

## Virginia Academy of Sleep Medicine Position Statement on School Start Times in Virginia

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### ABSTRACT

The Virginia Academy of Sleep Medicine endorses the 2017 American Academy of Sleep Medicine (AASM) position statement that middle and high schools should begin no earlier than 8:30 AM. The existing and updated scientific literature repeatedly identifies the detrimental impact of early high school start times—and the benefits of delaying start times—on the safety and well-being of students in Virginia. The adverse effects of early school start times on Virginia’s students have been demonstrated with respect to academic performance, mental health, and driving risks. Data published since the AASM position paper highlight these dangers further. Recent studies also demonstrate some of the benefits that can come from delaying school start times, including improved academic performance and attendance, reduced depression and suicidality, positive economic impact, and reduction of adolescent motor vehicle crashes.

Early middle and high school start times significantly contribute to the public health epidemic of sleep deprivation in adolescents and attendant harmful consequences. Addressing middle and high school start times, a modifiable risk factor, can not only address the teen sleep loss epidemic but also potentially lead to increased productivity, attention, vigilance/safety, performance, and improved health in this vulnerable population.

**KEYWORDS:** schools; public policy; circadian rhythm

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## INTRODUCTION

For decades, the scientific literature has clearly and consistently demonstrated the harms that come from starting middle and high schools too early in the day, including impaired daytime function (eg, academics and driving) and mental health, and the benefits that can be attributed to delaying those start times. The American Academy of Sleep Medicine (AASM) published a position paper in 2017, advocating for middle and high schools to start no earlier than 8:30 AM.<sup>1</sup> Response to that position has varied across the Commonwealth of Virginia.<sup>2–4</sup> As of 2017–2018, the average start time for high schools in Virginia was 8:14 AM, and only 25% started at 8:30 AM or later.<sup>5</sup>

The Virginia Academy of Sleep Medicine (VASM) is the leader in setting standards and promoting excellence in sleep medicine healthcare, education, and research in Virginia. A task force was created by the VASM Legislative and Education Committees on behalf of the Board of Directors; the aim was to re-evaluate the 2017 AASM position paper on delaying middle and high school start times with a focus on the Commonwealth of Virginia and based on an updated review of the scientific literature on the effects of earlier school start times on adolescents.

This position was adopted by the VASM Board of Directors, which approved the final version on August 25, 2022 (box).

### *VASM Position on School Start Times in Virginia*

The VASM reaffirms the AASM position<sup>1</sup> that middle and high schools should start at 8:30 AM or later. This position is especially relevant to Virginia and supports:

- adolescents having the opportunity to obtain sufficient sleep on school nights<sup>1</sup>
- public health and improved safety, with reduction in injuries
- improved alertness in the classroom and decreased tardiness and absenteeism to enable optimal academic performance<sup>1</sup>
- adolescent mental health and well-being<sup>1</sup> and decreased risk-taking behaviors
- economic benefits to individuals, communities, and the Commonwealth.

## DISCUSSION

An appreciation of the differences in normal sleep patterns vs the requirements of the developing school-aged and adolescent child is central to the discussion concerning sleep/wake patterns and school start times. Adolescents typically require 8–10 hours of sleep per night,<sup>6,7</sup> yet many teens routinely only

achieve 7 hours of sleep or less, particularly during the school week.<sup>8</sup> The preponderance of the scientific literature suggests that early school start times (or any early-morning required event) can pose a substantial and cruel burden to an adolescent's innate biology. At the start of adolescence, neurobiological changes to the adolescent's circadian system move the release of nocturnal melatonin approximately 2 hours later relative to childhood timing, postponing the sleep-wake cycle and resulting in an approximate 2-hour physiologically based sleep phase delay (later onset sleep and wake).<sup>9</sup> In addition, sleep "pressure" or "sleep drive" builds up more slowly in adolescents as compared to adults throughout the waking day and hence drives adolescents' ability to fall asleep even later. Evidence also suggests that the adolescent circadian clock is less sensitive to light during the morning when light advances the circadian clock and its timing of sleep.<sup>10</sup> All this causes teenagers to stay awake longer relative to children and adults and makes it difficult for most teenagers to sleep any earlier than 11:00 PM. The misalignment between the adolescent's natural circadian rhythm and early school start times results in chronic sleep loss and contributes to social jetlag,<sup>11</sup> which is the phenomenon of attempting to recover the sleep debt from the week, usually by awakening much later on weekends. While sleeping in on weekends may not routinely be seen as a problem, social jetlag in US

teens is associated with unhealthy eating behaviors and obesity,<sup>12</sup> as well as increased anxiety.<sup>13</sup>

Middle and high school students who start school earlier are known to have a higher risk for achieving insufficient sleep time<sup>14,15</sup> and showing altered brain development.<sup>16</sup> Experience in districts that have delayed school start times has shown that sleep time in students does appropriately increase with delayed start times.<sup>17,18</sup> The extension of sleep is shorter than the delay in school start times due to a typically small delay in bed times and longer delay in rise times.<sup>10,15</sup>

From an academic standpoint, sleep quality has been associated inversely and significantly with academic performance.<sup>16,19</sup> Various studies using sleep-restriction protocols have demonstrated the worsening of several neurocognitive functions such as memory, attention, and executive function as a consequence of sleep loss.<sup>20-22</sup> In a study from 2001 based on Arlington County, VA, public schools, tenth grade students' first-period grades improved after a 45-minute start time delay; no significant change was noted in seventh grade students' first-period grades after a 20-minute advance of school start times.<sup>15</sup> Among a group of disadvantaged students, later start times have been associated with reduced tardiness and daytime sleepiness,<sup>17,23</sup> as well as reduced school suspensions and higher course grades.<sup>24</sup>

Sleep-deprived teenaged drivers can present significant dangers on the road, at times resulting in injury and death. A survey of Fairfax County, VA, teens found that 76.6% reported drowsy driving, which was more frequent when there was shorter school-night sleep duration.<sup>25</sup> A study of 2 adjacent, demographically similar Southeastern Virginia cities with strikingly different high school start times (75–80 minute differential start times) revealed that the city with earlier start times (Virginia Beach) demonstrated a significantly higher adolescent motor vehicle crash rate relative to Chesapeake (which had later high school start times), suggesting early high school starts may pose significant driving risks to teens.<sup>26</sup> These results were replicated in a study of 2 adjacent, demographically similar Central Virginia counties with distinctly different high school start times: Teens from Chesterfield County, who started 85 minutes earlier on average, had significantly higher crash rates than those from Henrico County.<sup>27</sup> Delaying high school start times may provide additional benefit in Virginia. After Fairfax County delayed high school start times by 50 minutes, there was a significant decrease in the adolescent motor vehicle crash rate compared with the rate just 2 years earlier.<sup>28</sup> Similarly, researchers from Forsyth, NC, estimated an overall decrease of approximately 14% in per capita crash rates following a 75-minute change (ie, later opening) in the countywide high school start time and concluded that later high school start times after

8:30 AM were associated with reduced adolescent crash rates.<sup>29</sup> This is especially concerning because novice teen drivers (within 18 months of obtaining their licenses) have already been found to have 4 times the crash and near-crash rates of adults.<sup>30</sup> A 2018 American Academy of Pediatrics Policy Statement supported delaying high school start times to address “adolescent chronobiology and associated safety risks.”<sup>31</sup>

Sleep quantity and quality adversely affect mental health outcomes and risk-taking behaviors in teenagers. In Fairfax county adolescents (8th, 10th, and 12th graders), a reduction in weeknight sleep was associated with greater chances of feeling hopeless, suicidal thoughts and attempts, and substance use disorders.<sup>32</sup> Another national study demonstrated a direct relationship between sleep duration and suicidal planning, with an 11% reduction in the risk of suicide plans for every 1 hour increase in sleep duration.<sup>33</sup> Teens who are sleep deprived (ie, who obtain <8 hours of sleep at night) are much more likely to engage in risky behaviors, such as drug and alcohol use, to get lower grades, and to be at greater risk for car crashes.<sup>34</sup> One Swedish study examined a relatively shorter (20-minute) delay in start times (from 7:40 AM to 8:00 AM) and did not find this to be associated with any changes in the outcomes examined (behavioral persistence, tiredness, or positive attitude toward life); the authors concluded that the 20-minute delay may have been insufficient to result in

meaningful change.<sup>35</sup> Some other studies have suggested delayed school start times are associated with significant reductions in depressed mood and irritability or annoyance among students at boarding schools.<sup>36,37</sup> Furthermore, a delay beyond 8:30 AM to a start time of 10 AM was associated with a decrease in student illness over a 2-year period and improvements in the number of students making good academic progress.<sup>38</sup>

### *Improved middle and high school starting times*

More appropriate start times for middle and high schools may help to address student sleep health disparities.<sup>39–41</sup> The impact of start times is not equal among all students, including in Virginia.<sup>32</sup> Delaying start times for these schools improves academic performance overall, with larger effects demonstrated in those with lower test scores<sup>42</sup> or who are otherwise disadvantaged.<sup>24</sup> However, research on this area has been limited with sometimes conflicting results; more study is needed.

Nonetheless, delaying school start times in Virginia would have tremendous positive economic effects within a few years of implementation. With delayed school start times, one would anticipate higher academic achievement (evidenced by increased graduation rates), a reduction in mental health disorders and treatment, and fewer preventable deaths from motor vehicle crashes and suicide; these and similar changes would lead to a more educated, robust, and productive workforce.<sup>43</sup> In Virginia,

the economic gain per student just 2 years after implementation of a delayed start time is estimated to be around \$595 per student, and, overall, the modeling and data suggest that the long-term positive economic benefits far outweigh any short-term costs.<sup>43</sup> After 5 years, the gain is estimated to increase to \$2129 per student; over 20 years, the gain reaches a staggering \$10,765 per student per year.<sup>43</sup> Another study estimated that delaying school start times would result in \$17,500 (in 2011 dollars) in increased future earnings per student, but the cost to the system would be as little as \$0 to \$1950 per student over the course of each student's school career.<sup>44</sup> This comparatively modest investment required to delay school start times could thus result in billions of dollars of economic gain for the Commonwealth.

### *Special considerations*

The VASM does not endorse any single plan for achieving delayed middle and high school start times. The diversity of Virginia and Virginians requires that any plan must take into account a number of factors unique to each local community.

The mutually compatible goals of delaying school start times are to align the daily school schedule with the time of day at which adolescents are most alert and to allow middle and high school students the most opportunity to achieve sufficient sleep time. Some circumstances around the state, such as rural areas or

specialty schools, require extended commutes; in these cases, even later start times may be warranted.

The VASM makes no recommendations regarding start times for elementary schools in Virginia.

#### CONFLICT OF INTEREST

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#### PREPRINT

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