



Our Vision: Healthy school start times for all students to maintain health, stay safe and succeed in school

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Myths and Misconceptions

Fears

Bias

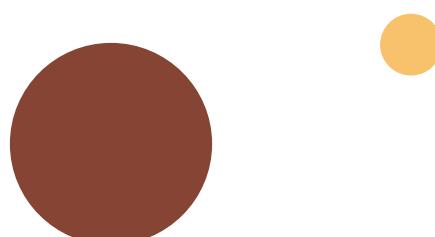
Overview

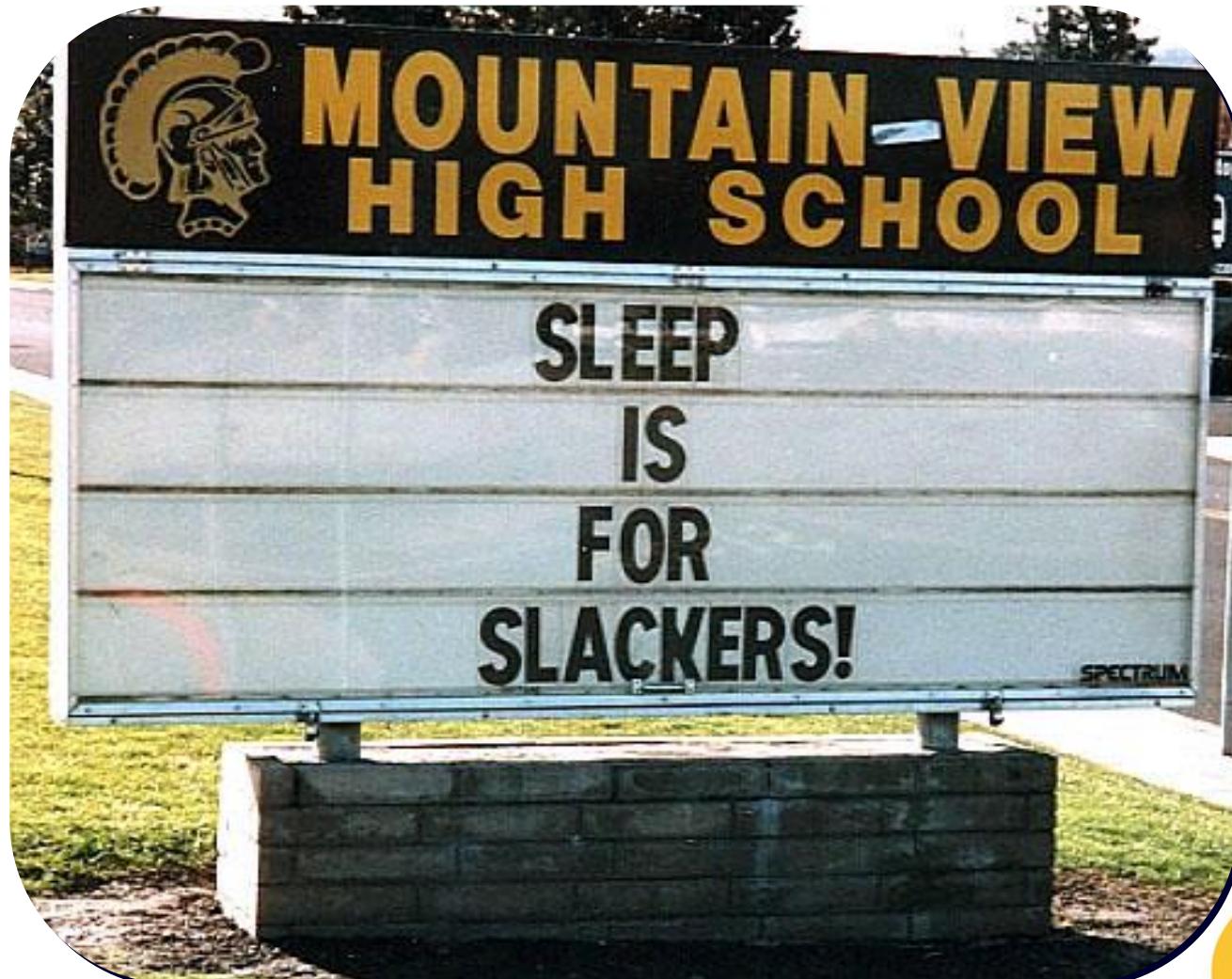
- Importance of sleep for health and learning
- Developmental changes in sleep and circadian biology
- Impact of sleep loss on students
- What students, parents and schools can do
- Evidence on later start times

“Sleep is the forgotten country and is not getting the attention it merits. It plays out in the home, in the pediatrician’s office, and in school. Sleep is an important factor in the lives of children.”

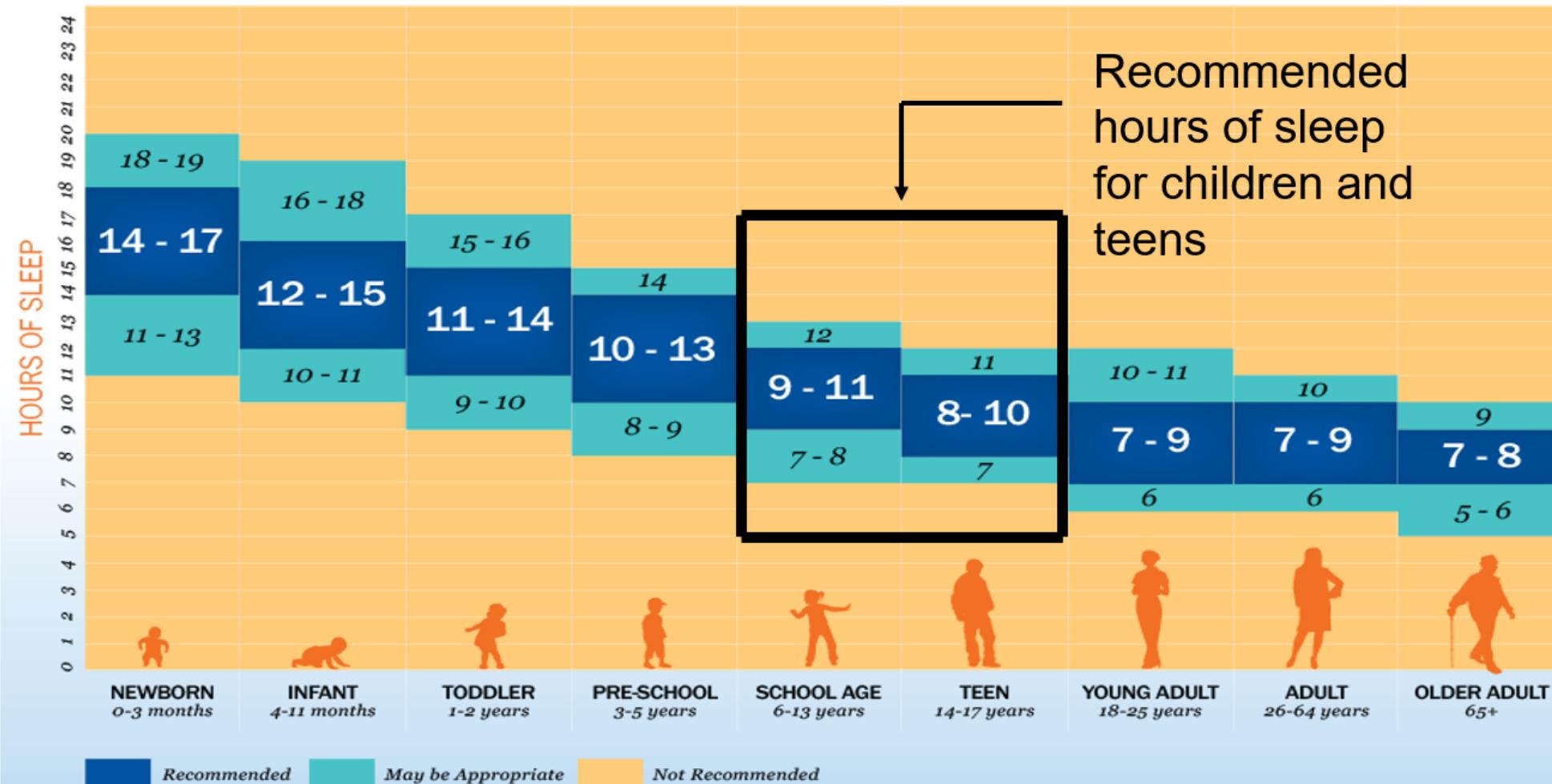
Mary A. Carskadon, PhD

Sleep is not Valued





SLEEP DURATION RECOMMENDATIONS



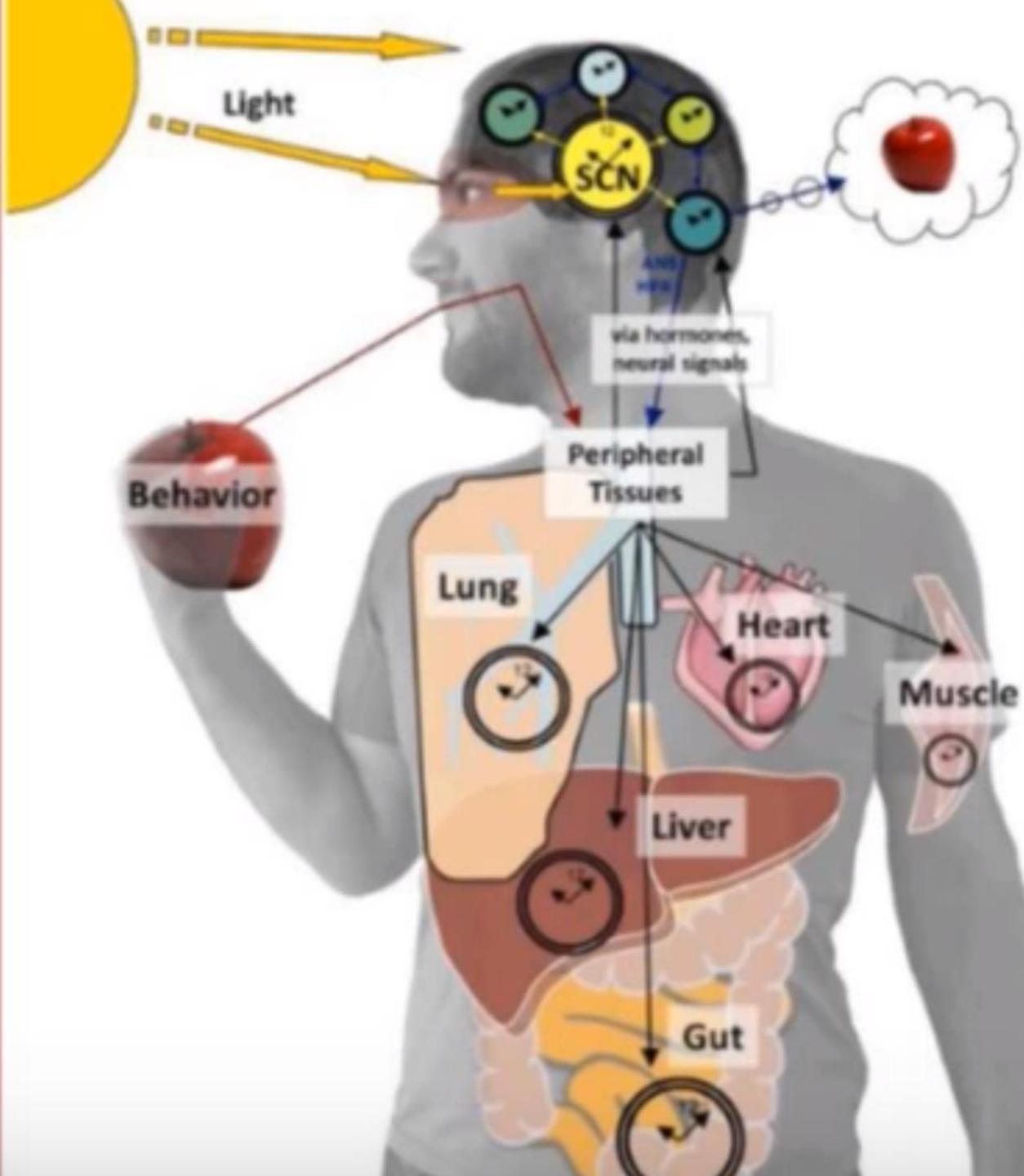
SLEEPFOUNDATION.ORG | SLEEP.ORG

Hirshkowitz M, The National Sleep Foundation's sleep time duration recommendations: methodology and results summary, *Sleep Health* (2015),
<http://dx.doi.org/10.1016/j.slehd.2014.12.010>

Sleep for the Mind and Body

- Essential to health, safety, productivity and well being
- Rids the brain of toxins
- Critical for learning & memory
- Both amount AND timing are important

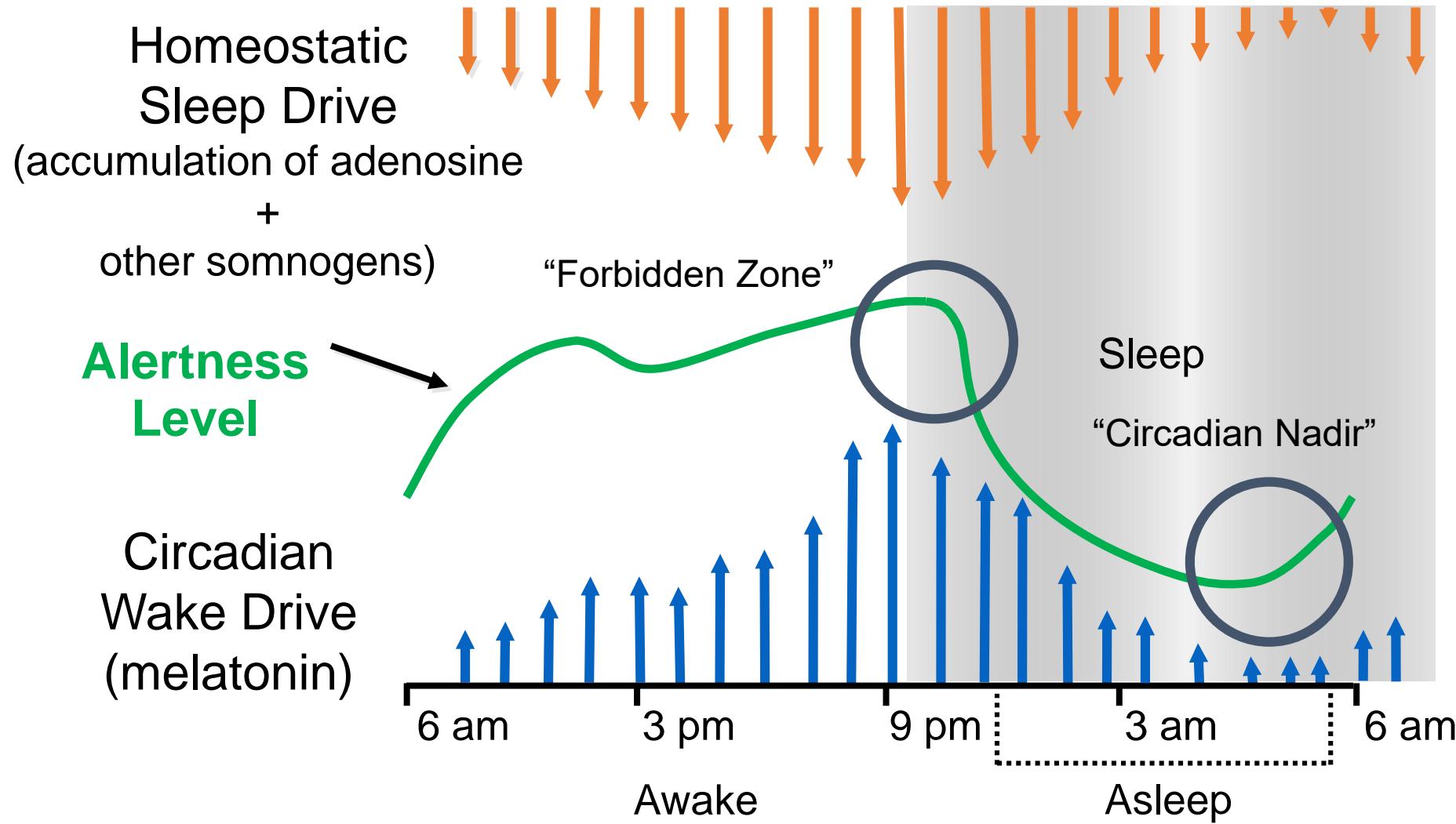




Timing of Sleep:

In addition to a “master clock” in the brain, each cell in the body posses a “circadian oscillator”/“clock” which must be synchronized with one another and the environment

“Two Process” Model of Sleep Regulation

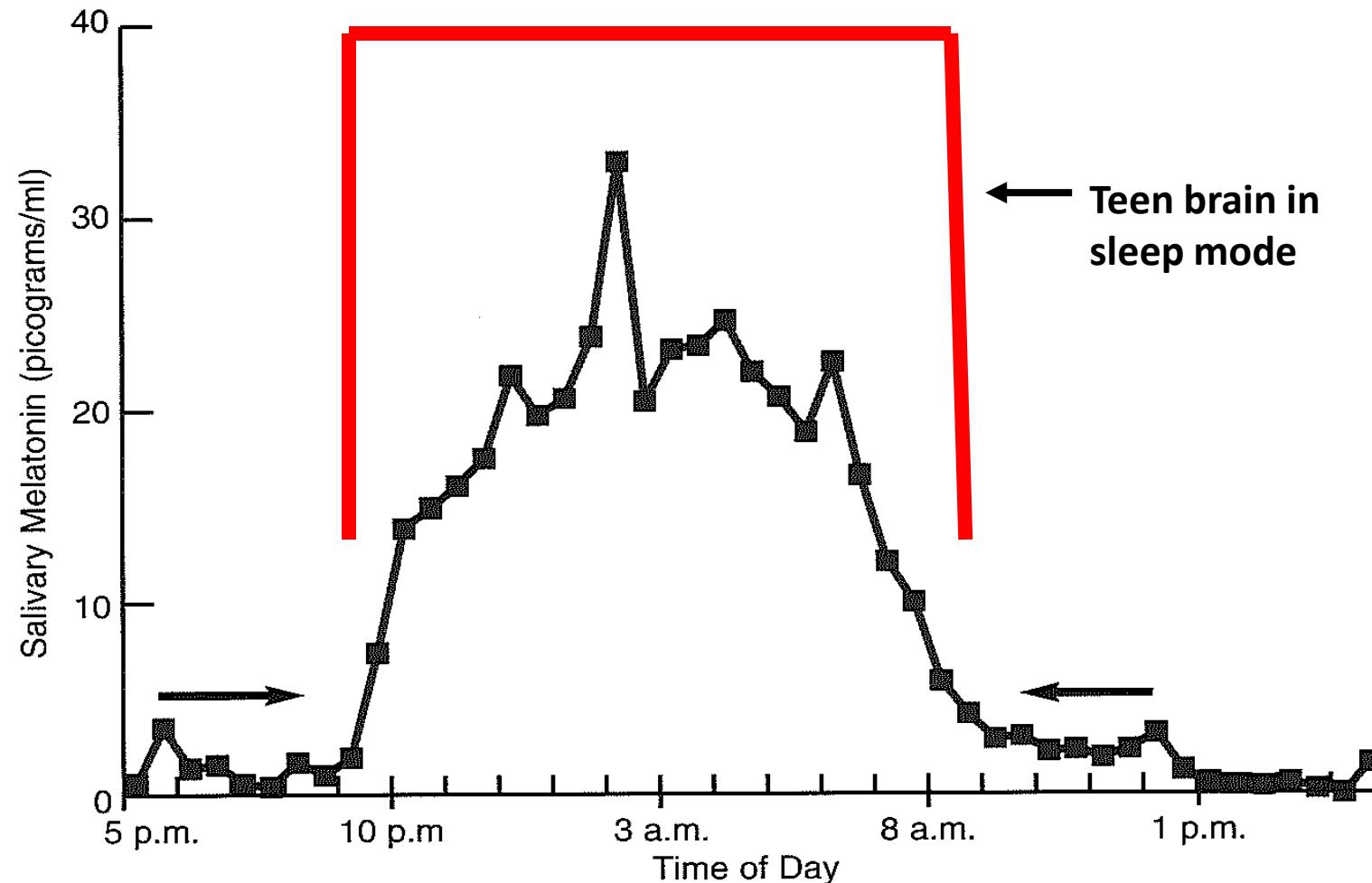


Now, imagine all of this shifting later by 2 hours...

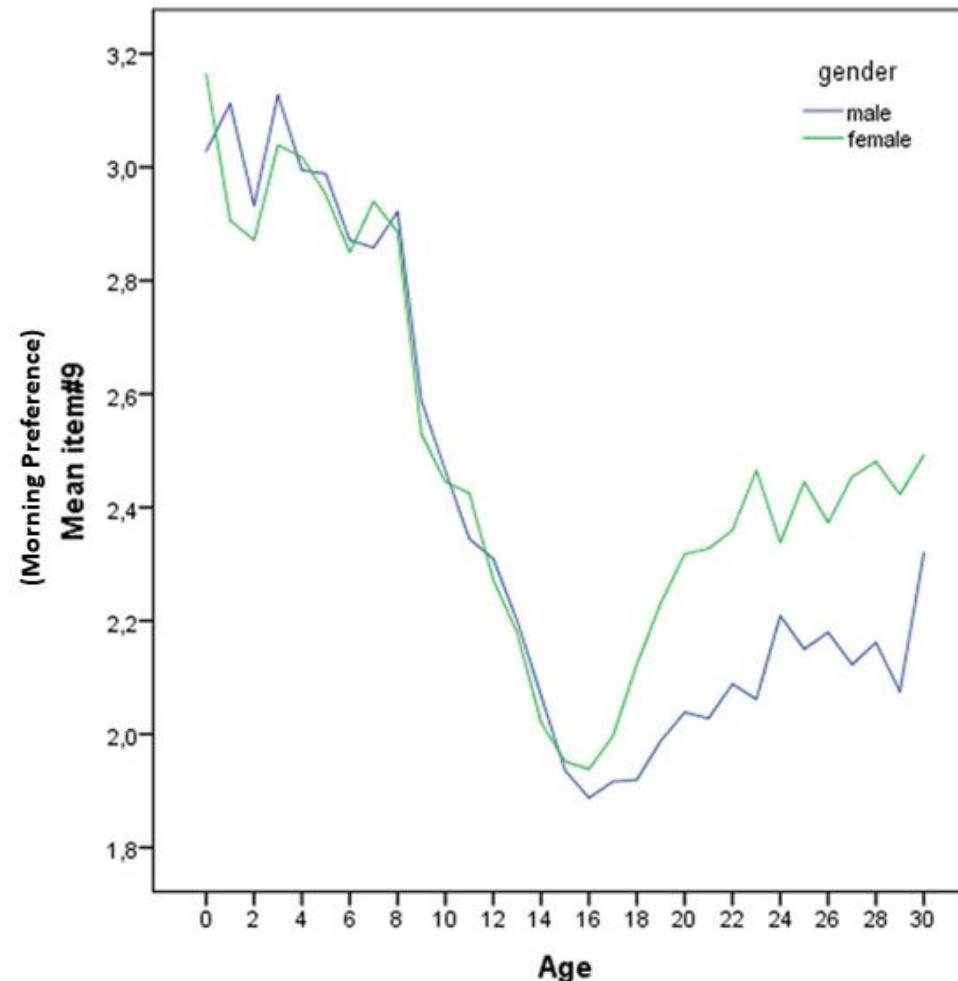
Teenagers have an eveningness (“night owl”) chronotype

Pattern of Melatonin Secretion in Adolescents (as measured in saliva samples)—
controlled by the circadian timing system

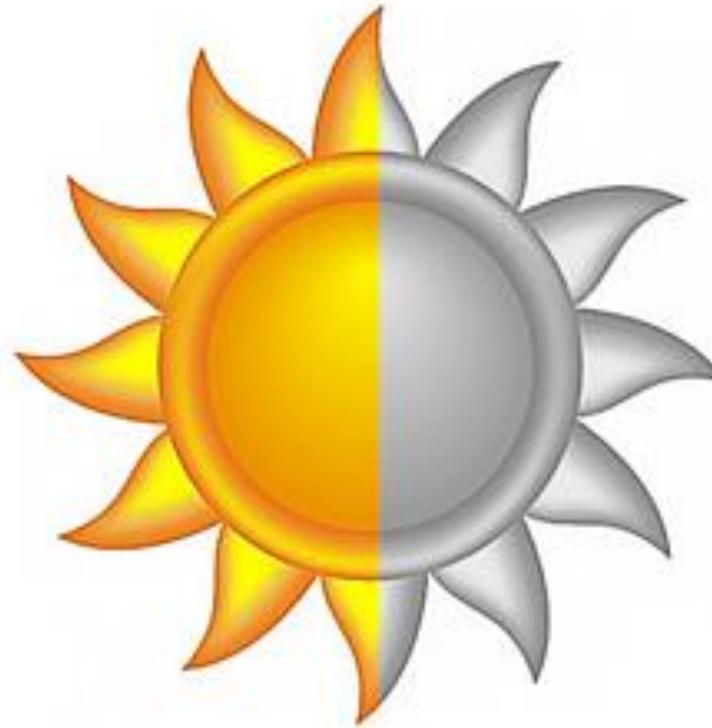
Carskadon et al., 1997



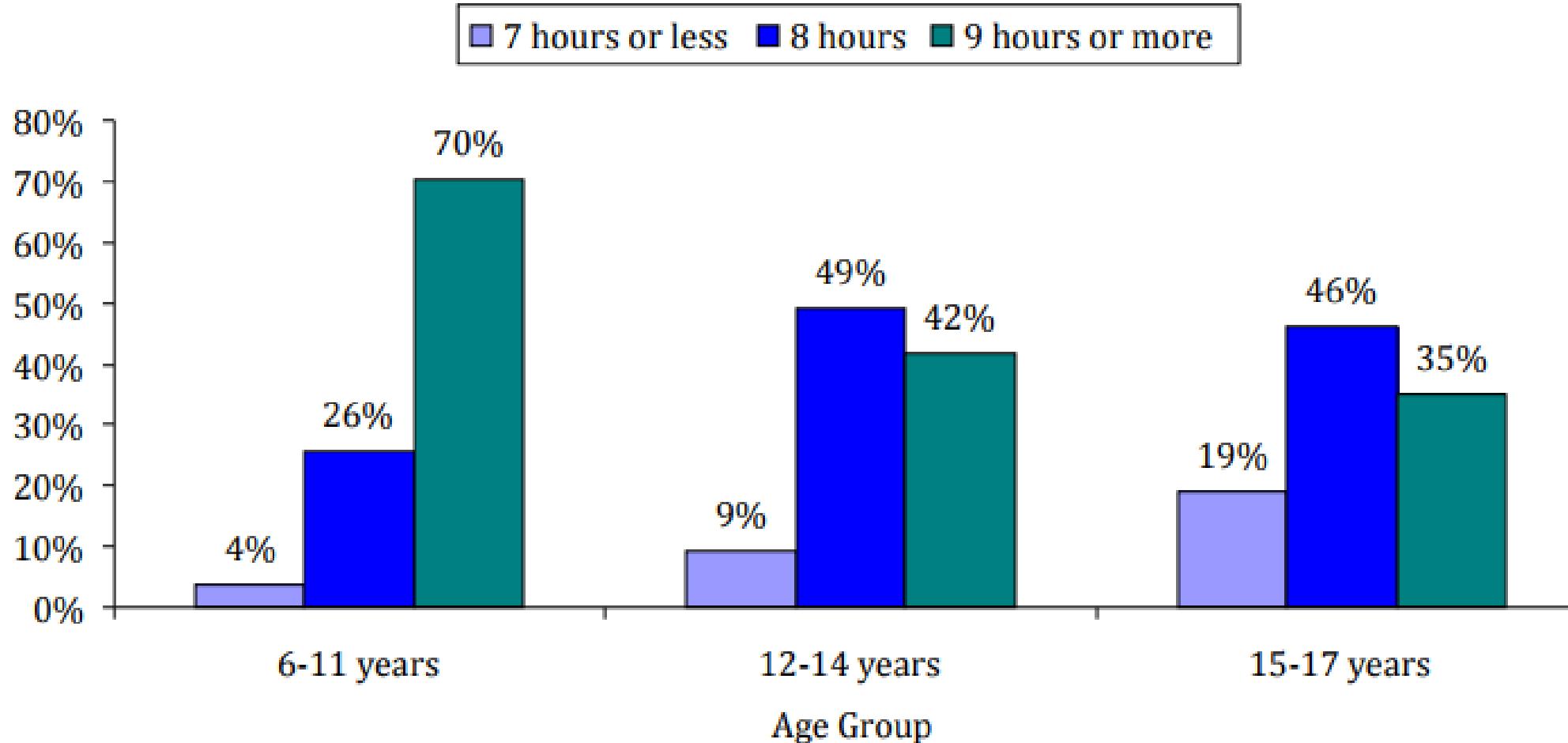
Young school-age children favor a morningness (“morning lark”) chronotype



Young children are more sensitive to light



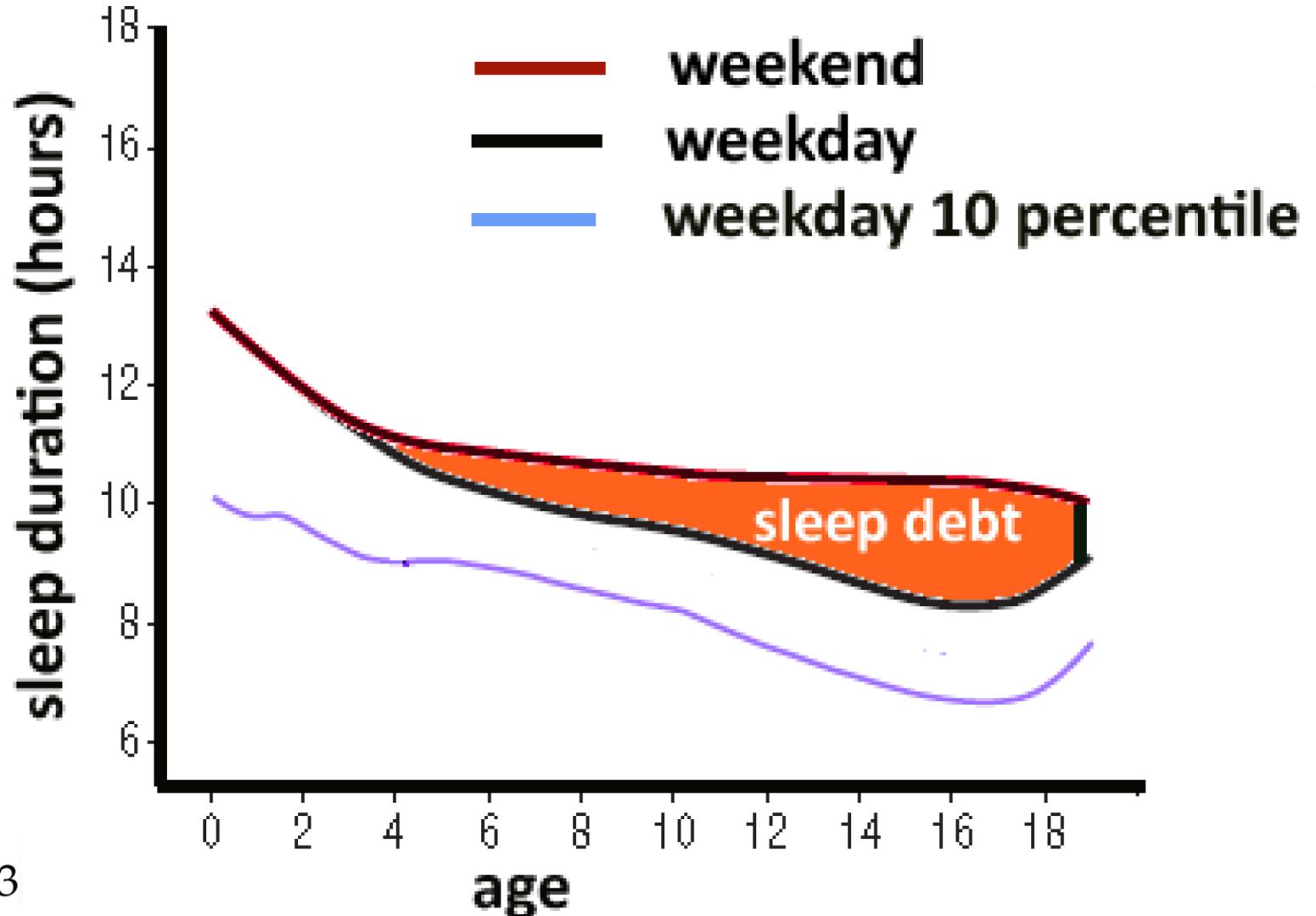
Total Sleep Time of Children



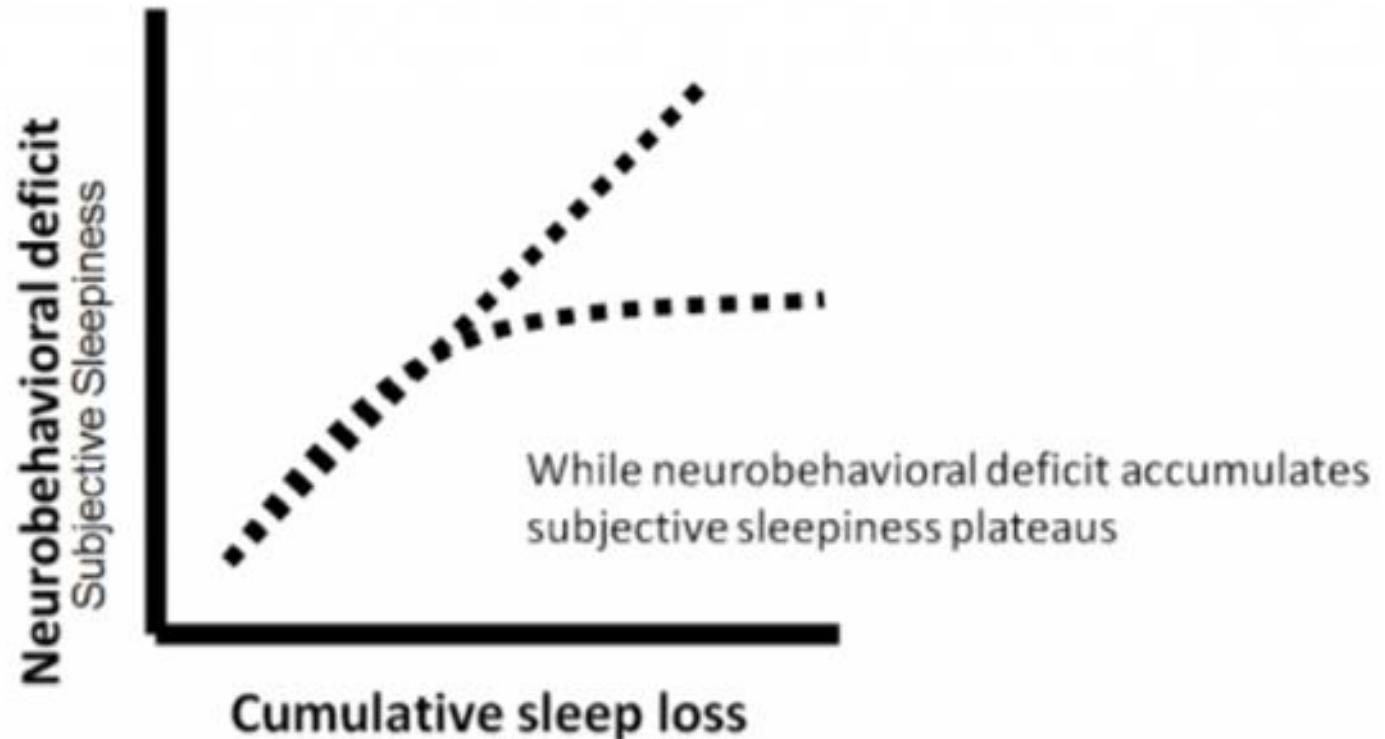
[National Sleep Foundation. \(2014\)](#). 2014 Sleep In America ® poll - Sleep in the modern family: Summary of findings.

Weekend Sleep as a Marker for Insufficient Sleep

Greater Burden in Teens



The more tired you are, the less aware you are tired

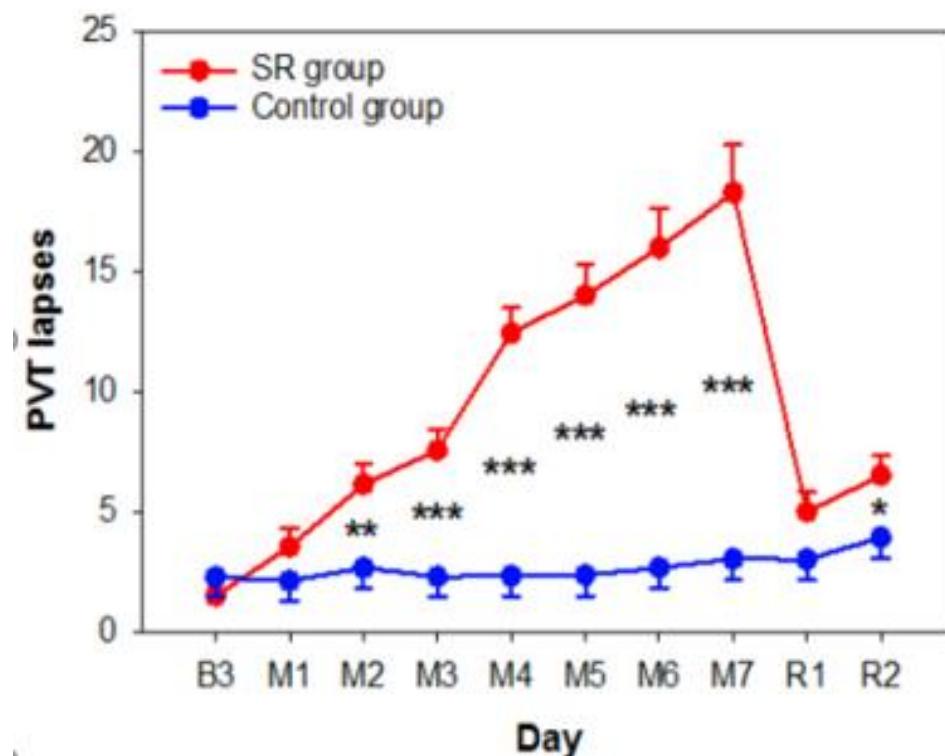


SLEEP 2003;2:117-126

Cumulative Deficit in Performance

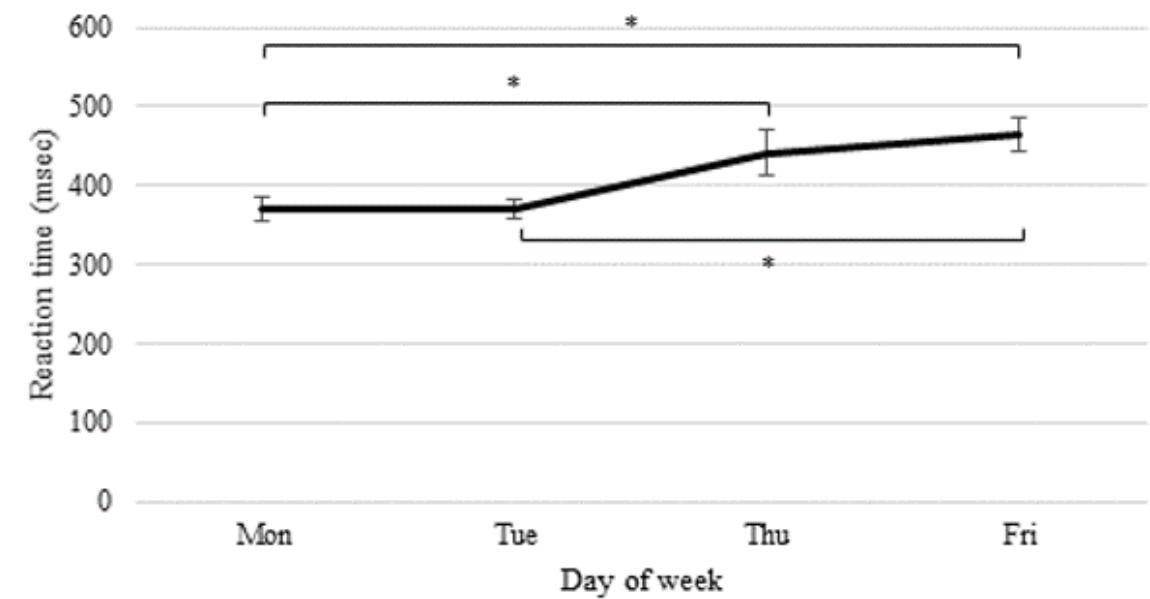
Academic

(A) Sustained attention

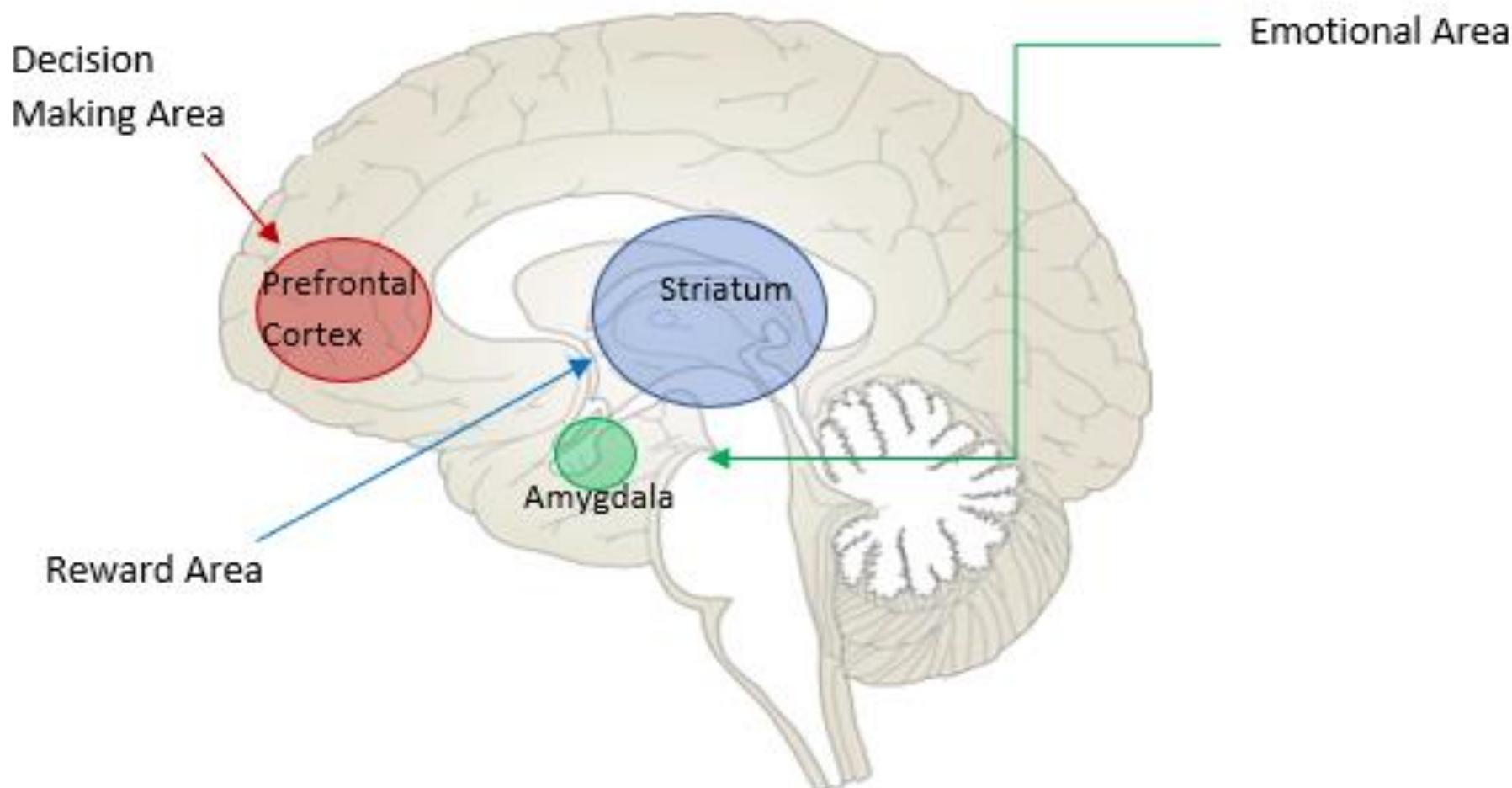


Athletic

B Average PVT Reaction Time



Sleep and Teen Brain Development



Teen Sleep Loss is not only about tiredness

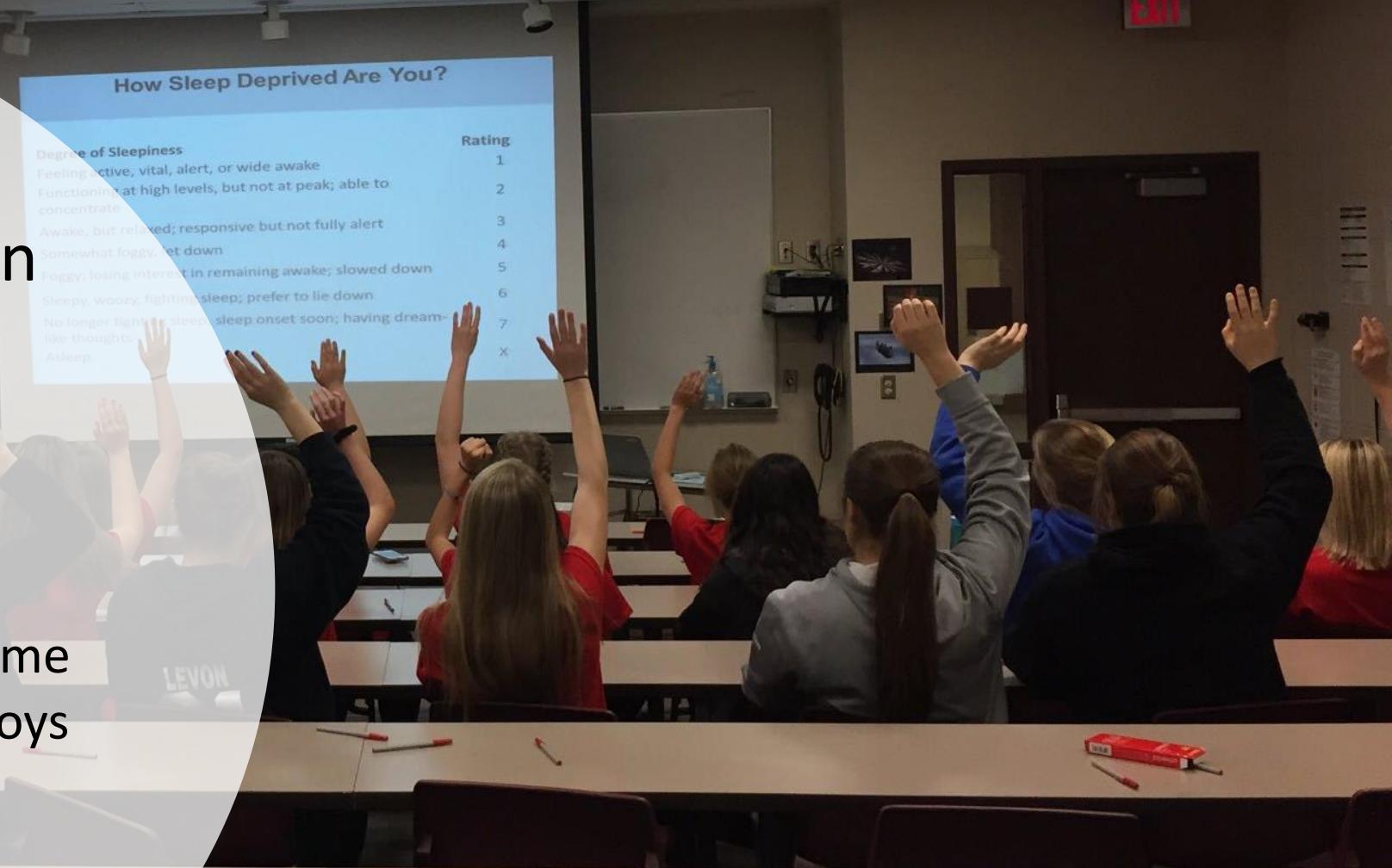
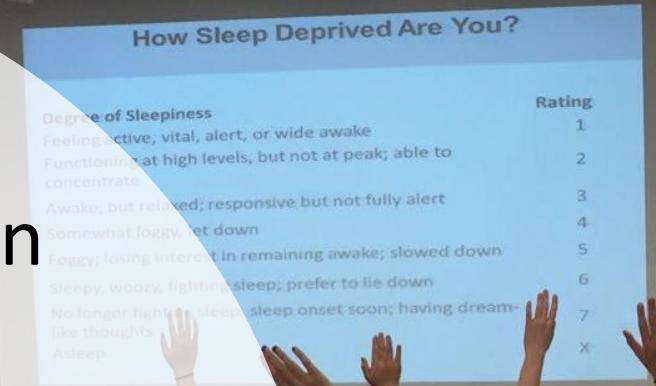
Sleep
Loss

Chronic
Stress

Vulnerable
Teen

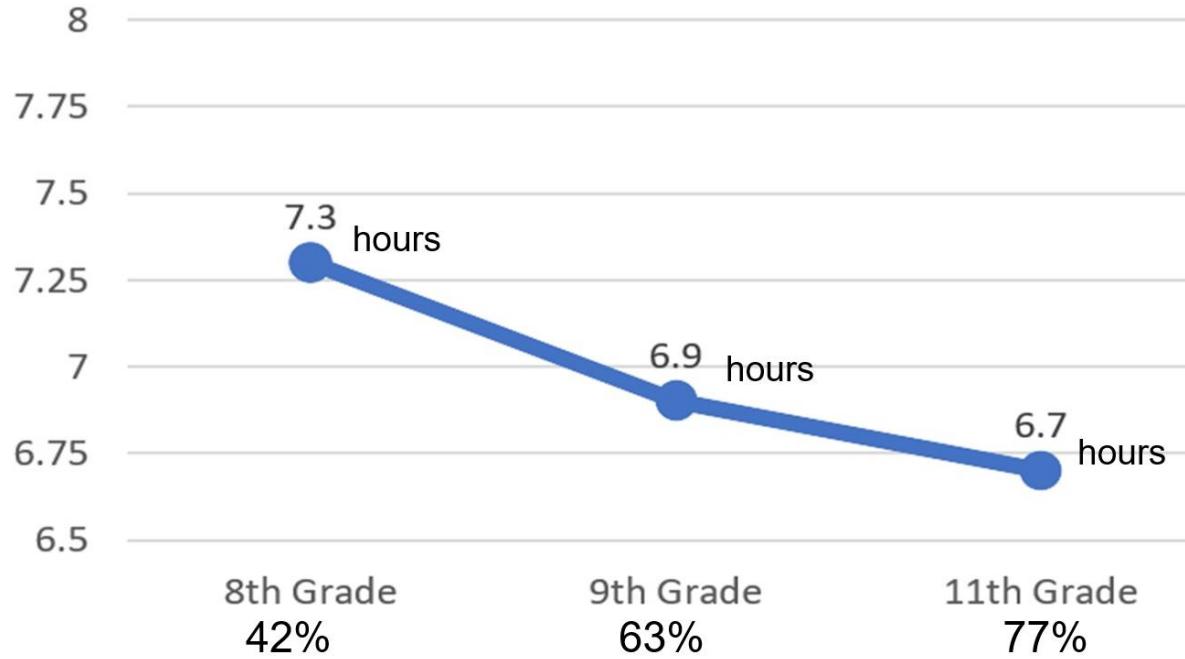
Teen Sleep Deprivation by Gender

Girls suffer more in high school
with their peak delayed sleep time
occurring around age 16 with boys
around age 18



Teen Sleep Deprivation by Age

Minnesota Student Survey 2016: 85% of schools participated



Nationally

- 57.8% middle school student
- 72.7% of high school students

Kentucky

- | Grade | Hours Slept | Percentage |
|------------|-------------|------------|
| 8th Grade | 7.3 | 42% |
| 9th Grade | 6.9 | 63% |
| 11th Grade | 6.7 | 77% |

[MMWR Morb Mortal Wkly Rep](#) [Wheaton et al, 2018](#)

What Percent of Teenagers Obtain Adequate Sleep (8 hours or more)

27.3%

Current average start time nationally

[Wheaton 2018](#), [Wheaton 2015](#)

57.8%

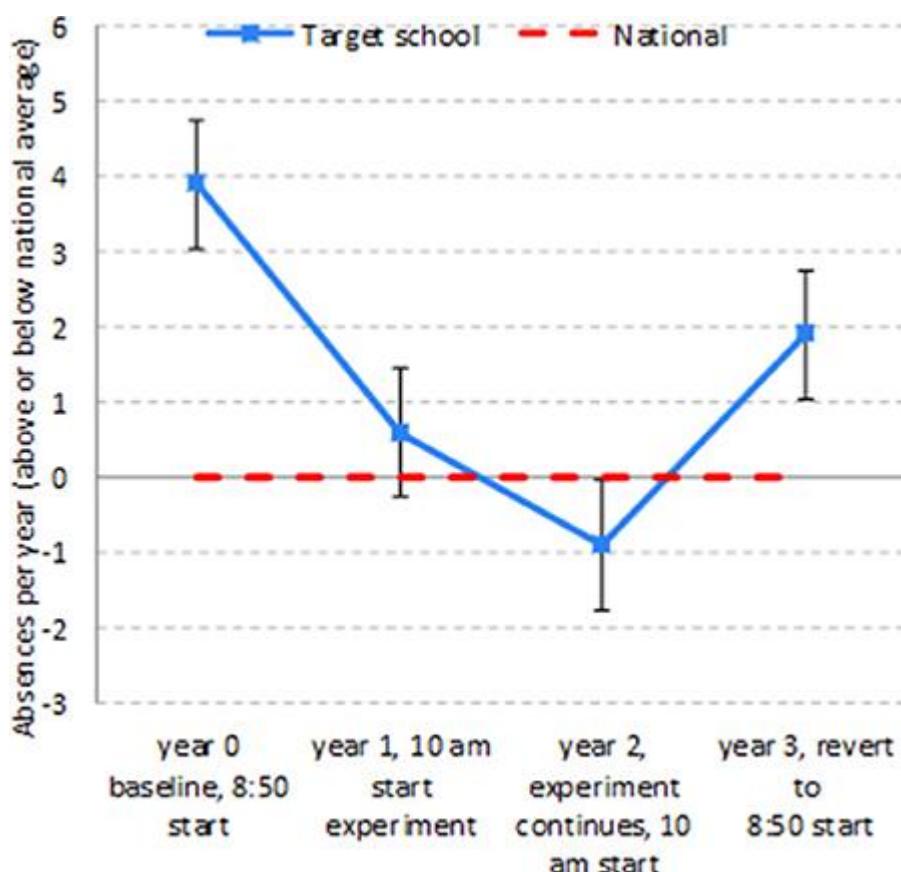
In schools where the start time was adjusted

[Danner et al 2008](#), [Owens et al 2010](#) and [Wahlstrom 2014](#)

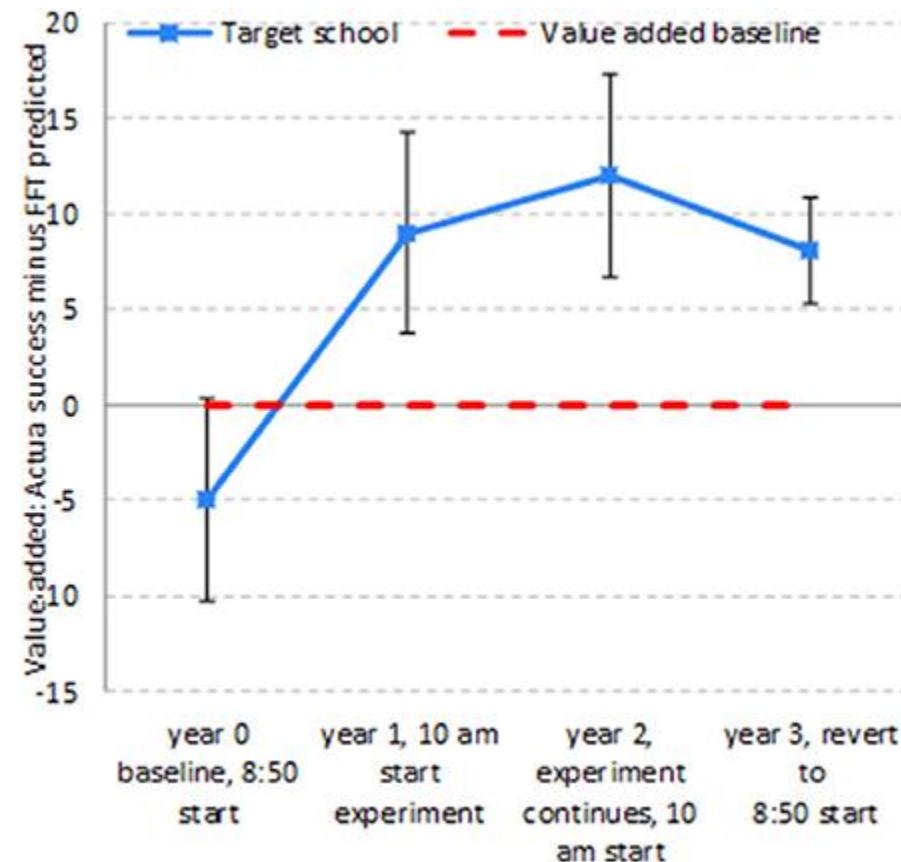
Is 8:30 am Late Enough?

8:50 am Start Time in Year 0 and Year 4 compared to 10:00 am in Year 2 and 3 (Kelley et al 2017)

Absence Due to Illness



Academic Success



Results of Insufficient or Poorly Timed Sleep

- Performance & Public Safety
 - Mental Performance
 - Preventable Accidents
- Disease Risk
 - Mood disorders, obesity, diabetes, high blood pressure, heart disease, stroke, immune function, dementia, cancer

Teens Have Later Bedtimes

- Normal shift in circadian rhythm
 - 10:45 pm to 8:00 am
- “Forbidden Zone” almost impossible for the average teen to fall asleep earlier
- Teens can not make themselves fall asleep



Teens Have Later Wake Times

These biological changes are in direct conflict with earlier high school start times (before 8:30am) because adolescents are biologically programmed to wake at 8am or later

As a result, students are required to wake for the day and function during the “circadian nadir” (the lowest level of alertness during the 24 hour day)

Early wake times also selectively rob teens of REM (rapid eye movement) sleep, which is critical for learning (*of new information in particular*) and memory

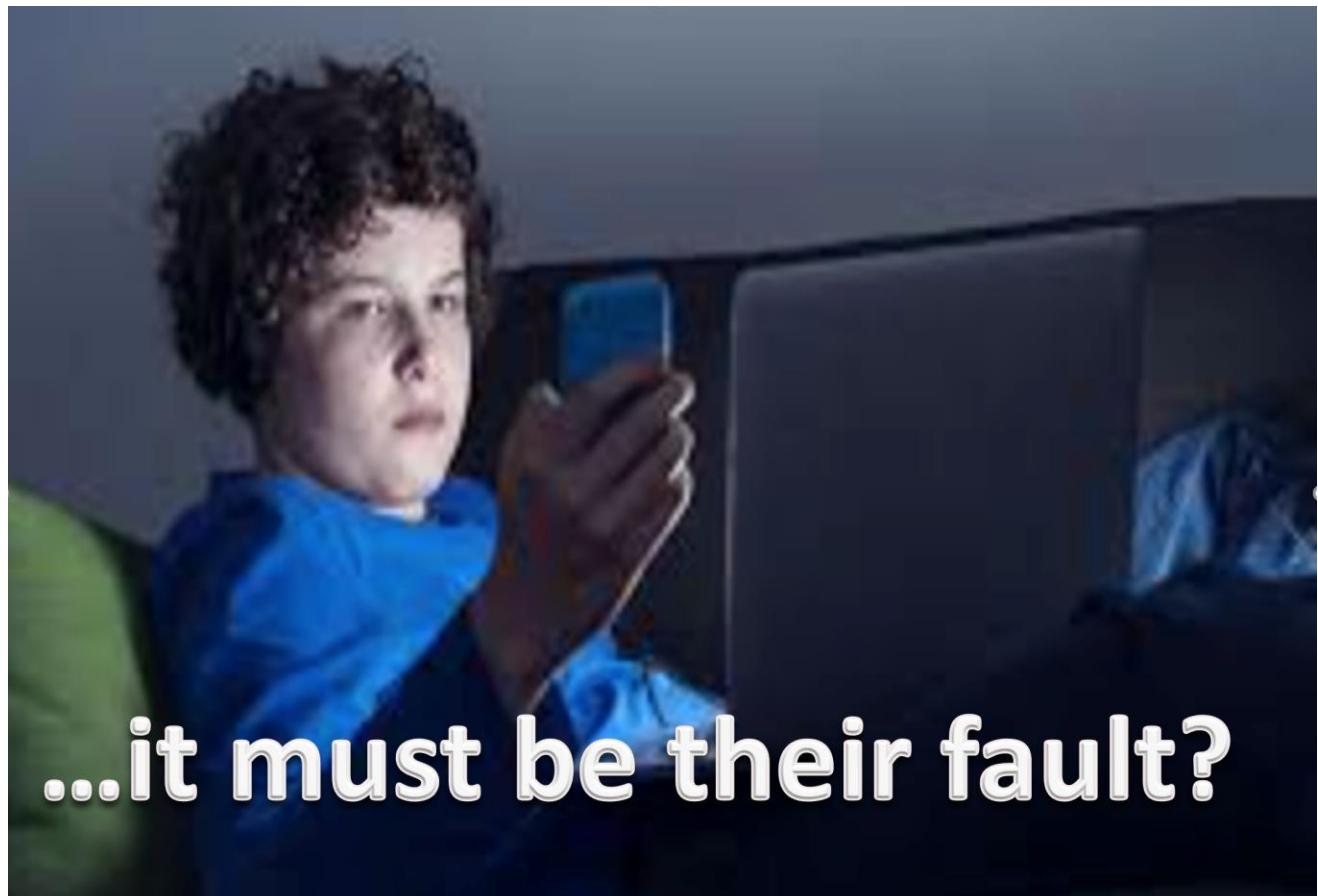


Adolescent Coping: Worsens the Problem

Caffeine, Napping, & Sleeping in on the Weekends which leads to “Social Jet-Lag”

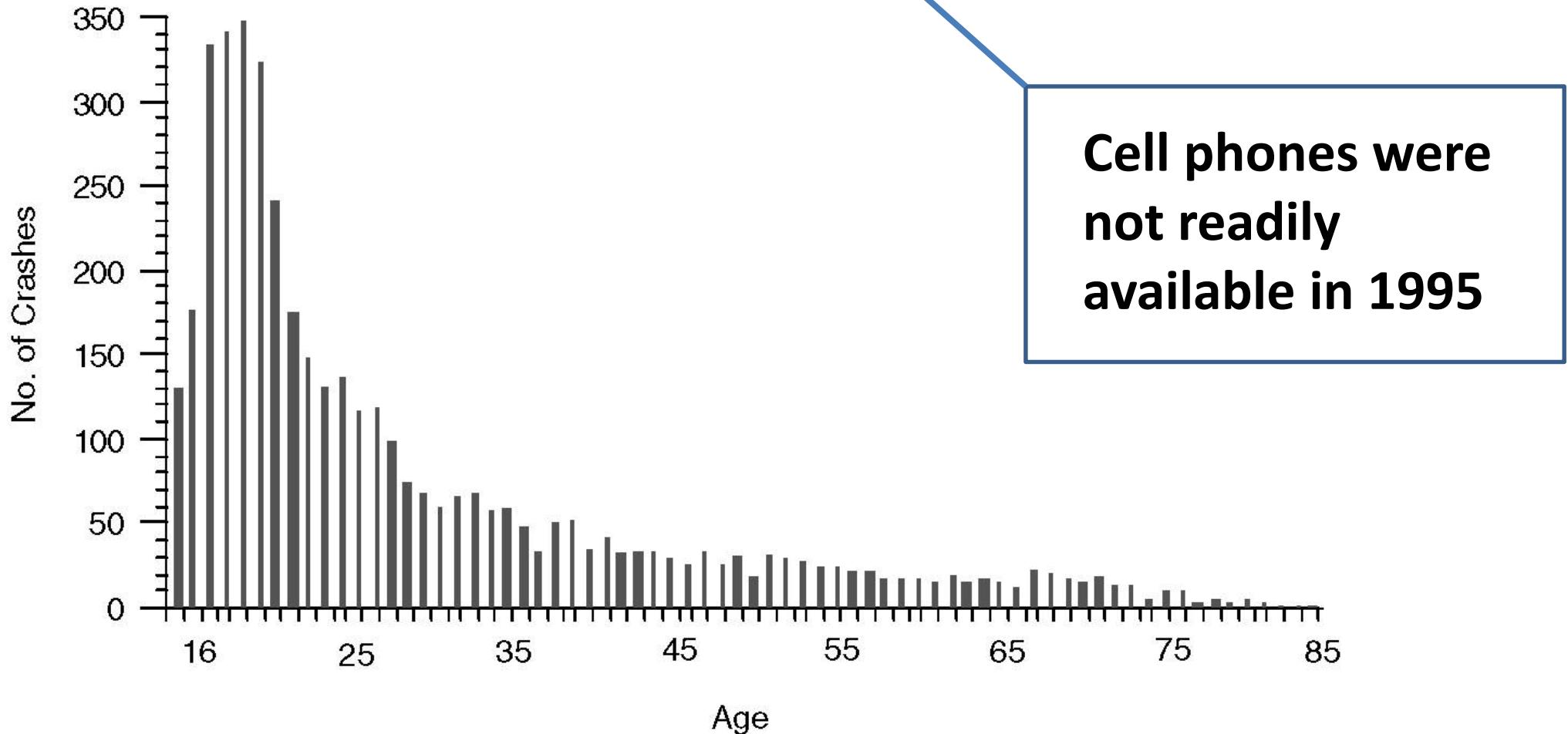
Does technology play a role?

- Light from devices suppresses melatonin, making it harder to fall asleep
- About one hour is needed for the brain to “unwind”



Age Distribution of Fall -Asleep Crashes

Pack et al, 1995



Technology use is not the only factor

Sleep Hygiene Study

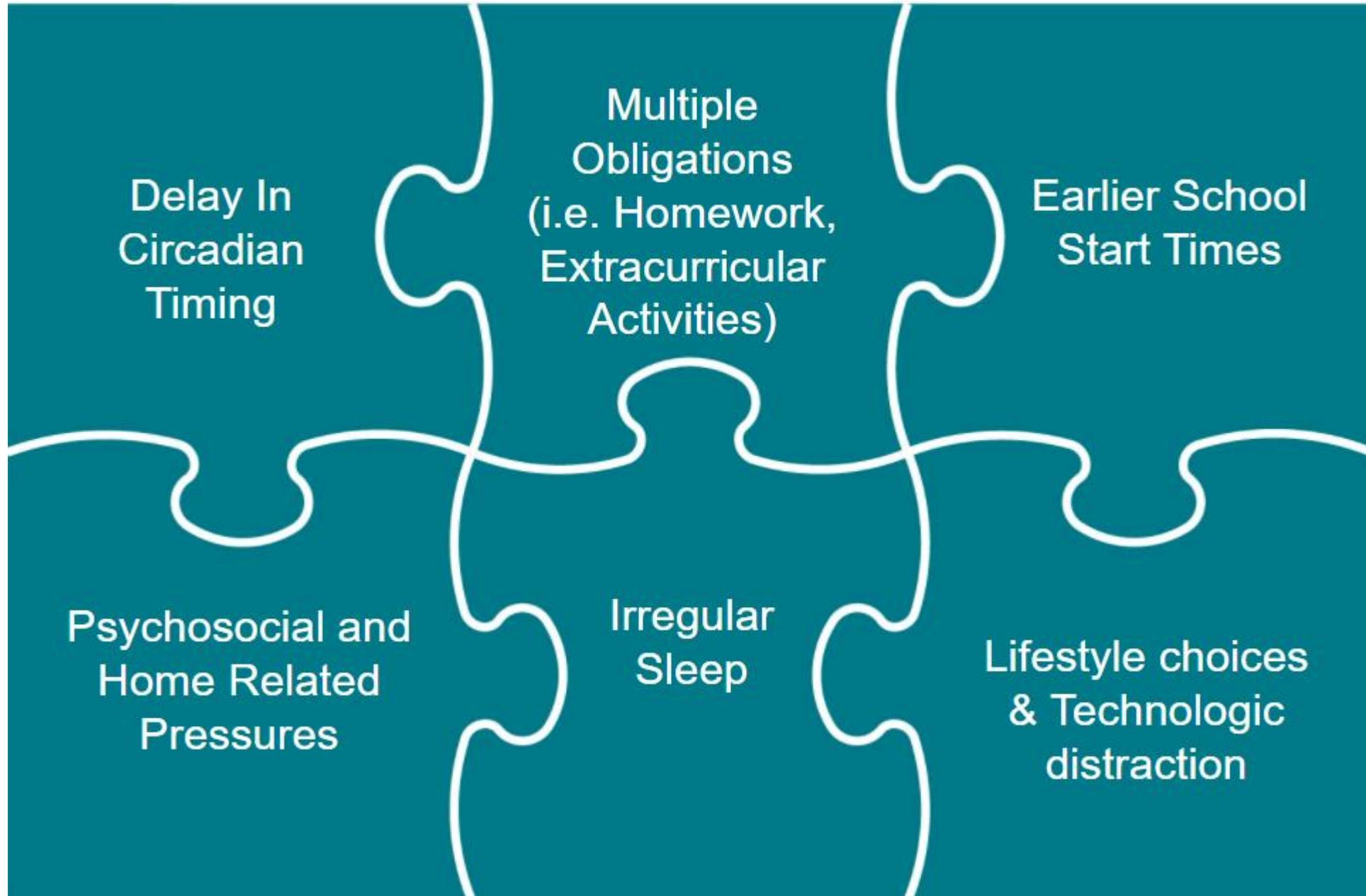
- 197 students across the country - ages of 14 and 17
 - Going to school before 8:30 am or after
 - Took into account Chronotype
 - Assessed Sleep Hygiene
 - Anxiety/Depression Levels
- Good sleep hygiene correlated with better mental health
- Good baseline sleep hygiene and earlier school start times had higher average daily depressive/anxiety symptoms

“It’s 6:55 am and I stand near the coffee pot in the kitchen. My 10th grader saunters in. “I hate school” is the first thing she says to me.

She’s exhausted and her pathological state of being tired has made everything difficult. But she actually goes to bed pretty early for a 15 year old; her phone is left downstairs at 9 pm and her light goes out at 10:30 pm. It’s just that then she lays there, unable to fall asleep. It’s beyond frustrating.”

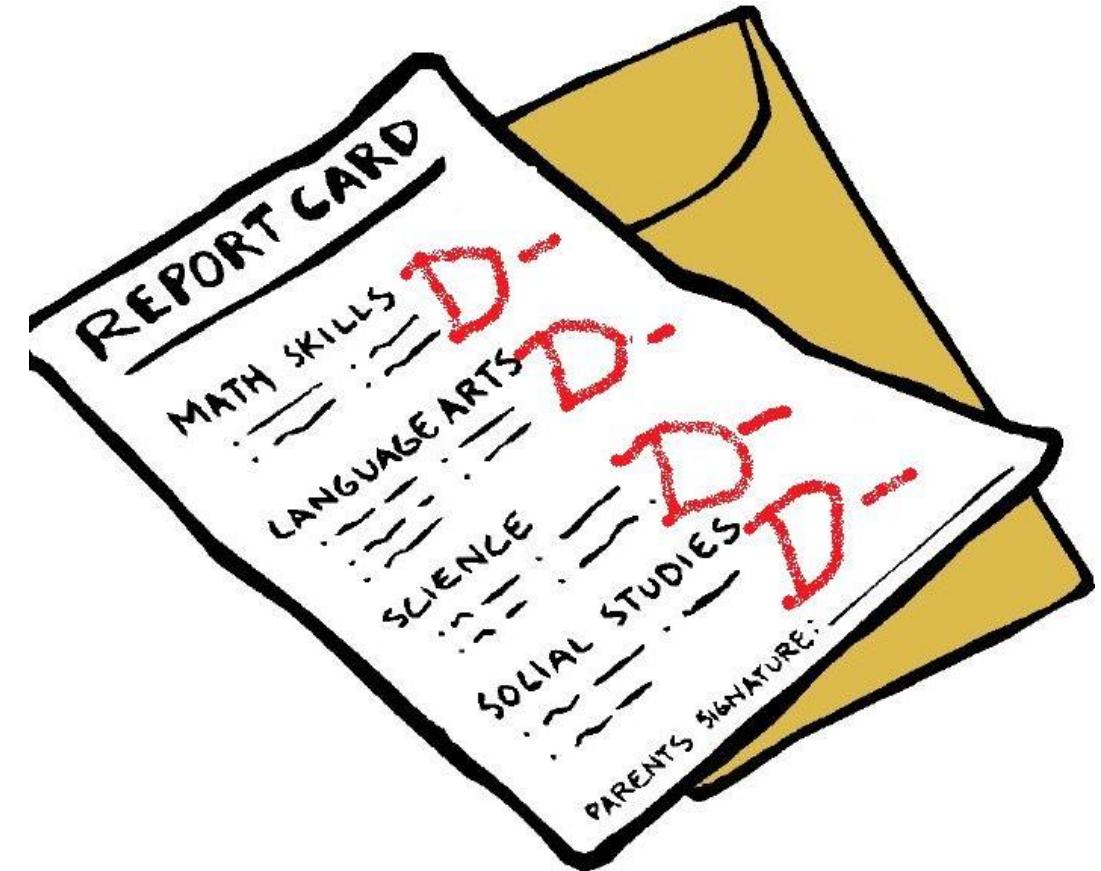
Renee Leinbach, Mahtomedi High School Mom

Many Factors Contribute to Inadequate Sleep for Teenagers



Insufficient Sleep and Academic Performance

- Variable school start times for 8th graders in one district: 7:20–7:30, 7:40–7:55, 8:00–8:10 am
- 33,000 total (50% female, 42% white)
- Findings:
 - Students in the two earlier start times were less likely to sleep 8 hours
 - 8 hours or more of sleep increased the probability of getting A's with the lowest probability for <7 hours
 - Students getting less sleep had lower rates of homework completion



Insufficient Sleep and Obesity

Sleep duration and timing affect:

- Hunger
- Food intake (type, amount patterns)
- Less physical activity
- Risk for chronic disease (diabetes, cardiovascular dysfunction)



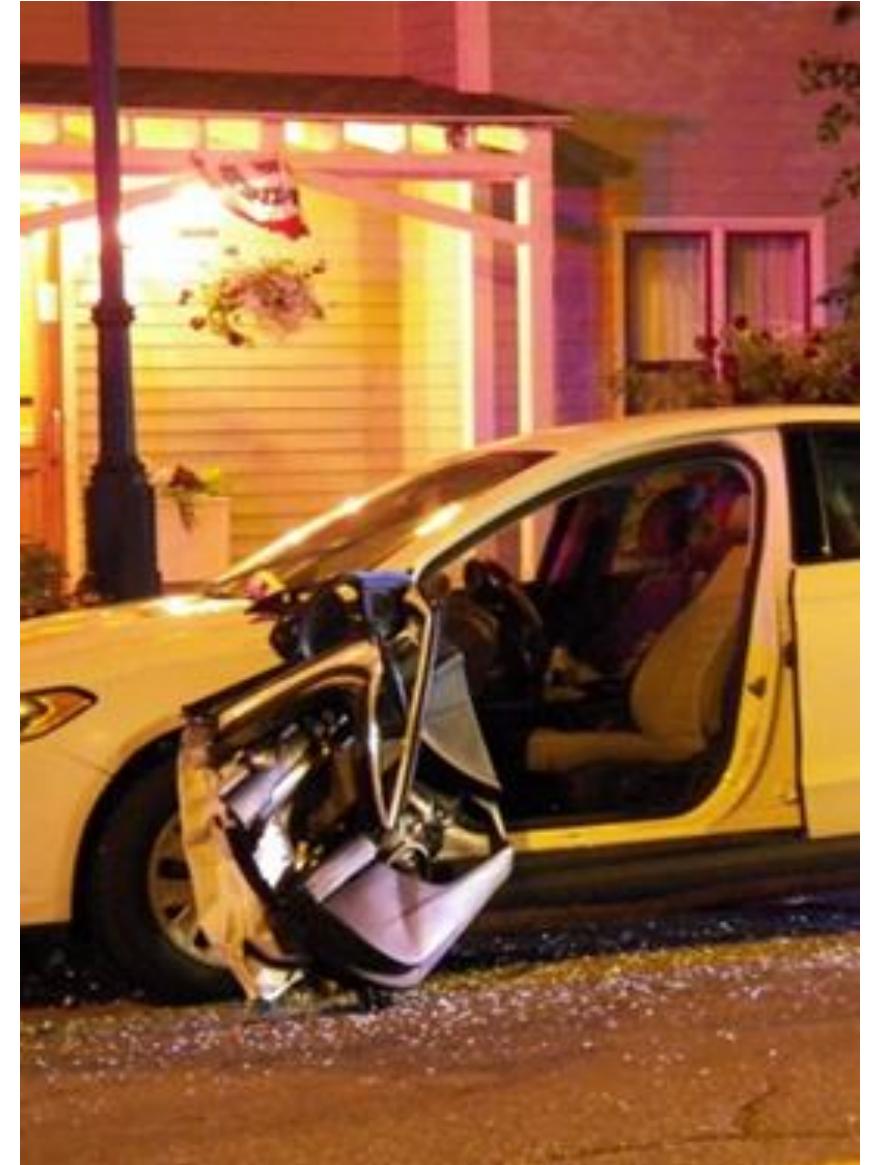
U.S.



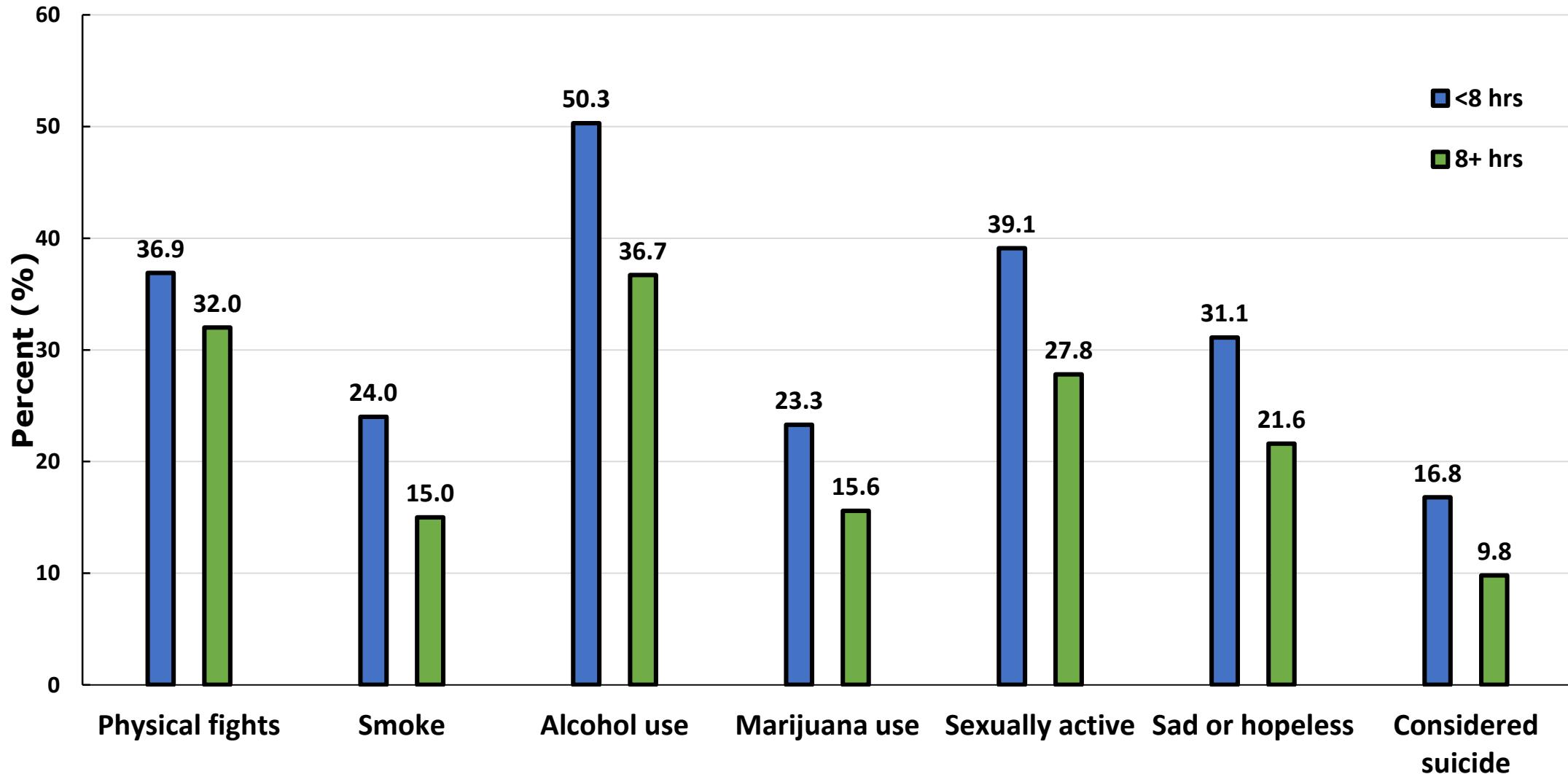
MIRACLE AS TEENAGER SURVIVES

Insufficient Sleep and Car Accidents

- 1/5th of all car crashes involve a drowsy driver
- Teenagers are driving drowsy! AAA (2012-2016)
 - 23% reported driving while sleepy
- AAA estimates 13% of fatal car crashes involve a drowsy teenager
- Impairment from driving sleepy is equivalent to moderate drinking (3-4 beers)
- This is an issue affecting the whole community/health



Insufficient Sleep and Risk-Taking Behaviors



Comparison* of Selected Risk Behaviors among 12,154 High School Students, by
Sleep Duration: YRBS, 2007

*All comparisons significant at p<0.05.

Adapted from McKnight-Eily LR et al. *Preventive Medicine* 2011;53:271-273.

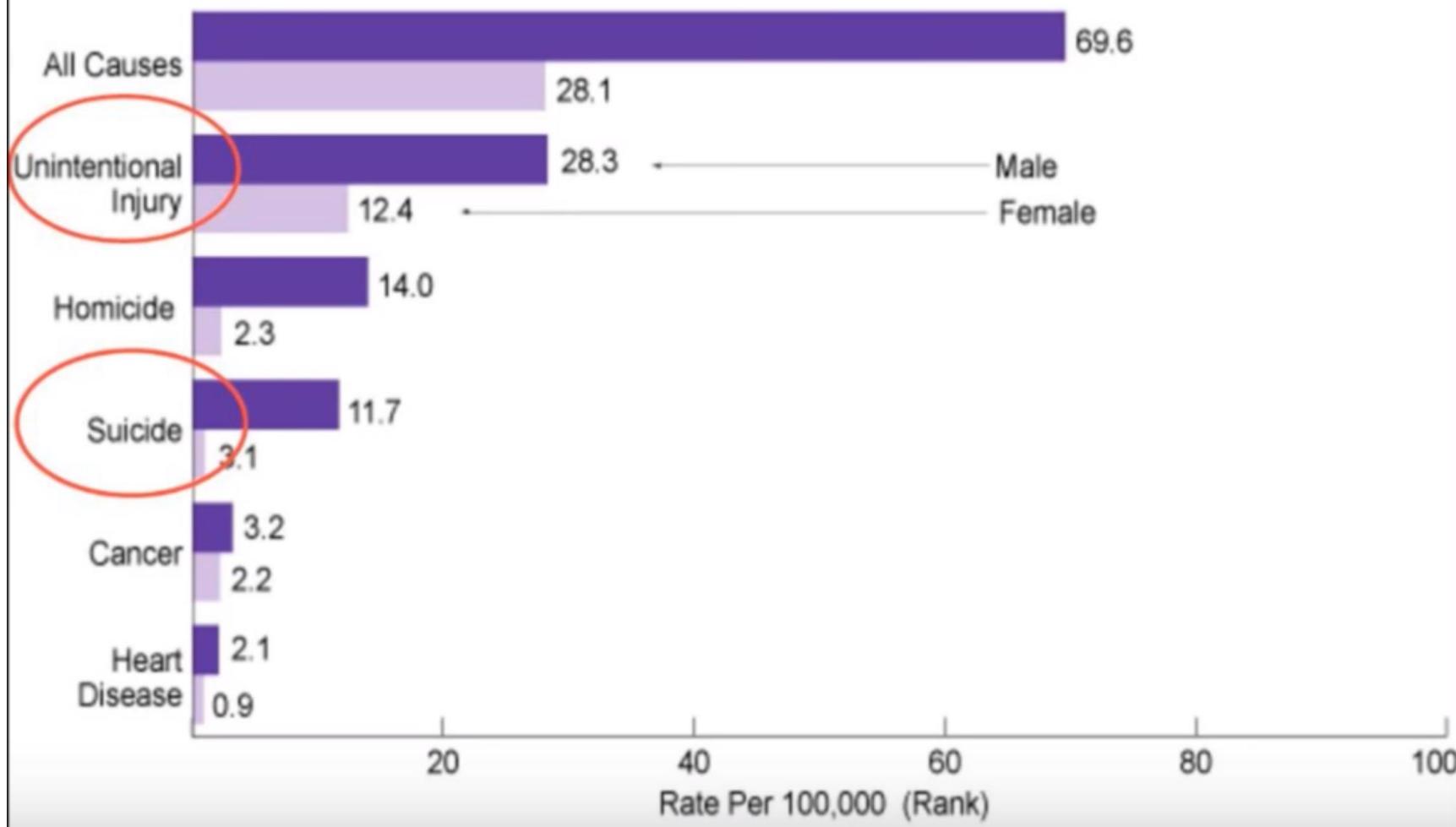


Insufficient Sleep and Depression

- Large studies reveal a correlation with insufficient sleep and depression with risk of suicide (Fitzgerald et al 2007-2009, Winsler et al 2015)
- Sleep deprivation led to more depressive symptoms and a 3x risk for major depression (Roberts & Duong, 2014)
- A teen who is not prone to depression, yet is sleep deprived (less than 8 hours vs 9+) still has a higher potential for a suicide attempt (Li, 2004)

Mortality in Teenagers

Mortality Rates Among Adolescents Aged 15–19 Years, by Selected Leading Cause of Death 2010



CDC, 2012
<http://wonder.cdc.gov/ucd-icd10.html>

What a Teenager Can Do

- Set a bedtime - aim for a minimum of 8 hours of sleep
- Keep a regular schedule - minimize caffeine, naps and sleeping in on the weekends
- Avoid screen time before bed
- Get bright light in the morning
- Have a relaxing bedtime routine
- Plan ahead to avoid the need to study late at night
- Avoid drowsy driving

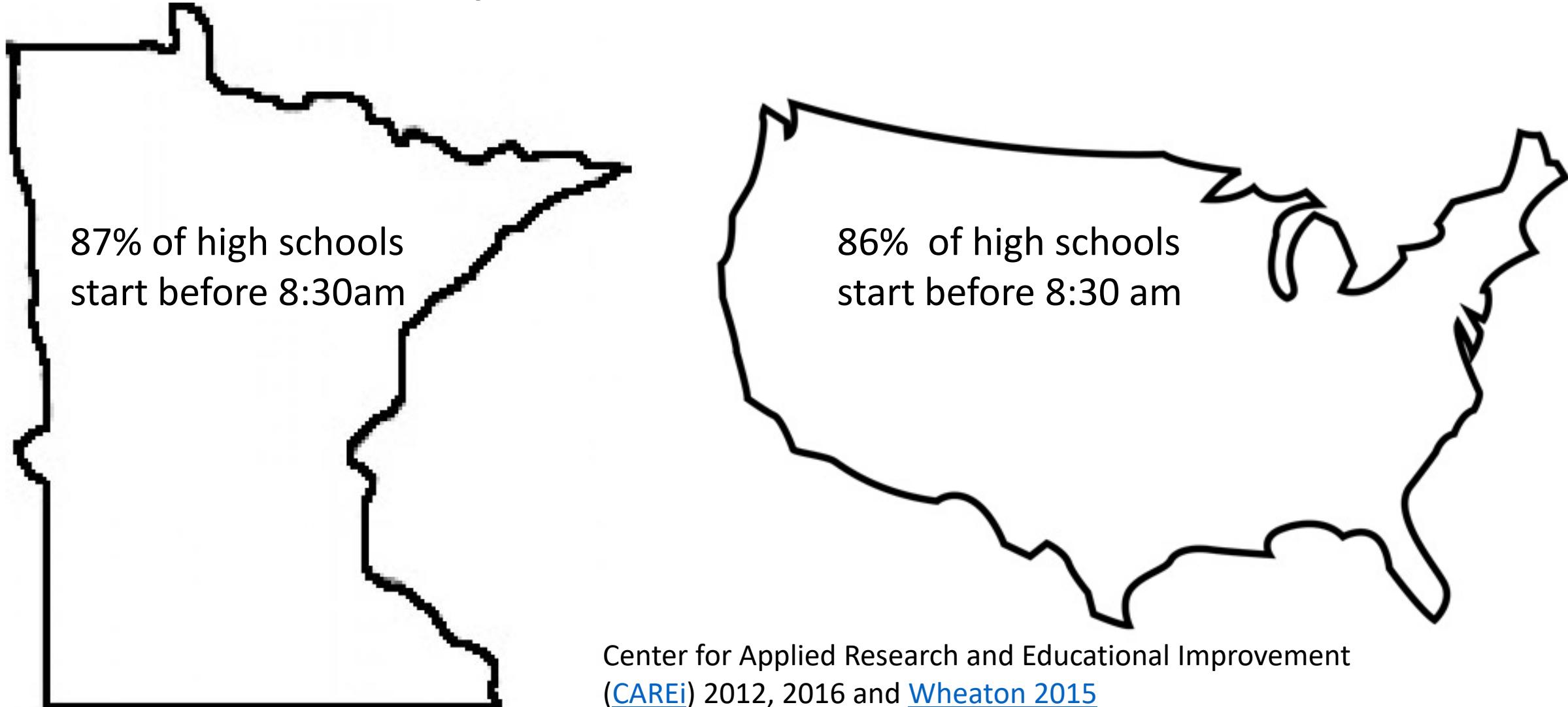
What a Parent Can Do

- Recognize if your child is sleep deprived
- Make sleep a priority
- Be a good role model
- Limit screen time
- Set an age appropriate bedtime
- Create a calm bedtime routine
- Limit “sleep” overs
- Prevent drowsy driving

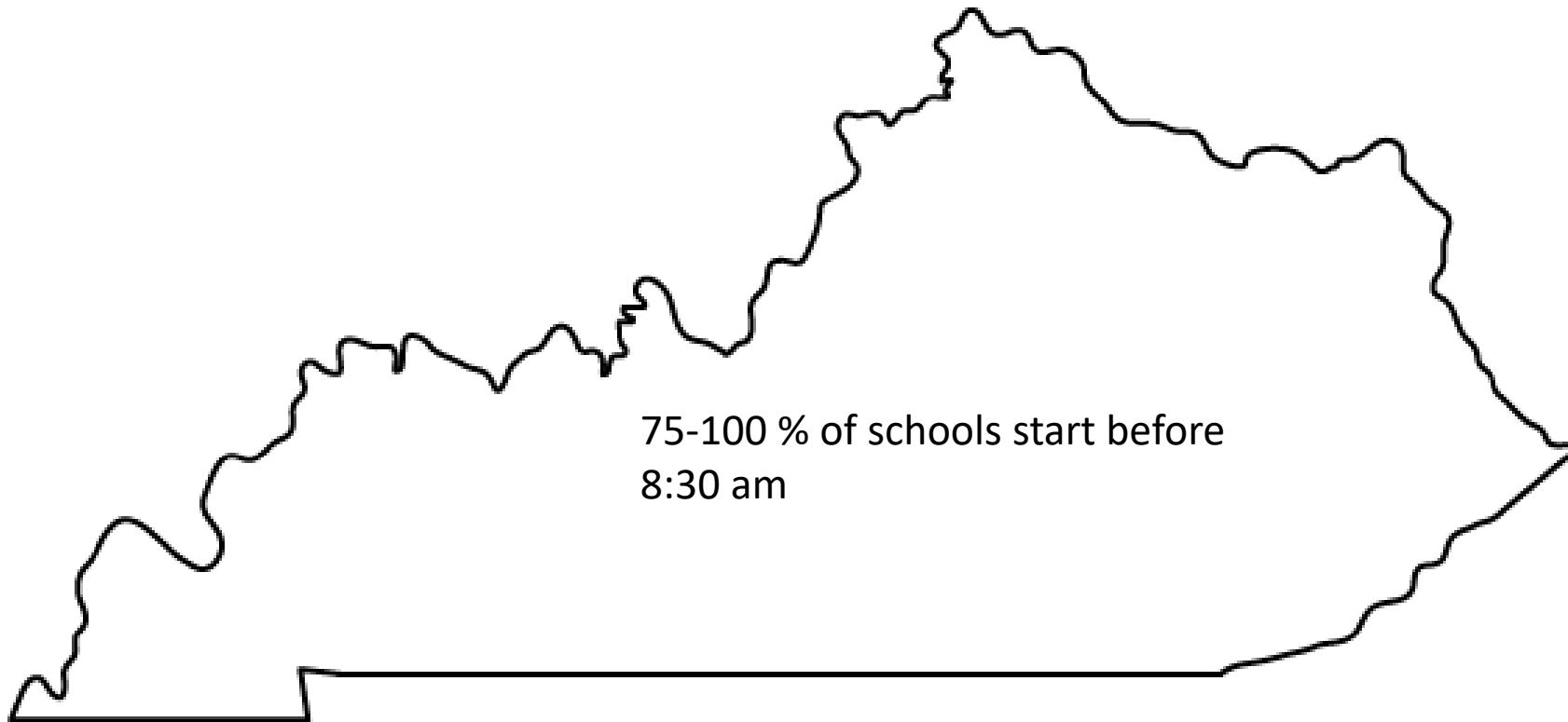
What a School Can Do

- End electronic homework submission deadlines and official school activities no later than 10 hours before bus pick-up the next day
- Include Sleep Education in health class, starting in elementary school
- Assess for sleep deprivation when counseling students
- Eliminate zero hour
- Adopt a later school start time, 8:30 or later

How does MN Compare to National Data in Respect to School Start Time



Kentucky Data on School Start Time



[Wheaton 2015](#)

Do teenagers sleep more when start times are later?

YES

According to
4 Meta-analyses

(Bowers et al, 2017, Morgenthaler et al, Marx et al, 2017, Minges et al, 2016)



More Sleep For Teens Means Less:

- Sleepiness
- Less struggling to stay awake
- Falling asleep in class
- Need for naps
- Less weekend “oversleep”

Policy Statements

- American Academy of Pediatrics - 2014
- CDC- 2015
- American Medical Association – 2016
- American Academy of Sleep Medicine - 2017



Recommend a start time for
middle and high school students
8:30 am or later

Effects of Early Start Time on Elementary Students

- Elementary age students obtained adequate sleep when start times went earlier (1)
- No difference in academic performance from an early-start elementary school compared to a later-start elementary school school, even when scores were evaluated at the middle school level (2)
- Decreased academic performance and behavior may be affected for early start elementary students (3,4)

1) Appleman 2015 , 2) Dupuis 2015, 3) Keller 2015, 4) Keller 2017

Evidence in Later School Start Times for Teens Decreased Car Accidents

Moving the school start time 1 hour later for all of the adolescents in 1 large county school district resulted in a significant drop in auto collision rates for high school-aged drivers in that county with a drop of 16.5%, whereas crash rates increased in the rest of the state by 7.8% during the same time period. [Danner, et al 2008](#)

[Vorona, et al 2014](#)

Evidence in Later School Start Times for Teens Decreased Risk-Taking

Teenagers reported less cigarette, alcohol and drug use reported, with more significant findings for those obtaining 8 hours of sleep or more

[Wahlstrom et al, 2014](#)

Evidence in Later School Start Times for Teens Decreased Depression

On an experimental basis, school start time was changed from 8:00 am to 8:25 am for a winter term with the number of students obtaining 8 hours of sleep increasing from 18% before the time was adjustment to 44%. Depressive symptoms were less common in students who reported obtaining an average of 8 hours of sleep.

[Boergers et al, 2014](#)

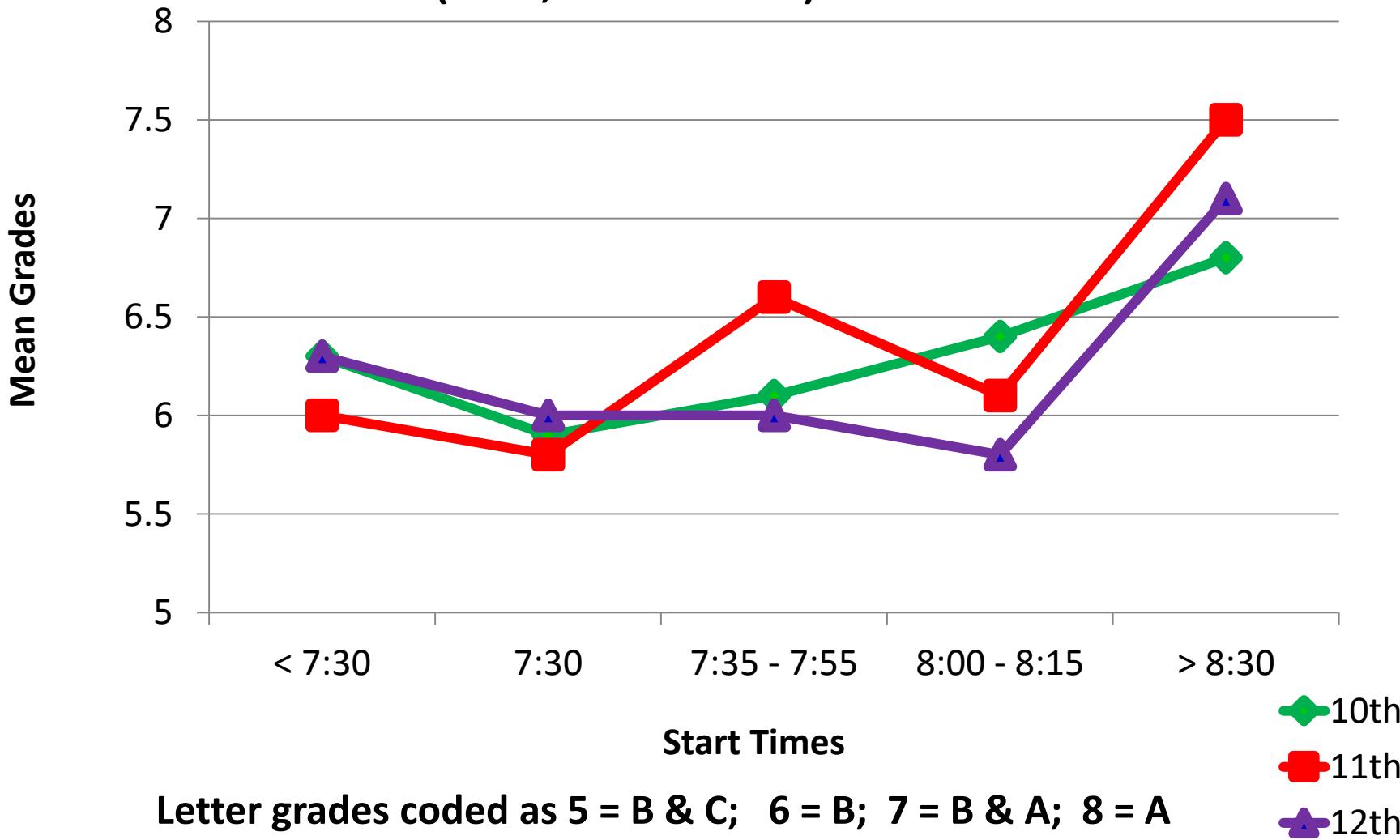
[Owens et al, 2010](#)

“Having the later start time meant I got to have an extra hour of sleep, and it made a world of difference in my physical and emotional well-being.

I was able to wake up on my own, I wasn’t falling asleep in classes. I was in a better mood and had much more energy for my after-school athletics and homework.”

Alex Malm, Former St Paul public high school student

Mean Grades Earned X Start Times (n = 7,168 students)



Evidence in Later School Start Times for Teens Improved Academic Performance

A three-year comparison of high school graduation and attendance rates for students whose schools shifted from early start to an 8:30 start revealed the average graduation rate rose from 79 percent to 88 percent. Average attendance rate rose from 90 percent to 94 percent. This study involved 30,000 students in 29 high schools in seven states

[McKeever et al, 2017](#)

Numerous studies reveal academics improvement

Attendance improves

Tardiness rates drop

Standardized test scores improve

Grades improve

Disadvantaged students may benefit more

[Edwards et al 2012](#), [Hysing et al 2016](#), [Wahlstrom et al, 2014](#)

Adjusting School Start Time is an Opportunity

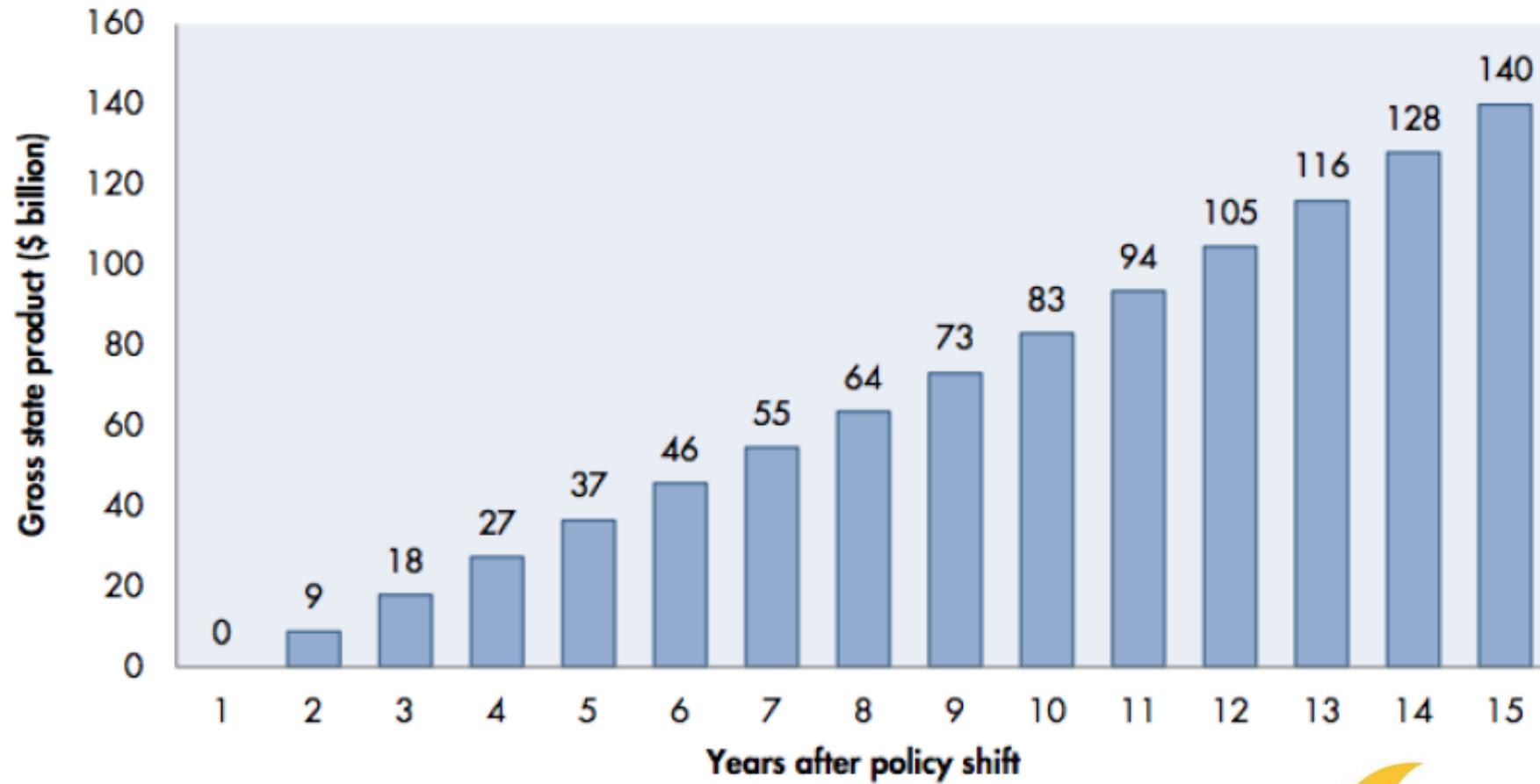
Keep the Current Schedule=
Less Healthy Student Brains

Adjust School Start Times=
More Healthy Student Brains



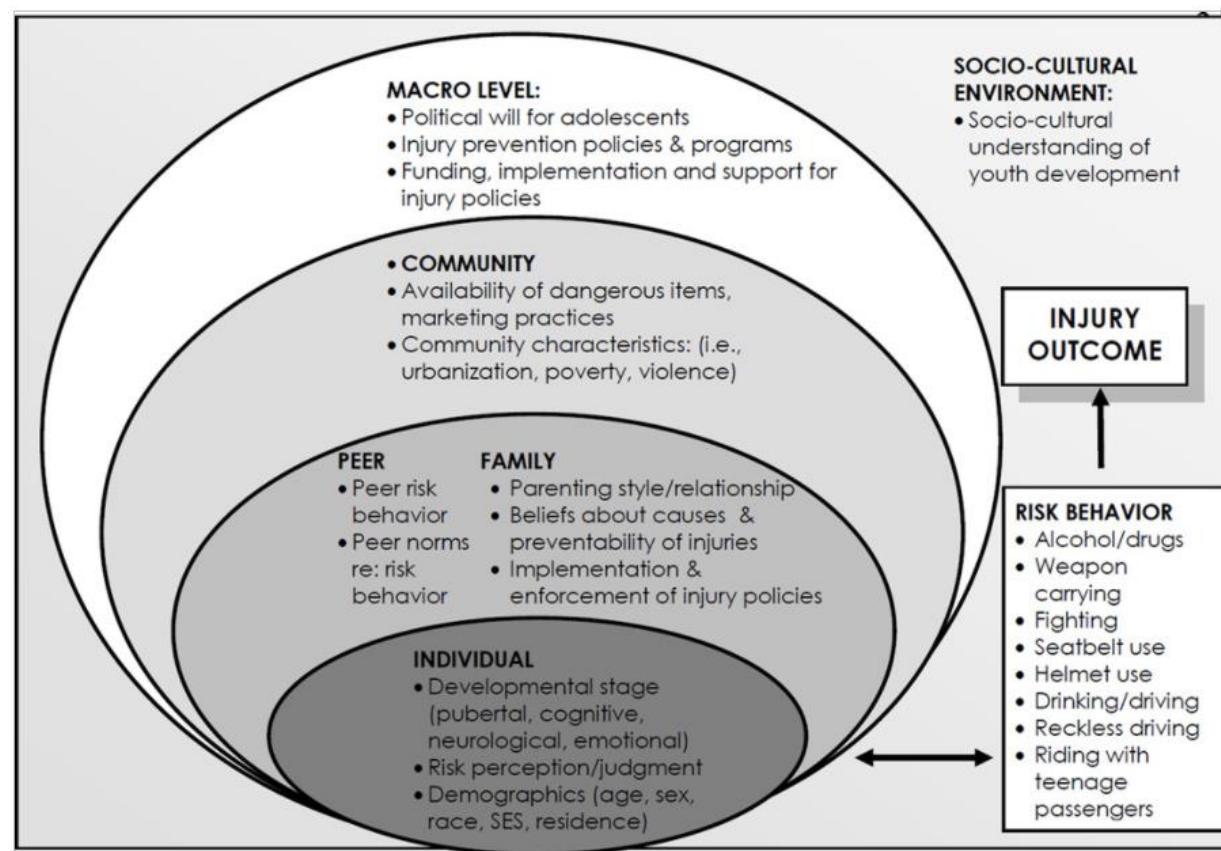
Economic benefits of Later Start Times: RAND

Figure ES1: Predicted cumulative economic gains from delayed SST to 8:30 a.m.



- In MN, Return on investment in 2.73 years

The Path To Healthy School Start Times



An ecological model of adolescent development and injury risk, which highlights the role of multiple levels of social organization in shaping both developmental biology and risk of injury.

[Johnson, S. B., & Jones, V. C. \(2011\). Adolescent development and risk of injury: Using developmental science to improve interventions. Injury Prevention : Journal of the International Society for Child and Adolescent Injury Prevention, 17\(1\), 50–54. http://doi.org/10.1136/ip.2010.028126](http://doi.org/10.1136/ip.2010.028126)



The Path to Healthy School Start Times

Julie Dahl, APRN, CNP

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Sleep is Essential to Life

You can live without:

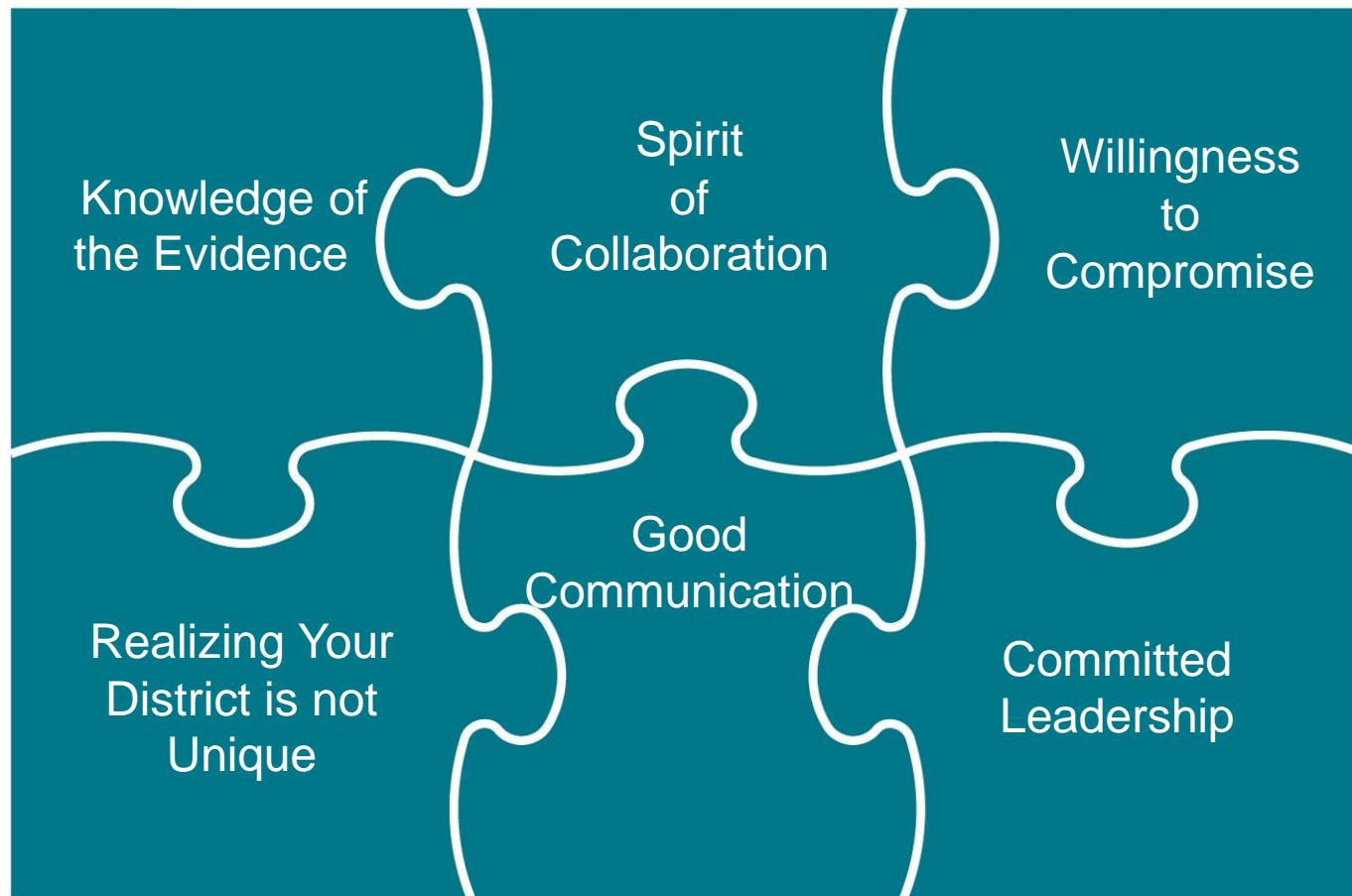
AIR for 3 minutes

WATER for 3 days

SLEEP for 11 days

FOOD for 21 days

6 Essential Requirements for School Leaders



The Evidence is Clear

Good Sleep is Important

- Keeps the brain functioning well – acts as the “gardener”
- Minimizes chronic stress
- Maximizes mental performance, helps prevent injury and lowers disease risk

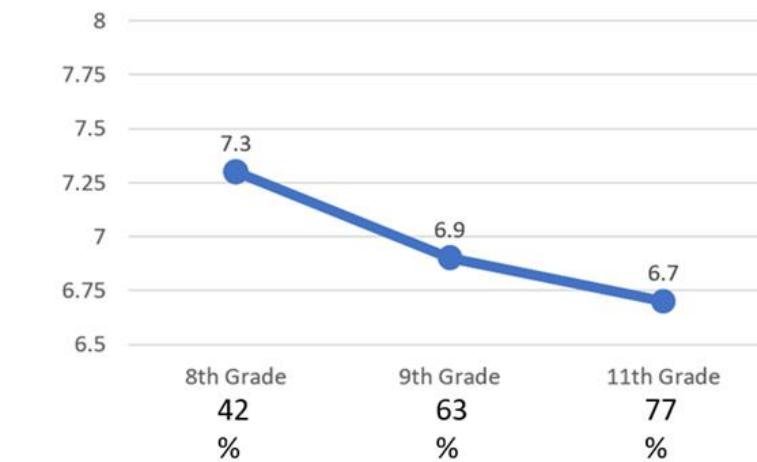
Later Start Times, in alignment with teen sleep schedules reveal:

- Improved driver safety
- Improved alertness to facilitate peak academic performance
- Reduced anxiety and depression
- Less risk taking behavior (i.e. substance use, sexual activity)
- Less tardiness and school absences to foster improved opportunities for learning

Inadequate &

Poorly Timed

Reporting less than 8 hours of sleep on a typical school night



Data pulled from the Minnesota Student Survey 2016: 85% of schools participated

87% of the high schools in Minnesota start before the recommended time of 8:30 am or later

Center for Applied Research and Education (CAREI) 2012,2016

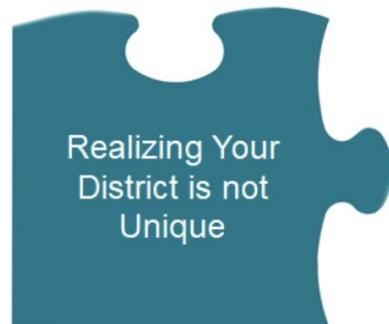


Sleep in Minnesota Teens

Realizing Your District is not Unique

What a School Can Do

- End electronic homework submission deadlines and official school activities no later than 10 hours before bus pick-up the next day
- Include Sleep Education in health class, starting in elementary school
- Assess for sleep deprivation when counseling students
- Eliminate zero hour
- Adopt a later school start time for teenagers, 8:30 or later



Understanding the Community Reaction - Situational Characteristics that Cause Stress

- NOVELTY
- UNPREDICTABILITY
- THREAT TO THE EGO
- SENSE OF CONTROL



Sonia Lupien, Centre for Studies on Human Stress

Lessons Learned from Boston

Boston parents demand delay in implementing earlier school start times



JOHN HILLIARD FOR THE BOSTON GLOBE

Angry parents confronted Mayor Martin J. Walsh at a Christmas tree lighting ceremony in West Roxbury on Sunday. The parents are angry over earlier start times planned for dozens of Boston's schools.

By John Hilliard | GLOBE CORRESPONDENT DECEMBER 18, 2017

Boston Public Schools Shelves Plan To Overhaul Start Times Next School Year

December 22, 2017 Updated Dec 22, 2017 2:45 PM By Max Larkin [Twitter](#)

Share ↗



Have a reasonable timeline

	School Leader	Teachers	Parents	Students	Community
Facts					
Reactions					
Impact					
Options					
Decisions					



First Steps

www.mnsleep.net

Teen Sleep Loss Tool Kit

- Communicate with internal stakeholders first, then the community
- Form an advisory committee of people willing to work towards a solution
- Data and Surveys may or may not be helpful, consider using them for later in the process
- Start the discussion with some general goal setting
- Get organized, try to anticipate everyone's needs



What informs parent support or opposition to later school start time?

51% Support Later Start Times

- Parent opinion that the current school start time was too early
- Agreement with the American Academy of Pediatrics recommendations for later start times
- Improved academic performance
- Increased sleep duration

49% Don't Support Later Start Times

- Possible negative effect on extracurricular activities
- Transportation changes



Dunietz et al, 2017

How to Communicate to the Community

- Communicate early and often
- Clearly define the problem and **rationale** for adjusting times
- Be transparent
- Link ALL of the information for the community to view
(executive summary and/or webpage)
- Have an outlet for them to provide feedback



Understanding the Community Reaction



*"My desire to be well-informed is currently
at odds with my desire to remain sane."*

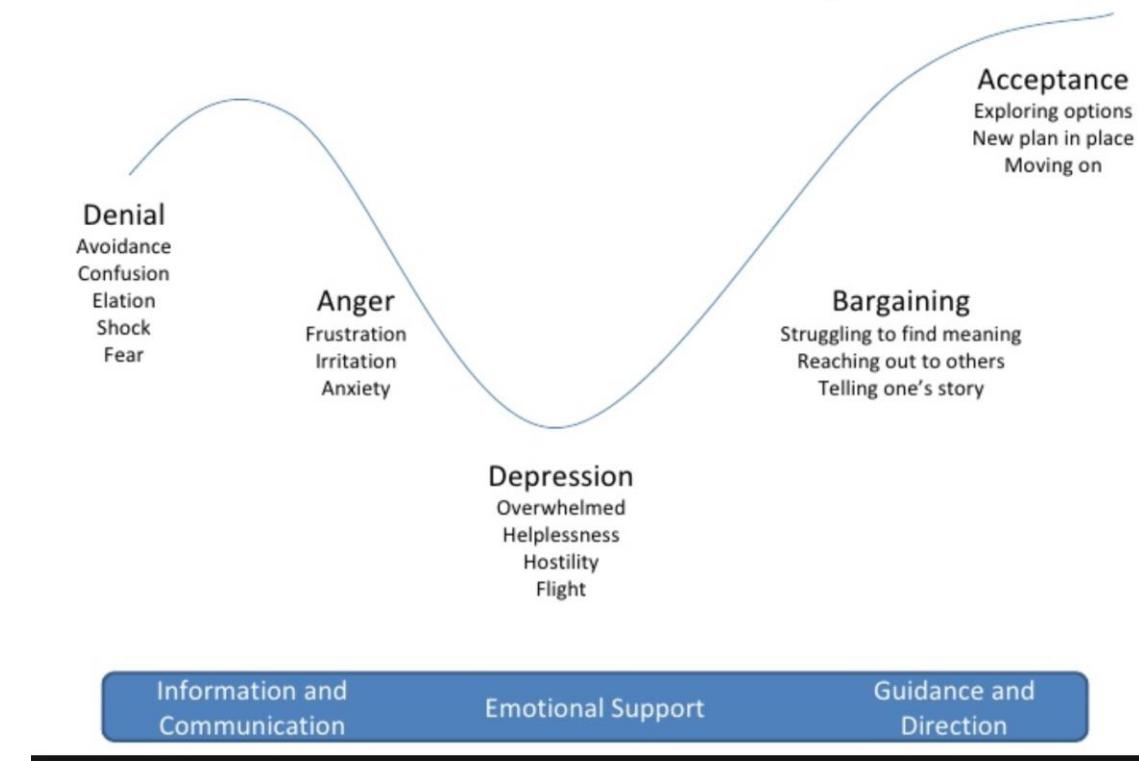
David Sipress, New York Times



HOW to Listen to the Community

- Understand their reaction as they cope
- Provide the right direction at the right time
- Organize the concerns: Are they individual or majority focused?

Kübler-Ross Grief Cycle



HOW to Listen to the Community

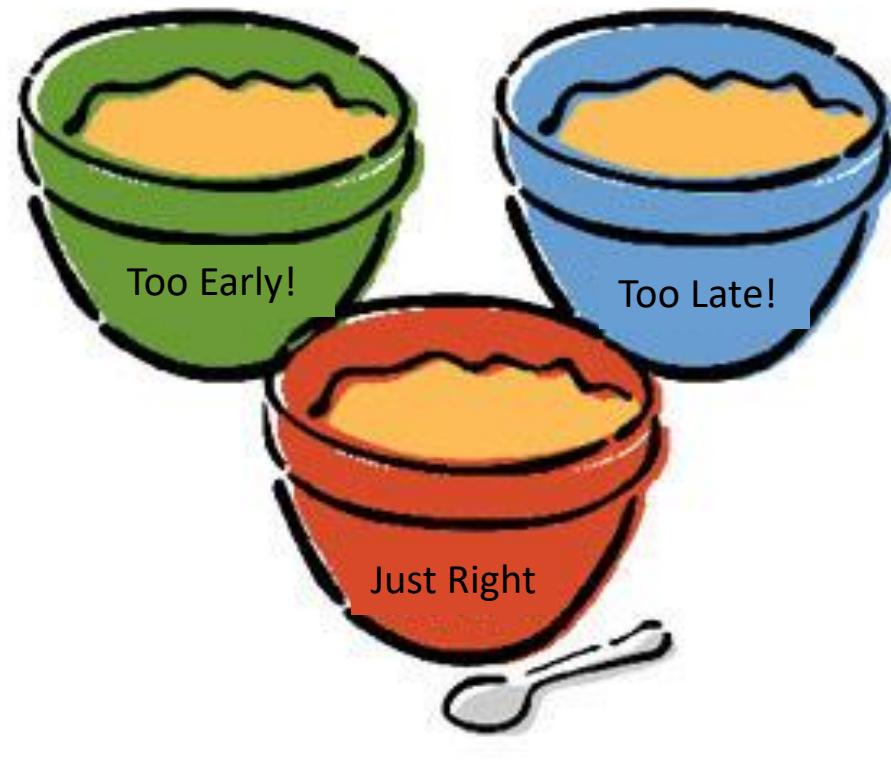
Categorize their concerns

- Individual or majority
- Real or is there lack of proof
 - Lack of proof:
 - Cost of transportation will go up, athletic programs will fail, after school- employment will be impacted
 - Real:
 - Change in busing routine with younger children on the bus corner in the morning if “flipped”, childcare in the afternoon, students leaving early for athletics

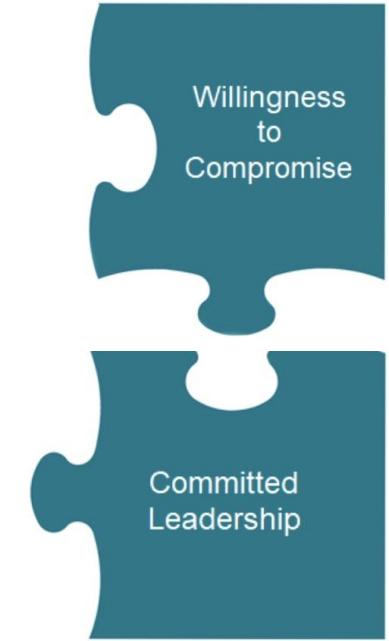


What time do parents want to start school?

- Minneapolis 2016 survey of 8000+ (6000+ parents)
 - 8-8:30 am



Strong leaders will look for
solutions to the real concerns and
Aim for a Compromise that
Benefits the Majority



The process of
adjusting school
start times
takes about 21
months

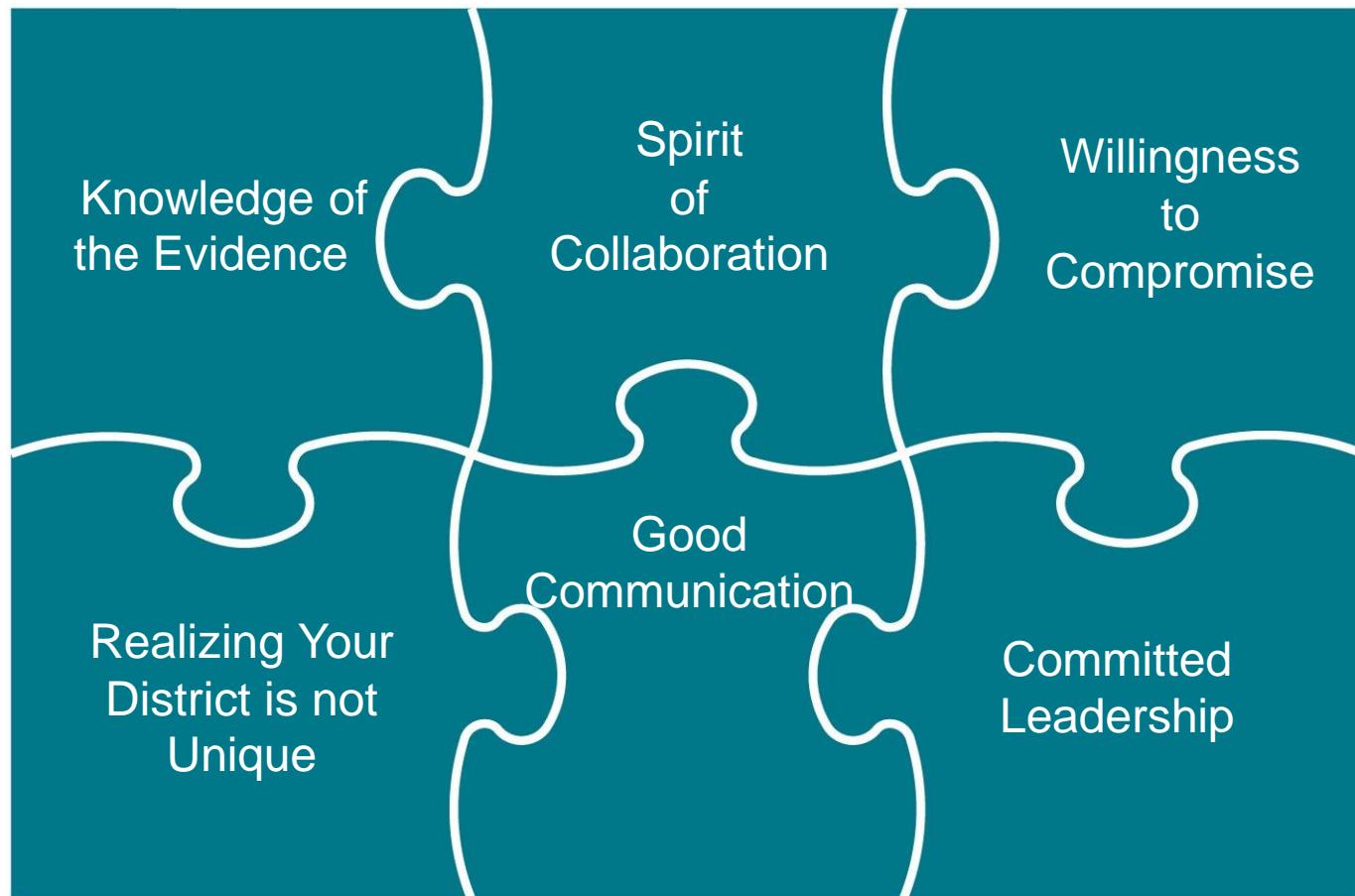


Superintendents Who Adjusted Start Times

- *“Changing the school start time was one of the most important achievements I made as a superintendent.”*
Kenneth Dragseth, former superintendent of Edina
- *“My only regret is I wish I would have done it (adjusted start times) earlier.”*
Chace Anderson, superintendent of Wayzata
- *“We did this because it was the right thing to do for students.”*
Scott Thielman, superintendent Buffalo/Hanover/Montrose
- *“We have no plan to go back to early start times for teenagers.”*
Keith Jacobus, South Washington Schools



6 Essential Requirements for Community Members



“I personally love this change as my high schooler needs the extra sleep in the morning.

I wish this would have been in place when my older daughter was in high school.

Also, when my now high schooler was in elementary school, she was up at 5:30-6 and did not start school until 9:10, it was a long morning of unproductive time prior to even going to school. Now the elementary kids start school at 7:45 which would've been so ideal when I was in that situation.

Although I realize change is hard, this change has made sense...”

Tami Stolt, Wayzata mom

Adjusting School Start Time is an Opportunity

Keep the Current Schedule=
Less Healthy Student Brains

Adjust School Start Times=
More Healthy Student Brains



In Summary: The Reason to make Healthy School Start Times a Priority

Adequate and well timed sleep allows a student be safe, healthy and function at their full potential

Teen biology is never going to change

School start times can change!

