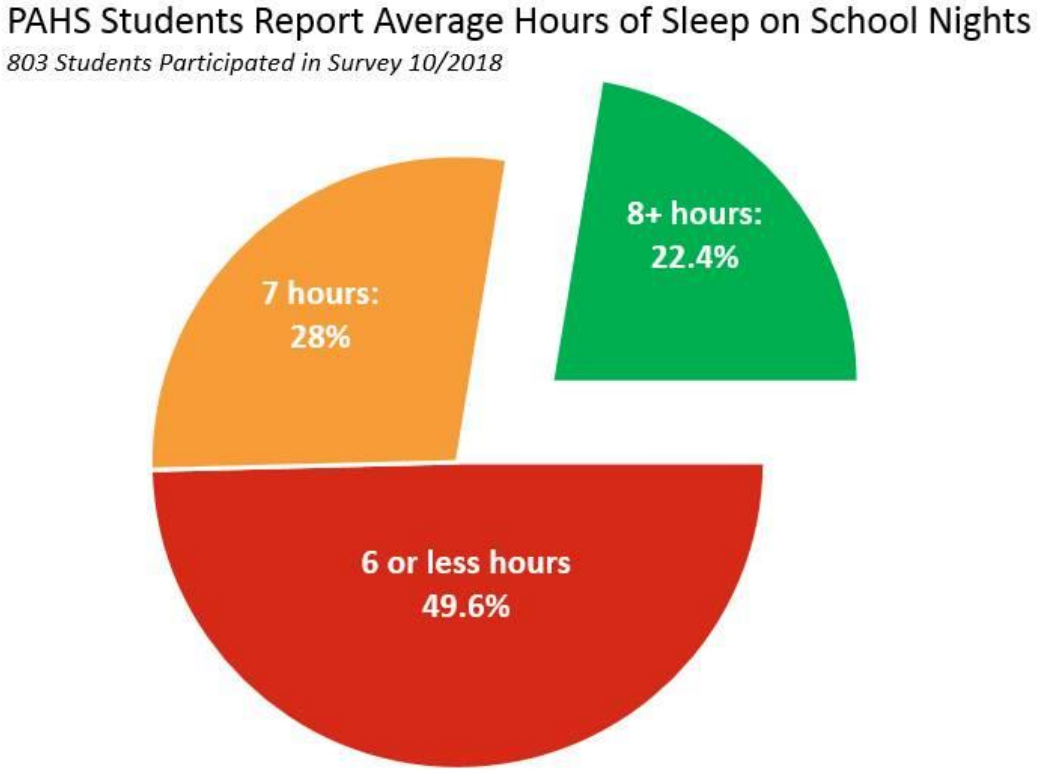
PASD Sleep Advisory Group

A Wellness-Based Presentation: The Science Behind Healthy Sleep and School Start Times

Presentation Overview

- **Problem Statement**: Our MS/HS students aren't getting enough quality sleep, which has a negative impact on their wellness.
- Review of scientific research on teen sleep.
- Review our options for addressing teen sleep, including proposed options for adjustments to school start times.
- Discuss some of the myths and acknowledge challenges associated with school start time change.

Only 22% of PAHS students get enough sleep each night



Fact #1: Only 22% of PAHS students report sleeping 8 or more hours per night.

Fact #2: Teens biologically need 8.5-9.5 hours of sleep each night. (AAP)

Fact #3: Lack of sleep has been linked to lower levels of physical, emotional and mental health, less success in school, lessened productivity, and higher rates of physical injuries.

Sleep deprivation in teens can lead to:

Behavioral/Psychological:

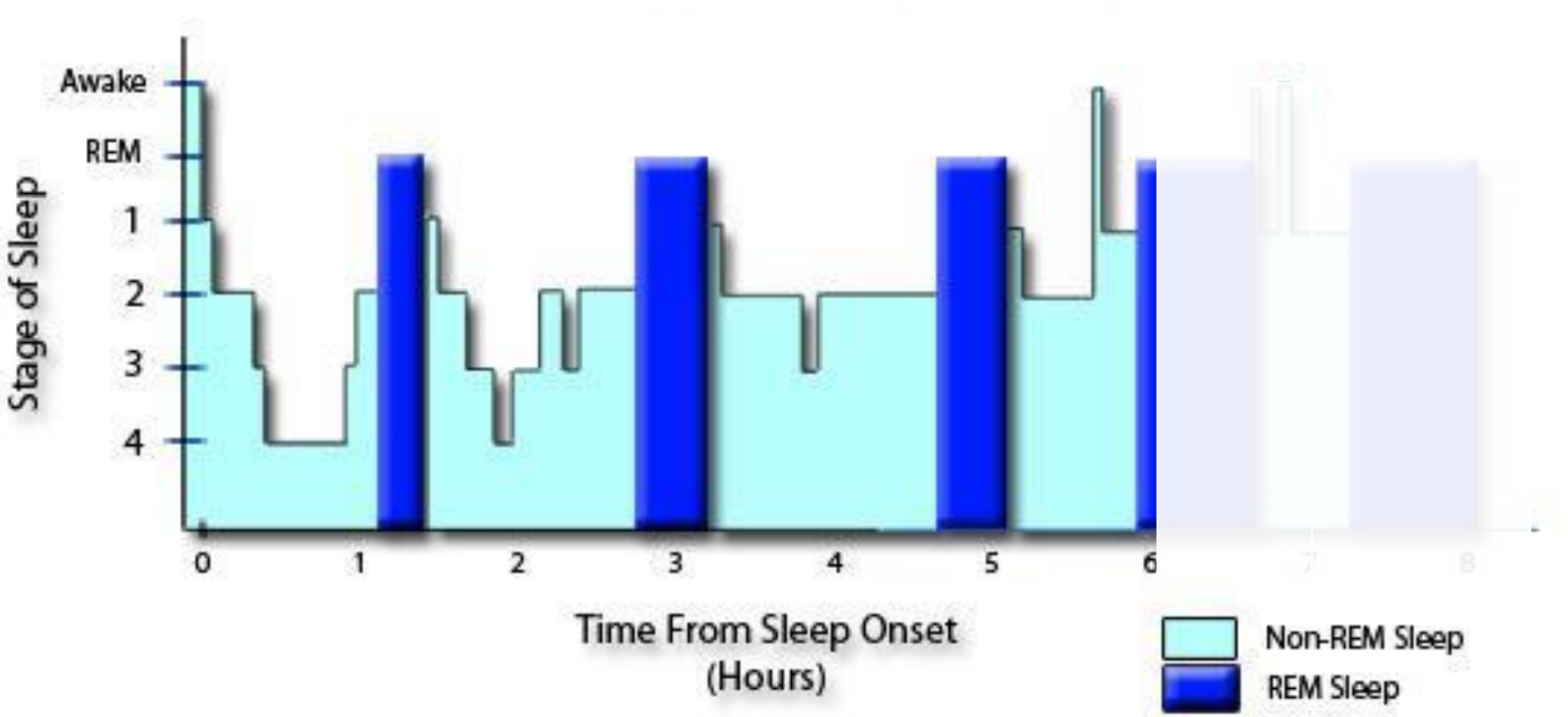
- Inappropriate emotional reactivity and extreme mood swings[1]
- Increased risk of depression, anxiety, bipolar disorder and schizophrenia[2]
- Aggression, bullying, violence
- Forgetfulness and an associated reduced ability to learn
- Decreased creativity, productivity and success in school
- Microsleep- a momentary lapse in concentration

Physical:

- Decreased motor coordination (leads to increased risk of sports injury and much higher risk of car crashes)[3]
- Weight gain, obesity and diabetes[4]
- Increased cortisol (stress hormone)
- Reduction or cessation of growth hormone production
- Weakened immune system[5]

Source: American Academy of Pediatrics

Our Teens Need Sleep Quantity and Quality



Source:http://www.end-your-sleep-deprivation.com/stages-of-sleep.html

Causes of Sleep Deprivation in Teens

Biological Causes:

- Fighting Our Own Biology - Circadian Rhythm Changes in Teens and Adolescents[1]
- Teen brains don't start producing melatonin (sleep hormone) until 10:45 p.m. & don't stop until 8 a.m.[2]

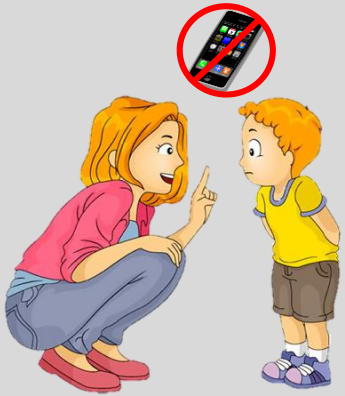
Social Causes:

- Blue Light from Phone & Screen Use Less Than 2 hrs Before Bed
- Technology Notifications Disrupt Solid Sleep
- After- School Commitments
- Early School Start Times - The Single Largest Factor in Sleep Loss Controlled by the School

Sleep Quality: We all have a role to play!

Parents:

Teach value of sleep!
Enforce bedtimes!
Remove tech!



Students:

Switch off your tech!
No caffeine after 4 p.m.!
Go to bed on time!

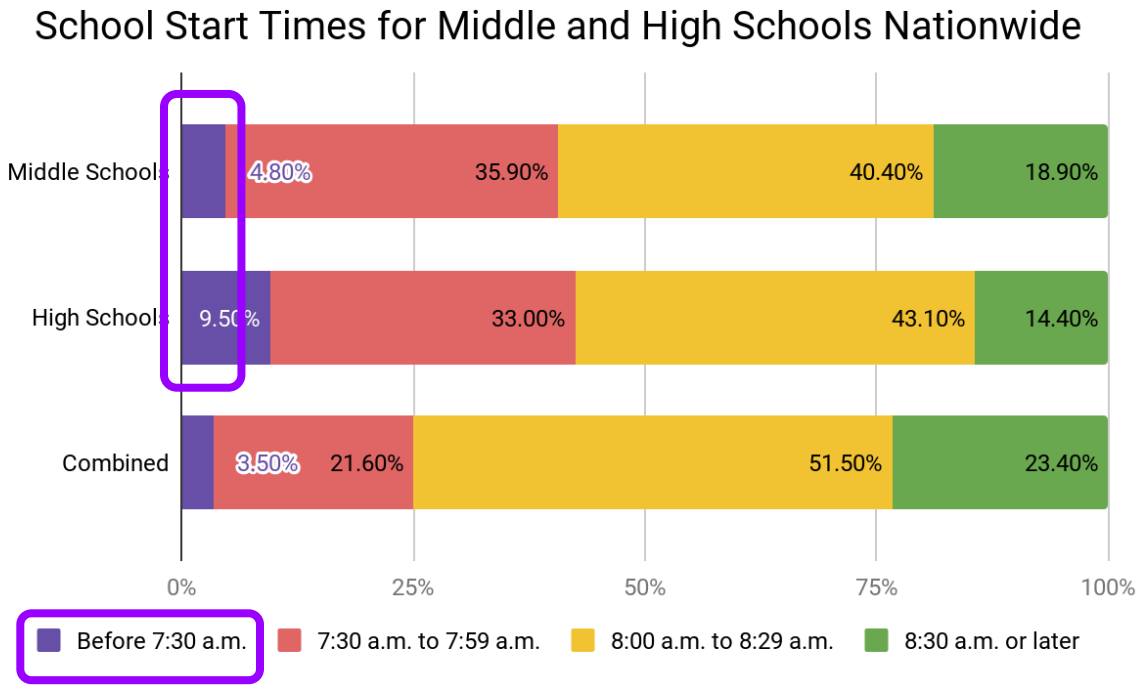
Schools:

Minimize homework!
Teach value of sleep!
Start school later!

School Start Times Nationwide - We are the outlier!

Facts:

1) The CDC, AMA, and AAP all recommend a start time no earlier than 8:30am.
2) The national average start time is 8:03am.
3) Our current start times of 7:24am(HS) & 7:28am(MS) are solidly within the purple section on this chart.



Source: https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6431a8.htm?s_cid=mm6431a8_w

Getting Our Priorities in Order

- Focus on **student wellness** as our **highest priority**, addressing logistics and other obstacles second

- Focus on plans that **increase hours of potential sleep** for students

- **Incorporate feedback** from student, parent & staff surveys including:
  - Impact on family schedules
  - Changes to staff work/life balance
  - After school activities
  - Child care changes and availability
  - Financial costs to the district and families
  - Bus stop safety

- Base our plans on a **solid and comprehensive** review of nationwide research studies and the **recommendation of the medical community**

Recommendations - 3 Options

	Concurrent Start	Delay for All	Flip with Delay
MS/HS:			
Start Time	8:30 a.m.	8:10 a.m.	8:45 a.m.
End Time	3:41 p.m.	3:21 p.m.	3:56 p.m.
Change?	(64 min later)	(44 min later)	(81 min later)
Elementary:			
Start Time	8:45 a.m.	9:00 a.m.	8:00 a.m.
End Time	3:30 p.m.	3:45 p.m.	2:45 p.m.
Change?	(15 min later)	(30 min later)	(30 min earlier)

Concurrent Start: Pros & Cons * Recommended

Secondary:
8:30 a.m.
3:41 p.m.
(64 min later)

Elementary:
8:45 a.m.
3:30 p.m.
(15 min later)

- **Best fits our district's specific needs (later start for secondary, minimal impact on elementary)**
- **Exact start time recommended by AMA, CDC, and AAP**
- **Maintains current schedule and work/life balance for elementary staff**
- **Best chance for all students (MS/HS and Elementary) to get the sleep they need**
- **Possibility of shorter bus rides**
- **HS/MS students get home at same time as elementary**
- **Easier logistics for families with children in elementary grades and MS/HS**

- **Transportation costs increase significantly (adding buses to transport entire district at same time)**
- **All ages of students would be on buses at same time**

Delay for All: Pros & Cons

Secondary
8:10 a.m.
3:21 p.m.
(44 min later)

Elementary
9:00 a.m.
3:45 p.m.
(30 min later)

- **Sleep gain for HS/MS is significant**
- **HS/MS students get home before elementary**
- **Least disruption to HS/MS after-school activities**
- **Elementary students also gain more sleep**

- **8:10 HS/MS start time is not ideal, does not match the recommendation of the medical community**
- **Delay will be hard on many elementary families - more elementary working parents may need Before Care**
- **Latest elementary bus drop off occurring at 4:45**
- **Affects work/life balance for all teaching staff**

Flip with Delay: Pros & Cons

Secondary
8:45 a.m.
3:56 p.m.
(81 min later)

Elementary
8:00 a.m.
2:45 p.m.
(30 min earlier)

- **Allows for the most quality sleep for our MS/HS students**
- **Best fit with research on student circadian rhythms**
- **Reduces the "danger window" of 3-6 p.m.[1]**
- **Reduces the need for Before Care for elementary families**

- **Very late MS/HS end time, impacting sports and after-school activities (example: swimming) negatively**
- **Elementary families expressed concerns with earlier start**
- **For 50 min daily, elem. kids will be home before HS/MS sibs**
- **Earlier elem. dismissal could result in greater need for After Care, (specifically mentioned as harder to provide)**
- **Evidence suggests that 5th graders (particularly girls) may already be affected by circadian rhythm changes**
- **Unknown impact (very little data) of earlier start times on younger children (who need more sleep)[2]**

Results from districts that made a change

- Both the percentage of students sleeping over 8 hrs per night and the overall average length of sleep increase in schools that have pushed their start times to later.[1]
- Delaying high school start times to 8:30 a.m. and later significantly improved graduation and attendance rates.[2]
- 75% of students said they used the later start time to get more sleep or eat breakfast. About half reported feeling less stress.[3]
- Statistically significant increases in the 1st-period grade point average in one or more core courses of English, math, social studies, and science in three districts with start times from 8:00-8:35 a.m.[4]
- Significant increases in grade point average in all 1st-period core courses for all semesters in all grades in Jackson Hole High School in Wyoming, with a start time of 8:55 a.m.[4]
- Number of car crashes in districts that have adopted later start times decreased. [5,6]

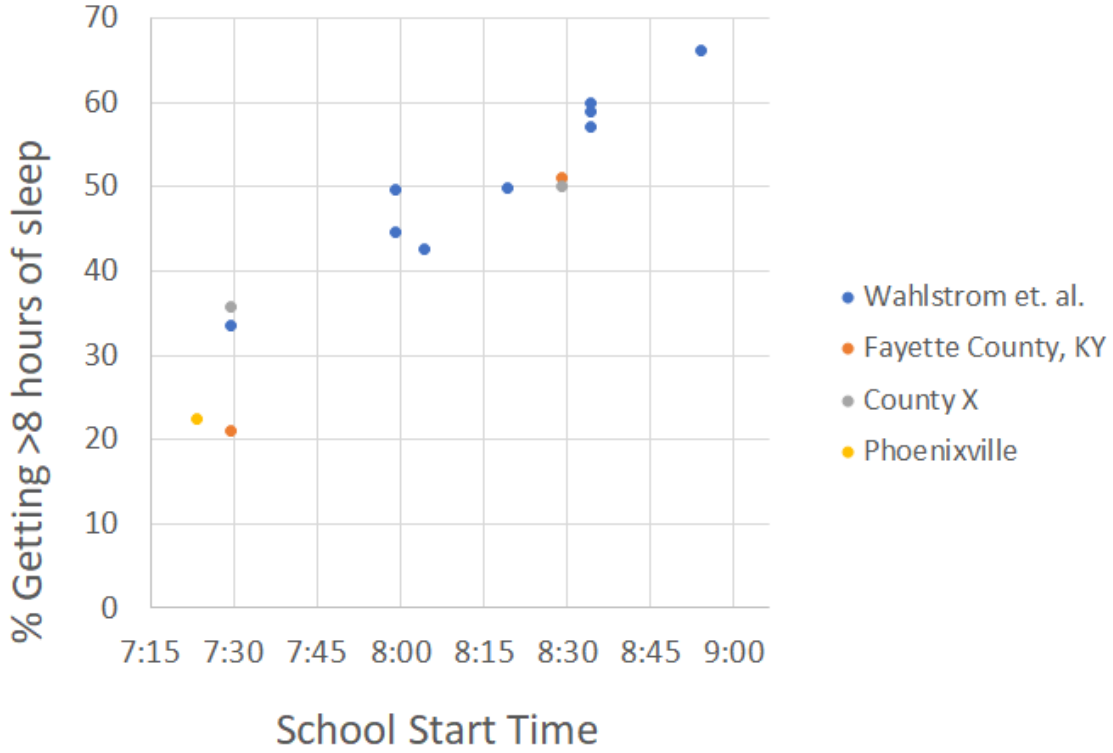
Lessons from Unionville-Chadds Ford

- Students are going to bed at the same time and getting 15-30 minutes more sleep each night
- Rate of school nurse visits and concussions dropped (31% fewer nurse visits, 47% fewer concussions at the middle school; 25% fewer concussions at the high school)
- Most parents report their children are less sleepy and more relaxed in the morning
- Some staff have had a hard time adjusting their family schedules to the later time
- Having gone through everything, Unionville reps say they wish they had pushed for a bigger change
- **Athletics:**
    - District 1 / PAC moved evening game from 5:30 to 6 p.m. start, then discovered that change wasn't actually needed. **Spring sports therefore did not shift** their times.
    - Middle School opponents were called and asked to move to 3:30 p.m. start (from 3:15 p.m.)
    - Hopeful that all schools will soon shift to a 4 p.m. start
    - Swim team is only team allowed to practice before school
    - Non-teacher coaches found later start to be better

Myths and Facts About Changing School Start Times

Myth: "If school starts later, kids will just stay up later."

<u>Fact</u>: Later start times = more students getting more sleep.



Myth: “We’re coddling the kids, not preparing them for Real Life.”

Facts:

1) The circadian rhythm changes seen in adolescence **gradually shift back in adulthood** (between the ages of 20-65), when “Real Life” schedules begin.
2) **Waking an adolescent at 6 a.m. is roughly equivalent (in sleep cycle disruption) to waking an adult at 4 a.m.**
3) It is our responsibility to teach our children how to **make healthy choices** in life, and **modeling** this behavior is key.

Myth: “A 25 minute push is the same as a 60 minute push.”

Facts:

1) The 25-30 min pushes cited in research studies with positive results are **boarding schools** that already **started much later** than we do.
2) The most important thing is **not how many minutes** we shift, but **the time we choose to begin school**.

Owens, Belon & Moss (2010) Actual Data

Type of School:	College Prep Boarding School
Original Start Time:	8:00 a.m.
New Start Time:	8:30 a.m.
Amount of Change:	30 minutes

Boergers, Gable, and Owens (2014) Actual Data

Type of School:	College Prep Boarding School
Original Start Time:	8:00 a.m.
New Start Time:	8:25 a.m.
Amount of Change:	25 minutes

Myth: “This will affect our district’s athletics negatively.”

Facts:

1) Research shows that athletes are able to **remember plays better** and **perform better physically** with more sleep.

2) Optimal sleep habits and **obtaining adequate sleep** plays an important role in **peak performance** in all levels of sports.[1]

3) “...in 2015, the International Olympic Committee published a consensus statement highlighting the **critical importance of, and essential need for, sleep** in athletic development **across all sports** for men and women.”[2]

Myth, cont. : “This will affect our district’s athletics negatively.”

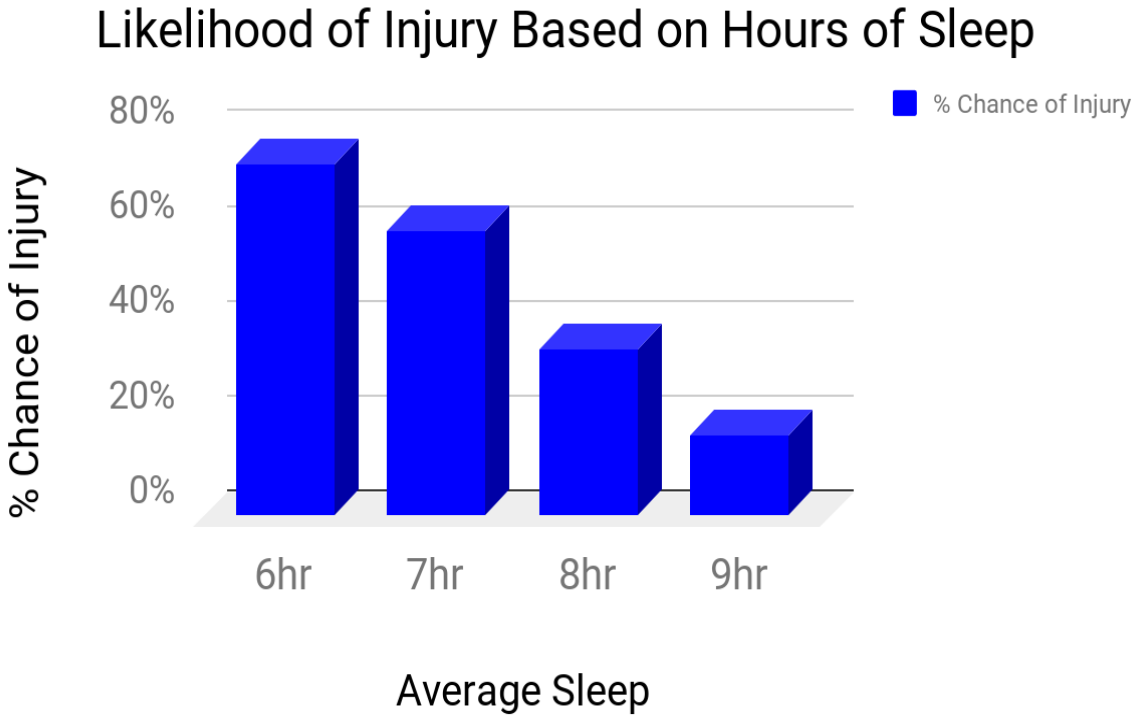
Facts:

Physical results of less than 8 hours of sleep (and especially less than 6 hours):

- Time to physical exhaustion **drops** by 10-30%
- Aerobic output significantly **reduced**
- **Impairments** observed in limb extension force and vertical jump height
- **Decreases** in peak and sustained **muscle strength**
- **Impairments** in cardiovascular, metabolic and respiratory capabilities
- Faster rates of **lactic acid** buildup
- **Reduction** in blood **oxygen saturation** and converse increases in blood CO_2
- Impaired ability of the body to cool itself through sweating
- **Much higher risk of injury**

Myth, cont. : "This will affect our district's athletics negatively."

<u>Fact</u>: Athletes are far less likely to injure themselves with proper sleep.



M.D. Milewski et al., "Chronic lack of sleep is associated with increased sports injuries in adolescent athletes," Journal of Paediatric Orthopaedics 34, no. 2 (2014): 129-33.

Changing our School Start Time will not be easy...

Many challenges stand in the way of an easy switchover to a more healthy school start time:

- Logistics/Transportation
- Possible Financial Cost
- Impact on Sports & Music Practices and After School Clubs
- Adjustments to family and staff schedules

Change will require a strong commitment to students' health and wellness, *but research tells us that it's the right thing to do.*

Thank You for Your Consideration

Thank you to the more than 65 parents, teachers, students, community members and administrators who worked together for over a year on subcommittees investigating Child Care, Transportation, Education, Scheduling, Activities, and Athletics.

Thank you to Wendy M. Troxel, PhD, CBSM for sharing her research with us.

Thank you to Betty Kucharczuk, Pat Crater and John Nolen, representatives from Unionville-Chadds Ford School District, for speaking with us about their experience.

Appendix

Helpful Definitions:

Circadian Rhythm: 24-hour internal clock that is running in the background of your brain and cycles between sleepiness and alertness at regular intervals. (National Sleep Foundation)

Melatonin: A hormone secreted by the pineal gland that help to control your sleep/wake cycle. Your circadian rhythm determines when and how much melatonin the pineal gland makes. (Sleep.org)

R.E.M. Sleep: Rapid Eye Movement. REM sleep stimulates the brain regions used in learning. It is also the deepest stage of sleep, where dreams occur. During REM sleep the thalamus and cerebral cortex work together to interpret and process information from short to long-term memory. This is the only stage of sleep where this happens. (NINDS, Psych Central)

H.G.H. Levels: Human Growth Hormone. A protein produced by the Pituitary Gland and a part of the body's endocrine system. It is especially active in a growing child's maturation and is released by the brain into the bloodstream during sleep. Its release is part of the repair and restoration function of sleep. (Tuck.com)

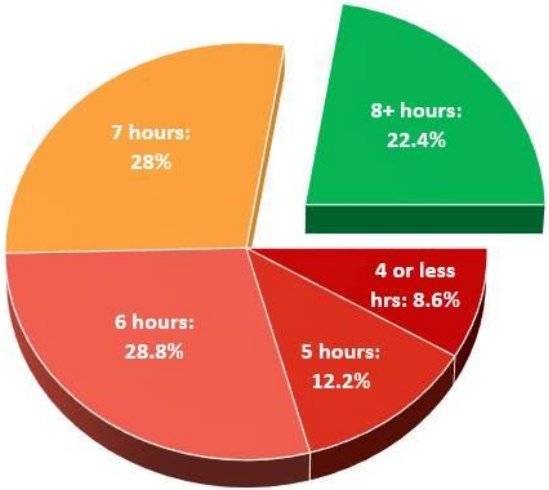
Cortisol: A steroid hormone that regulates a wide range of processes throughout the body, including metabolism and the immune response. It also has a very important role in helping the body respond to stress. (Society of Endocrinology)

Data Pertaining to Phoenixville Area School District

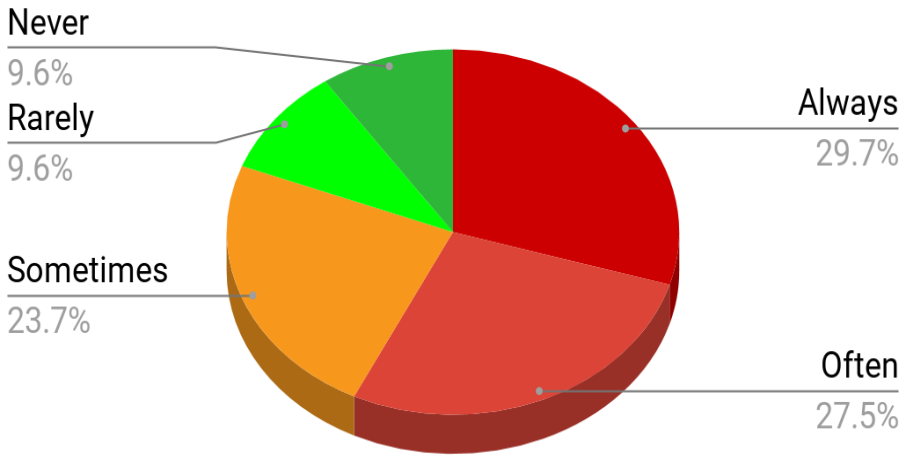
How many of our PAHS students feel tired at school?

PAHS Students Report Average Hours of Sleep on School Nights

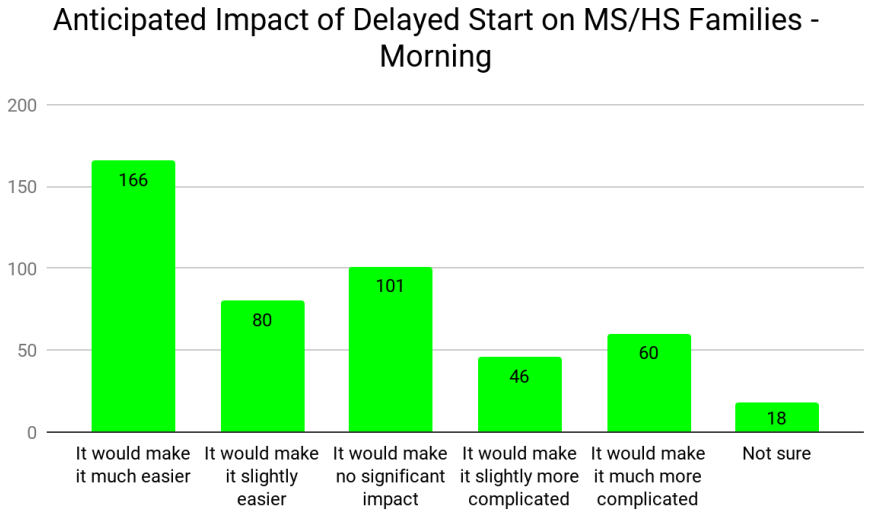
803 Students Participated in Survey 10/2018

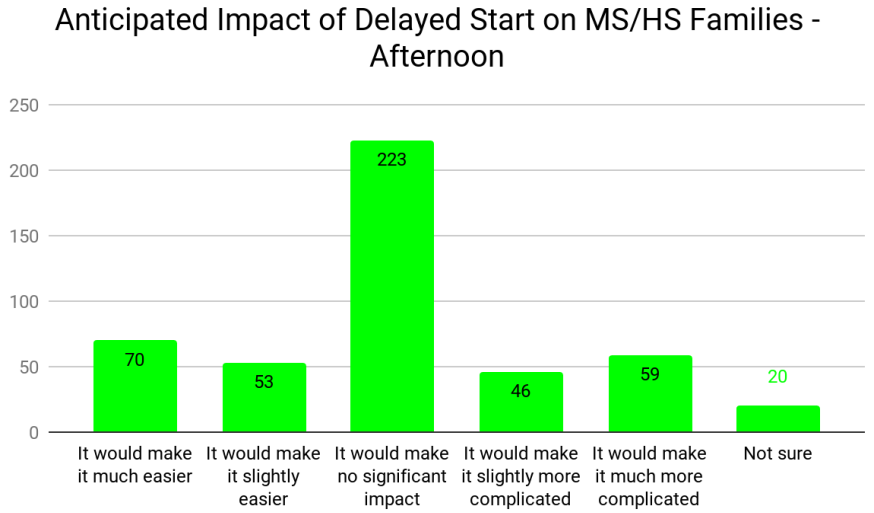


How often PAHS students feel sleepy or sleep-deprived during the school week



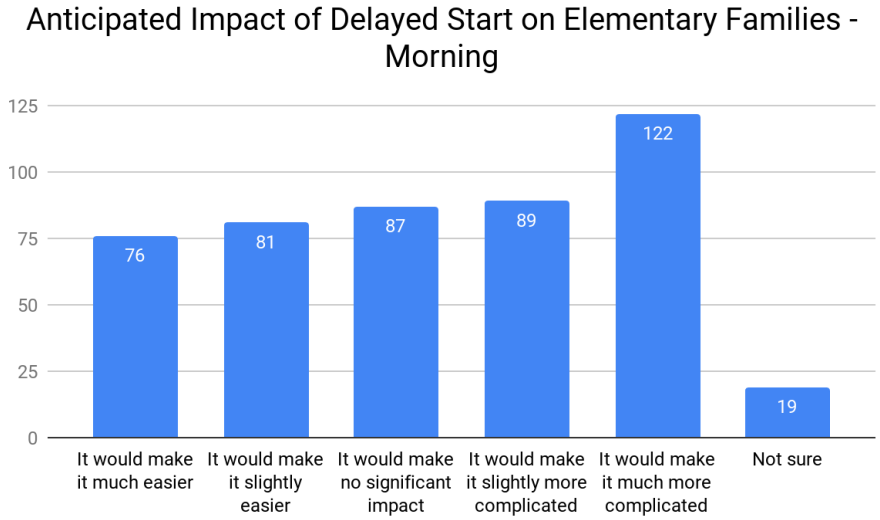
Anticipated impact of a delayed start on PASD MS/HS families:

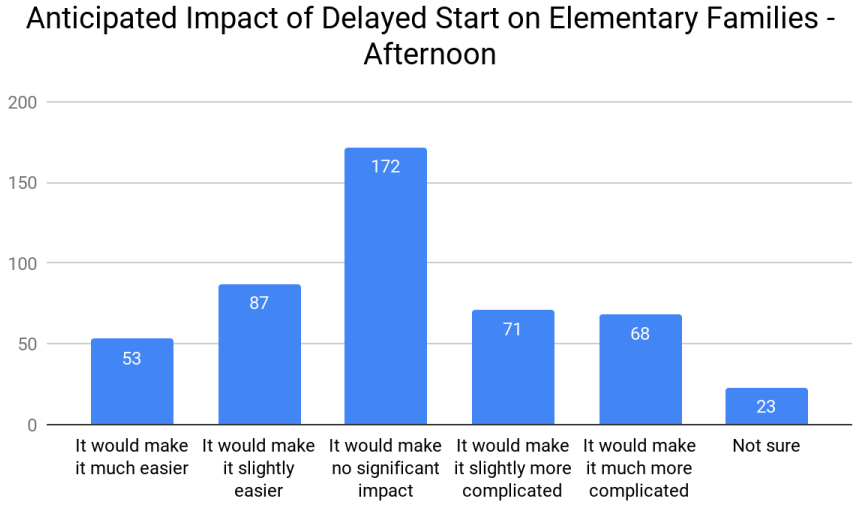




According to survey results, the impact of a **delayed start** on our **middle and high school families** would likely be **positive** in the morning, and would make **no significant impact** in the afternoon.

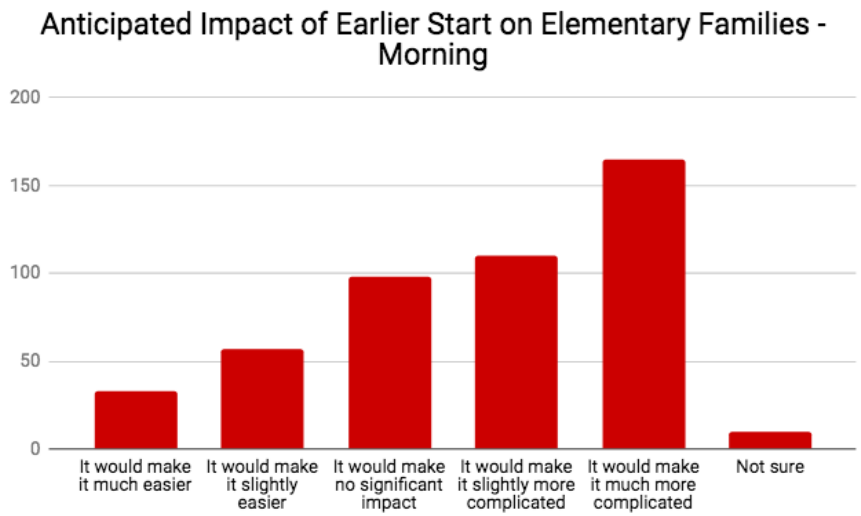
Anticipated impact of a delayed start on PASD Elementary families:

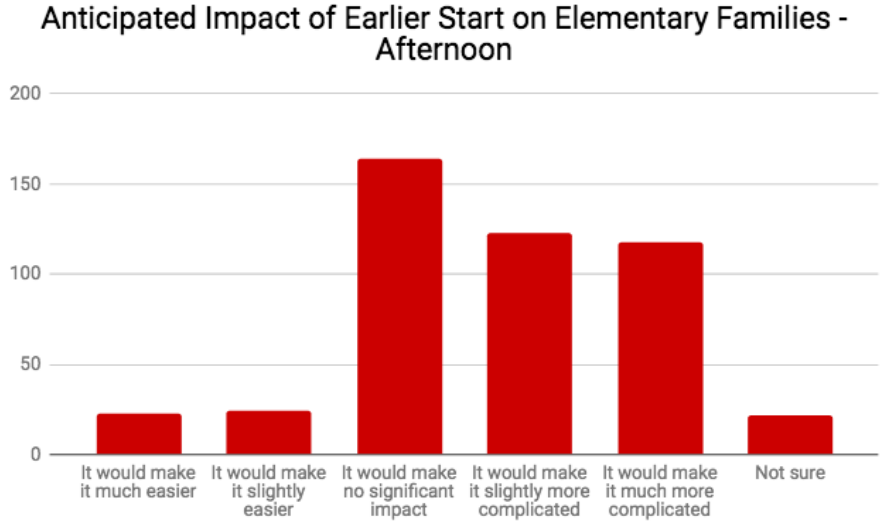




According to survey results, the impact of a **delayed start** on our **elementary families** would likely be **more negative than positive** in the morning, and would make **no significant impact** in the afternoon.

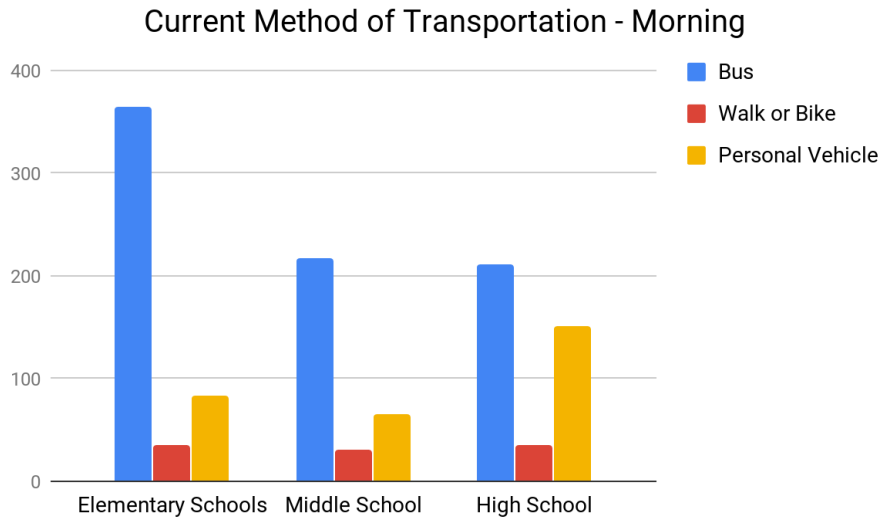
Anticipated impact of an earlier start on PASD Elementary families:

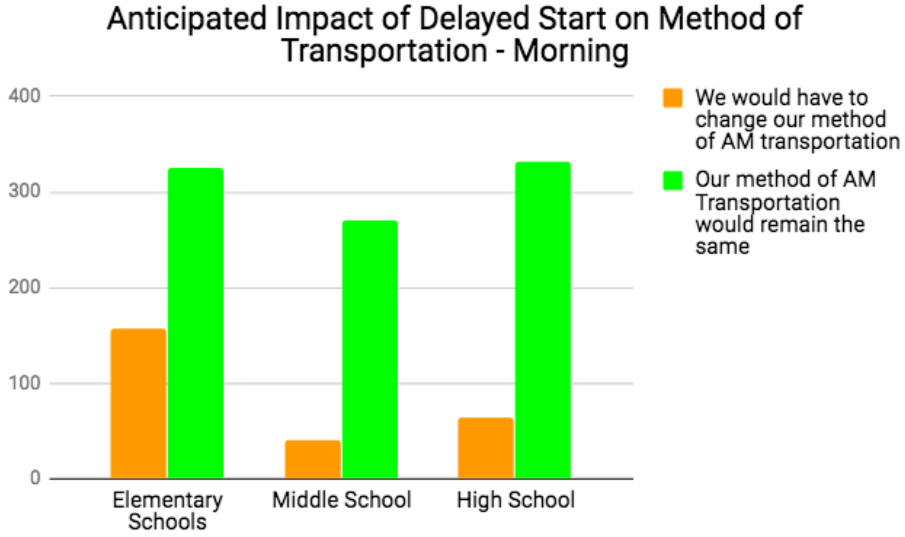




According to survey results, the impact of an **earlier start** on our **elementary families** would likely be **significantly negative** in the morning, and **significantly negative** in the afternoon.

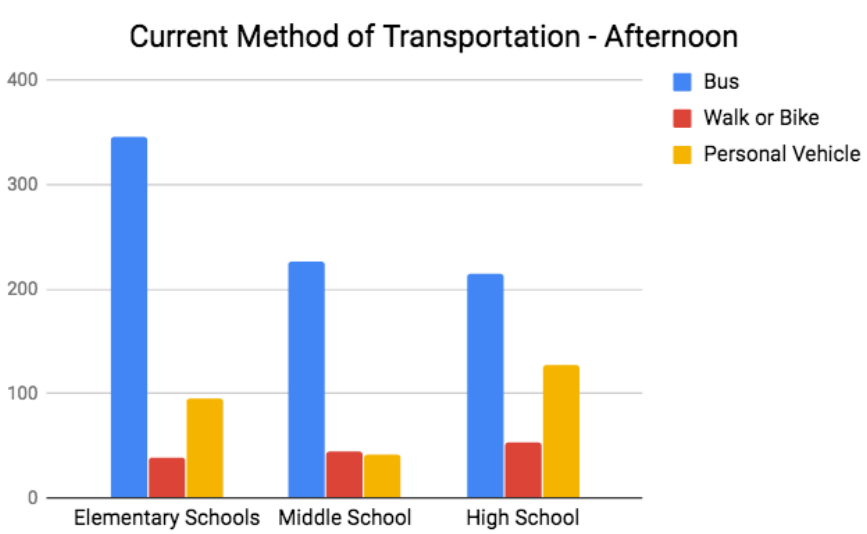
Current and Projected Transportation Needs - Morning

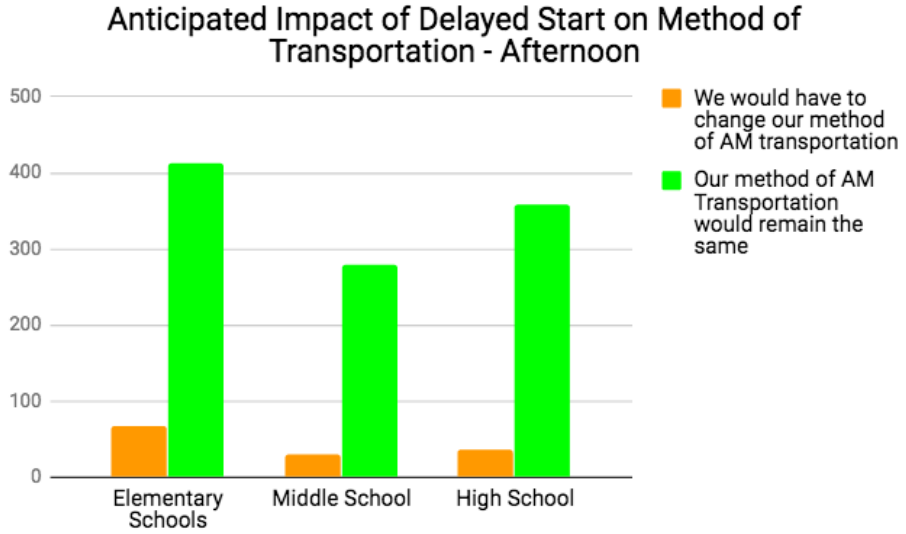




According to survey results, the majority of families in our district would **not change their current method of transportation to school** in the case of a 45-min delay, though the impact on elementary families would be greatest.

Current and Projected Transportation Needs - Afternoon





According to survey results, the majority of families in our district would **not change their current method of transportation from school** in the case of a 45-min delay.

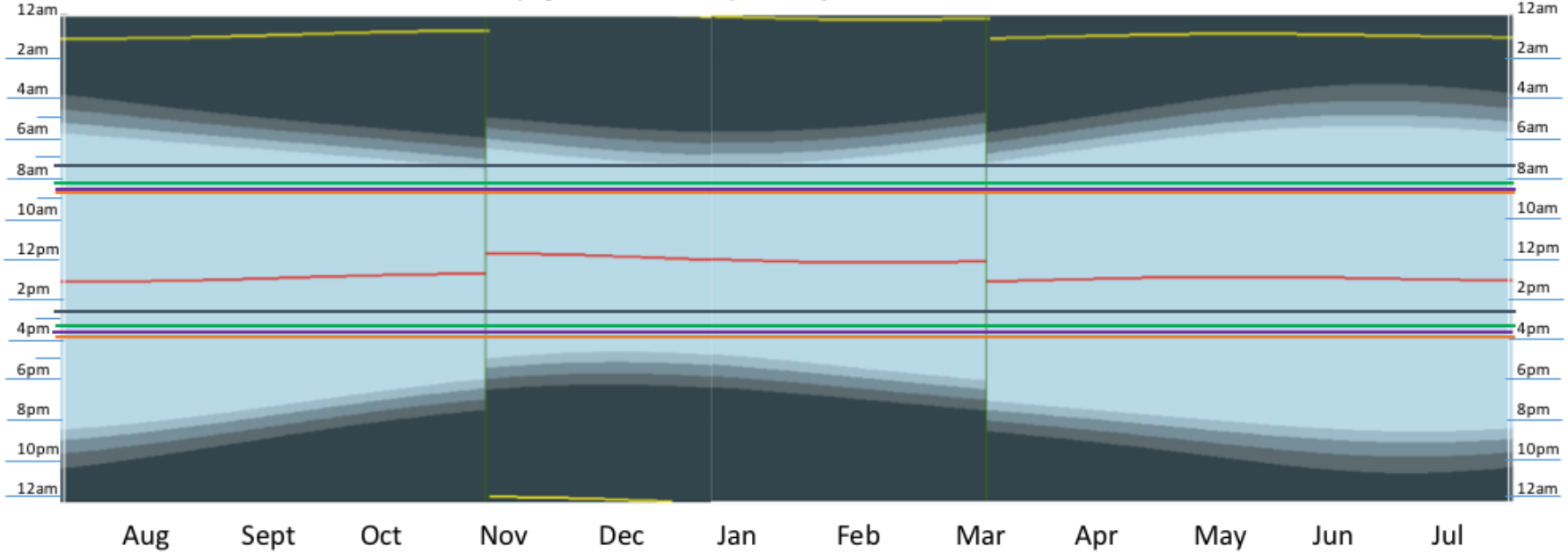
PASD Survey Response Rate per Building

	# of Respondents		/ Total # of Surveys		= % Responding:
PAHS	404	/	1289	=	31%
PAMS	319	/	1044	=	31%
Barkley	91	/	367	=	25%
Manavon	208	/	515	=	40%
PAELC	330	/	747	=	44%
Schuylkill	196	/	584	=	34%
Overall:	1548	/	4546	=	34%

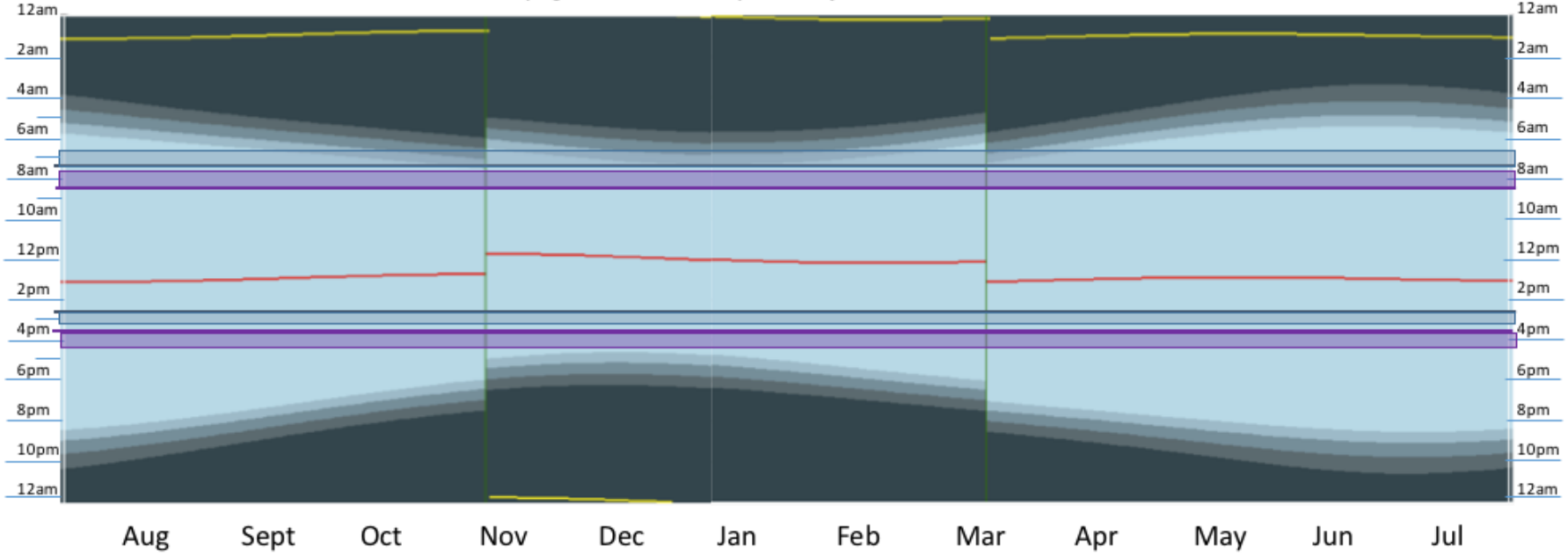
Sun Graphs Showing Hours of Daylight in PASD With Current and Suggested School Start Times and Bus Travel Times

(for purposes of visual comparison)

Yearly Sun Graph for Phoenixville:
Hours of Daylight with Overlay of **Proposed HS/MS Start & End Times**

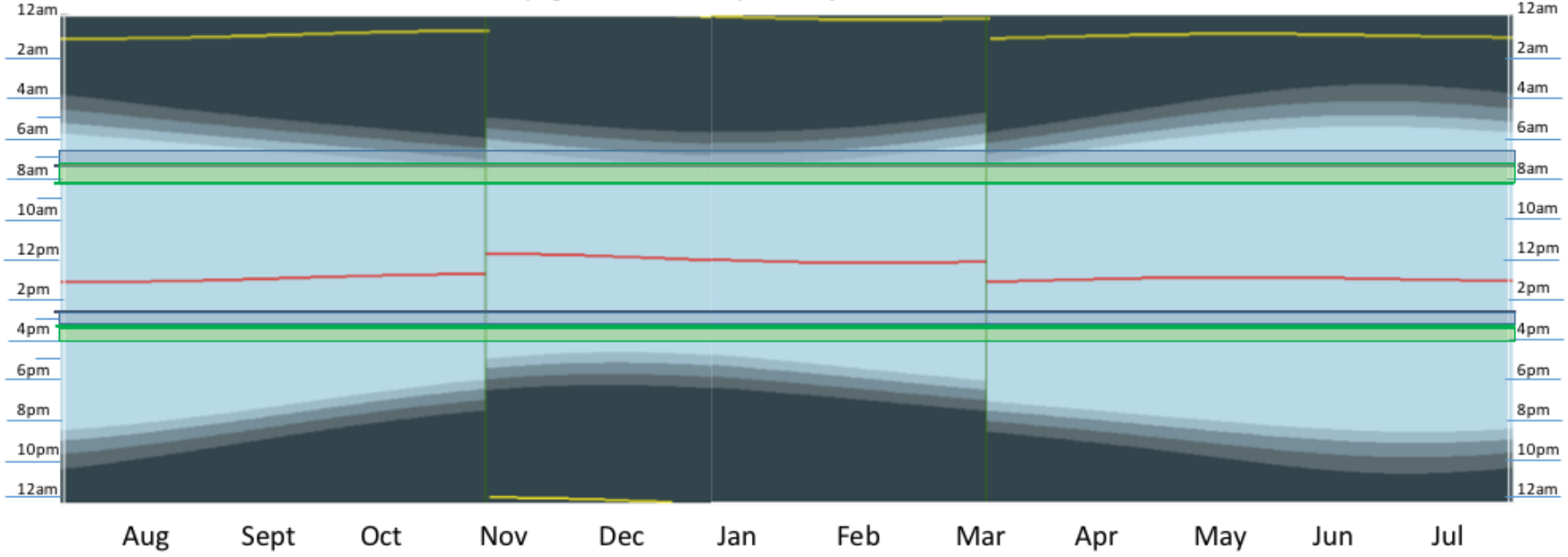


Yearly Sun Graph for Phoenixville:
Hours of Daylight with Overlay of **Proposed HS/MS Bus Travel Times**



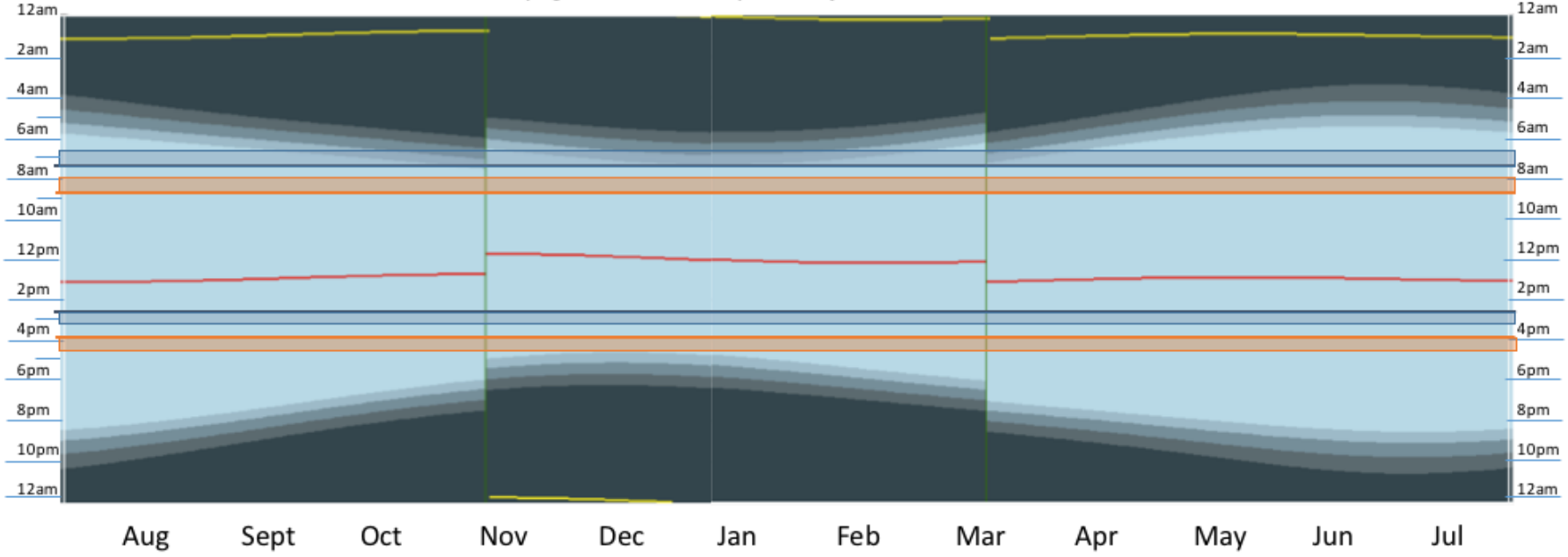
Solar Noon
Solar Midnight
Current (HS/MS) Schedule Bus Pick-Up and Drop-Off Range
Proposed (HS/MS) Schedule: Concurrent Start - Bus Pick-Up and Drop-Off Range

Yearly Sun Graph for Phoenixville:
Hours of Daylight with Overlay of **Proposed HS/MS Bus Travel Times**



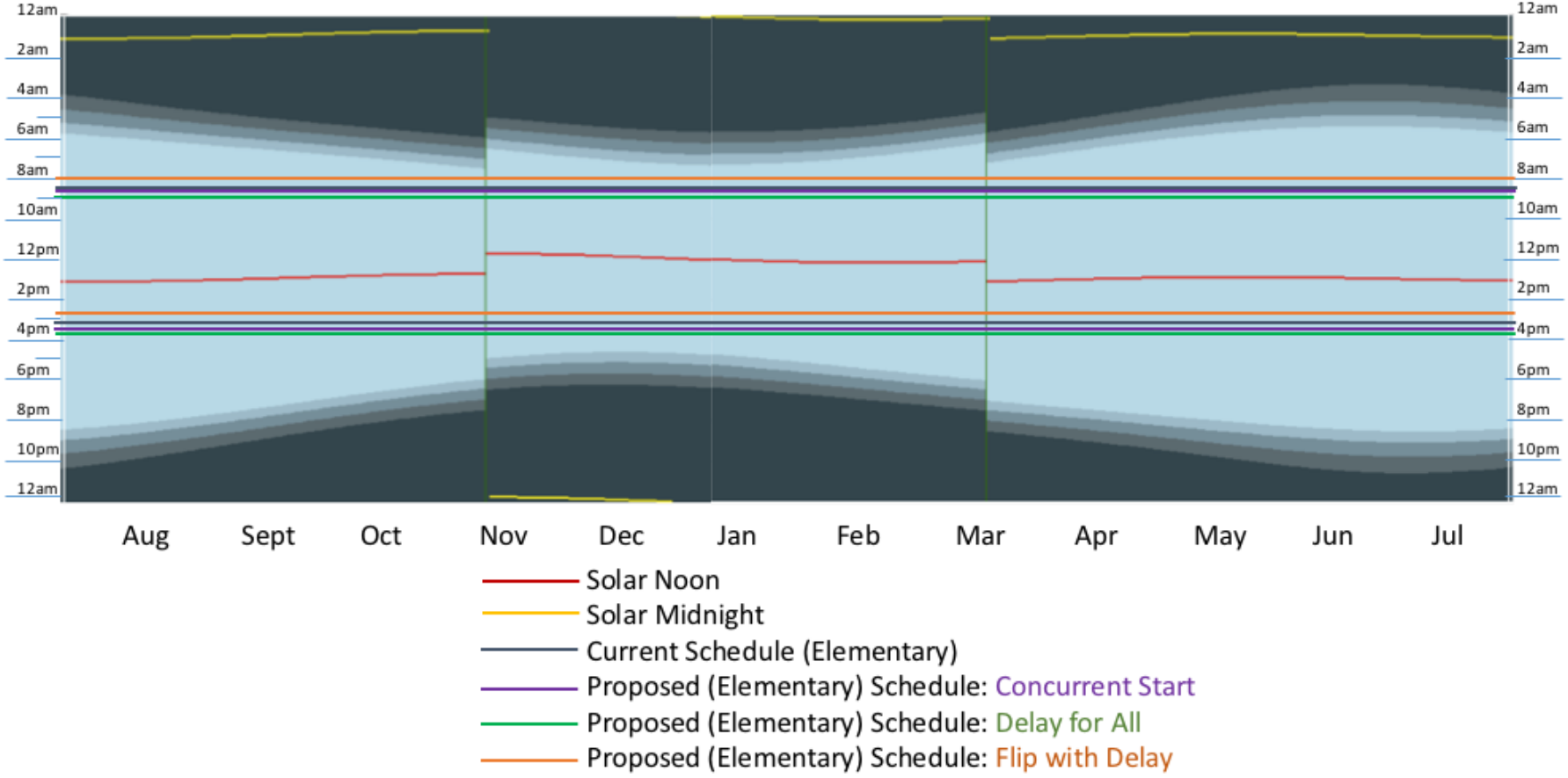
Solar Noon
Solar Midnight
Current (HS/MS) Schedule Bus Pick-Up and Drop-Off Range
Proposed (HS/MS) Schedule: Delay for All - Bus Pick-Up and Drop-Off Range

Yearly Sun Graph for Phoenixville:
Hours of Daylight with Overlay of **Proposed HS/MS Bus Travel Times**

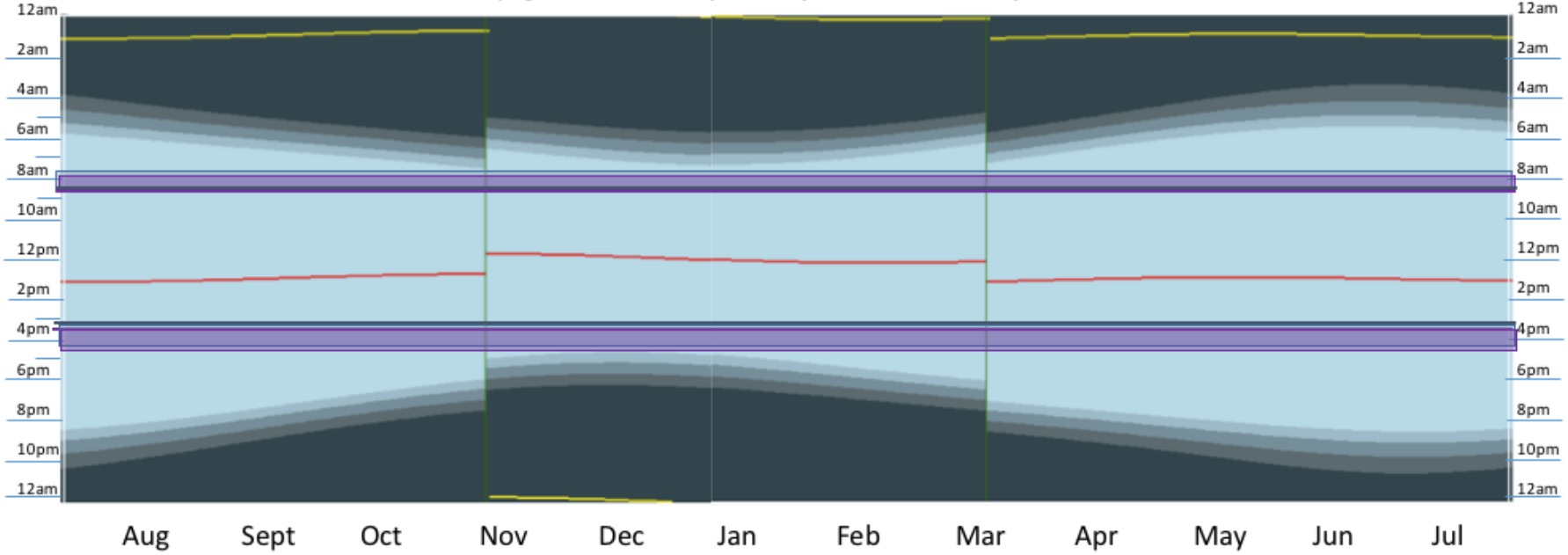


Solar Noon
Solar Midnight
Current (HS/MS) Schedule Bus Pick-Up and Drop-Off Range
Proposed (HS/MS) Schedule: Flip with Delay - Bus Pick-Up and Drop-Off Range

Yearly Sun Graph for Phoenixville:
Hours of Daylight with Overlay of **Proposed Elementary Start & End Times**

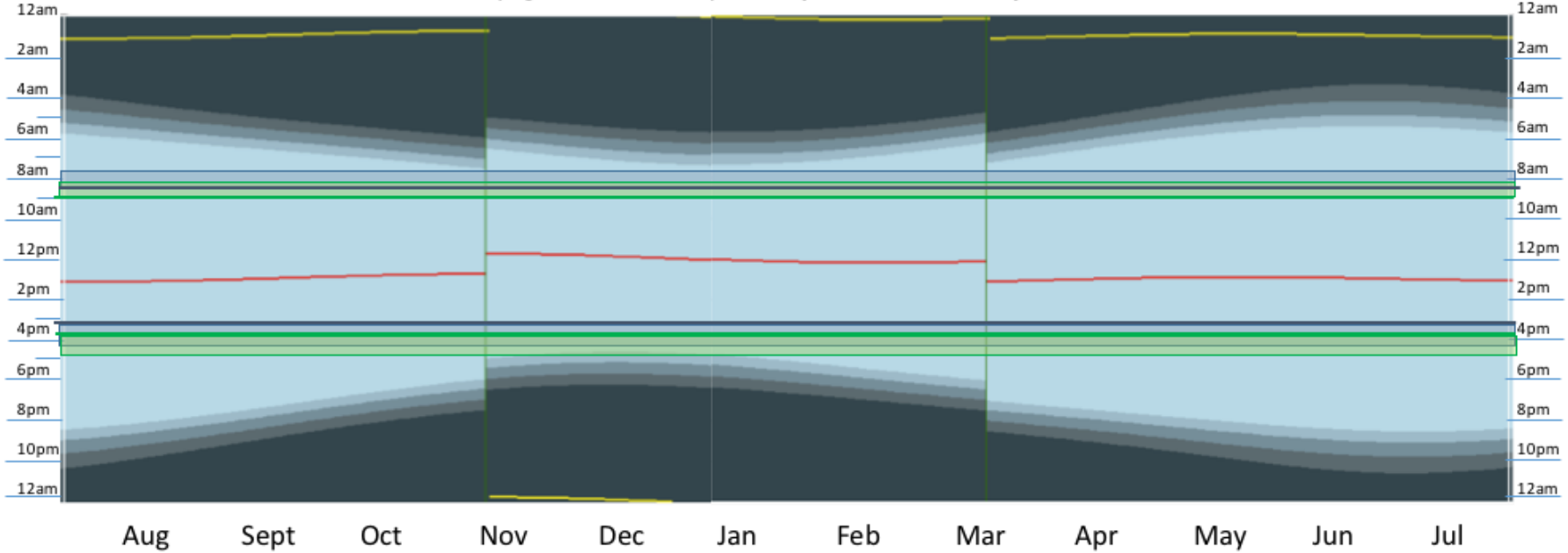


Yearly Sun Graph for Phoenixville:
Hours of Daylight with Overlay of **Proposed Elementary Bus Travel Times**



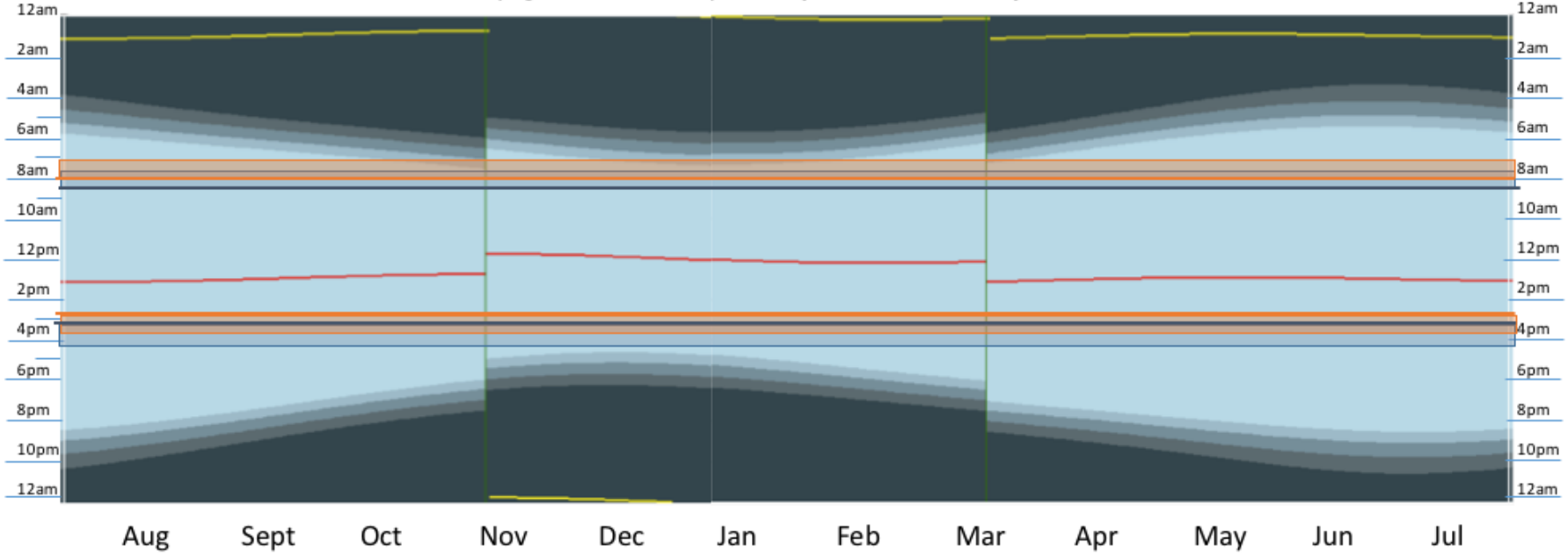
Solar Noon
Solar Midnight
Current (Elementary) Schedule Bus Pick-Up and Drop-Off Range
Proposed (Elementary) Schedule: Concurrent Start - Bus Pick-Up and Drop-Off Range

Yearly Sun Graph for Phoenixville:
Hours of Daylight with Overlay of **Proposed Elementary Bus Travel Times**



Solar Noon
Solar Midnight
Current (Elementary) Schedule Bus Pick-Up and Drop-Off Range
Proposed (Elementary) Schedule: Delay for All - Bus Pick-Up and Drop-Off Range

Yearly Sun Graph for Phoenixville:
Hours of Daylight with Overlay of **Proposed Elementary Bus Travel Times**

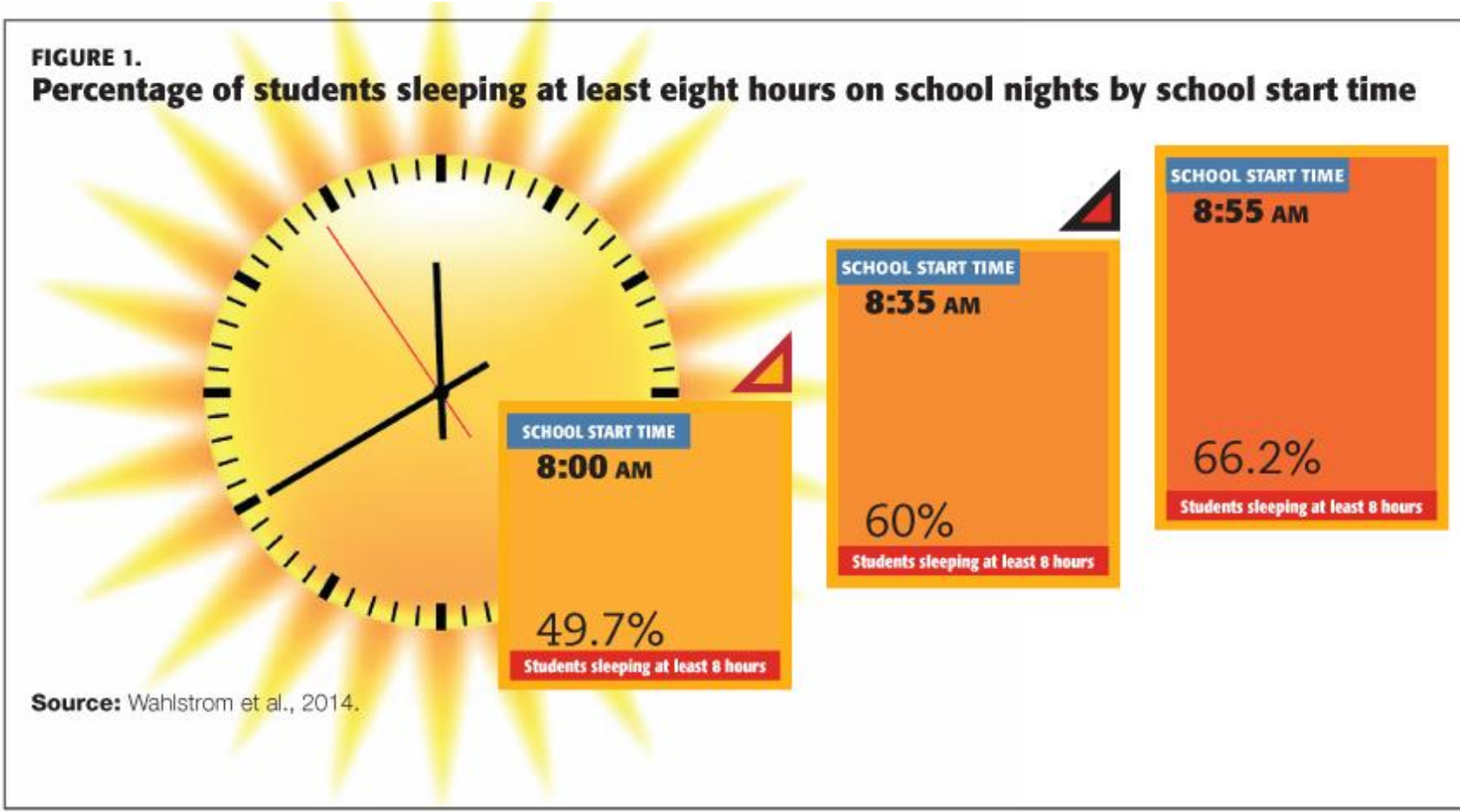


Solar Noon
Solar Midnight
Current (Elementary) Schedule Bus Pick-Up and Drop-Off Range
Proposed (Elementary) Schedule: Flip with Delay - Bus Pick-Up and Drop-Off Range

Graphs and Data from Other Districts and Sleep Studies

FIGURE 1.

Percentage of students sleeping at least eight hours on school nights by school start time



Source: Wahlstrom et al., 2014.

Actual Wahlstrom Data (2014) of High School Start Times

St. Louis Park HS (MN) moved from 7:50 a.m. → **8:20 a.m.** (30 min change)

Mahtomedi HS (MN) moved from 7:30 a.m. → **8:00 a.m.** (30 min change)

Woodbury HS (MN) moved from 7:35 a.m. → **8:35 a.m.** (60 min change)

Park HS (MN) moved from 7:35 a.m. → **8:35 a.m.** (60 min change)

Boulder HS (CO) moved from 7:30 a.m. → **8 a.m.**(M,T,Th,F), **9 a.m.**(W) (30 & 90 min changes)

Fairview HS (CO) moved from 7:35 a.m. → **8:05 a.m.** (30 min change)

Jackson Hole HS (WY) moved from 7:35 a.m. → **8:55 a.m.** (80 min change)

Owens, Belon & Moss 2010 Actual Data

Owens, Belon & Moss 2010 Actual Data

This is a college preparatory **boarding school**. They do not ride buses, they walk from their dorms to their classrooms. Their original start time was 8:00 a.m., and they moved their start time by 30 minutes to meet the recommended start time of 8:30 a.m.

Boergers, Gable, and Owens (2014) Actual Data

This is also a boarding school. They do not ride buses, they walk from their dorms to their classrooms. Their original start time was 8:00 a.m., and they moved their start time by 25 minutes to 8:25 a.m.

Later Start Times Mean Fewer Teen Car Accidents

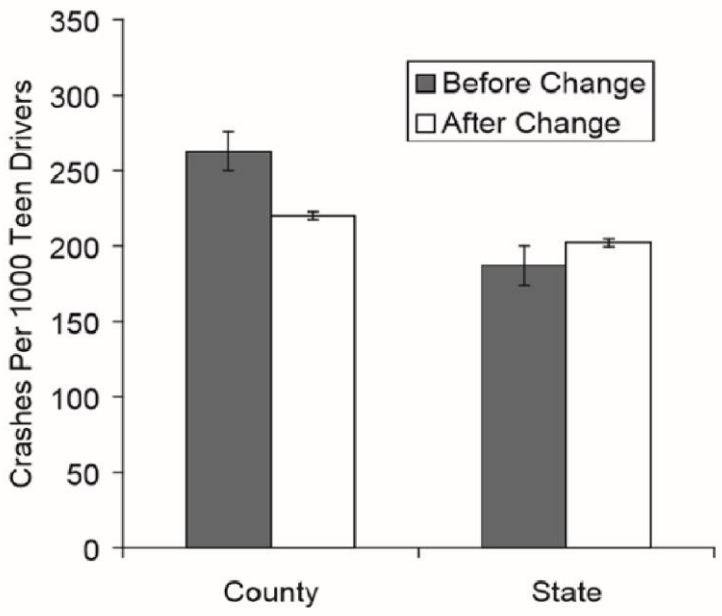
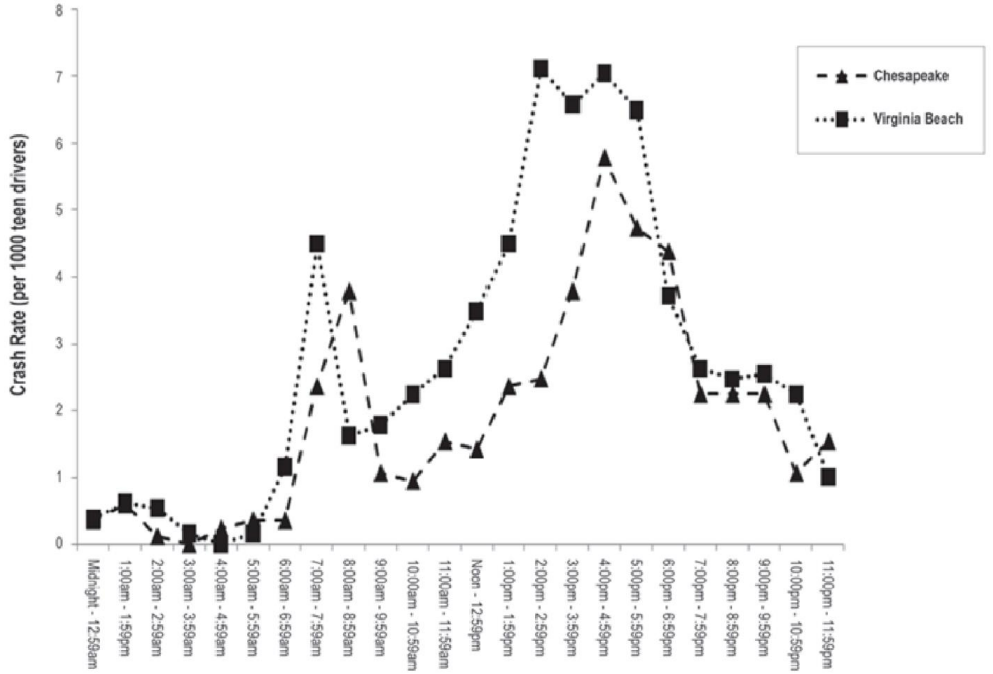


Figure 4—Number of motor vehicle crashes per 1000 drivers aged 17 or 18 years during the 2 years before and 2 years after a change in school start times.

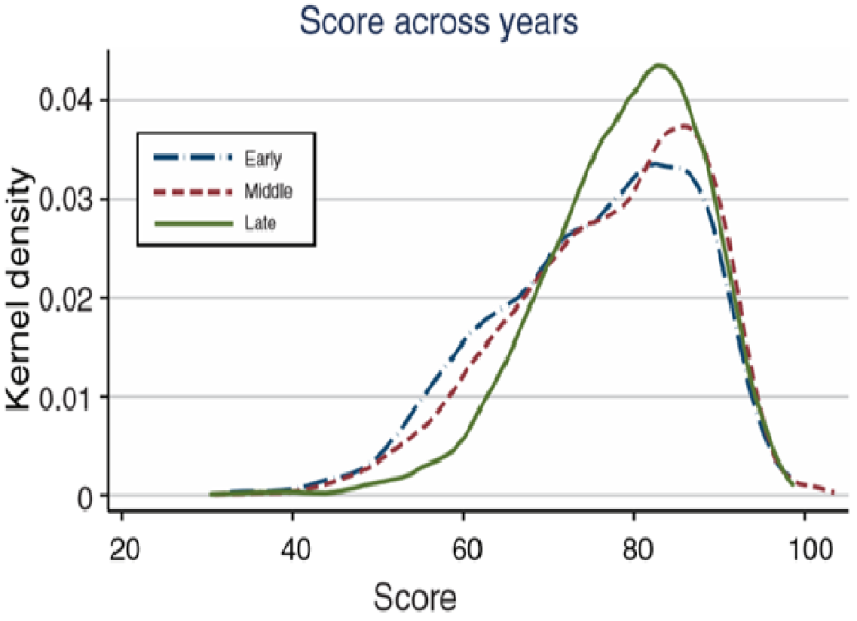
RD Vorona, M Szklo-Coxe, A Wu et al

Figure 1—Weekday crash rate of 16- to 18-year age groups in Chesapeake and Virginia Beach for year 2008

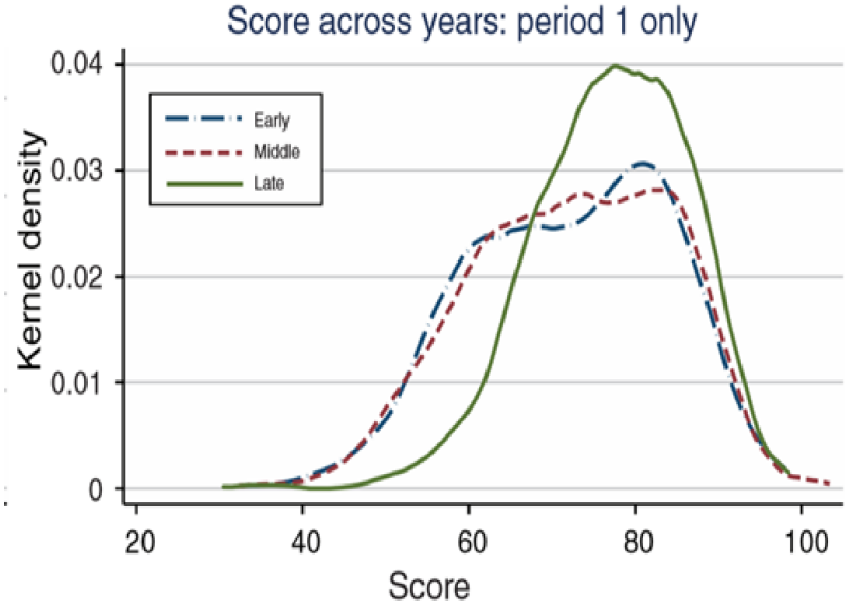


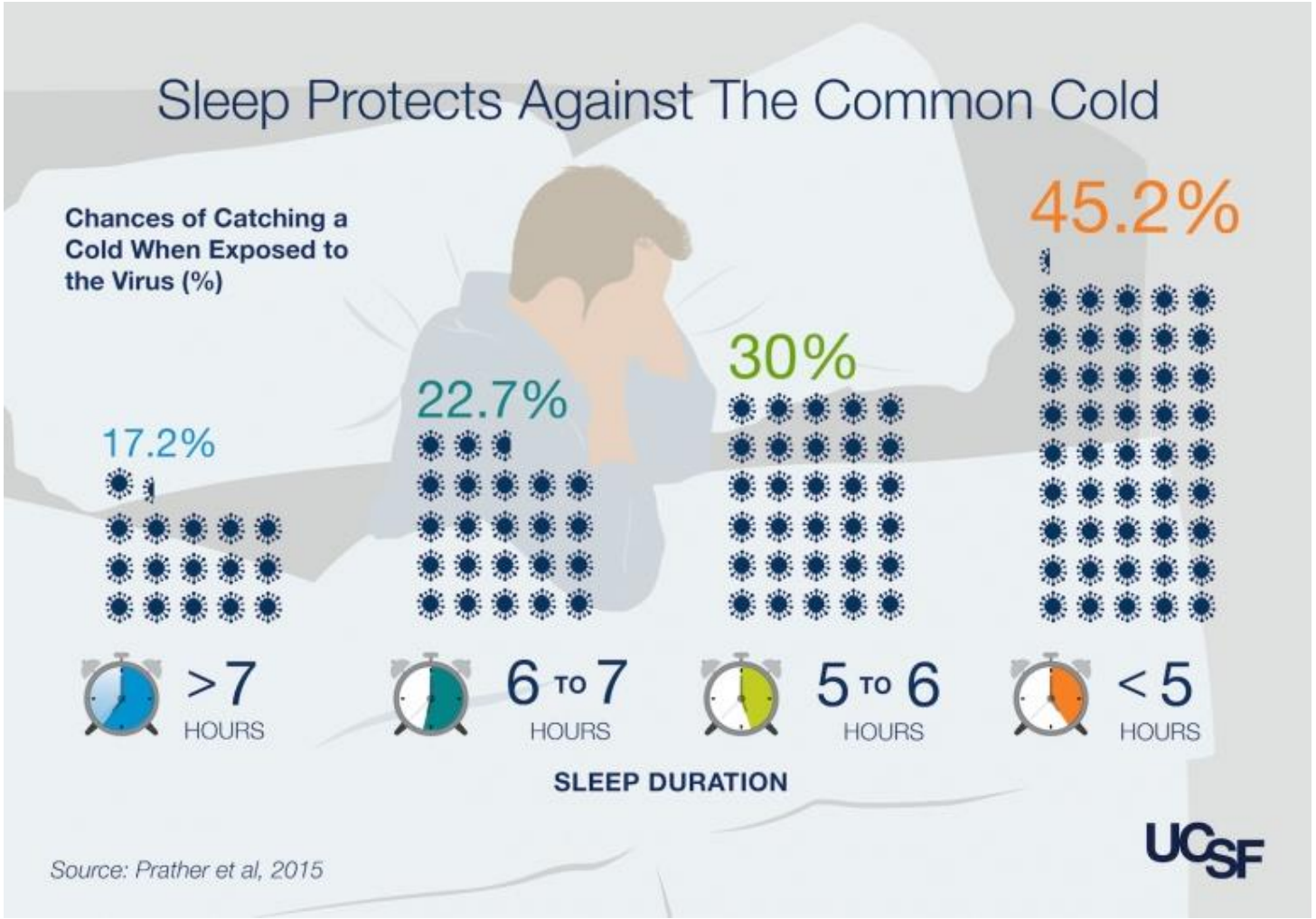
Later Class Starts = Better Grades for USAFA Freshman

All class periods



First period only




Sleep Protects Against The Common Cold
Chances of Catching a Cold When Exposed to the Virus (%)
17.2%
22.7%
30%
45.2%
>7 HOURS
6 TO 7 HOURS
5 TO 6 HOURS
<5 HOURS
SLEEP DURATION
Source: Prather et al, 2015
UCSF

Most U.S. middle and high schools start the school day too early

5 out of **6** U.S. middle and high schools start the school day before **8:30** AM

The American Academy of Pediatrics has recommended that middle and high schools should aim to start no earlier than 8:30 AM to enable students to get adequate sleep.

Teens need at least **8** hours of sleep per night.

Younger students need at least **9** hours.

2 out of **3** U.S. high school students sleep less than **8 hours** on school nights

Adolescents who do not get enough sleep are more likely to

be overweight

not get enough physical activity

suffer from depressive symptoms

engage in unhealthy risk behaviors such as drinking alcohol, smoking tobacco, and using illicit drugs

perform poorly in school

For more information: www.cdc.gov

National Center for Chronic Disease Prevention and Health Promotion
Division of Population Health

CDC

In Conclusion:

We recognize that change is hard! There are many challenges. But the wellness of our students is worth facing and overcoming these obstacles. We live in a wonderful community; we will help and support one another. Now that we know better, we must do better!

"Given that the primary focus of education is to maximize human potential, then a new task before us is to ensure that the conditions in which learning takes place addresses the very biology of our learners."

-Mary Carskadon, Ph.D, Brown University

"The Phoenix still rises from the ashes- just about an hour later!"

-Teresa Olsen