



**ANNE ARUNDEL COUNTY
OFFICE OF THE COUNTY AUDITOR**

To: Members of the County Council

From: Teresa Sutherland, County Auditor

Date: January 28, 2015

Subject: Resolution No. 6-15: Resolution encouraging the Anne Arundel County Board of Education and Superintendent of Anne Arundel County Public Schools to establish safe and healthy hours for all students

This resolution encourages the Board of Education and Superintendent of Schools George Arlotto to:

- act on the recommendations of the Anne Arundel County Public Schools (AACPS) School Start Times Task Force and the Maryland Task Force to Study Safe and Healthy School Hours for Maryland Public Schools; and
- expeditiously take measures to establish safe and healthy high school hours.

Background

The AACPS high school start time of 7:17 a.m. is the earliest in the state and among the earliest in the nation. Approximately 58,000 students are transported daily on 566 buses. AACPS uses a tiered bus system whereby the buses first transport high school students (tier 1), then middle school students (tier 2), followed by one or more elementary school runs (tiers 3 and 4). Some buses run as many as seven tiers, transporting students to half-day pre-kindergarten, the Centers for Applied Technology, etc.

AACPS instructs students to arrive at their bus stops ten minutes before pickup. As shown in Attachment 1, twelve buses pickup students at 6 a.m. or earlier. The two earliest bus pickups are at 5:30 a.m. and 5:35 a.m., requiring the children to arrive at their buses at 5:20 a.m. and 5:25 a.m., respectively, a full two hours before sunrise in the winter months.

In response to community concerns about the impact of early high school start times on student health, safety, and learning, former Interim Superintendent Mamie Perkins convened the AACPS School Start Times Task Force in February 2014. Subsequent to Ms. Perkin's convening the AACPS task force, the General Assembly passed House Bill 883 requiring the Department of Health and Mental Hygiene (DHMH) to (1) review the science on the sleep needs of children and adolescents, including the effects of sleep deprivation on academic performance and the benefits of sufficient sleep; (2) review and study how school systems have implemented alternative start times and the impacts on various activities; and (3) make recommendations regarding whether public schools should implement start times no earlier than 8 a.m.

The DHMH report is lengthy, and the AACPS task force's analysis, findings, and recommendations are available only via a web link. Therefore, I have attached a reference page that provides web links to these reports and to other documents referenced in this letter.

Whereas Clauses

This resolution contains a number of “whereas” clauses that address healthy and safe school start times. The statements recognizing the sleep needs of adolescents and the impact of insufficient sleep on adolescent health, behavior, and academic performance are supported by DHMH’s findings and by findings issued by the American Academy of Pediatrics, the Centers for Disease Control, the National Sleep Foundation, and the National Institutes of Health. The statement regarding the increased danger of traveling in darkness and extreme cold is supported by DHMH’s findings, including the association of early start times with increases in teenage vehicle crashes. Additionally, with respect to the danger of walking in the dark, the National Transportation Safety Board (NTSB) found that pedestrians have a higher probability to be killed in a crash under a dark condition than under light conditions; pedestrians are more likely to be killed in a crash between 3 a.m. and 6 a.m.; and pedestrians are more likely to be killed in a crash under a sleet condition than under any other weather condition.

Maryland Task Force to Study Safe and Healthy School Hours for Maryland Public Schools

DHMH issued its report to the General Assembly in December 2014. In its report, DHMH summarizes the scientific literature on sleep physiology and sleep needs of youth; the effects of insufficient sleep on school performance, academics, and overall health and well-being; and the positive outcomes associated with sufficient sleep.

DHMH’s Findings and Recommendations

DHMH’s review of the scientific literature found:

- There is general consensus among the health community and sleep experts that school-aged children need 8 - 10 hours of sleep each night (9-10 hours for teens), and the literature consistently shows that sleep is an important predictor of attention and cognitive ability in children and adolescents.
- Physiologic changes during puberty trigger dramatic alteration in sleep needs and behaviors as children transition to adulthood. Melatonin is secreted later in the evening and shuts off later at night, so adolescents take longer to fall asleep and spend less time in the phase of sleep believed to be critical to brain refreshment and restoration. These developmental changes provide a biological foundation for insufficient sleep and daytime sleepiness in adolescents.
- Insufficient sleep is associated with poorer academic performance across multiple academic subjects, as well as lower scores on achievement tests and tests of eye-hand coordination, dexterity, and nonverbal concept formation. Conversely, more sleep is associated with improvement in executive function and measures of attention and impulsivity.
- Insufficient sleep is associated with depression, anxiety, suicidal ideation, and obesity.
- Some studies have found a link between reduced sleep and risk-taking behavior such as alcohol and drug use, tobacco use, sexual activity, and truancy.
- Sleep duration of less than six hours is associated with increases in motor vehicle accidents and subjective sleepiness while driving.
- Early school start times have been identified as one of the strongest predictors of shorter weeknight sleep in adolescents.

With respect to the effect of later school start times, DHMH found that:

- When school start times are delayed, sleep duration increases. The literature consistently demonstrates that students go to bed at a similar time despite being able to sleep later in the morning.

- Schools that have implemented later school start times reported financial savings, improved academic achievement, improved mental and overall health, decreased motor vehicle accidents, and higher attendance and graduation rates. Some schools reported increased enrollment and fewer tardy arrivals.
- Objective parameters show performance improvements in a variety of school subjects and on state and national achievement tests.
- Students' subjective assessments of their own well-being show less daytime sleepiness and fatigue, greater motivation, and a better ability to stay awake while studying, taking tests, or attending class.
- A review of the effects of later start times noted a 65-70% reduction in vehicle crashes when start times were delayed.

DHMH acknowledges that while the Maryland State Board of Education has the authority to determine elementary and secondary educational policies, each county board of education is responsible for managing its own operational logistics, including transportation. For this reason, statewide legislation addressing school start times was strongly opposed by many stakeholders. DHMH also acknowledges the unique demographics and resources of each jurisdiction and expresses its concern about the impact of later start times on families of lower socioeconomic status who were more likely to report limited transportation and child care options and financial support from teens working to supplement household earnings.

DHMH concludes by recognizing the connection between sufficient sleep and student health and wellness, stating that while the consequences of changing school start times are unavoidable, the consequences can be ameliorated with proper planning and preparation. To that end, DHMH encourages the State Board of Education to use its authority to advise the local school systems of the benefits of later school start times and encourage the local boards to conduct feasibility studies regarding the implementation of school start times of 8 a.m. or later. Finally, DHMH cautions that by preserving the status quo where school start times are a matter for each jurisdiction, *"the state risks letting local resistance trump a strong body of scientific evidence that sleep is critical to health and academic achievement."*

Maryland State Department of Education (MSDE) Response to DHMH's Report

In response to DHMH's findings and recommendations, MSDE issued a supplemental report that examines the impact of a later school start time on safety, finance, scheduling, extracurricular activities, and student achievement. MSDE reports that the one overriding issue repeatedly voiced at an MSDE forum was that of local autonomy vs. State control. MSDE observes that having the State legislature or State Board of Education mandate start times for local school systems would be a departure from the present order because it would reduce local autonomy and discount the unique characteristic of each district. However, MSDE recognizes the connection between sufficient sleep and student health and wellness and concludes its comments by stating that it concurs with DHMH's recommendation to use its authority to advise the local school systems of the benefits of later start time policies and encourage them to conduct feasibility studies regarding the implementation of school start times of 8 a.m. or later.

AACPS School Start Times Task Force Study

The AACPS School Start Times Task Force convened by Interim Superintendent Mamie Perkins comprised eight AACPS employees, one representative from the County Police Department, one from the County Department of Recreation and Parks, and five members representing other stakeholder groups. The task force presented its findings and recommendations to the Board of Education in September 2014.

The task force was guided by the following fundamental assumptions:

- Adolescents will be better students if they are healthier, and a contributing factor to good health is getting an appropriate amount of sleep.
- Starting high schools later than 7:17 a.m. will allow adolescents to get more sleep each night.
- Children need access to both curricular and co-curricular activities.
- Students should not walk to or from school/bus stops in the dark during the morning or afternoon twilight hours.
- Providing school start times that align with a family's schedule, when possible, minimizes the time students are unsupervised, before and after school, and maximizes time for family engagement.

As the task force members considered options to adjust school start times, they deliberated on the following questions:

- How much additional sleep will this option provide for our adolescent students?
- Is this option conducive for all pre-kindergarten - grade 12 learners?
- Will all students have a safe environment for walking to and from school or their school bus?
- How will this option impact before and after school care for young students and families?
- How will this option impact K-12 sports and other co-curricular activities - both school and community-based offerings?
- How many additional buses and drivers, if any, will AACPS need to transport students to and from school at the proposed adjusted times?
- How many additional staff will be needed, if any, to manage the proposed additional buses and transportation routes?

Findings and Recommendations

The AACPS task force concluded that extra sleep potentially gained by starting school later would be beneficial for high school students and that later school start times can be achieved in an acceptable way. While there are myriad alternative bell schedules for later high school start times, the task force's analysis was limited to four options because AACPS lacks bus routing software that would allow AACPS or the task force to effectively and efficiently analyze other alternatives. The four options the task force analyzed were:

- *Option A:* high school start times of 8:30 a.m.; middle school start times of 9:30 a.m., and elementary school start times between 7:50 a.m. and 9:15 a.m.
 - *Cost: \$8.9 million, including 124 additional buses and seven additional employees (two area specialists, two operational technicians, two drivers/trainers, and one clerical staff).*
- *Option B:* high school start times of 9:15 a.m.; middle schools start times between 8:20 and 8:30 a.m., and elementary school start times between 7:40 and 9:15 a.m.
 - *Cost: \$9.4 million, including 131 additional buses and seven additional employees (two area specialists, two operational technicians, two drivers/trainers, and one clerical staff).*
- *Option C:* Shift all start times 30 minutes with high school start times of 7:47 a.m.; middle school start times between 8:25 and 9:40 a.m., and elementary school start times between 8:30 and 9:55 a.m. (This option pushes the latest elementary school ending time from 3:55 p.m. to 4:20 p.m.)
 - *Cost: \$600,000 for ten additional buses to transport students to nonpublic special education facilities.*
- *Option D:* Shift all start times 30 minutes with a late-start hybrid learning option for some high school students. The traditional start time for high school would be 7:47 a.m. with a hybrid start time of approximately 10 a.m. Middle schools would start between 8:25 and 9:40 a.m., and

elementary schools would start between 8:30 and 9:55 a.m. Under the hybrid schedule, students in grades 10-12 could attend four courses in person, one or two online courses, and two hybrid courses (part online, part in person).

- *Cost: \$9,630,000 including \$2.3 million for ten additional buses to transport students to nonpublic special education facilities and additional buses to make a second morning pickup for students electing the hybrid option; \$370,000 for 3-13 additional employees to manage the additional bus and transportation routes, a virtual learning manager and 12 school-based computer support technicians; \$6.6 million for a virtual classroom instruction platform; \$360,000 for Chromebook tablets, and \$170,000 for start-up costs related to the Chromebook tablets.*

AACPS Survey Results

After the task force presented its report to the Board of Education, AACPS conducted a survey. The survey showed 68% of the respondents favored starting high school later:

- 15% supported Option A.
- 16% supported Option B.
- 4% supported Options A and B.
- 17% supported Option C.
- 3% supported Option D.
- 6% supported other combinations of Options A, B, C, and D.
- 7% supported later high school start times, but not the options presented by the task force.

By stakeholder type:

- 71% of parents favored a change.
- 74% of students favored a change.
- 55% of AACPS employees favored a change.
- 63% of community members (child care providers, club and sports leaders, etc.) favored a change.
- 71% of "other stakeholders" favored a change.

Bus Routing Software

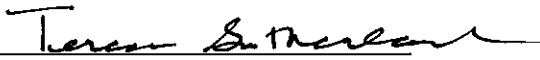
The lack of bus routing software that hampered the task force's analysis is also a weakness noted by the State Legislative Auditor in both his 2007 and 2014 Fiscal Management Audit Reports. The State Auditor noted that AACPS does not use bus routing software, a recognized best practice to design efficient routes, reduce ride times, and minimize the number of buses needed. Rather, AACPS relies on the experience and knowledge of its transportation staff to manually develop routes. In the 2014 audit report, the State Auditor noted that AACPS does not have formal targets and goals to guide decisions made during the process of reviewing and revising bus routes, and in fiscal year 2013, 336 routes of 1,272 routes (26%) were below 50% of AACPS's informal bus occupancy goals. In both 2007 and 2014, the State Auditor recommended that AACPS purchase and implement routing software.

Bus routing software can also be used to analyze bell times by entering acceptable parameters for starting and ending bell times and designing the most efficient bus routes to minimize ride times and optimize ridership. AACPS could use routing software to refine the four options considered by the task force or to explore the impact of other options. For example, routing software could be used to analyze the impact of shifting the earliest start time 30 minutes to 7:47 a.m. and maintaining four bus tiers, but flipping the tiers so that elementary school students are picked up first, followed by middle school and high school students.

Fiscal Impact

I have asked AACPS to provide documentation of how it developed the cost estimates for the four options presented by the task force, i.e., what assumptions were used to derive the number of additional buses required, fuel costs, driver costs, increases in Transportation Division staff, etc. I also have asked for the current bus contracts and for any RFP or contracts issued for next year to determine the impact of the significant declines in diesel fuel prices on the transportation budget. (The U.S. Energy Information Administration projects calendar year 2015 diesel prices will be 39% less than calendar year 2013 prices, and calendar year 2016 diesel prices will be 24% less than calendar year 2013 prices.) When I receive this information, I will review it and provide my comments to you.

With respect to bus routing software, Dr. Arlotto included \$600,000 for routing software, \$104,230 for an analyst position specializing in computerized routing, and \$34,000 for two servers in his proposed fiscal year 2016 budget. However, if the Board of Education did not want to delay the software purchase for another four months or more, they could instruct Dr. Arlotto to purchase the software now from the projected \$12.5 million of surplus funds Dr. Arlotto projects will be on hand at the end of fiscal year 2015 (pp. 3 and 5 of Dr. Arlotto's proposed budget). This \$12.5 million surplus is not restricted or earmarked for a specific purpose, and it is in addition to the \$26 million surplus projected in the Health Insurance Fund at the end of this fiscal year (p. 245 of Dr. Arlotto's proposed budget).



Teresa Sutherland, CPA
County Auditor

ATTACHMENT 1 - AACPS EARLIEST BUS PICKUPS		
Bus #	Student Arrival Time	Bus Arrival Time
565	5:20 a.m.	5:30 a.m.
754	5:25 a.m.	5:35 a.m.
56	5:40 a.m.	5:50 a.m.
512	5:45 a.m.	5:55 a.m.
710	5:45 a.m.	5:55 a.m.
172	5:50 a.m.	6:00 a.m.
173	5:50 a.m.	6:00 a.m.
300	5:50 a.m.	6:00 a.m.
338	5:50 a.m.	6:00 a.m.
747	5:50 a.m.	6:00 a.m.
380	6:00 a.m.	6:10 a.m.
413	6:00 a.m.	6:10 a.m.

Source: <http://www.aacps.org/buses/hs.asp> on January 4, 2015 with correction via email from Bob Mosier, AACPS, for Bus 565 from the published time of 5:15 a.m. to 5:30 a.m..

REFERENCES

- **American Academy of Pediatrics:**
 - www.aap.org/en-us/about-the-aap/aap-press-room/Pages/Let-Them-Sleep-AAP-Recommend-Delaying-Start-Times-of-Middle-and-High-Schools-to-Combat-Teen-Sleep-Deprivation.aspx
- **Centers for Disease Control and Prevention (CDC):**
 - www.cdc.gov/media/subtopic/matte/pdf/2011/teen_sleep.pdf
 - www.cdc.gov/sleep/about_sleep/how_much_sleep.htm
- **National Sleep Foundation (NSF):**
 - www.sleepfoundation.org/sleep-topics/teens-and-sleep
- **National Institutes for Health (NIH):**
 - www.nhibi.nih.gov/health/health-topics/topics/sdd/
- **Maryland Department of Health and Mental Hygiene (DHMH) - House Bill 883 Report:**
 - http://www.startschoollater.net/uploads/9/7/9/6/9796500/maryland_dhmh_school_start_time_report_123114.pdf
- **AACPS Task Force Report and Survey Results:**
 - http://www.aacpublicschools.org/aacps2/_top
- **AACPS Task Force Report and Survey Results:**
 - http://www.aacpublicschools.org/aacps2/_top
- **National Safety Transportation Board (NTSB):**
 - <http://www-nrd.nhtsa.dot.gov/Pubs/810968.pdf>
- **AACPS Task Force Report and Survey Results:**
 - http://www.aacpublicschools.org/aacps2/_top
- **U.S. Energy Administration**
 - <http://www.eia.gov/forecasts/steo/tables/?tableNumber=8#>
- **State of Maryland Office of Legislative Audits**
 - 2014 audit findings on AACPS transportation - pp. 25-29
 - <https://www.ola.state.md.us/Reports/Schools/AACPS14.pdf>
 - 2007 audit findings on AACPS transportation - pp. 41-46
 - <https://www.ola.state.md.us/Reports/Schools/AASchools07.pdf>
- **Superintendent George Arlotto's Proposed FY2016 Budget**
 - http://www.aacps.org/2016budget/fy16super_recommend.pdf