

REPORT 6 OF THE COUNCIL ON SCIENCE AND PUBLIC HEALTH (A-16)
Delaying School Start Time to Alleviate Adolescent Sleep Deprivation (Resolution 404-A-15)
(Reference Committee D)

EXECUTIVE SUMMARY

Objectives. Insufficient sleep among adolescents has been a concern for the past several decades. It is recommended that teenagers get 8 to 10 hours of sleep per night, but as adolescents age through middle school and high school, they get progressively less sleep on an average school night. One contributor to insufficient sleep in adolescents is an early school start time. In the past few decades, high school start times have become increasingly early, with many high schools beginning at or before 7:30 a.m. Acknowledging a need to increase alertness and readiness to learn among high school students, many school districts have recently pushed back high school start times. In this report, the Council on Science and Public Health briefly reviews the health and academic consequences of decreased sleep in adolescents and examines more recent evidence for delaying school start times as a mechanism to address adolescent sleep deprivation. This report builds on a 2014 American Academy of Pediatrics (AAP) policy statement entitled “School Start Times for Adolescents.”

Data Sources. English language reports published between 2005 and 2016 were selected from a search of the PubMed and Google Scholar databases using the search terms “school start time” and “sleep deprivation” combined with “adolescents,” “teenagers,” “schools,” “students,” and “adolescent behavior.” Additional articles were identified by manual review of the references cited in these publications. Further information was gathered from a 2014 policy statement issued by the AAP and from Internet sites managed by relevant federal agencies and public health organizations.

Results. The majority of adolescents do not get sufficient sleep (i.e., at least 8 hours) each night. Changes in circadian rhythm and sleep habits due to puberty, night-time distractions, and early school start times all contribute to insufficient sleep among adolescents. Decreased total sleep time among teens is strongly associated with several negative outcomes including decreases in emotional processing and memory, metabolic disorders, impaired immune function, depression and anxiety, high risk behaviors, increased injury from sport activities, unhealthy BMI, and decreased academic performance. Evidence strongly suggests that allowing adolescents more time for sleep results in improvements in health, academic performance, behavior, and general well-being. Overwhelming evidence exists that sleep duration in adolescents can be significantly increased when school start time is delayed, particularly past 8:30 a.m.

Conclusions. Implementing a delayed school start can be an emotional and potentially stressful issue for school districts, families, and members of the community. No “one-size fits all” approach to delaying school start times will be appropriate for all school districts. However, the Council on Science and Public Health believes that the benefits of delaying school start times to allow for adequate sleep among adolescents outweigh the potential negative consequences. The Council believes that physicians, as well as parents and educators, should work together to convey the benefits of increased sleep among teens and support later start times for schools.

REPORT OF THE COUNCIL ON SCIENCE AND PUBLIC HEALTH

CSAPH Report 6-A-16

Subject: Delaying School Start Time to Alleviate Adolescent Sleep Deprivation
(Resolution 404-A-15)

Presented by: Louis J. Kraus, MD, Chair

Referred to: Reference Committee D
(Michael D. Bishop, MD, Chair)

1 INTRODUCTION

2
3 Resolution 404-A-15 “Altering School Days to Alleviate Adolescent Sleep Deprivation,”
4 introduced by Medical Student Section at the 2015 Annual Meeting of the House of Delegates and
5 referred to the Board of Trustees, asks:

6
7 That our American Medical Association (AMA) support appropriate entities in establishing
8 clear evidence-based recommendations from existing research on adolescent sleep needs and
9 school start times, and that our AMA support legislation congruent with those guidelines.

10
11 Current AMA policy identifies insufficient sleep and sleepiness as a public health issue, and
12 supports education about sleep health as a standard component of care for adolescent patients
13 (Policy H-60.930).

14
15 METHODOLOGY

16
17 English language reports published between 2005 and 2016 were selected from a search of the
18 PubMed and Google Scholar databases using the search terms “school start time” and “sleep
19 deprivation” combined with “adolescents,” “teenagers,” “schools,” “students,” and “adolescent
20 behavior.” Additional articles were identified by manual review of the references cited in these
21 publications. Further information was gathered from a 2014 policy statement issued by the
22 American Academy of Pediatrics (AAP) and from Internet sites managed by relevant federal
23 agencies and public health organizations.

24
25 BACKGROUND

26
27 Insufficient sleep among adolescents (aged 12-18 years) has been a concern for the past several
28 decades. The AAP recommends that teenagers (aged 14-17 years) get 8.5 to 9.5 hours of sleep per
29 night,¹ and an expert panel convened by the National Sleep Foundation (NSF) recommends that
30 teenagers get 8 to 10 hours of sleep per night.² However, in 2013, only approximately 32 percent of
31 teens in grades 9-12 reported getting at least 8 hours of sleep on an average school night.³ This
32 proportion varied widely by sex, race/ethnicity, and grade level. In addition, approximately 40
33 percent of 9th graders reported at least 8 or more hours of sleep per night, compared to
34 approximately 23 percent of 12th graders.³ Recognizing these patterns as a substantial concern, the

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Action of the AMA House of Delegates 2016 Annual Meeting: Council on Science and Public
Health Report 6 Recommendations Adopted as Amended, and Remainder of Report Filed.

1 topic of “Sleep Health” was incorporated into Healthy People 2020, with a specific objective to
 2 increase the overall proportion of students in grades 9-12 who get sufficient sleep (defined as 8 or
 3 more hours per night) to 33.1 percent by 2020.⁴

4
 5 One contributor to insufficient sleep in adolescents is an early school start time.⁵⁻⁸ In the 1960s, to
 6 accommodate a large influx of baby-boomers, school districts began experimenting with staggered
 7 start times. By 1975, most high schools in the U.S. started as early as 8:00 a.m.⁹ In the past few
 8 decades, high school start times have become increasingly early, with many high schools beginning
 9 at or before 7:30 a.m.^{9,10} Acknowledging a need to increase alertness and readiness to learn among
 10 high school students, many school districts have recently pushed back high school start times, and
 11 maintained those changes.¹¹ Delaying high school start times, while beneficial to the student, are
 12 often controversial within the school district and community.¹² This report builds on a 2014 AAP
 13 policy statement “School Start Times for Adolescents”¹ by briefly reviewing the health and
 14 academic consequences of decreased sleep in adolescents and examining more recent evidence for
 15 delaying school start times as a mechanism to address adolescent sleep deprivation.

16 17 DECREASED SLEEP AMONG ADOLESCENTS

18
 19 The majority of adolescents do not get sufficient sleep (i.e., at least 8 hours) each night.^{3,4} Changes
 20 in circadian rhythm and sleep habits due to puberty, night-time distractions, and early school start
 21 times all contribute to insufficient sleep among adolescents.^{5,13}

22 23 *Circadian rhythm*

24
 25 Puberty is accompanied by a biological delay or shift in circadian rhythm, contributing to later
 26 bedtimes among teens.^{1,14-17} With the onset of puberty, most adolescents experience a sleep/wake
 27 “phase delay,” resulting in both later sleep and wake times.¹ Pubertal influences on the circadian
 28 cycle occur among most mammals, and in humans, are cross-cultural.^{13,16}

29
 30 Two primary biological factors contribute to changes in sleep regulation during adolescence.¹ First,
 31 the secretion of melatonin, a hormone that signals readiness for sleep, is delayed during puberty.¹⁴
 32 On average, melatonin secretion in prepubescent individuals begins at approximately 9:30 p.m., but
 33 in adolescents, starts around 10:30 p.m.¹¹ Therefore, most teens are not ready for melatonin-
 34 triggered sleep until at least 11:00 p.m. or later.^{10,11} The preferred (natural) biological wake-time
 35 for 16-year-olds is estimated to be close to 8:00 a.m., while for 18-year-olds is estimated to be
 36 closer to 9:00 a.m. This is in contrast to the approximately 6:30 a.m. biological wake time for 10
 37 year-olds.¹⁶ These differences in adolescent biology mean that a 7:00 a.m. wake up time for
 38 adolescents is roughly equivalent to a 4:30 a.m. wake-up time for a middle-aged adult.¹⁶ Second, an
 39 altered “sleep drive” occurs throughout adolescence, meaning that it can take much longer for teens
 40 to fall asleep.¹ Therefore, adolescents undergoing puberty will typically take longer to fall asleep
 41 when being awake for 14.5-18.5 hours compared to prepubertal teens.¹

42
 43 The shifting circadian rhythm in teens results in loss of sleep on school days. Total sleep time on
 44 school days decreases significantly from ages 11 to 15 years, with 11-year-olds averaging 9 hours,
 45 26 minutes of sleep, and 15-year-olds averaging 7 hours, 55 minutes of sleep.¹⁸ Total sleep time
 46 decreases even more as teens get older, with only 23.3 percent of 12th graders getting more than 8
 47 hours of sleep on school days.³ On weekends, adolescents tend to shift bedtimes 1-2 hours later and
 48 rise times 1.5-4 hours later than during the week.¹⁴ Although this “catch-up sleep” can partially
 49 offset sleep deficits incurred during the week, circadian disruptions persist.¹

50 In a study examining the sleep/wake patterns for the Navy’s training camp, young recruits (aged
 51 17-19 years) in the training camp were allowed six hours of sleep per night, 10:00 p.m. to 4:00

1 a.m.^{9,19} In order to address performance issues related to sleep deprivation, bedtime was moved to
2 9:00 p.m. Despite the extra hour of time allowed for sleep, the recruits were unable to fall asleep
3 and no improvements in performance were noted. However, when sleep times changed from 10:00
4 p.m. to 6:00 a.m., sleep came more easily and substantial improvements were noted. In particular,
5 standardized test scores increased and sick-calls were reduced by 70 percent.^{9,19}

6 7 *Risk factors*

8
9 In addition to circadian biology, several factors affect total sleep time among adolescents.
10 Computer and electronic use, family dynamics, and social activities also influence bed time.²⁰
11 Night-time use of screen-based technologies (phones, televisions, computers, etc.) impact daytime
12 sleepiness and academic performance. According to the NSF's 2014 Sleep in America Poll, more
13 than 70 percent of adolescents have at least one electronic device in the bedroom.²¹ Data from the
14 Pew Research Institute show that over three-quarters of Americans between the ages of 12 and 17
15 years now own a mobile phone, almost half of which are smartphones.^{22,23} Nearly 85 percent of
16 adolescents in the U.S. who have a smartphone sleep with it in or near their bed, and in-bed use has
17 been reported by more than 60 percent of adolescents.^{22,24} A recent study of more than 3,000 U.S.
18 middle and high school students found that mobile device use just before bed time or after lights-
19 out is significantly associated with insomnia and daytime sleepiness and is correlated with poor
20 academic performance, later bedtimes and fewer hours of sleep on school nights.²²

21
22 In addition to displacing sleep time, night-time use of some electronics further affects sleep
23 patterns by suppressing melatonin. Exposure to the blue wavelength light found on screen-based
24 technologies is associated with increased alertness and difficulty falling asleep.^{16,25,26} The short
25 wavelength spectral light emitted by electronics inhibits the secretion of melatonin, delaying the
26 melatonin-induced sleep process.^{13,27}

27
28 Other social factors such as a negative family environment (defined as an environment with
29 conflict and/or chaos) and stress coping strategies that involve disengagement also impact the
30 ability to fall asleep.^{25,28} Additionally, students working part-time jobs for more than 20 hours per
31 week often have difficulty getting adequate sleep. For every 10 hours worked per week outside of
32 school, students lose approximately 14 minutes of sleep per night.⁹

33
34 School start time is a large contributor to diminished sleep among adolescents.⁵⁻⁸ Students
35 beginning school before 8:15 a.m. often are substantially sleep deprived.⁵ School start times
36 typically remain constant or become earlier as students get older.²⁵ This is in juxtaposition to the
37 changing sleep patterns and sleep/wake cycles of adolescents as they progress through puberty.¹⁶
38 The impact of school start times on adolescent health and performance is discussed in more detail
39 later in this report.

40 41 *Consequences of sleep deprivation*

42
43 The proper amount of sleep is essential for healthy development during adolescence. Growth
44 hormone is released during slow wave sleep and gonadotrophic hormones also are secreted during
45 sleep.⁹ In addition, sleep impacts learning and memory.^{9,16} Adequate rapid eye movement (REM)
46 sleep is essential for emotional processing and cognitive development.⁹ Inadequate REM is
47 associated with poor memory performance, mood disorders, daytime sleepiness/unintended sleep,
48 anxiety, decreased socialization, hypersexuality, mental fatigue, and decreased capability of
49 handling complex tasks.^{5,9}

1 Several other negative health effects also are related to short sleep duration. For example, restricted
2 sleep is associated with hypertension and metabolic disorders, including diabetes.¹⁶ Impaired
3 immune function has been linked with short sleep duration; those with diminished sleep are more
4 likely to have an increased susceptibility to viruses such as the common cold.^{16,29,30} A study
5 assessing adolescents between the ages of 12 and 17 years found that cortisol levels and white
6 blood cell, neutrophil, monocyte, and CD4+ lymphocyte counts were negatively correlated with
7 short sleep duration.³⁰ Among females only, short sleep duration also was found to be negatively
8 associated with pro-inflammatory cytokine levels.³⁰

9
10 Behaviors increasing risk for injury are more prevalent among U.S. high school students who sleep
11 less than 7 hours on an average school night compared to those who sleep 7-10 hours per average
12 school night.³¹ These behaviors include infrequent bicycle helmet use, infrequent seatbelt use,
13 riding with a driver who has been drinking, drinking and driving, and texting while driving.³¹ A
14 higher risk of injury during after-school sporting activities also appears to be related to decreased
15 sleep duration among adolescents.³²

16
17 Adolescents with decreased sleep often are cited as being less physically active.^{33,34} Body mass
18 index (BMI) is believed to be directly related to inadequate sleep among adolescents.^{16,18,35-38}
19 Adolescents aged 16 to 19 years who are underweight, overweight, or obese have shorter sleep
20 durations than those who are normal weight.³⁵ However, sex differences in the relationship
21 between obesity and decreased sleep may differ depending on the study design. Obesity is more
22 likely among U.S. adolescent girls getting less than 4 hours of sleep or more than 9 hours of sleep,
23 but these effects were less consistently observed among adolescent boys.³⁸ In contrast, a more
24 recent study found an association between obesity and short duration of sleep among adolescent
25 boys, but not among adolescent girls.³⁵

26
27 Generally, a less positive attitude toward life and symptoms of depression and anxiety are more
28 evident with short sleep duration.^{16,39} The association with mood and anxiety is most apparent
29 among those getting less than 6 hours of sleep per night.⁹ Adolescents getting less than five hours
30 of sleep per night are more likely to engage in other high risk behaviors, such as smoking, drug use,
31 and high risk sexual activity.^{9,33,34,37} A negative or poorly structured family environment, which is
32 itself a risk factor for shorter sleep duration, additionally contributes to these behaviors.^{9,25}

33 34 SCHOOL START TIMES IN THE UNITED STATES

35
36 School start times for high school students have become increasingly early over the past several
37 decades.⁹ Nearly 10 percent of high schools in the U.S. begin at or before 7:30 a.m.¹⁰ Recently, the
38 Centers for Disease Control and Prevention (CDC) and the U.S. Department of Education analyzed
39 data from the 2011–2012 Schools and Staffing Survey (SASS).^{10,40} This survey assessed 39,700
40 public schools (middle, high, and combined schools), with an estimated total enrollment of 26.3
41 million students. The average start time for all middle, high, and combined schools in the U.S. was
42 8:03 a.m.^{10,40} Average start time varied widely by state. The average start time for adolescent
43 students in Louisiana is approximately 7:40 a.m., whereas in Alaska and North Dakota, start times
44 are almost an hour later at 8:33 a.m. and 8:31 a.m., respectively.^{10,40}

45
46 School start times vary by state, school size, whether the school is located in urban or rural
47 locations, and the presence and type of the busing system. Schools with more than 1,000 students
48 tend to start approximately 15 minutes earlier compared to smaller schools, and rural schools begin
49 on average 15 minutes later than urban or suburban schools.¹⁰ Schools that do not have a tiered bus
50 system start 15 minutes later than schools with two-tiered systems, or 20 minutes later than schools
51 with three-tiered systems.⁴¹ Several school districts stagger the start times of their elementary,

1 middle, and high schools, which accommodates large influxes of students and allows for the same
2 bus drivers to serve multiple schools, thus reducing costs incurred by the school district.^{9,41,42}

3
4 Available data support a high school start time of 8:30 a.m. or later to ensure adequate essential
5 sleep among adolescents.^{8,9,17} However less than 18 percent of public schools start at or later than
6 8:30 a.m.^{10,40} This percentage varies widely by state, with more than three-quarters of schools in
7 North Dakota and Alaska starting later than 8:30 a.m., and no schools in Hawaii, Mississippi, or
8 Wyoming starting at or later than 8:30 a.m.^{10,40} Forty-two states report that 75-100 percent of their
9 public schools start before 8:30 a.m.^{10,40}

10 11 OUTCOMES DUE TO DELAYED SCHOOL START TIMES

12
13 As of 2009, more than 80 schools had delayed school start times in an effort to allow adolescents to
14 attain extra sleep.¹¹ To date, schools in over 43 states have delayed school start times.⁴³ Several
15 studies, including a systematic review, have evaluated the impact of delayed school start times.^{8,44-}
16 ⁵² Benefits have been observed by parents, teachers, school administrators, and students, while few
17 disadvantages or harmful effects have been noted.^{5,7,12,53} School districts that have delayed start
18 times typically have not returned to their previous schedules.¹¹

19 20 *Sleep duration*

21
22 Several studies have compared patterns of sleep duration and the sleep/wake cycle among
23 adolescents with earlier school start times to those with later school start times. One study
24 compared students beginning school at 7:15 a.m. to students beginning school later, at 8:37 a.m.;
25 students at both schools reported similar bedtimes, but students at the school with a later start time
26 woke up an hour later on average on school days than students at the school with the earlier start
27 time.⁴⁵ In addition, students at the school with the later start time experienced an average of 50
28 more minutes of sleep per night and reported less daytime sleepiness compared to their
29 counterparts starting school more than one hour earlier.⁴⁵ A three year study that examined the
30 effects of delayed school start times noted that schools starting after 8:30 a.m. allow for almost
31 60% of students to achieve a sleep duration of at least 8 hours per night on school days,⁸ nearly
32 twice the proportion of 9th-12th grade students currently achieving 8 hours of sleep each night
33 nationwide.³

34
35 In 1997, citing the negative effects of sleep deprivation, seven Minnesota high schools shifted
36 school start time from 7:15 a.m. to 8:40 a.m. Prior to the change it was anticipated that students
37 would adapt to the change in start time by delaying their bedtime.⁵ However, after several years of
38 follow-up, bedtime remained unchanged from the years prior to the change in school start time; as
39 a result, more students had increased total sleep duration each night.⁵ Other studies have observed
40 the same, i.e., bedtime remains the same and sleep duration increases with delayed school start
41 time.^{13,20,45-48} The average bedtime for teens (approximately 10:30 p.m.) has remained relatively
42 constant for the past several decades.²⁰ Bedtimes of teens in 1981 were similar to those of bedtimes
43 among teens in 2003-2006 despite drastic changes in school start times within this time frame.^{9,11,20}

44
45 Evidence that bedtime remains unchanged when school start time is delayed has not been
46 completely consistent. A cross-sectional survey of 7,308 U.S. adolescents aged 13 to 17 years
47 found that those with later school start times went to bed later than students with earlier school start
48 times.⁴⁹ Despite this difference, those with later school start times consistently obtained more sleep
49 and were more likely to achieve the recommended 8-10 hours of sleep per night, compared to
50 students attending schools with earlier start times.⁴⁹

1 Even modest changes in school start time induce positive changes in sleep duration.^{50,51} For
2 example, a half-hour delay, from 8:00 a.m. to 8:30 a.m. was responsible for students gaining an
3 average of more than 45 minutes of sleep per night.⁵⁰ Notably, reports of less than 7 hours of sleep
4 per night were reduced by almost 80%.⁵⁰ Others also have observed that a small delay in start time
5 from 8:00 a.m. to 8:25 a.m. was associated with at least one half-hour increase in sleep duration,
6 and more students experiencing at least 8 hours of sleep per school night.⁵¹

7 8 *Social and physical outcomes*

9
10 School districts that have delayed school start times have identified several changes in mood,
11 behavior, and overall well-being among students. In particular, in the time period following
12 institution of delayed start times, students were less likely to have self-reported depression, and
13 more likely to report increased or improved motivation and increased energy level than before the
14 delayed start times were instituted.^{9,13,45,50} Parents, teachers, and school administrators in schools
15 with delayed start times also have noted improved student demeanor and significantly fewer
16 disciplinary problems.^{5,42}

17
18 Two years following a delay in school start times by one hour in some Kentucky school districts, a
19 notable decrease (16.5 percent) in motor vehicle crash rates among teens was observed in the
20 geographic areas near the schools with delayed start times.⁵² In contrast, the motor vehicle crash
21 rate for the rest of Kentucky increased by almost 8 percent during the same time period.⁵² This
22 phenomenon has been observed elsewhere as well. In Virginia, teen crash rates were compared
23 between geographically adjacent communities with vastly different high school start times,
24 Virginia Beach, VA, and Chesapeake, VA.⁵⁴ School start time in Virginia Beach is 75-80 minutes
25 earlier than in Chesapeake. For the two years studied, crash rates were significantly higher in
26 Virginia Beach compared to Chesapeake.⁵⁴ Peak crash times occurred during teens' morning
27 commute timeframe, but other factors, such as congestion rates, were not found to be associated
28 with crash rates.⁵⁴ This trend has remained in other counties within the state of Virginia as well.⁵⁵
29 In addition, decreases in motor vehicle crashes among teenagers aged 16-18 years decreased
30 between 65-70 percent after schools in both Minnesota and Wyoming delayed school start times.⁷

31 32 *Extracurricular activities and responsibilities*

33
34 While positive outcomes have been observed following delays in school start times, negative
35 impacts also have been noted. Later end times to school affect the ability of students to participate
36 in athletic and other extracurricular activities and to have part-time jobs.^{9,42} In addition, since it gets
37 dark earlier during the fall and winter months, increased concern exists regarding students waiting
38 for the school bus in the dark.^{56,57}

39
40 Traditionally, sports practice occurs at the end of the day. The consequent delay of practice and/or
41 start times for games to accommodate a later school start time is a significant concern among
42 parents, students, and coaches.^{5,56} Some schools with delayed start times have allowed for early
43 dismissal from class to accommodate scheduling of sports games and practices.⁴² In addition, in
44 order to minimize the reduced time allotted for sports practices, other schools have opted to hold
45 practices in the morning, prior to school start, thus negating the reason for delaying school start
46 times.^{41,56}

47
48 Two studies evaluating the effects of delayed school start times on whether students were too tired
49 to play sports found no significant changes.^{43,51,52} Similarly, no significant differences in
50 participation in music activities, volunteer work, or socializing with friends were noted after
51 delayed start times were initiated.^{43,51,52}

1 Teachers also have after-school commitments, and for personal reasons, report mixed support for
 2 delayed school start times.^{5,12} The majority acknowledge that students are more alert during the
 3 day, and many appreciate the extra time in the morning for lesson planning before students arrive.⁵
 4 But about half of teachers are concerned that the later end times mean less time for personal
 5 commitments, such as having a second job, and longer commutes home due to rush hour traffic.¹²

6 7 *Academic performance and attendance*

8
9 Selected markers of academic performance indicate that decreased sleep duration is associated with
 10 poorer academic performance among adolescents.^{33,58,59} When school start times are delayed,
 11 improvements in academic performance are noted.^{8,9,60} Specifically, when classes begin after 8:35
 12 a.m., substantial improvements in grades in math, English, and social studies are observed, and
 13 improvements in performance on academic achievement tests at both the state and national level
 14 are apparent.⁸ In addition, when teens begin school before 8:00 a.m., they tend to perform more
 15 poorly throughout the day, compared to teens beginning school later.⁵⁹ However, when grades or
 16 grade point average (GPA) alone are considered, data on academic performance and school start
 17 times are less clear.^{8,9,13,57,60} For example, little to no association has been found between GPA and
 18 decreased sleep.^{57,60} Confounding factors, such as student selection of coursework and specific
 19 instructors may bias any association between grades or GPA and decreased sleep.

20
21 Improvements to attendance also have been noted when school start time is delayed. Fewer
 22 students are tardy or absent from school, and fewer truancies occur.^{8,13,15,41,48}

23 24 *Bus schedule impact*

25
26 Costs associated with changes to school bus schedules often are cited as a major reason to not delay
 27 school start times.^{5,42} However, evidence from school districts that have instituted delays does not
 28 support this view. Schools in Minnesota that implemented a change in school start time from 7:15
 29 a.m. to 8:40 a.m. had no changes in transportation costs.⁵ In these schools, buses and bus routes
 30 remained the same, yet the time the buses used the routes was delayed.⁵

31
32 If schools with tiered bus systems opt to dismantle the tiered schedule as a result of later school
 33 start times, then increases in transportation costs can be expected. However, the costs may not be as
 34 high as previously imagined. Eliminating a three-tiered bus schedule is estimated to cost
 35 approximately \$150 per student per year.⁴¹ In contrast, reducing class size by one-third to allow for
 36 a more enriched learning environment and an increase in standardized test scores is estimated to
 37 cost roughly \$2,151 per student per year, about seven times the cost of eliminating the tiered bus
 38 system to accommodate a delayed school start, with an almost equivalent benefit to students.⁴¹

39 40 *Impacts on family schedules*

41
42 In school districts considering delaying start times, parents have reported concern about the impact
 43 that the later start times could have on their work and family schedules.⁵ Some parents have jobs
 44 with inflexible start times, so a delay in school start time may require them to arrange for
 45 alternative transportation to get their children to and from school. For families with younger
 46 siblings, a delay in high school start time may mean that the schedules of younger children will be
 47 offset, creating the need for multiple trips to drop off and pick up children from school. Similarly,
 48 older siblings are often counted on to provide after-school care for younger siblings, so a shift in
 49 school end times may leave parents with the need to find alternative care for those children.^{9,42}
 50 However, many parents who express concern about the impact of delayed school start times on

1 their family's schedule still support later start times because of the anticipated positive impact on
2 students' health and learning.⁵

4 CURRENT LEGISLATION

6 In 1998, the Zzz's to A's Act was introduced in the U.S. House of Representatives, advocating for
7 later school start times. Newer versions and revisions have occurred over the past decade and a
8 half. The Act directs the Secretary of Education to study the effect of delaying school start times
9 for adolescents and present the findings to Congress. The Act's sponsor believes that the study will
10 help local school districts to recognize the impact that school start times can have on the well-being
11 of adolescents.⁶¹

13 The newest version of the Act, H.R. 1306, was introduced in the House in March of 2015. As of
14 April 2015, it has been referred to the Subcommittee on Early Childhood, Elementary and
15 Secondary Education, which is part of the House Education and Workforce Committee.⁶² The Act
16 has several original cosponsors and is supported by both the National Sleep Foundation and Start
17 School Later, Inc.⁶¹

19 ROLE OF PHYSICIANS, PARENTS, AND EDUCATORS

21 Adolescent sleep hygiene is highly influenced by parents.¹⁶ Significant concordance exists between
22 parent and adolescent sleep time; adolescents sleep more or less on days in which their parents
23 sleep more or less, respectively.⁶³ Parents can therefore impact sleep patterns by establishing a
24 sleep routine for the family and by modeling adequate sleep duration and appropriate sleep
25 behavior.⁶³

27 School-based education programs on sleep hygiene have generally improved students' knowledge
28 of appropriate sleep practices, but have resulted in improved sleep behavior only on weekends, not
29 weeknights.^{64,65} However, a positive outcome from one education program was a decrease in
30 behaviors that can negatively impact sleep, such as caffeine intake and hyperactivity.⁶⁵

32 School administrators, parents, and community members involved in the process of delaying
33 school start times can become overwhelmed by the available data, and the process can be
34 emotionally charged.¹² Lack of sufficient community support to delay start times has led to
35 controversy and worry about the cascade of transportation and athletic/extracurricular activity
36 consequences that could result from a schedule change.¹²

38 School start time delays have generally been unsuccessful when only partial facts are explained,
39 implementation is too rapid, and incorrect assumptions are conveyed.⁵ Physicians and medical
40 professionals can assist school districts that are considering delaying school start times. The AAP
41 recommends that pediatricians and other health professionals educate adolescents, parents,
42 educators, athletic coaches and other stakeholders about the biological and environmental factors
43 that contribute to sleep deprivation in youth.¹ Further, the AAP recommends that health
44 professionals provide scientific information, evidence-based rationales, guidance, and support to
45 educate school administrators, parent-teacher associations, and school boards about the benefits of
46 instituting a delay in start times as a potentially highly cost-effective countermeasure to adolescent
47 sleep deprivation and sleepiness.¹ The presence of physicians, particularly sleep medicine
48 specialists and pediatricians, at public meetings on delaying school start times has been
49 influential.^{1,56,66-69} Support from other professionals has been similarly influential. In Kentucky,
50 support from a child psychologist and the school's legal counsel were helpful in the decision to
51 delay school start times.⁵⁶

1 CONCLUSIONS

2
3 Adolescent sleep health is an important public health topic. Decreased total sleep time among teens
4 is strongly associated with several negative outcomes including decreases in emotional processing
5 and memory, metabolic disorders, impaired immune function, depression and anxiety, high risk
6 behaviors, increased injury from sport activities, unhealthy BMI, and decreased academic
7 performance.^{5,9,16,18,29-39,44,58,59} Evidence strongly suggests that allowing adolescents more time for
8 sleep results in improvements in health, academic performance, behavior, and general well-being.
9 Overwhelming evidence exists that sleep duration in adolescents can be significantly increased
10 when school start time is delayed, particularly past 8:30 a.m.^{7-9,13,20,45,47-51,69} The AAP and the
11 National Association of School Nurses and the Society of Pediatric Nurses support a delay in
12 school start times to allow more adolescents to achieve the recommended sleep duration of 8-10
13 hours per night.^{1,69}

14
15 Implementing a delayed school start can be an emotional and potentially stressful issue among
16 members of the community. No “one size fits all” approach to delaying school start times will be
17 appropriate for all school districts.¹² However, the Council on Science and Public Health believes
18 that the benefits of delaying school start times to allow for adequate sleep among adolescents
19 outweigh the potential consequences. The Council believes that physicians, as well as parents and
20 educators, should work together to convey the benefits of increased sleep among teens and support
21 later start times for schools.

22
23 RECOMMENDATIONS

24
25 The Council on Science and Public Health recommends that the following statements be adopted in
26 lieu of Res 404-A-15 and the remainder of the report be filed.

27
28 That our American Medical Association:

- 29
- 30 1. Encourage school districts to aim for the start of middle schools and high schools to be no
31 earlier than 8:30 a.m., in order to allow adolescents time for adequate sleep. (New HOD
32 Policy)
 - 33
34 2. Encourage physicians, especially those who work closely with school districts, to become
35 actively involved in the education of parents, school administrators, teachers, and other
36 members of the community to stress the importance of sleep and consequences of sleep
37 deprivation among adolescents, and to encourage school districts to structure school start
38 times to accommodate the biologic sleep needs of adolescents. (New HOD Policy)
 - 39
40 3. Reaffirm Policy H-60.930, Insufficient Sleep in Adolescents, identifying adolescent
41 insufficient sleep and sleepiness as a public health issue and supporting education about
42 sleep health as a standard component of care for adolescent patients. (Reaffirm HOD
43 Policy)
 - 44
45 4. Encourage continued research on the impact of sleep on adolescent health and academic
46 performance. (New HOD Policy)

Fiscal note: Less than \$500

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