

The Science Behind Changing School Start Times to Improve Health and Education



Rochelle Zozula, PhD, DABSM

Sleep Services International, LLC

*Clinical Associate Professor of Neuroscience,
Seton Hall University*

Member, NJAAP Task Force on Adolescent Sleep and School Start Times

Bert Mandelbaum, MD

Princeton Nassau Pediatrics

Montgomery and Hillsborough BOE School Physician

Chairman, Dept of Pediatrics, Penn Medicine Princeton Health

Chair, NJAAP Task Force on Adolescent Sleep and School Start Times

Objectives

- Bring awareness of the health related issues regarding lack of sleep in adolescents
- Make the connections that the lack of sleep is in large part due to early school start times
- Motivate communities to consider their values regarding students' well-being and education and to look at all opportunities to help achieve those goals

What Will We Review?

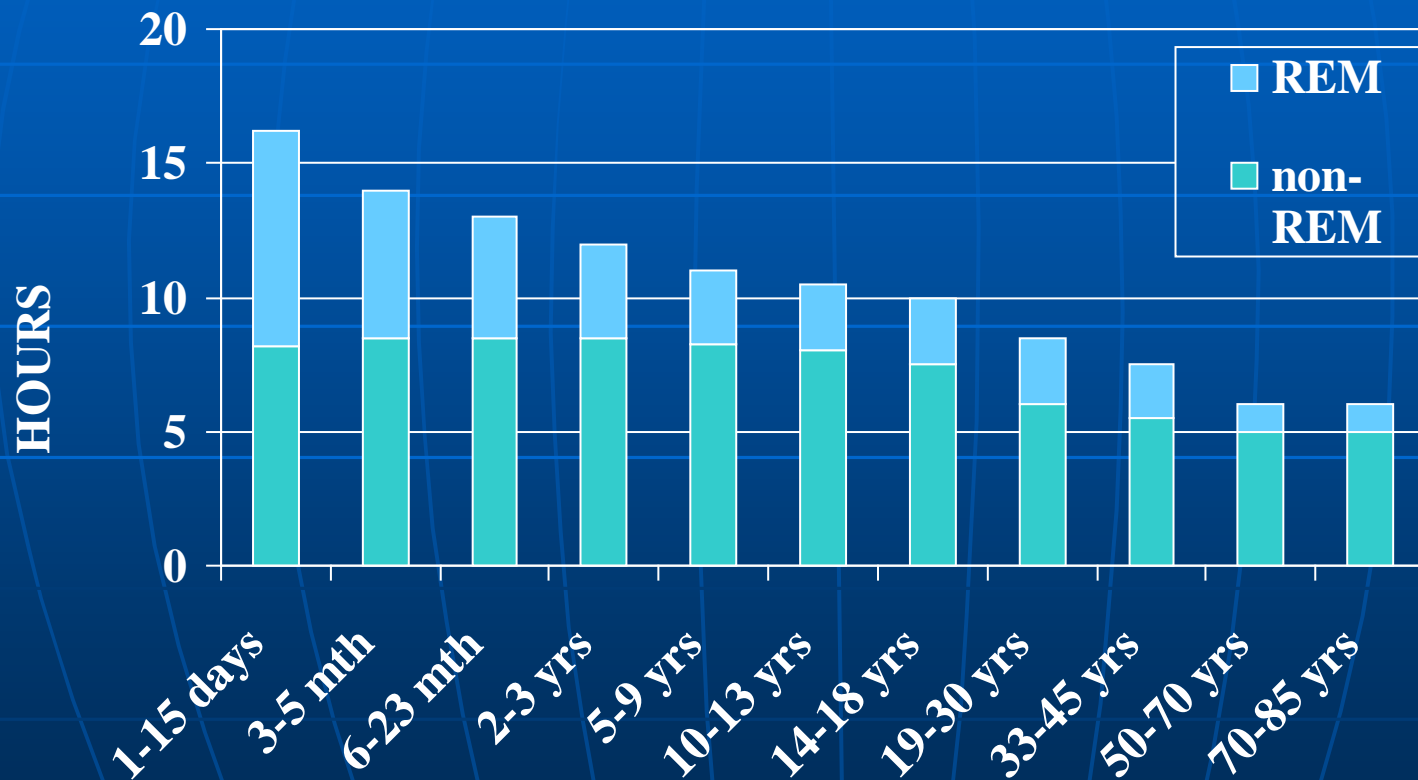
- The Why:

- Science of Adolescent Brain and Sleep
- History of School Start Times
- Mental Health in Adolescents
- Expert opinions, policy statements and evidence supporting delaying school start times

- The How:

- Examples of school districts who have successfully delayed school start times
- Provide some concrete steps on how initiate the process and potential solutions for the most common issues

Changes in Total Hours of Daily Sleep with Age



Adolescent Sleep Patterns

- The early adolescent attains sleep patterns similar to those seen in the young adult
- REM sleep has attained adult levels
- The adolescent restricts their time in bed, but there is *no* decrease in the *physiologic need* for sleep

Chronic Insufficient Sleep Syndrome in Teens

- Teenagers are habitually deprived of sleep
- Most teens require between 8.5–9.5 hrs of sleep/nt.
- 40% of teens go to bed later than 11 pm on school nights
- 26% teens sleep <6.5 hrs/nt
- Only 9% of teens obtained the recommended amount of sleep!

Chronic Insufficient Sleep Syndrome (cont.)

- Teens often try to make up for lost sleep on weekends (may sleep till midday!)
- Late sleeping on weekends reinforces an irregular sleep pattern and creates a vicious cycle of poor-quality sleep



Consequences of Insufficient Sleep in Teens



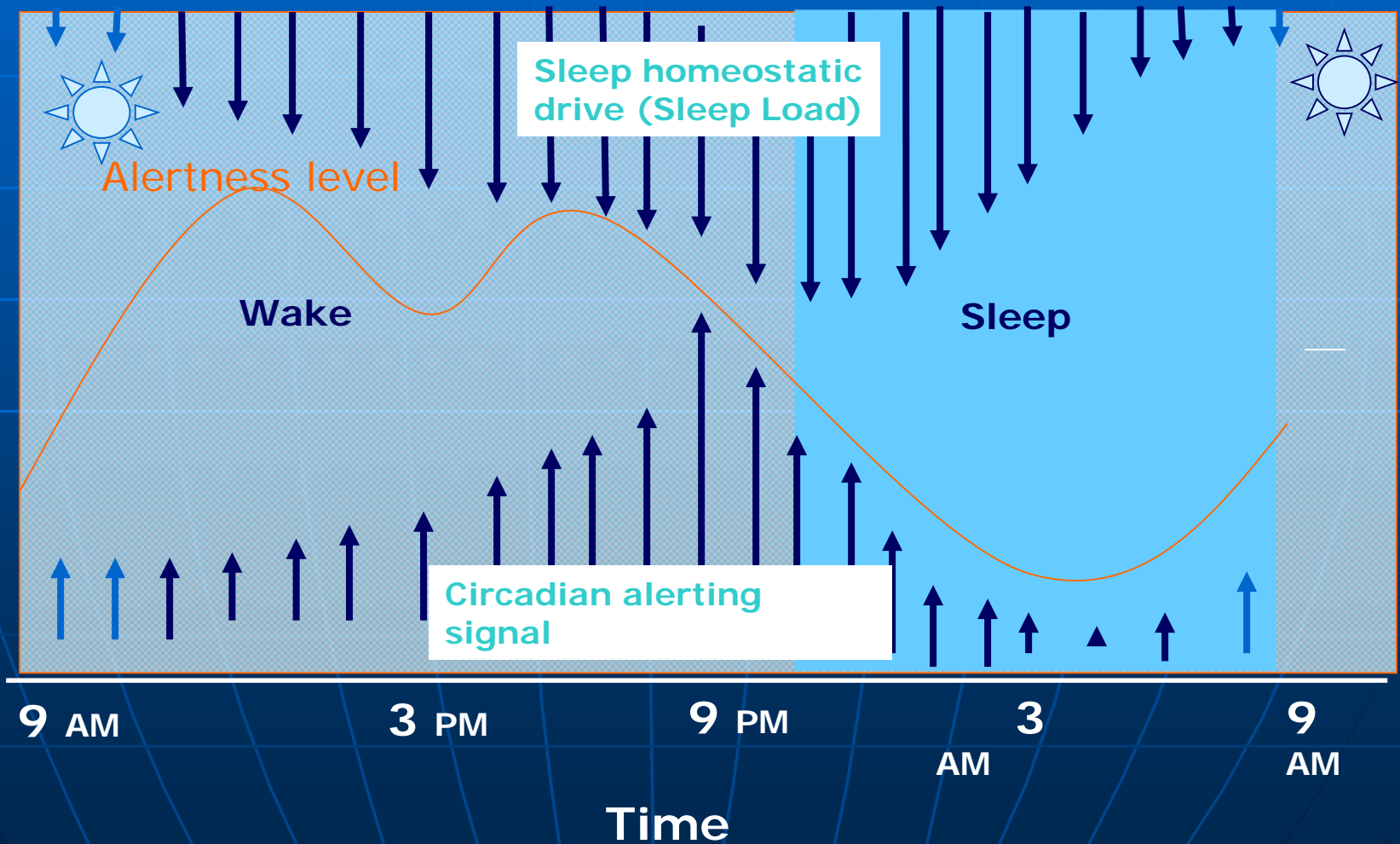
- Academic problems –poor memory and concentration; absenteeism/tardiness
- Behavioral issues/ mood disorders
- More likely to abuse stimulants (e.g., caffeine and nicotine), alcohol and other substances
- Decreased immune function
- Growth impairment
- Development of metabolic syndrome (obesity, cardiac, endocrine changes)
- Increased risk of sports injuries

Consequences of Insufficient Sleep in Teens

- Increased risk of impulsive behaviors
- Impaired reaction times
- **Drowsy driving!** (Drivers < 25 yrs old account for 55% of all fall-asleep accidents)



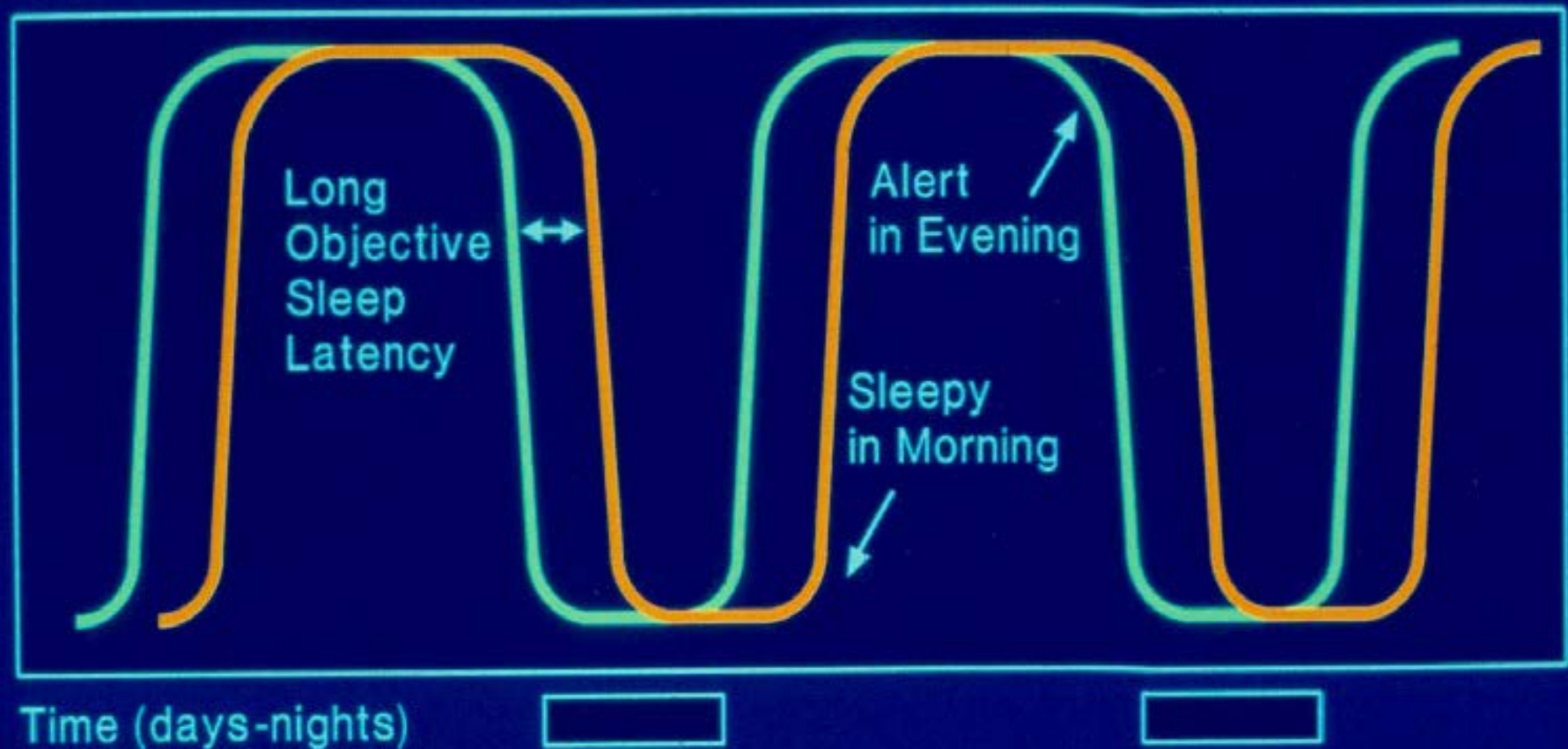
Two Process Model of Sleep Regulation



Delayed Sleep Phase

Bedtime Ahead - Sleepiness Behind



Sleep Tendency



Time (days-nights)



- Symptoms**
- Can't fall asleep at night
 - Can't get up in morning
 - Tired all day except evening

-  Scheduled Bedtime Hours
-  Circadian Sleep Tendency
-  Desired Schedule

Environmental Factors Exacerbating DSPS



- Computer in bedroom
- TV in bedroom
- Use of electronic devices at night
- Light exposure in the late evening
- All these factors may additionally suppress the production of melatonin, which is necessary for promoting sleep

What Are The Issues Limiting Sleep in Adolescents?

- **What prevents students from going to bed earlier?**
 - Homework
 - Activities
 - Social Media
 - Poor Sleep Hygiene (inconsistent bed times, staying in bed while awake, using electronics/social media right before bed)
- **BUT- almost all Adolescents have a Normal Physiologic Change in Circadian Rhythms**
- **What makes students wake up early?**
 - *Only one reason- School Start Times!*

History of School Start Times

- Early school start times in most districts implemented to solve transportation issues
 - Schools in the 1950's and 1960's started 8:30 – 9:00 am
 - They progressively moved to earlier times from 1980's to early 2000's
 - There is *no* educational benefit to HS students from starting school early

Sleep and mental health

Sleep deprivation can affect your mental health

The brain basis of a mutual relationship between sleep and mental health is not yet completely understood. But neuroimaging and neurochemistry studies suggest that a good night's sleep helps foster both mental and emotional resilience, while chronic sleep deprivation sets the stage for negative thinking and emotional vulnerability.

“Sleepless in Fairfax: The Difference One More Hour of Sleep Can Make for Teen Hopelessness, Suicidal Ideation, and Substance Use.”

(Winsler et al, 2015)



- Analysis of 2009 YRBS surveys from 27,937 middle and high school students in Fairfax, VA
- Controlled for background variables (such as age, ethnicity, etc)
- Results...



- For every one hour less of sleep a student obtained, the odds of...
 - ... feeling sad and hopeless increased by 38 %
 - ... reporting serious suicidal ideation increased by 42 %
 - ... having already attempted suicide increased by 58%
 - ... using tobacco, alcohol, and/or marijuana increased by 23 %
 - ... using illicit/prescription drugs increased by 37 %
- As the lost hours add up, the risks multiply. Example...
 - ... a student who obtains 5 hours of sleep is 2.64 to 3.92 times more likely to be depression and/or suicidal than a student who obtains 8 hours of sleep.

Associations between sleep duration and suicidality in adolescents: A systematic review and dose-response meta-analysis

(Chiu et al, 2018, Sleep Medicine Reviews)

Findings:
Every 1 hour increase in sleep duration led to a decreased risk of suicide plans in adolescents of 11%.



“Sleep duration is an independent risk factor for the development of youth suicidality.” (Page 6)

Multi-night Sleep Restriction Impairs Long-Term Retention of Factual Knowledge in Adolescents

(Cousins, Kian, et al. , Oct 2019, *J of Adolescent Health*)

- Adolescents given 5 hrs sleep opportunity vs 9 hours for five consecutive nights
- On Day 5, spent 6 hours learning about arthropods
- Tested 3 times: post-30 min, post-3 days and post-42 days
- Conclusion: Memory was significantly impaired in the sleep deprived group, reinforcing the need for good sleep habits to optimize learning

Effects of Sleep Restriction and Extension in School-Age Children: What a Difference an Hour Makes

(Sadeh et al. , March 2003, *Child Dev*)

- 77 children; 9-12 yrs
- 2 nts baseline sleep followed by either 3 nights of "modest" sleep extension (SE) or sleep restriction (SRT)
- Neurobehavioral functioning (NBF) tested Day#2 and Day#6
- Conclusion: Improved performance noted on tasks assessing vigilance, RT, and memory with SE; decreased performance with SRT

Chronic Lack of Sleep is Associated with Increased Risk of Injury in Adolescent Athletes

(Milewski et al., March 2014, *J Ped Orthoped*)

- Survey of 112 Middle and HS students in Studio City, CA (mean age 15)
- Students getting ≥ 8 hrs of sleep per night were 68% less likely to sustain injury
- Each higher grade level of athlete had 2.3 greater risk for injury (independent of gender, hrs of play, # of sports, training)
- Conclusion: Two most important factors contributing to injury were hrs of sleep and grade in school

Sleep and Athletic Performance

(Watson AM, Nov-Dec 2017, *Current Sports Med Rep*)

- “...Along with being an integral part of the recovery and adaptive process between bouts of exercise, accumulating evidence suggests that increased sleep duration and improved sleep quality in athletes are associated with improved performance and competitive success.”
- “In addition, better sleep may reduce the risk of both injury and illness in athletes, not only optimizing health but also potentially enhancing performance through increased participation in training.”

Summary of Policy Statements - *ALL* Recommend School Start Times After 8:30am for Adolescents

American Academy of Pediatrics (AAP) 2014: *“School Start Times for Adolescents”*

American Academy of Sleep Medicine (AASM) 2017:
“Delaying Middle School and High School Start Times Promotes Student Health and Performance”

CDC- <https://www.cdc.gov/features/school-start-times/index.html>

County Health Rankings and Roadmaps-
<http://www.countyhealthrankings.org/take-action-to-improve-health/what-works-for-health/policies/later-middle-and-high-school-start-times>

Evidence That Delaying School Start Times Works

- **Multiple studies in past 5 years show districts that delayed the school start times realized all the benefits that were expected:**
 - Improved grades, feeling of well-being
 - Decreased tardiness, accidents, mental health issues, substance abuse
- **Evidence supports the fact that teen sleep more when school start times delayed:**
 - almost exactly as much as the delay in school start times
 - ***School start times were delayed 25-60 min; total sleep time increased from 25 to 77 min per weeknight***

(Minges KE, Redeker NS, August 2016, Delayed school start times and adolescent sleep: A systematic review of the experimental evidence, *Sleep Med Rev*)
- **Studies also support better teacher satisfaction and mood with delayed start times** - teachers were able to sleep more!

Evidence for Changing School Start Times

(Dunster et al., Dec 2018, *Science Advances*)

SCIENCE ADVANCES | RESEARCH ARTICLE

DEVELOPMENTAL NEUROSCIENCE

Sleepmore in Seattle: Later school start times are associated with more sleep and better performance in high school students

Gideon P. Dunster¹, Luciano de la Iglesia¹, Miriam Ben-Hamo¹, Claire Nave¹,
Jason G. Fleischer², Satchidananda Panda², Horacio O. de la Iglesia^{1,3*}

“Sleepmore in Seattle”

- “The Seattle School District delayed the secondary school start time by nearly an hour. We carried out a pre/post-research study and show that there was an **increase in the daily median sleep duration of 34 min**, associated with a **4.5% increase in the median grades** of the students and an **improvement in attendance.**”

Benefits Found after 1 Year

- Longer sleep duration during the week
- Less “social jetlag” (catch up sleep) on weekends
- Better attendance
- Less tardiness
- Increased academic performance
- Improved reported mood

What Are Schools Doing Nationally?

- **Nationally** (NCES, 2015):
 - 82% of US middle schools start earlier than 8:30
 - 86% of US high schools start earlier than 8:30
 - 10% of high schools start earlier than 7:30
- **Locally?**

Somerset County HS Start Times

Bernards	7:45
Bound Brook	7:30
Bridgewater	7:20
Franklin	7:20
Hillsborough	7:30
Manville	7:45
Montgomery	7:20
North Plainfield	7:53
Ridge	7:35
Somerville	7:35
Watchung Hills	7:30

Mercer County HS Start Times

Ewing	7:45am
Hamilton	7:50am
Hopewell	7:45am
Hightstown	7:30am
Lawrence	7:45am
Princeton	8:20am
WWHS	7:35am

Los Angeles Times

TARYN LUNA , OCT. 13, 2019

Los Angeles Times



CALIFORNIA



California becomes first state in the country to push back school start times

SB328 -Sponsored by Sen. Anthony Portantino

JOINT STATE GOVERNMENT COMMISSION

General Assembly of the Commonwealth of Pennsylvania

SLEEP DEPRIVATION IN ADOLESCENTS: THE CASE FOR DELAYING SECONDARY SCHOOL START TIMES

**Report of the Advisory Committee on
Later School Start Times at Secondary Schools**

OCTOBER 2019

JSGC: SLEEP DEPRIVATION IN ADOLESCENTS: THE CASE FOR DELAYING SECONDARY SCHOOL START TIMES - PA

*Report of the Advisory Committee on Later School Start Times at Secondary Schools
Oct 2019*

■ **Findings and Recommendations :**

- The Advisory Committee acknowledges the medical community consensus that a **public health crisis** in the form of an epidemic of chronic sleep loss and daytime sleepiness in U.S. adolescent exists.
- The Advisory Committee agrees that the benefits of later school start times for secondary students are **supported by robust research.**
- The Advisory Committee realizes that biologically-driven changes in adolescent sleep patterns are beyond the control of adolescents, their parents, or their teachers. **Adapting the daily schedule of adolescents to recognize and accommodate their sleep needs is a potentially manageable response and can be accomplished by establishing later secondary school start times.**

JSGC: SLEEP DEPRIVATION IN ADOLESCENTS: THE CASE FOR DELAYING SECONDARY SCHOOL START TIMES - PA

*Report of the Advisory Committee on Later School Start Times at Secondary Schools
Oct 2019*

- **“The Advisory Committee recognizes that establishing later school starts times has the potential to positively impact the epidemic of sleep deprivation, but also recognizes that there are other factors that contribute to the problem. Therefore, appropriate education and support for healthy sleep habits is also recommended to strengthen and sustain those benefits.”**

Obstacles to changing middle school/high school start times

- Transportation- increased buses/bus drivers if decreasing length of routes - financial Implications
- Sports- coordinating competitions, practices and games starting later, daylight/lighting issues
- Teacher/parent schedules
- After school activities/impact on other stakeholders
(rec leagues)

Transportation

Successful school districts have:

- Examined and tightened bus routes, shaving off time (30-40 minutes for a route, instead of an hour)
- Repurposed bus drivers for out of district routes instead of contracting those out
- Found funding to increase buses/bus drivers, going from triple tier back to double tier busing
- Swapped school start times of older and younger children

***** Consider Hiring a Transportation Consultant***

High School Sports

- Sports are important for many reasons; want to ensure the ability to encourage and continue sports participation
- Multiple things to consider:
 - Practices
 - Discrepancy between school end times with competing schools
 - Home Games
 - Away Games
 - Missed class time at end of day

HS School Sports With a Delayed School Start Time

- Practices - more efficient; get them to start later and end earlier; no > 90 minutes for practice; give coaches and students more time in their day
- Games - to run in parallel instead of sequentially; request more officials to be available
 - Home games - usually not impacted
 - Away games - might be pushed back, but often can be accommodated
- Communicate - Discuss with other ADs in advance

HS School Sports And Missed Classes

- Create an Option 2 program allowing HS sports to count as physical education time
- Create rotating schedule so students not always missing the same class
 - Princeton rotates its 4 morning and 4 afternoon classes on a daily basis
- Have gym as last class - Radnor has “Fitness for Athletes” Class
- Shorten school day by decreasing HR time and time between classes (Radnor)
 - delaying school start by 55 minutes but only delaying the end of the day by 37 minutes (18 minutes saved)

Teacher/Parent Schedules

- Educate stakeholders regarding scientific rationale for change and perceived benefit to adolescent education and well being
- Include all stakeholders in planning
- Plan for implementation giving teachers and families time to adjust their personal lives to new schedules

Prioritize Goals

- Health, well-being and education of students should always be the first priority!
- Needs of the adults, although important, should be a secondary issue
- We can fix the issue of school time and attempt to minimize any secondary concerns from all the other stakeholders

How Long of A Delay Works Best?

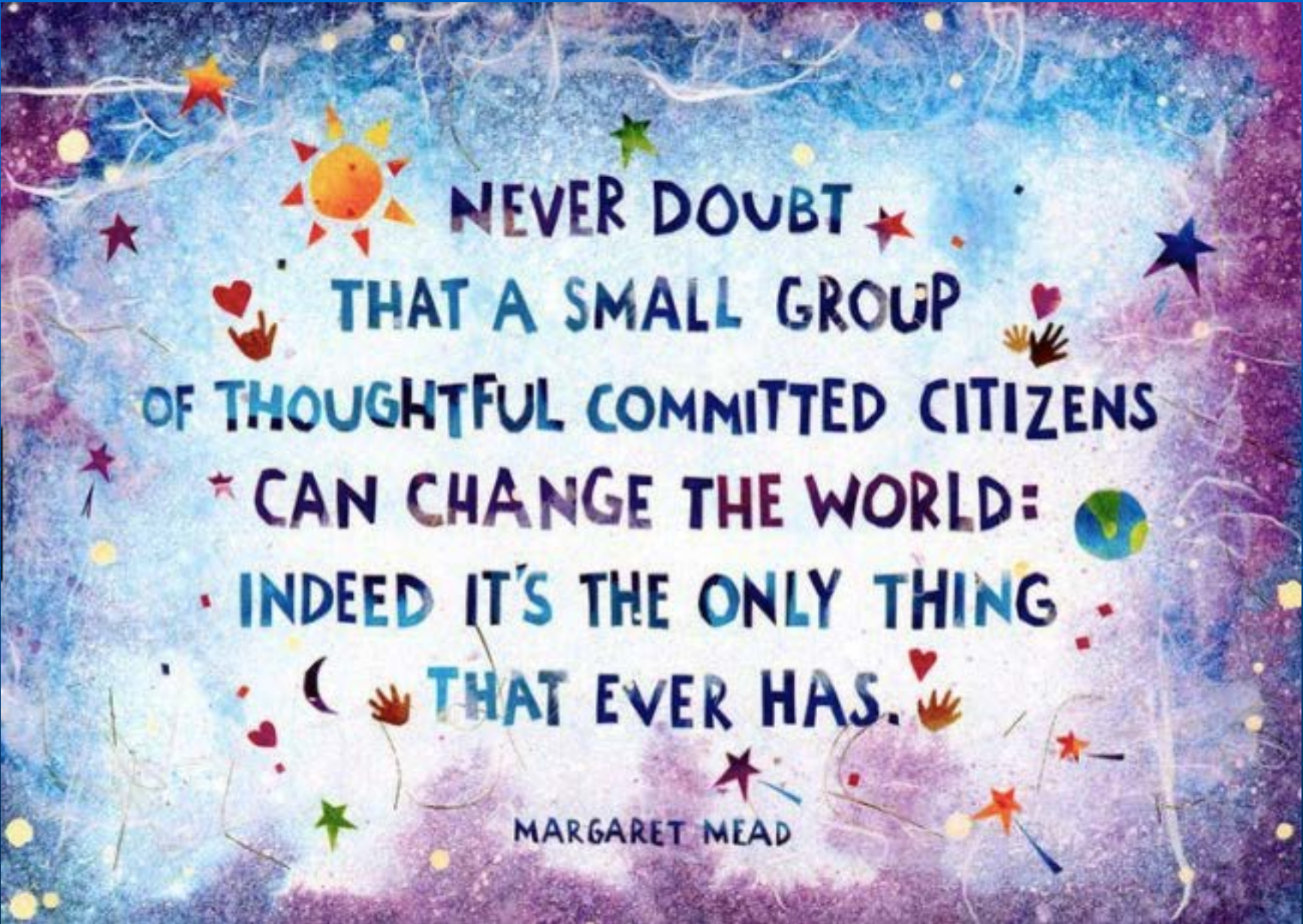
- **Go for the latest start time**
- Research findings suggest that districts that make a “modest” move to a later start experience modest benefits, but also experience the same amount of community disruption as districts that make the change to start at 8:30 or later
- Benefits are proportional to the degree of time change

Easy First Steps - At the Very Least, Do This

- **Think about this topic** and start having dialogue
- **Promote good sleep hygiene** to the students in your district via education
 - Importance of sleep
 - Limiting/balancing social media
 - Assess quantity of homework
- **Analyze your transportation** - can you become more efficient and decrease route times, allowing routes to start later?
- **Be supportive** of districts who are looking to make changes regarding sports competitions

Bigger Steps - Your Real Goals

- **Consider getting data** from your students regarding sleep and emotional health
- **Form a committee** to address changing school start times
 - Should be led by school administrators
 - Should be populated/have input from all constituents- transportation, teachers, parents, students, community members, coaches/AD
 - Reinforce- **"No Decisions Have Been Made"**
- **Use resources from other communities** to kickstart your program
- **Safety and Mental Health-** consider school start times as part of your Safety and Security plan, as well as part of your Mental Health Initiatives
- **Set a reasonable timetable!**



NEVER DOUBT
THAT A SMALL GROUP
OF THOUGHTFUL COMMITTED CITIZENS
CAN CHANGE THE WORLD:
INDEED IT'S THE ONLY THING
THAT EVER HAS.

MARGARET MEAD