Dear Members of the Westport Board of Education:

As health professionals working in Connecticut who are concerned about the adverse effects of chronic sleep deficits in teenagers, we strongly endorse the policy statements of the American Academy of Pediatrics ("AAP"), American Medical Association ("AMA"), and the Centers for Disease Control and Prevention ("CDC"), which provide that middle and high schools should start at 8:30 a.m. or later. These policy statements are grounded in a broad medical and scientific consensus about the importance of sleep to adolescents and the biological changes that occur to adolescent sleep cycles when children enter puberty. At this time, adolescents' biological clocks shift later so that it is difficult to fall asleep before 11:00 p.m., even with the best sleep hygiene.

The AAP describes a school start time of no earlier than 8:30 a.m. for adolescents as "an effective countermeasure to chronic sleep loss" that "has a wide range of potential benefits to students with regard to physical and mental health, safety, and academic achievement." Data shows that starting school at 8:30 a.m. or later leads to better academic performance, better sports performance, better mental and physical health, fewer motor vehicle accidents, and fewer sports injuries. The academy notes in an accompanying technical report a nearly threefold increase in the risk of suicide attempts among adolescents who sleep less than eight hours per night, even when controlling for confounding factors. This data underscores the potential seriousness of this issue. The policy statement concludes that "both the urgency and the magnitude of the problem of sleep loss in adolescents and the availability of an intervention that has the potential to have broad and immediate effects are highly compelling."

We would also point out that the CDC policy statement in support of later start times explains that, "among the possible public health interventions for increasing sufficient sleep among adolescents, delaying school start times has the potential for the greatest population impact (emphasis added) by changing the environmental context for students in entire school districts."

We agree with these conclusions and endorse the AAP, AMA, and CDC's recommendations. We view moving secondary school start times to 8:30 a.m. or later to be a practical and necessary public health measure.

Very truly yours: Signatures as of July 20, 2017

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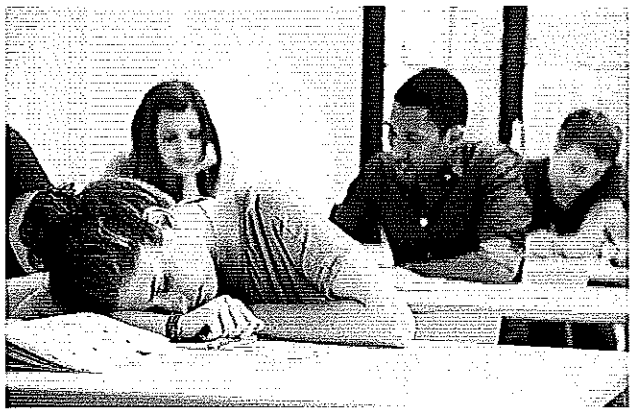
POSITION STATEMENT:

Start Middle and High Schools at 8:30 a.m. or Later to Promote Student Health and Learning

(NOVEMBER 2017) Tracy Trevorrow, PhD, Chaminade University, Honolulu, HI; Eric S. Zhou, PhD, Harvard University, Boston, MA; Jessica R. Dietch, MS, University of North Texas, Denton, TX; and Brian D. Gonzalez, PhD, Moffitt Cancer Center, Tampa, FL

The Society of Behavioral Medicine recommends school officials start middle and high school classes at 8:30 a.m. or later. Such a schedule promotes students' sleep, resulting in improvements in physical health, psychological well-being, attention and concentration, academic performance, and driving safety.



As a consequence of puberty, teenagers are biologically driven to have later sleep and wake-up times than younger children.[1] Most middle and high schools in the United States start well before 8:30 a.m., which is too early to accommodate for this shift in sleep patterns and contributes to a nation of chronically sleep-deprived students.[2] Inadequate sleep results in compromised physical health, emotional and behavioral problems, and reduced ability to perform and learn.[3-6] Starting schools early may be intended to accommodate adult considerations such as bus schedules, parents' work schedules, and the use of athletic facilities; these issues have not been problematic for schools with later star times.[7]

The American Academy of Sleep Medicine, the American Academy of Pediatrics, and the American Medical Association recommend middle and high schools start no earlier than 8:30 a.m.[8-10] However, only about 15% of U.S. public high schools start at 8:30 a.m. or later.[11] For decades, starting school after 8:30 a.m. has been the standard in many countries, such as Finland, Japan, New Zealand, Australia, and England, all of which outperform the United States on international student achievement tests.[12,13] Out of 50 countries, U.S. children ranked worst in sleep deprivation.[14]

There are no demonstrable health or learning benefits to support early start times for middle and high schools. However, schools with delayed start times have shown improvements in:

- daytime alertness and concentration;[3,15-17]
- mood;[6,17]
- behavioral control;[3,4,6,17]
- academic achievement, including standardized test scores;[4,5,18-20]
- tardiness;[4,16,17,21]
- school attendance;[4,17,21]
- coffee and stimulant drink use;[16] and
- rates of motor vehicle accidents for teen drivers.[4,22]

BARRIERS TO CHANGING START TIMES

Changing school start times is often met with resistance in school districts across the United States.[2-4] Barriers include:

- conflicts with after-school programs, sports activities, and after-school student jobs;
- teacher concerns regarding scheduling and total work hours;
- transportation costs for busing children to school;
- difficulties in changing family patterns of daily life; and
- lack of awareness among school community stakeholders (i.e., school administrators, faculty, students, families) regarding the importance of sleep.

However, schools that have delayed start times do not report significant problems with this change.[3,15-17] As such, a national trend to delay high school start times may not only be possible but also welcomed as school administrators and school communities appreciate the related benefits to students' health and learning.

In consideration of a later school start time, it is important to note:

- Teachers' arrivals and departures from school do not need to change. Teachers may use the period before instruction each morning for preparation, grading, meetings, and professional development.

- Bus schedules may be staggered to allow younger students to be transported to school before middle and high school students.[7]
- Schools that start between 8:30 and 9 a.m. would typically finish between 3and 3:30 p.m., allowing daylight time for sports and after-school activities. Coaches often need late afternoon practices and game times due to their day jobs.
- Families' morning routines may be less chaotic when teen students are rested.
- Students are less likely to have unsupervised time when school finishes later in the day.

RECOMMENDATIONS FOR CHANGING SCHOOL START TIMES

The Society of Behavioral Medicine (SBM) advocates for a four-tiered approach to promote later start times for middle and high schools.

1. **School board members must enact an 8:30 a.m. or later school start time policy in their school districts.** It is fundamentally at the school district level that administrators can prioritize school start times that promote students' health, well-being, and learning.
2. **State departments of education and state legislators, particularly those on education committees, should advocate for later school start times for middle and high schools.** This advocacy can be achieved by including student healthy-sleep promotion on committee agendas and by lobbying school board members to enact an 8:30 a.m. or later school start policy.
3. **SBM encourages lobbying of the U.S. Department of Education through congressional representatives,** particularly those on the House Committee on Education and the Workforce, and the Senate Committee on Health, Education, Labor and Pensions, so they understand the value of later school start times and can enact pertinent legislation.
4. **To increase awareness, SBM suggests school-level promotion of education about the importance of sleep** through in-services, workshops, curriculum changes, and family and community events. On a community level, media should be engaged to promote the public's understanding of the benefits of later school start times for middle and high school students. Healthy student sleep campaigns may be provided through media programming.

It is no longer a question of whether policies promoting later school start times *should be adopted, but rather how they should be implemented.*

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ENDORSEMENTS

NATIONAL EDUCATION ASSOCIATION — Great Public Schools for Every Student

National PTA — everychild. onevoice.

PARENTS FOR PUBLIC SCHOOLS

Sleep Research Society

Start School Later.net

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School Start Times for Adolescents

ADOLESCENT SLEEP WORKING GROUP, COMMITTEE ON ADOLESCENCE, COUNCIL ON SCHOOL HEALTH

Abstract

The American Academy of Pediatrics recognizes insufficient sleep in adolescents as an important public health issue that significantly affects the health and safety, as well as the academic success, of our nation's middle and high school students. Although a number of factors, including biological changes in sleep associated with puberty, lifestyle choices, and academic demands, negatively affect middle and high school students' ability to obtain sufficient sleep, the evidence strongly implicates earlier school start times (ie, before 8:30 am) as a key modifiable contributor to insufficient sleep, as well as circadian rhythm disruption, in this population. Furthermore, a substantial body of research has now demonstrated that delaying school start times is an effective countermeasure to chronic sleep loss and has a wide range of potential benefits to students with regard to physical and mental health, safety, and academic achievement. The American Academy of Pediatrics strongly supports the efforts of school districts to optimize sleep in students and urges high schools and middle schools to aim for start times that allow students the opportunity to achieve optimal levels of sleep (8.5–9.5 hours) and to improve physical (eg, reduced obesity risk) and mental (eg, lower rates of depression) health, safety (eg, drowsy driving crashes), academic performance, and quality of life.

adolescents **insufficient sleep** **school start times**

Factors Influencing Insufficient Sleep in Adolescents

Insufficient sleep represents one of the most common, important, and potentially remediable health risks in children,[1,2] particularly in the adolescent population, for whom chronic sleep loss has increasingly become the norm.[3] The reasons behind the current epidemic of insufficient sleep are complex and interrelated. From a biological perspective, at about the time of pubertal onset, most adolescents begin to experience a sleep–wake "phase delay" (later sleep onset and wake times), manifested as a shift of up to 2 hours relative to sleep–wake

cycles in middle childhood.[4] Two principal biological changes in sleep regulation are thought to be responsible for this phenomenon.[5,6] One factor is delayed timing of nocturnal melatonin secretion across adolescence[5,7,8] that parallels a shift in circadian phase preference from more "morning" type to more "evening" type, which consequently results in difficulty falling asleep at an earlier bedtime.[4] The second biological factor is an altered "sleep drive" across adolescence, in which the pressure to fall asleep accumulates more slowly, as demonstrated by the adolescent brain's response to sleep loss[9] and by a longer time to fall asleep after being awake for 14.5 to 18.5 hours in postpubertal versus prepubertal teenagers.[10] Thus, these 2 factors typically make it easier for adolescents to stay awake later. At the same time, several studies from different perspectives indicate that adolescent sleep needs do not decline from preadolescent levels, and optimal sleep for most teenagers is in the range of 8.5 to 9.5 hours per night.[5,11,12] On a practical level, this research indicates that the average teenager in today's society has difficulty falling asleep before 11:00 pm and is best suited to wake at 8:00 am or later.[4,12,13]

The sleep–wake changes that flow from this biological maturation may enable teenagers' interactions with such environmental factors and lifestyle/social demands as homework, extracurricular activities, after-school jobs, and use of technology.[14–16] As a result, most teenagers stay up late on school nights, getting too little sleep, and then sleep in on weekends to "catch up" on sleep. Although this weekend oversleeping can help offset the weekly sleep deficit, it can worsen circadian disruption and morning sleepiness at school.[9,17,18]

The Extent and Effects of Adolescent Sleep Loss

Given both biological demands and today's sociocultural influences, it is not surprising that many studies have documented that the average adolescent in the United States is chronically sleep deprived and pathologically sleepy (ie, regularly experiencing levels of sleepiness commensurate with those of patients with sleep disorders such as narcolepsy).[19] For example, a recent National Sleep Foundation poll[20] found that 59% of sixth- through eighth-graders and 87% of high school students in the United States were getting less than the recommended 8.5 to 9.5 hours of sleep on school nights; indeed, the average amount of school night sleep obtained by high school seniors was less than 7 hours. In this same survey, however, 71% of parents believed that their adolescent was obtaining sufficient sleep. This mismatch indicates a significant lack of awareness among adults regarding the extent of adolescent sleep loss. As a result, many middle and high school students are at risk for adverse consequences of insufficient sleep, including impairments in mood, affect regulation, attention, memory, behavior control, executive function, and quality of life (**Table 1**).[21–26]

TABLE 1 View inline

Impact of Chronic Sleep Loss in Adolescents

Insufficient sleep also takes a toll on academic performance. In the National Sleep Foundation poll cited previously,[20] 28% of students reported falling asleep in school at least once a week, and more than 1 in 5 fell asleep doing homework with similar frequency. Many studies show an association between decreased sleep duration and lower academic achievement at the middle school, high school, and college levels, as well as higher rates of absenteeism and tardiness and decreased readiness to learn (**Table 1**).[17,27–30]

An increased prevalence of anxiety and mood disorders has also been linked to poor quality and insufficient sleep in adolescents.[31–33] Other specific health-related effects of sleep loss include increased use of stimulants (eg, caffeine, prescription medications) to counter the effects of chronic sleepiness on academic performance.[34,35] Adolescents are also at greater risk of drowsy driving–related crashes as a result of insufficient sleep.[36,37] Chronic sleep restriction increases subsequent risk of both cardiovascular disease and metabolic dysfunction, such as type 2 diabetes mellitus.[38,39] An association between short sleep duration and obesity in children and adolescents has been demonstrated in several cross-sectional and prospective studies, underscoring how chronic sleep restriction can undermine health (**Table 1**).[40,41]

Identifying Solutions: The Role of Delaying School Start Times

This "epidemic" of delayed, insufficient, and erratic sleep patterns among adolescents and the accompanying negative effects on adolescent health and well-being highlight the importance of identifying potentially modifiable factors. The quest to reduce the high cost of sleep loss in adolescents is not only an important public health issue but one of paramount importance to educators, pediatric health care providers, and advocates for adolescent health. Although many changes over the course of adolescence can affect the quality and quantity of sleep, one of the most salient and, arguably, most malleable is that of school start times. Numerous studies have demonstrated that early start times impede middle and high school students' ability to get sufficient sleep. Studies comparing high schools with start times as little as 30 minutes earlier versus those with later start times demonstrate such adverse consequences as shorter sleep duration, increased sleepiness, difficulty concentrating, behavior problems, and absenteeism.[29,30,42–46] For example, in one key school transition study, Carskadon et al[19] evaluated the effects of a 65-minute advance (ie, move earlier) in school start time from grade 9 to grade 10 in 40 students. They found a delay in the biological markers of circadian timing but also objectively measured daytime sleepiness levels typical of patients with sleep disorders.

Because circadian-based phase delays emerge at around the time of pubertal onset, they also affect younger adolescents, who increasingly are subject to many of the same environmental and lifestyle competing priorities for sleep as older teenagers. Recent research shows that delaying school start times for middle school students is accompanied by positive outcomes similar to those found in high schools, including later rise times, more school night total sleep, less daytime sleepiness, decreased tardiness rates, improved academic performance, and better performance on computerized attention tasks.[30,47,48]

According to the US Department of Education statistics for 2011–2012,[49] approximately 43% of the over 18 000 public high schools in the United States currently have a start time before 8:00 AM. Over the last 15 years, however, a small but growing number of school districts have responded to research reports regarding insufficient sleep among middle and high school students with what may be viewed as a "systematic countermeasure" to reduce the prevalence of sleepiness and its consequences: delaying school start times. Early studies addressed a core question: "Does delaying start time result in students obtaining more sleep, or do students just stay up later and thus negate the effects of the delayed start time?" Wahlstrom et al[50,51] assessed more than 18 000 high school students in Minneapolis before and after the district's school start time changed from 7:15 am to 8:40 am beginning with the 1997–1998 school year. Bedtimes after the change were similar (ie, did not shift to a later time) to those of students in schools that did not change start times, and, as a result, students obtained nearly 1 additional hour of sleep on school nights during the 1999–2000 school year. Other studies have also failed to show a delay in bedtime in response to delayed start times. In a study involving grades 6 through 12 in a school district that delayed high school start times by 1 hour (7:30 to 8:30 am), students averaged 12 to 30 minutes more nightly sleep, and the percentage of students who reported ≥8 hours of sleep increased from 37% to 50%.[52] Owens et al,[53] in a study of adolescents attending an independent school that instituted a start time delay of 30 minutes (from 8:00 to 8:30 am), reported that average bedtimes actually shifted *earlier* by an average of 18 minutes, and mean self-reported school night sleep duration increased by 45 minutes. In addition, the percentage of students getting less than 7 hours of sleep decreased by 79%, and those reporting at least 8 hours of sleep increased from 16% to 55%. Finally, in a 3-year study of >9000 students from 8 public high schools in 3 states (Colorado, Wyoming, and Minnesota), the percentage of students sleeping ≥8 hours per night was dramatically higher in those schools that had a later start time (eg, 33% at 7:30 am vs 66% at 8:55 am).[54]

Moreover, a number of studies have now clearly demonstrated that delaying school start times not only results in a substantive increase in average sleep duration but also has a significant positive effect on a variety of key outcomes; these effects range from decreased levels of self-reported sleepiness and fatigue to improvements in academic measures. In the Minneapolis study,[50,51] attendance rates for students in

grades 9 through 11 improved, and the percentage of high school students continuously enrolled increased. Likewise, Dexter et al[42] found that public high school sophomores and juniors at a later- versus earlier-starting high school reported more sleep and less daytime sleepiness. Htwe et al[55] reported that high school students slept an additional 35 minutes, on average, and experienced less daytime sleepiness after their school start time was delayed from 7:35 to 8:15 am.

Improvements in academic achievement associated with delayed start times have been somewhat less consistently demonstrated; in the Minneapolis study, grades showed a slight but not statistically significant improvement,[50] and standardized test scores were not increased overall compared with those before the start time change.[46,56] However, several recent studies have documented improvements in academic performance associated with later start times. A study of students in Chicago public high schools demonstrated that absences were much more common and student grades and test score performance were notably lower for first-period classes compared with afternoon classes and that performance on end-of-year subject-specific standardized tests (ie, math, English) correlated with whether the student was scheduled for that subject during first period.[56] Similarly, first-year Air Force Academy students assigned to start classes after 8:00 am (compared with before 8:00 am) performed better in their first-period course and, in addition, had a 0.15 SD increase in performance across all of their courses.[44] In a study focusing on middle school students,[45] a 1-hour later shift in school start times was associated with an increase in reading test scores by 0.03 to 0.10 SD and in math test scores by 0.06 to 0.09 SD. The author concluded that an increase in start times by 1 hour would result in a 3 percentile point gain in both math and reading test scores for the average student. Furthermore, students performing in the lower end of the test score distribution seemed to benefit most, with gains roughly twice those in above-average students, and the effects persisted into high school. In a more recent middle school study by the same research group, the results suggested that moving school start later by 1 hour can have an impact on standardized test scores comparable to decreasing the class size by one-third. Finally, in a recent 3-state study, 5 of the 6 high schools in which grade point average was assessed showed a significant pre–post increase in grade point average in core subjects of math, English, science, and social studies.[54]

Finally, there may be additional health-related and other benefits associated with delays in start time. For example, students in the independent school study cited previously[53] reported significantly more satisfaction with their sleep. In addition, class attendance improved, as did health-related variables, including fewer visits to the campus health center for fatigue-related complaints.[53] Although not specifically assessed as an outcome in previous research, later start times might increase the likelihood that students will eat breakfast before school and thus further enhance their readiness to learn.[57] Finally, improvements in teacher satisfaction linked to increased sleep offers yet another potential mechanism for classroom enrichment.

Several other outcome measures examined in these studies also deserve emphasis. In the study by Owens et al,[53] there were significantly fewer students self-reporting symptoms of depressed mood as well as improved motivation after the start time delay. In a more recent study, also conducted in an independent school setting, a 25-minute delay in start time was associated not only with increased sleep duration and decreased daytime sleepiness but also with less self-reported depressed mood.[58] Although more research is needed, given the mounting evidence supporting a bidirectional link between sleep patterns and problems and mood disorders in this population[59] (including an increased risk of suicidal ideation[57]), countermeasures that could potentially mitigate these effects have important public health implications.

Furthermore, adolescents are at particularly high risk of driving while impaired by sleepiness, and young drivers aged 25 years or younger are involved in more than one-half of the estimated 100 000 police-reported, fatigue-related traffic crashes each year.[60] Danner and Phillips[52] examined the relationship between automobile crash records for students 17 to 18 years of age and high school start times. Car crash rates for the county that delayed school start times decreased by 16.5% over the 2 years before and after the school-start change, whereas those for the state as a whole increased by 7.8% across the same time period. In another recent study conducted in 2 adjacent,

demographically similar cities, there were significantly increased teen (16- to 18-year-olds) crash rates over a 2-year period in the city with earlier high school start times (2007: 71.2 per 1000 vs 55.6 per 1000; 2008: 65.8 per 1000 vs 46.6 per 1000 [$P < .001$]), and teen drivers' morning crash peaks occurred 1 hour earlier.[61] Finally, the recent study by Wahlstrom et al[54] found a crash rate reduction in 16- to 18-year-olds of 65% and 70%, respectively, in 2 of the 4 high schools studied; notably, the high school with the latest start time (Jackson Hole, WY) had the largest decline in car crashes.

Although considerable empiric support exists for the concepts that early school start times are detrimental to adolescents' health and well-being and that delaying school start times results in substantive and sustained benefits to students, the ongoing debate among school districts in the United States regarding the widespread institution of later start times for middle and high schools continues to spark controversy. Moreover, the logistical considerations in implementing delayed school start times in middle and high schools are far from trivial. Wolfson and Carskadon[62] surveyed 345 public high school personnel regarding their perspective on high school start times, factors influencing school start times, and decision-making around school schedules. Most respondents at that time had not changed or contemplated changing their school start times. Perceived barriers to changing school schedules commonly endorsed included curtailed time for athletic practices and interference with scheduling of games, reduced after-school employment hours for students, challenges in providing child care for younger siblings, adjustments in parent and family schedules, potential safety issues, effects on sleep duration in younger children if elementary school schedules are "flipped" with those of middle/high school students, and the need to make alternative transportation arrangements. However, to date, to our knowledge, there have been no published studies that have systematically examined the impact of school start time delay on these parameters, although anecdotal evidence suggests that many of these concerns are unfounded (www.sleepfoundation.org). Moreover, communities across the country have adopted a variety of creative solutions to address these problems, including shifting to public transportation for older students, enlisting community volunteers to provide supervision at bus stops, adjusting class schedules to minimize late dismissal times, scheduling free periods/study halls at the end of the school day to allow participation in after-school extracurricular activities, exempting student athletes from physical education requirements, and installing lights for athletic fields.

In addition, as outlined in a recent Brookings Institute Report ("Organizing Schools to Improve Student Achievement: Start Times, Grade Configurations, and Teacher Assignments"),[63] economists have suggested that delaying school start times would have a substantial benefit-to-cost ratio (9:1). This finding is based on a conservative estimate of both costs per student ($0–$1950, largely related to transportation) and the increase in projected future earnings per student in present value because of test score gains related to moving start times 1 hour later (approximately $17 500). Finally, because the appropriation of federal dollars for schools is partially dependent on student attendance data, reducing tardiness and absenteeism levels could result in increased funding and further offset costs related to moving start times later.

Conclusions

Taken together, these studies support the presence of significant improvements in benchmarks of health and academic success in a variety of settings in association with later school start times, including in urban school districts with a large percentage of low-income and minority students, suburban public schools, and college-preparatory independent schools. It is clear that additional research is needed to further document the effects of changes in school start times over time, to examine specific factors that increase or decrease the likelihood of positive outcomes, and to assess the effect on families, the community, other stakeholders, and the educational system in general. However, it may be strongly argued that both the urgency and the magnitude of the problem of sleep loss in adolescents and the availability of an intervention that has the potential to have broad and immediate effects are highly compelling.

It should also be emphasized that delaying school start times alone is less likely to have a significant effect without concomitant attention to other contributing and potentially remediable factors, such as excessive demands on students' time because of homework, extracurricular activities, after-school employment, social networking, and electronic media use. One of the biggest challenges school districts face is the need to inform community stakeholders (eg, parents, teachers and administrators, coaches, students, bus drivers, businesses that employ students, law enforcement officials) about the scientific rationale underpinning the merits of delaying school start times; the threats to health, safety, and academic success posed by insufficient sleep; and the potential benefits for adolescents of school start time delay. Thus, education and community engagement are equally key components in increasing the likelihood of success.

The American Academy of Pediatrics recognizes insufficient sleep in adolescents as a public health issue, endorses the scientific rationale for later school start times, and acknowledges the potential benefits to students with regard to physical and mental health, safety, and academic achievement. The American Academy of Pediatrics lends its strong support to school districts contemplating delaying school start times as a means of optimizing sleep and alertness in the learning environment and encourages all school administrators and other stakeholders in communities around the country to review the scientific evidence regarding school start times, to initiate discussions on this issue, and to systematically evaluate the community-wide impact of these changes (eg, on academic performance, school budget, traffic patterns, teacher retention).

Recommendations

. Pediatricians should educate adolescents and parents regarding the optimal sleep amount teenagers need to match physiologic sleep needs (8.5–9.5 hours). Although napping, extending sleep on weekends, and caffeine consumption can temporarily counteract sleepiness, these measures do not restore optimal alertness and are not a substitute for regular sufficient sleep.

. Health care professionals, especially those working in school-based clinics or acting in an advisory capacity to schools, should be aware of adolescent sleep needs. They should educate parents, teenagers, educators, athletic coaches, and other stakeholders about the biological and environmental factors, including early school start times, that contribute to widespread chronic sleep deprivation in America's youth.

. Educational interventions for parents and adolescents as well as the general public should be developed and disseminated by the American Academy of Pediatrics and other child and sleep health advocacy groups. Content should include the potential risks of chronic sleep loss in adolescents, including depressed mood, deficits in learning, attention and memory problems, poor impulse control, academic performance deficits, an increased risk of fall-asleep motor vehicle crashes, and an elevated risk of obesity, hypertension, and long-term cardiovascular morbidity. Information should also be included about the potential utility of systemic countermeasures, including delaying school start times, in mitigating these effects. Finally, educational efforts should also emphasize the importance of behavior change on the individual level and the personal responsibility that families and students themselves have in modifying their sleep habits.

. Pediatricians and other pediatric health care providers (eg, school physicians, school nurses) should provide scientific information, evidence-based rationales, guidance, and support to educate school administrators, parent-teacher associations, and school boards about the benefits of instituting a delay in start times as a potentially highly cost-effective countermeasure to adolescent sleep deprivation and sleepiness. In most districts, middle and high schools should aim for a starting time of no earlier than 8:30 am. However, individual school districts also need to take average commuting times and other exigencies into account in setting a start time that allows for adequate sleep opportunity for students. Additional information regarding opportunities, challenges, and potential solutions involved in changing school start times may be found at: http://www.sleepfoundation.org/article/sleep-topics/school-start-time-and-sleep; http://schoolstarttime.org.

. Pediatricians should routinely provide education and support to adolescents and families regarding the significance of sleep and healthy sleep habits as an important component of anticipatory guidance and well-child care. In particular, pediatricians should endorse parental involvement in setting bedtimes and in supervising sleep practices, such as social networking and electronic media use in the bedroom; for example, pediatricians could recommend to parents that they establish a "home media use plan" and enforce a "media curfew." Adolescents should be regularly queried regarding sleep patterns and duration and counseled about the risks of excessive caffeine consumption, misuse of stimulant medications as a countermeasure to sleepiness, and the dangers of drowsy driving.

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Morbidity and Mortality Weekly Report (*MMWR*)

School Start Times for Middle School and High School Students — United States, 2011–12 School Year

Please note: *An erratum has been published for this article. To view the erratum, please click here.*

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Anne G. Wheaton, PhD1; Gabrielle A. Ferro, PhD1; Janet B. Croft, PhD1

Adolescents who do not get enough sleep are more likely to be overweight (*1*); not engage in daily physical activity (*2*); suffer from depressive symptoms (*2*); engage in unhealthy risk behaviors such as drinking, smoking tobacco, and using illicit drugs (*2*); and perform poorly in school (*3*). However, insufficient sleep is common among high school students, with less than one third of U.S. high school students sleeping at least 8 hours on school nights (*4*). In a policy statement published in 2014, the American Academy of Pediatrics (AAP) urged middle and high schools to modify start times as a means to enable students to get adequate sleep and improve their health, safety, academic performance, and quality of life (*5*). AAP recommended that "middle and high schools should aim for a starting time of no earlier than 8:30 a.m." (*5*). To assess state-specific distributions of public middle and high school start times and establish a pre-recommendation baseline, CDC and the U.S. Department of Education analyzed data from the 2011–12 Schools and Staffing Survey (SASS). Among an estimated 39,700 public middle, high, and combined schools* in the United States, the average start time was 8:03 a.m. Overall, only 17.7% of these public schools started school at 8:30 a.m. or later. The percentage of schools with 8:30 a.m. or later start times varied greatly by state, ranging from 0% in Hawaii, Mississippi, and Wyoming to more than three quarters of schools in Alaska (76.8%) and North Dakota (78.5%). A school system start time policy of 8:30 a.m. or later provides teenage students the opportunity to achieve the 8.5–9.5 hours of sleep recommended by AAP (*5*) and the 8–10 hours recommended by the National Sleep Foundation (*6*).

Every few years, the U.S. Department of Education conducts SASS, which provides data on the condition of elementary and secondary education in the United States. SASS consists of several questionnaires, including those tailored to schools, teachers, principals, school districts, and library media centers. SASS is a mail-based survey, with telephone and field follow-up, and uses a stratified probability sample design.† For the 2011–12 school year, the sample included about 10,250 traditional public schools and 750 public charter schools, with a unit response rate for public schools of 72.5%. As part of the school questionnaire in the 2011–12 school year, respondents were asked, "At what time do most of the students in this school begin the school day?" Because AAP recommends school start times of 8:30 a.m. or later for both middle schools and high schools, the analyses in this report include public middle schools, high schools, and schools with combined grades. Average start time (with standard error) and percentage distribution of start times were calculated by school level and state. Results are weighted to reflect the complex sample design and to account for nonresponse and other adjustments.

Among an estimated 39,700 U.S. public middle, high, and combined schools (with an estimated total enrollment of 26.3 million students), the average start time was 8:03 a.m. Forty-two states reported that 75%–100% of their public schools had early start times (before 8:30 a.m.) (Figure). Overall, only 17.7% of public schools (with an estimated total enrollment of 4.2 million students), started school at 8:30 a.m. or later (Table). The proportion was lowest for high schools (14.4%) and highest for combined schools (23.4%). The percentage of schools that started at 8:30 a.m. or later varied greatly by state, ranging from 0% in Hawaii, Mississippi, and Wyoming to 76.8% in Alaska and 78.5% in North Dakota. North Dakota and Alaska also reported the latest average school start times (8:31 a.m. and 8:33 a.m., respectively), whereas Louisiana reported the earliest average school start time (7:40 a.m.) and the largest percentage of schools starting before 7:30 a.m. (29.9%).

Discussion

Obtaining adequate sleep is important for achieving optimal health. Among adolescents, insufficient sleep has been associated with adverse risk behaviors (*2*), poor health outcomes (*1*), and poor academic performance (*3*). In view of these negative outcomes, the high prevalence of insufficient sleep among high school students is of substantial public health concern. *Healthy People 2020* includes a sleep objective for adolescents: to "increase the proportion of students in grades 9 through 12 who get sufficient sleep (defined as 8 or more hours of sleep on an average school night)."§ However, the proportion of students who get enough sleep has remained approximately 31% since 2007 (*4*), the first year that the national Youth Risk Behavior Survey included a question about sleep, meaning that more than two thirds of high school students do not get enough sleep. Multiple contributors to insufficient sleep in this population might exist. In puberty, biological rhythms commonly shift so that adolescents become sleepy later at night and need to sleep later in the morning (*7*). These biological

changes are often combined with poor sleep hygiene (including irregular bedtimes and the presence of televisions, computers, or mobile phones in the bedroom) (*8*). During the school week, the chief determinant of wake times is school start time (*9*). The combination of delayed bedtimes and early school start times results in inadequate sleep for a large portion of the adolescent population.

Citing evidence of the benefits of delayed school start times for adolescents, AAP released a policy statement in 2014 that encouraged middle and high schools to modify start times to enable students to get sufficient sleep and subsequently improve their health, safety, academic performance, and quality of life (*5*). AAP recommended that schools start at 8:30 a.m. or later (*5*), but this was the case in only one in six U.S. public middle and high schools, with substantial variation by state. Because school start times are determined at the district or even individual school level, local stakeholders have the most influence on whether start times change in their communities.

Groups seeking to delay school start times in their district often face resistance. Common barriers to delaying school start times include concerns about increased transportation costs because of changes in bus schedules; potential for traffic congestion for students and faculty; difficulty in scheduling after-school activities, especially athletic programs; and lack of education in some communities about the importance of sleep and school start times.¶ Advocates for delayed start times might benefit from 1) becoming familiar with research about the negative impact of insufficient sleep and early start times on adolescents' health, well-being, and academic performance; 2) identification of persons who might be impacted by the decision to delay start times, including parties involved in transportation and school athletic programs, as well as students, teachers, and school staff; and 3) preparing responses to common arguments against delaying start times. Many school systems have successfully overcome barriers to delay start times.**

Among the possible public health interventions for increasing sufficient sleep among adolescents, delaying school start times has the potential for the greatest population impact by changing the environmental context for students in entire school districts. However, a late school start time does not preclude the need for other interventions that have the potential to improve the sleep of adolescents. Health care providers who treat adolescents, both in and outside of school settings, should educate patients and parents about the importance of adequate sleep, as well as factors that contribute to insufficient sleep among adolescents. Parents can help their children practice good sleep hygiene (i.e., habits that help promote good sleep). A regular bedtime and rise time, including on weekends, is recommended for everyone, whether they are children, adolescents, or adults.†† In addition, adolescents with parent-set bedtimes usually get more sleep than those whose parents do not set bedtimes (*8*). Adolescents who are exposed to more light (such as room lighting or from electronics) in the evenings are less likely to get enough sleep (*8*). Technology use (e.g., computers, video gaming, or mobile phones) might also contribute to late bedtimes (*8*) and parents might consider implementing a "media curfew" or removing these technologies from the bedroom. Finally, parents might benefit themselves and their children by setting a good example. Adolescent sleep habits tend to reflect their parents' sleep habits (*10*).

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* Middle schools include any schools with no grade lower than 5 and no grade higher than 8. High schools include any school with no grade lower than 7 and at least one grade higher than 8. Combined schools include any schools with at least one grade lower than 7 and at least one grade higher than 8, or with all students in ungraded classrooms.

† Additional information available at http://nces.ed.gov/surveys/sass/overview.asp and http://nces.ed.gov/statprog/handbook/sass_surveydesign.asp. Questions about SASS can be directed to Chelsea Owens at chelsea.owens@ed.gov.

§ Information on *Healthy People 2020* sleep objectives is available at http://www.healthypeople.gov/2020/topics-objectives/topic/sleep-health.

¶ A discussion of common barriers faced by proponents of delayed school start times is available at http://sleepfoundation.org/sleep-news/eight-major-obstacles-delaying-school-start-times.

** Several case studies that describe how this was done were compiled by the National Sleep Foundation and are available at http://www.startschoollater.net/case-studies.html.

†† Information on healthy sleep habits, often referred to as good "sleep hygiene", is available at http://sleepfoundation.org/sleep-tools-tips/healthy-sleep-tips.

Summary

What is already known on this topic?

The American Academy of Pediatrics (AAP) has urged middle and high schools to modify school start times to enable adolescent students to get sufficient sleep and improve their health, safety, academic performance, and quality of life. AAP recommends that schools aim to start no earlier than 8:30 a.m.

What is added by this report?

During the 2011–12 school year, before publication of the new AAP recommendations, only 17.7% of public middle and high schools in the United States started school at 8:30 a.m. or later. The percentage varied greatly by state, ranging from 0% in Hawaii, Mississippi, and Wyoming to more than three quarters of schools in Alaska (76.8%) and North Dakota (78.5%).

What are the implications for public health practice?

School start time policies are established at the district and individual school levels. Educating parents and school system decision-makers about the impact of sleep deprivation on adolescent health and academic performance might lead to adoption of later start times.

TABLE. Average start time and percentage distribution of start times for public middle, high, and combined schools,* by school level and state — Schools and Staffing Survey 2011–12 school year

School level and state	Estimated no. of public middle, high, and combined schools		Estimated no. of students in public middle, high, and combined schools		Average start time (a.m.)¶		Percentage distribution† of public middle, high, and combined school start times							
					Before 7:30 a.m.		7:30 a.m. to 7:59 a.m.		8:00 a.m. to 8:29 a.m.		8:30 a.m. or later		8:30 a.m. or later	
	No.	(SE)	No.	(SE)	Time	(SE)§	%	(SE)	%	(SE)	%	(SE)	%	(SE)
Total	**39,700**	**(390)**	**26,284,000**	**(613,100)**	**8:03**	**(1)**	**6.7**	**(0.4)**	**31.9**	**(0.8)**	**43.7**	**(0.8)**	**17.7**	**(0.7)**
School level														
Middle	13,990	(169)	8,674,000	(135,800)	8:04	(1)	4.8	(0.7)	35.9	(1.3)	40.4	(1.1)	18.9	(1.0)
High	18,360	(434)	14,995,000	(413,600)	7:59	(1)	9.5	(0.6)	33.0	(1.1)	43.1	(1.1)	14.4	(0.9)
Combined	7,350	(571)	2,615,000	(300,600)	8:08	(3)	3.5	(0.7)	21.6	(2.2)	51.5	(2.6)	23.4	(2.7)
State														

Alabama	680	(39)	344,000	(31,100)	7:49	(2)	6.4	(2.2)††	57.8	(4.4)	34.0	(5.3)	—**	—
Alaska	—**	—	—**	—	8:33	(8)	0.0	—§§	11.6	(3.8)††	11.6	(4.8)††	76.8	(7.8)
Arizona	860	(159)	506,000	(53,100)	8:03	(3)	8.1	(2.9)††	23.3	(6.6)	47.3	(5.8)	21.3	(5.0)
Arkansas	450	(28)	292,000	(30,300)	8:01	(1)	—**	—	29	(4.7)	63.0	(4.7)	7.3	(2.0)
California	3,880	(219)	3,303,000	(146,300)	8:07	(2)	3.5	(0.9)	27.7	(3.1)	47.6	(3.3)	21.2	(2.9)
Colorado	730	(84)	527,000	(51,700)	7:54	(2)	16.9	(5.1)	31.3	(6.6)	40.9	(5.1)	10.9	(2.6)
Connecticut	380	(24)	260,000	(23,900)	7:46	(2)	13.8	(2.9)	57.4	(4.2)	24.0	(3.8)	4.8	(2.1)††
Delaware	090	(4)	63,000	(4,900)	7:42	(3)	24.0	(5.3)	51.9	(6.3)	16.6	(4.6)	7.5	(3.0)††
District of Columbia	—**	—	—**	—	—**	—	—**	—	—**	—	—**	—	—**	—
Florida	1,570	(100)	1,406,000	(111,400)	8:17	(3)	19.5	(2.5)	18.6	(2.4)	19.3	(2.9)	42.6	(3.8)
Georgia	1,030	(24)	955,000	(77,500)	8:09	(2)	—**	—	28.7	(4.3)	43.9	(4.6)	24.0	(3.4)
Hawaii	—**	—	—**	—	8:03	(3)	0.0	—§§	42.5	(17.3)††	57.5	(17.3)††	0.0	—§§
Idaho	370	(182)	157,000	(40,300)	8:13	(28)	0.0	—§§	20.9	(7.5)††	58.3	(14.5)	—**	—
Illinois	1,590	(48)	1,008,000	(145,200)	8:13	(3)	—**	—	19.7	(3.4)	48.7	(5.5)	28.4	(6.0)
Indiana	740	(27)	559,000	(43,800)	7:58	(2)	—**	—	41.8	(3.2)	45.1	(4.0)	10.2	(2.7)
Iowa	550	(35)	249,000	(31,300)	8:23	(6)	0.0	—§§	6.3	(2.0)††	66.3	(7.2)	27.4	(7.6)
Kansas	540	(20)	204,000	(20,000)	8:00	(1)	—**	—	26.5	(3.5)	71.5	(3.7)	—**	—
Kentucky	710	(32)	358,000	(33,100)	8:03	(4)	8.6	(4.2)††	24.8	(4.0)	49.0	(5.8)	17.5	(4.0)
Louisiana	630	(32)	316,000	(33,100)	7:40	(2)	29.9	(4.8)	53.1	(4.9)	12.1	(3.5)	—**	—
Maine	240	(5)	105,000	(5,500)	7:53	(3)	6.6	(1.9)	53.1	(5.1)	32.8	(4.8)	7.5	(3.6)††
Maryland	—**	—	—**	—	—**	—	—**	—	—**	—	—**	—	—**	—
Massachusetts	700	(58)	527,000	(48,600)	7:53	(4)	8.0	(3.6)††	53.3	(6.1)	27.2	(5.1)	11.5	(5.4)††
Michigan	1,540	(47)	891,000	(59,100)	7:54	(2)	9.5	(2.1)	43.6	(3.6)	39.0	(3.5)	7.9	(2.2)
Minnesota	1,100	(58)	522,000	(43,100)	8:18	(3)	0.9	(0.4)††	18.8	(2.6)	46.7	(3.7)	33.6	(3.5)
Mississippi	570	(23)	272,000	(18,600)	7:47	(2)	12.4	(3.7)††	58.3	(4.3)	29.3	(4.3)	0.0	—§§
Missouri	900	(37)	530,000	(28,700)	7:54	(1)	6.7	(1.7)	39.0	(3.9)	51.0	(3.9)	3.2	(1.4)††
Montana	220	(15)	78,000	(8,200)	8:13	(2)	0.0	—§§	5.8	(2.1)††	80.9	(6.1)	13.4	(5.5)††

TABLE. (*Continued*) Average start time and percentage distribution of start times for public middle, high, and combined schools,* by school level and state — Schools and Staffing Survey 2011–12 school year

School level and state	Estimated no. of public middle, high, and combined schools	Estimated no. of students in public middle, high, and combined schools	Average start time (a.m.)¶	Percentage distribution† of public middle, high, and combined school start times			
			Before 7:30 a.m.	7:30 a.m. to 7:59 a.m.	8:00 a.m. to 8:29 a.m.	8:30 a.m. or later	8:30 a.m. or later

	No.	(SE)	No.	(SE)	Time	(SE)§	%	(SE)	%	(SE)	%	(SE)	%	(SE)
Nebraska	370	(26)	150,000	(19,200)	8:07	(1)	0.0	—§§	8.0	(2.5)††	88.9	(2.4)	3.0	(1.4)††
Nevada	260	(12)	276,000	(20,900)	7:51	(3)	18.0	(3.0)	30.7	(5.5)	38.2	(6.0)	13.1	(3.6)
New Hampshire	180	(18)	116,000	(7,800)	7:46	(2)	11.6	(3.2)	64.4	(5.7)	19.7	(4.4)	—**	—
New Jersey	870	(52)	698,000	(45,200)	8:00	(2)	6.7	(2.0)	37.2	(4.5)	41.2	(4.7)	14.9	(3.6)
New Mexico	310	(99)	151,000	(47,000)	8:10	(3)	1.6	(0.7)††	24.1	(5.8)	53.9	(10.2)	20.4	(5.9)
New York	2,070	(108)	1,670,000	(149,100)	7:59	(2)	7.7	(3.1)††	31.6	(2.9)	49.6	(3.4)	11.0	(2.5)
North Carolina	1,120	(35)	768,000	(88,900)	8:03	(2)	—**	—	36.6	(5.0)	45.3	(5.4)	15.2	(4.2)
North Dakota	220	(9)	67,000	(5,000)	8:31	(1)	0.0	—§§	2.8	(1.2)††	18.7	(3.2)	78.5	(3.4)
Ohio	1,640	(73)	1,061,000	(60,800)	7:52	(2)	13.1	(2.0)	45.3	(4.3)	29.3	(3.7)	12.3	(3.0)
Oklahoma	700	(27)	356,000	(29,000)	8:10	(2)	0.0	—§§	12.0	(2.8)	77.6	(3.9)	10.4	(2.8)
Oregon	480	(25)	282,000	(21,100)	8:14	(3)	—**	—	25.2	(3.8)	45.0	(4.1)	28.9	(4.2)
Pennsylvania	1,280	(145)	1,001,000	(189,700)	7:48	(2)	13.0	(3.0)	51.3	(6.6)	32.6	(7.9)	3.1	(1.3)††
Rhode Island	100	(10)	68,000	(6,200)	7:50	(4)	24.8	(6.1)	27.5	(7.9)	40.3	(9.2)	—**	—
South Carolina	500	(9)	411,000	(26,400)	8:03	(2)	—**	—	35.3	(6.5)	50.9	(6.8)	12.3	(3.7)
South Dakota	230	(11)	78,000	(5,200)	8:13	(2)	—**	—	6.6	(2.7)††	77.7	(4.2)	14.8	(4.9)††
Tennessee	760	(47)	533,000	(31,000)	7:57	(3)	13.3	(3.4)	29.4	(4.7)	40.0	(5.1)	17.2	(3.5)
Texas	3,940	(183)	2,556,000	(254,700)	8:05	(2)	3.1	(1.2)††	28.3	(3.4)	46.3	(3.5)	22.4	(2.7)
Utah	410	(22)	297,000	(45,200)	8:05	(3)	0.0	—§§	33.1	(5.3)	49.6	(5.9)	17.3	(5.9)††
Vermont	100	(2)	46,000	(2,600)	8:05	(2)	—**	—	34.1	(5.1)	48.0	(4.8)	15.1	(3.0)
Virginia	850	(17)	555,000	(37,700)	8:04	(2)	10.0	(2.6)	26.6	(4.4)	42.6	(4.4)	20.8	(3.6)
Washington	930	(35)	526,000	(42,300)	8:08	(2)	6.4	(1.9)††	24.2	(3.8)	50.2	(4.6)	19.3	(3.5)
West Virginia	300	(5)	160,000	(7,000)	7:54	(2)	11.1	(2.0)	33.9	(3.3)	47.9	(4.0)	7.1	(2.3)††
Wisconsin	860	(37)	423,000	(44,200)	7:59	(3)	2.3	(1.0)††	48.2	(5.4)	39.1	(4.3)	10.4	(4.4)††
Wyoming	130	(8)	50,000	(4,300)	7:59	(1)	0.0	—§§	41.1	(5.2)	58.9	(5.2)	0.0	—§§

Source: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey (SASS), "Public School Data File," 2011–12.

Abbreviation: SE = standard error.

* Middle schools include any schools with no grade lower than 5 and no grade higher than 8. High schools include any school with no grade lower than 7 and at least one grade higher than 8. Combined schools include any schools with at least one grade lower than 7 and at least one grade higher than 8, or with all students in ungraded classrooms.

† Detail may not sum to totals because of rounding and because some data are not shown.

§ SE of average start time is expressed in minutes.

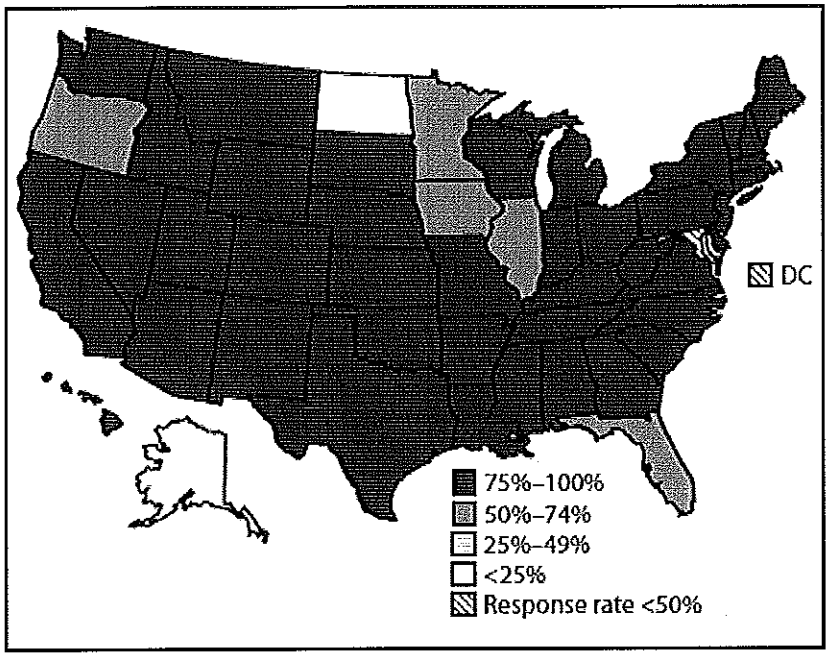
¶ Schools with afternoon start times were not included in analysis.

** Reporting standards not met. Relative standard error ≥0.5 or the response rate <50%.

†† Interpret data with caution. 0.3 ≤ relative standard error < 0.5.

§§ Rounds to zero. SE is not applicable.

FIGURE. Percentage of public schools* with early school start times (before 8:30 a.m.), by state — Schools and Staffing Survey, United States, 2011–12 school year



Source: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, public school data file, 2011–12. Additional information available at http://nces.ed.gov/surveys/sass/overview.asp.

* Includes middle, high, and combined schools. Middle schools include any schools with no grade lower than 5 and no grade higher than 8. High schools include any school with no grade lower than 7 and at least one grade higher than 8. Combined schools include any schools with at least one grade lower than 7 and at least one grade higher than 8, or with all students in ungraded classrooms.

Alternate Text: The figure above is a map of the United States showing the percentage of public schools with early school start times (before 8:30 a.m.), by state, during the 2011-12 school year.

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Content source: Centers for Disease Control and Prevention

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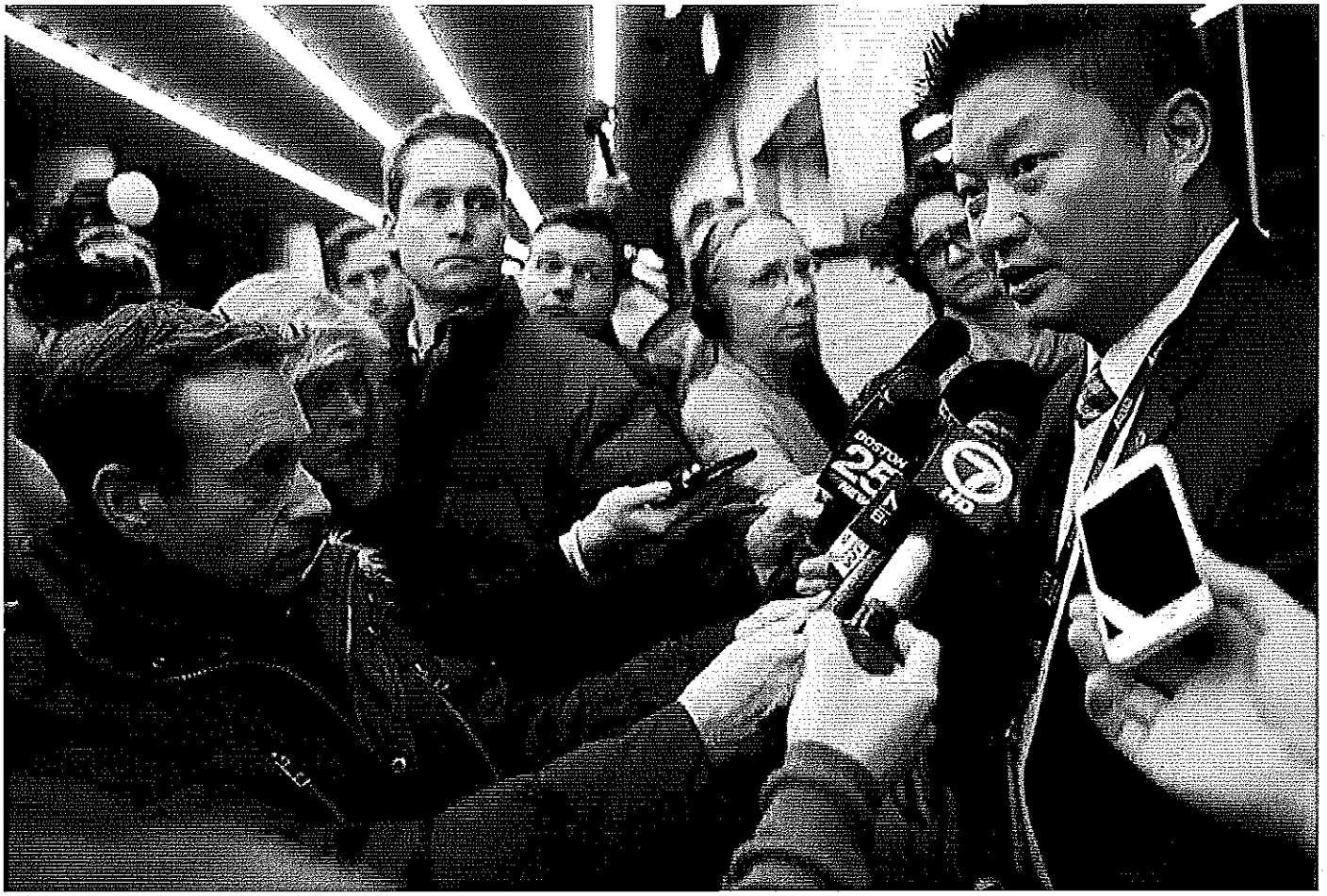
Metro

Boston drops plan to change school hours



CRAIG F. WALKER/GLOBE STAFF

Boston Public Schools Superintendent Tommy Chang spoke to members of the media last week.

By James Vaznis

GLOBE STAFF DECEMBER 22, 2017

The Boston school system, bowing to widespread opposition from parents and a growing number of city councilors, is abandoning its plan to change the opening and closing bells for schools across the city next fall, officials announced Friday.

In making the announcement on the first day of school vacation, Superintendent Tommy Chang said he would work collaboratively with school communities to develop new bell schedules "for future years."

The reversal occurred just two weeks after it was announced.

"Over the past few weeks, we have heard from families, staff, and stakeholders that there are concerns with the implementation of the new start and end times policy," Chang wrote in a letter e-mailed to families. "After reflecting on this feedback, we understand that while the new schedule would achieve our goal of supporting academic success for all ages, the shifts to many school start times caused a more significant disruption to family schedules than we intended."

The letter represented a major retreat for Chang, who was insistent on implementing changes next fall. He and other school officials wanted city high schools to start later in the morning — giving