**Research: A Literature Review of Evidence Regarding School Start Times**

<table>
<thead>
<tr>
<th>Research Summaries</th>
<th>Key Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changing Times: Findings from the First Longitudinal Study of Later High School</td>
<td>In reviewing longitudinal evidence related to delayed high school start time, researchers found significant benefits such as improved attendance and enrollment rates, less sleeping in class, and less student-reported depression.</td>
</tr>
<tr>
<td>Start Times</td>
<td></td>
</tr>
<tr>
<td>Wahlstrom, Kyla</td>
<td></td>
</tr>
<tr>
<td><em>NASSP Bulletin</em>, v86 n633 p3-21 2002</td>
<td></td>
</tr>
<tr>
<td>In the early 1990s, medical research found that teenagers have biologically different sleep and wake patterns than the preadolescent or adult population. On the basis of that information, in 1997 the seven comprehensive high schools in the Minneapolis Public School District shifted the school start time from 7:15 a.m. to 8:40 a.m. This article examines that change, finding significant benefits such as improved attendance and enrollment rates, less sleeping in class, and less student-reported depression. Policy implications are briefly discussed.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>School Start Time Change: An In-Depth Examination of School Districts in the United States</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Owens, Judith; Drobnich, Darrel; Baylor, Allison; Lewin, Daniel</td>
<td></td>
</tr>
<tr>
<td><em>Mind, Brain, and Education</em>, v8 n4 p182-213 Dec 2014</td>
<td></td>
</tr>
<tr>
<td>In response to the scientific evidence documenting both profound developmental changes in sleep and circadian biology during adolescence and the myriad of negative health, performance, and safety outcomes risks associated</td>
<td></td>
</tr>
</tbody>
</table>
during adolescence and the myriad of negative health, performance, and safety outcomes risks associated with chronic sleep loss, at least 70 public school districts in the United States, representing approximately 1,000 schools, have successfully implemented a delay in high school start times. However, despite the compelling evidence supporting school start time change as a key strategy in addressing the epidemic of adolescent sleep loss, many school districts across the country with early high school start times have not considered the option to implement later bell schedules for adolescents. Moreover, while the current scientific literature has clearly documented the positive "outcomes" associated with delayed high school start times, these studies contain limited information regarding the "process" by which school districts consider, approve and implement bell schedule changes. Thus, this in-depth examination of those school districts that have been successful in changing their bell schedules is intended to support the efforts of other districts in various stages of contemplating this measure. We utilized a multi-pronged approach (literature review, case studies, telephone interviews, online survey) to summarize the experiences of school districts across the United States in regard to challenges faced, strategies employed, and lessons learned in the hope that this information will be a useful tool for other school districts looking to chart a course forward to promote the health, safety, and academic opportunities of their students.


Kirby, Matthew; Maggi, Stefania; D'Angiulli, Amedeo

*Educational Researcher, v40 n2 p56-61 Mar 2011*

The authors have integrated the major findings on the sleep-wake cycle and its performance correlates in adolescents. Basic research shows that lack of synchronicity between early school start times and the circadian rhythm of adolescents (and with chronic sleep loss, at least 70 public school districts in the United States, representing approximately 1,000 schools, have successfully implemented a delay in high school start times. There is sufficient evidence that adolescent students would benefit from delaying school start times and that this change can be implemented with tolerable consequences if adequately strategized by school districts and communities.
the sleep debt accumulated as a result) involves several cognitive correlates that may harm the academic performance of adolescent students. The authors therefore examined findings from pilot interventions in which schools delayed their start times; specifically, they examined the effects on students, including potential pitfalls and strategies to consider for effective scheduling change. There is sufficient evidence that adolescent students would benefit from delaying school start times and that this change can be implemented with tolerable consequences if adequately strategized by school districts and communities.

School Start Times, Sleep, Behavioral, Health, and Academic Outcomes: A Review of the Literature

Wheaton, Anne G.; Chapman, Daniel P.; Croft, Janet B.

*Journal of School Health, v86 n5 p363-381 May 2016*

Insufficient sleep in adolescents has been shown to be associated with a wide variety of adverse outcomes, from poor mental and physical health to behavioral problems and lower academic grades. However, most high school students do not get sufficient sleep. Delaying school start times for adolescents has been proposed as a policy change to address insufficient sleep in this population and potentially to improve students' academic performance, reduce engagement in risk behaviors, and improve health. This article reviews 38 reports examining the association between school start times, sleep, and other outcomes among adolescent students. Most studies reviewed provide evidence that delaying school start time increases weeknight sleep duration among adolescents, primarily by delaying rise times. Most of the studies saw a significant increase in sleep duration even with relatively small delays in start times of half an hour or so. Later start times also generally correspond to improved attendance, less tardiness, less falling asleep in class, better grades, and fewer motor vehicle crashes. Although additional
research is necessary, research results that are already available should be disseminated to stakeholders to enable the development of evidence-based school policies.

<table>
<thead>
<tr>
<th>Earlier School Start Times as a Risk Factor for Poor School Performance: An Examination of Public Elementary Schools in the Commonwealth of Kentucky</th>
<th>Findings support the growing body of research showing how early school start times influence student learning.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keller, Peggy S.; Smith, Olivia A.; Gilbert, Lauren R.; Bi, Shuang; Haak, Eric A.; Buckhalt, Joseph A.</td>
<td></td>
</tr>
</tbody>
</table>

*Journal of Educational Psychology, v107 n1 p236-245 Feb 2015*

Adequate sleep is essential for child learning. However, school systems may inadvertently be promoting sleep deprivation through early school start times. The current study examines the potential implications of early school start times for standardized test scores in public elementary schools in Kentucky. Associations between early school start time and poorer school performance were observed primarily for schools serving few students who qualify for free or reduced-cost lunches. Associations were controlled for teacher-student ratio, racial composition, and whether the school was in the Appalachian region. Findings support the growing body of research showing that early school start times may influence student learning but offer some of the first evidence that this influence may occur for elementary school children and depend on school characteristics.

<table>
<thead>
<tr>
<th>Setting Adolescents up for Success: Promoting a Policy to Delay High School Start Times</th>
<th>This paper outlines the impact of chronic inadequate sleep on poor academic performance including executive function impairments, mood, and behavioral issues, as well as adverse health outcomes such as an increased risk of obesity.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barnes, Margaux; Davis, Krista; Mancini, Mackenzie; Ruffin, Jasmine; Simpson, Tina; Casazza, Krista</td>
<td></td>
</tr>
</tbody>
</table>

*Journal of School Health, v86 n7 p552-557 Jul 2016*

A unique biological shift in sleep cycles occurs during adolescence causing later sleep and wake times. This shift is not matched by a concurrent modification in school start times,
resulting in sleep curtailment for a large majority of adolescents. Chronic inadequate sleep is associated with poor academic performance including executive function impairments, mood, and behavioral issues, as well as adverse health outcomes such as an increased risk of obesity, hypertension, and cardiovascular disease. In order to address sleep deficits and the potential negative outcomes associated with chronic sleep deprivation, the American Academy of Pediatrics (AAP) and US Centers for Disease Control and Prevention (CDC) support delaying school start times for middle and high school students. Researchers summarize current evidence, explicate the need for policy change, and urge school districts to put adolescent students' health as top priority and implement school start times consistent with their developmental needs. Whereas substantial evidence illustrating adverse consequences of inadequate sleep on psychological and physical health, and recommendations exist to adapt daytime school schedules to match sleep needs have been released, actual implementation of these recommendations have been limited.

School Start Time, Sleepiness and Functioning in Norwegian Adolescents

Vedaa, Oystein; Saxvig, Ingvild West; Wilhelmsen-Langeland, Ane; Bjorvatn, Bjorn; Pallesen, Stale


The study's aim was to investigate how school start time affects sleepiness and functioning in Norwegian 10th grade students (N = 106). The intervention school started at 0930 hours on Mondays and 0830 hours the rest of the week. A control school started at 0830 hours all schooldays. The students were assessed on a reaction time test as well as with self-report measures of sleepiness, mood and sleep. The intervention school obtained one hour longer total sleep time on Sunday nights compared to

hypertension, and cardiovascular disease.
the control school and performed better on the reaction time test on Mondays than on Fridays, relative to the control school.

Later Education Start Times in Adolescence: Time for Change
Kelley, Paul; Lee, Clark

_Education Commission of the States_

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. This brief report 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.

Do Schools Begin Too Early?
Edwards, Finley

_Education Next, v12 n3 p52-57 Sum 2012_

School start times vary considerably, both across the nation and within individual communities, with some schools beginning earlier than 7:30 a.m. and others after 9:00 a.m. Proponents of later start times, who have received considerable media attention in recent years, argue that many students who have to wake up early for school do not get enough sleep and that beginning the school day at a later time would boost their achievement. A number of school districts have responded by delaying the start of their school day, and a 2005 congressional resolution introduced by Rep. Zoe Lofgren (D-CA) recommended that secondary schools nationwide start at 9:00 or later. Despite this

This brief report summarizes the latest research on the later school start times, 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.

The author finds that delaying school start times by one hour, from roughly 7:30 to 8:30, increases standardized test scores by at least 2 percentile points in math and 1 percentile point in reading. The effect is largest for students with below-average test scores, suggesting that later start times would narrow gaps in student achievement.
attention, there is little rigorous evidence directly linking school start times and academic performance. In this study, the author uses data from Wake County, North Carolina, to examine how start times affect the performance of middle school students on standardized tests. The author finds that delaying school start times by one hour, from roughly 7:30 to 8:30, increases standardized test scores by at least 2 percentile points in math and 1 percentile point in reading. The effect is largest for students with below-average test scores, suggesting that later start times would narrow gaps in student achievement.

**Early to Rise? The Effect of Daily Start Times on Academic Performance**

Edwards, Finley

*Economics of Education Review*, v31 n6 p970-983 Dec 2012

Local school districts often stagger daily start times for their schools in order to reduce busing costs. This paper uses data on all middle school students in Wake County, NC from 1999 to 2006 to identify the causal effect of daily start times on academic performance. Using variation in start times within schools over time, the effect is a two percentile point gain in math test scores -- roughly fourteen percent of the black-white test score gap. There were similar results for reading scores and using variation in start times across schools. The effect is stronger for students in the lower end of the distribution of test scores. There is evidence supporting increased sleep as a mechanism through which start times affect test scores. Later start times compare favorably on cost grounds to other education interventions which result in similar test score gains.

**A Survey of Factors Influencing High School Start Times**

Wolfson, Amy R.; Carskadon, Mary A.

*NASSP Bulletin*, v89 n642 p47-66 2005

Of those schools in which start time changes were contemplated, 32% noted concerns about teenagers'
The present study surveyed high school personnel regarding high school start times, factors influencing school start times, and decision making around school schedules. Surveys were analyzed from 345 secondary schools selected at random from the National Center for Educational Statistics database. Factors affecting reported start times included economic background of the students, number of bus tiers, and school size. Most schools had not contemplated changing or changed their school start times. Of those schools in which changes were contemplated, 32% noted concerns about teenagers' sleep needs and about 50% of the respondents endorsed possible positive outcomes, such as lower tardiness and absenteeism rates. Perceived barriers to changing school schedules commonly endorsed included sports practices, after-school activities, and the transportation system. Approximately 50% of respondents indicated that sleep is included in their district's high school health or biology course offerings.

<table>
<thead>
<tr>
<th>Meeting Teen Sleep Needs Creatively</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wolfson, Amy R.; Carskadon, Mary A.</td>
</tr>
</tbody>
</table>

*Education Digest: Essential Readings Condensed for Quick Review, v71 n1 p47-51 Sep 2005*

Research on the sleep needs of adolescents and the influence of sleep on learning and behavior have captured the interest of school districts nationwide and in other countries as well. As a result, school officials are being urged to acknowledge the evidence and to adjust school schedules accordingly (e.g., to delay high school start times). The authors surveyed high school personnel on high school start times, factors influencing school start times, and decision making around school schedules. Surveys were analyzed from secondary schools selected at random from the National Center for Educational Statistics database. The final data set includes 345 surveys from "regular" public schools serving grades 9-12 for which data at least back to the 1986-87 school year were available. The result of the

sleep needs and about 50% of the respondents endorsed possible positive outcomes, such as lower tardiness and absenteeism rates. Perceived barriers to changing school schedules commonly endorsed included sports practices, after-school activities, and the transportation system.

This paper highlights survey results indicating recommended creative solutions that will allow for increased sleep, quality education, and co-curricular activity time for high-school students.
Surveys and some recommended creative solutions that will allow for sleep and quality education and co-curricular activity time for high-school students are presented in this article.

<table>
<thead>
<tr>
<th>Table Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleep Duration, Positive Attitude toward Life, and Academic Achievement: The Role of Daytime Tiredness, Behavioral Persistence, and School Start Times</td>
<td>In this study, daytime tiredness and behavioral persistence mediated the relationship between short sleep duration and positive attitude toward life and school grades. Students who started school 20 min later received reliably more sleep and reported less tiredness.</td>
</tr>
<tr>
<td>Perkinson-Gloor, Nadine; Lemola, Sakari; Grob, Alexander</td>
<td>Journal of Adolescence, v36 n2 p311-318 Apr 2013</td>
</tr>
<tr>
<td>Sleep timing undergoes profound changes during adolescence, often resulting in inadequate sleep duration. The present study examines the relationship of sleep duration with positive attitude toward life and academic achievement in a sample of 2716 adolescents in Switzerland (mean age: 15.4 years, SD = 0.8), and whether this relationship is mediated by increased daytime tiredness and lower self-discipline/behavioral persistence. Further, we address the question whether adolescents who start school modestly later (20 min; n = 343) receive more sleep and report better functioning. Sleeping less than an average of 8 h per night was related to more tiredness, inferior behavioral persistence, less positive attitude toward life, and lower school grades, as compared to longer sleep duration. Daytime tiredness and behavioral persistence mediated the relationship between short sleep duration and positive attitude toward life and school grades. Students who started school 20 min later received reliably more sleep and reported less tiredness. (Contains 3 tables and 1 figure.)</td>
<td></td>
</tr>
<tr>
<td>Organizing Schools to Improve Student Achievement: Start Times, Grade Configurations, and Teacher Assignments. Discussion</td>
<td>Authors estimate that the ratio of school performance benefits to costs of delayed school start times is 9 to 1.</td>
</tr>
<tr>
<td>Jacob, Brian A.; Rockoff, Jonah E.</td>
<td>Brookings Institution</td>
</tr>
</tbody>
</table>
This paper describes organizational reforms that recent evidence suggests have the potential to increase K-12 student performance, including starting school later in the day for adolescent students.

Additional Reference Articles:
http://www.edudemic.com/case-starting-schools-later/
http://www.startschoollater.net/
http://www.educationworld.com/a_admin/admin/admin314.shtml

Other recommended articles and resources to help document improved academic achievement, improved attendance and improved health for adolescent/teen students.

### Athletics: Big 12 Illinois High School Conference Start and End Times

- Manual – 7:30 am start, 2:30 end time
- Peoria Central – 7:30 am start, 2:30 end time
- Richwoods – 7:30 am start, 2:30 end time
- Bloomington – 7:30 am start, 2:15 end time
- Urbana – 8 am start, 3:16 end time, weekly Wednesday early end time 2:26 (same 8 am start time)
- Champaign Central – 8:05 am start, weekly Wednesday late start @ 8:50 am, 3:18 end time
- Centennial (Champaign) – 8:10 am start, 3:18 end time. Wednesday late start 8:50 am
- Danville – Starting 1/4/17: 8:25 am start, 7:30 am zero hour
- Normal Community – 8:30 am start, 3:30 end time, 7:35 am zero hour, late start 9:30 am
- Normal Community West – 8:30 am start, 3:30 end time, 7:35 am zero hour, late start 9:30 am
- Peoria Notre Dame – 8:30 am start, 3:30 end time