce health risk and improve faster than other states or districts must have at least some appeal.

## Education Policy on Starting Times

While start times are typically set at the local level, leaders can help raise awareness of the overwhelming evidence that later starts are beneficial.

State support could take the form of briefing papers such as this one, or through sharing examples of successful approaches to the management of change. There are other preliminary steps that can be taken; for example, giving advice on improving the quality of sleep to students. Although biological drivers determine the extent of the shift to later wake/sleep times in adolescence, the impact on sleep can be made worse by use of screen technologies in the last hour before sleep (such as televisions, computers and phones). Sleep can be enhanced when bedroom temperatures are lower, and there are other ways to contribute to better quality sleep.

The current context is one in which there is a growing pressure to change to later start times for adolescent students. Of particular note is the 2009 U.S. House resolution calling for secondary schools to begin the school day no earlier than 9 a.m. Already, schools in the United Kingdom and New Zealand start at 10 a.m. or later for older adolescents, with strong positive impacts on achievement and behaviors. Many colleges already start at these times both in the United States and internationally.

### ***Political and Legislative Context***

*Public interest is growing in later school starts with organizations including the National Sleep Foundation and campaigns such as Start School Later taking a consistent line that change is necessary.*

*Legislative and policy proposals are increasing. Virginia and Massachusetts have considered new laws, and Maryland passed legislation related to later school start times recently. Action on a national level includes the House Concurrent Resolution 176 (2009), expressing the sense of the Congress that secondary schools should begin the school day no earlier than 9 a.m.*

*U.S. Secretary of Education Arne Duncan in 2013 tweeted "let teens sleep, start school later." He was no doubt aware the statement already had wider research and political support.*

The cost of implementing policies related to later start times is negligible. Later school start times can improve learning and reduce health risks. It is a change that is in the best interests of our students, families, communities and nation.

### ***About the Authors***

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## **Endnotes**

- <sup>1</sup> Hansen et al. 2005 <http://pediatrics.aappublications.org/content/115/6/1555.long>; Jenni et al. 2005 <http://www.journalsleep.org/Articles/281116.pdf>; Foster et al. 2013 <http://www.ncbi.nlm.nih.gov/pubmed/23899602>
- <sup>2</sup> Edwards, F. 2012. <http://eric.ed.gov/?id=EJ989056>
- <sup>3</sup> Carrell et al. 2011 <http://old.econ.ucdavis.edu/faculty/scarrell/sleep.pdf>
- <sup>4</sup> Center for Applied Research and Educational Improvement (CAREI). 2002. School start time study: Final Report Summary. (University of Minnesota)
- <sup>5</sup> Möller-Levet et al., 2013 <http://www.pnas.org/content/110/12/E1132>
- <sup>6</sup> Cappuccio et al. 2010. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2864873/>

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