



# Evaluation of the Sleepy Child



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# Disclosures

## Relevant Financial Relationship(s)

None

## Off Label Usage

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# Objectives

- Review normal sleep in childhood and adolescence.
- Demonstrate the impact of sleep disorders and insufficient sleep on neurocognitive development.
- Identify common causes for excessive sleepiness in childhood.
- Discuss appropriate evaluation strategies for the sleepy child.

# Normal sleep in childhood and adolescence

# Why do we sleep?

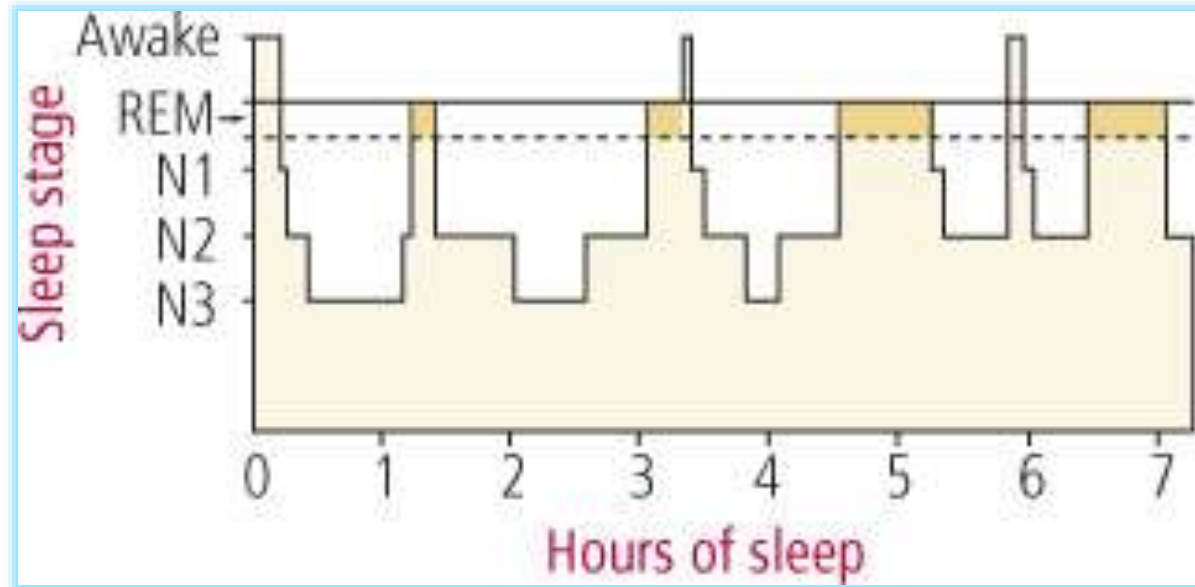
- Purpose of sleep is poorly understood
- Multiple theories:
  - Restorative theory
  - Energy conservation
  - Memory consolidation
  - Immune regulation
  - Brain plasticity
  - Mood stability



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# Sleep stages

- Wake
- NREM (75%):
  - N1 (5%)
  - N2 (50%)
  - N3 (20-25)
- REM (25%)

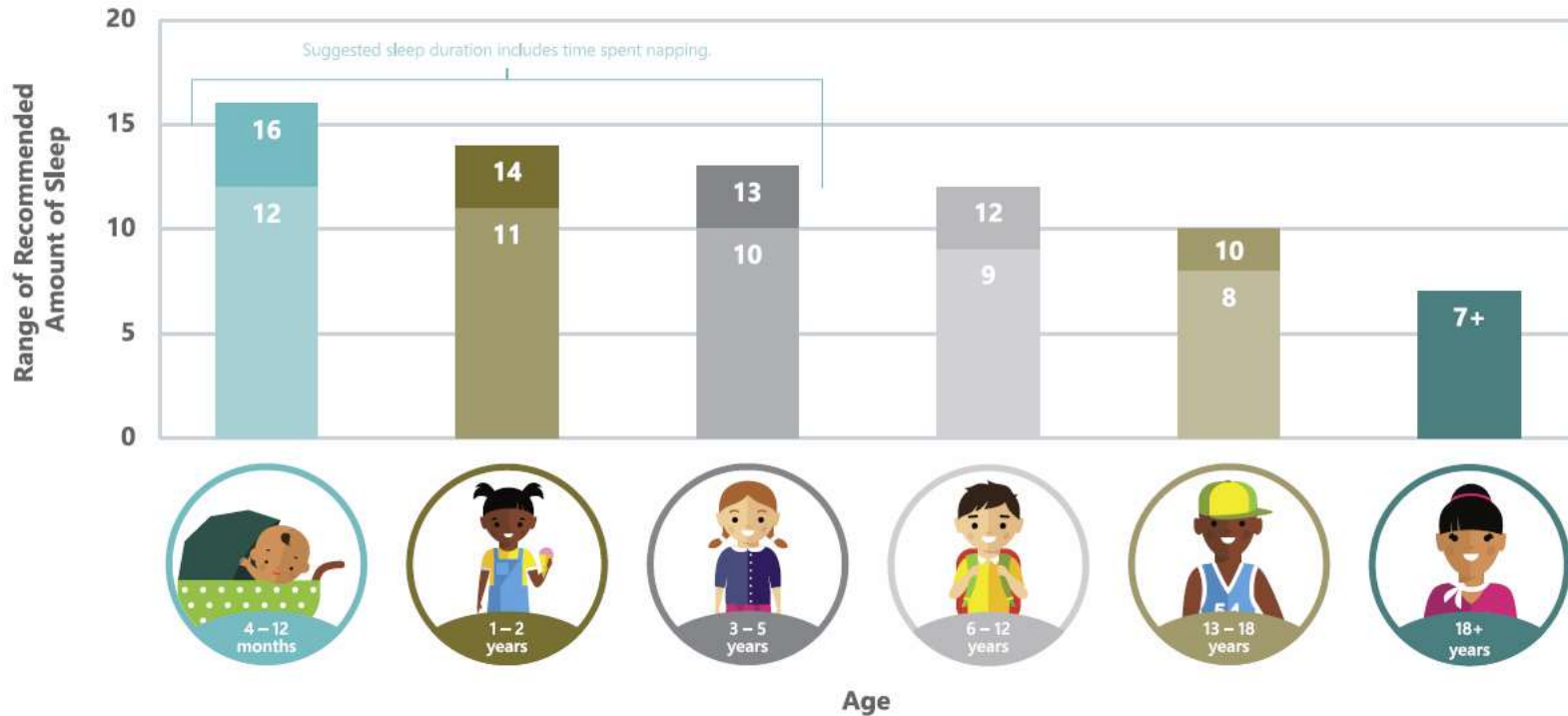


# How much sleep is enough?

- Newborns average around 15 hours/day (+/- 5)
- By 2 years of age, the average child has spent 9,500 hours (or 13 months) sleeping and 8,000 hours awake
- Between age 2 and 5 years, equal sleep/wake
- Childhood and adolescence, 40% of the day

# Healthy Sleep Duration

The American Academy of Sleep Medicine recommends that you get the following hours of sleep on a regular basis for optimal health at each stage of life.



[SleepEducation.org](http://SleepEducation.org)

A sleep health information resource by the American Academy of Sleep Medicine

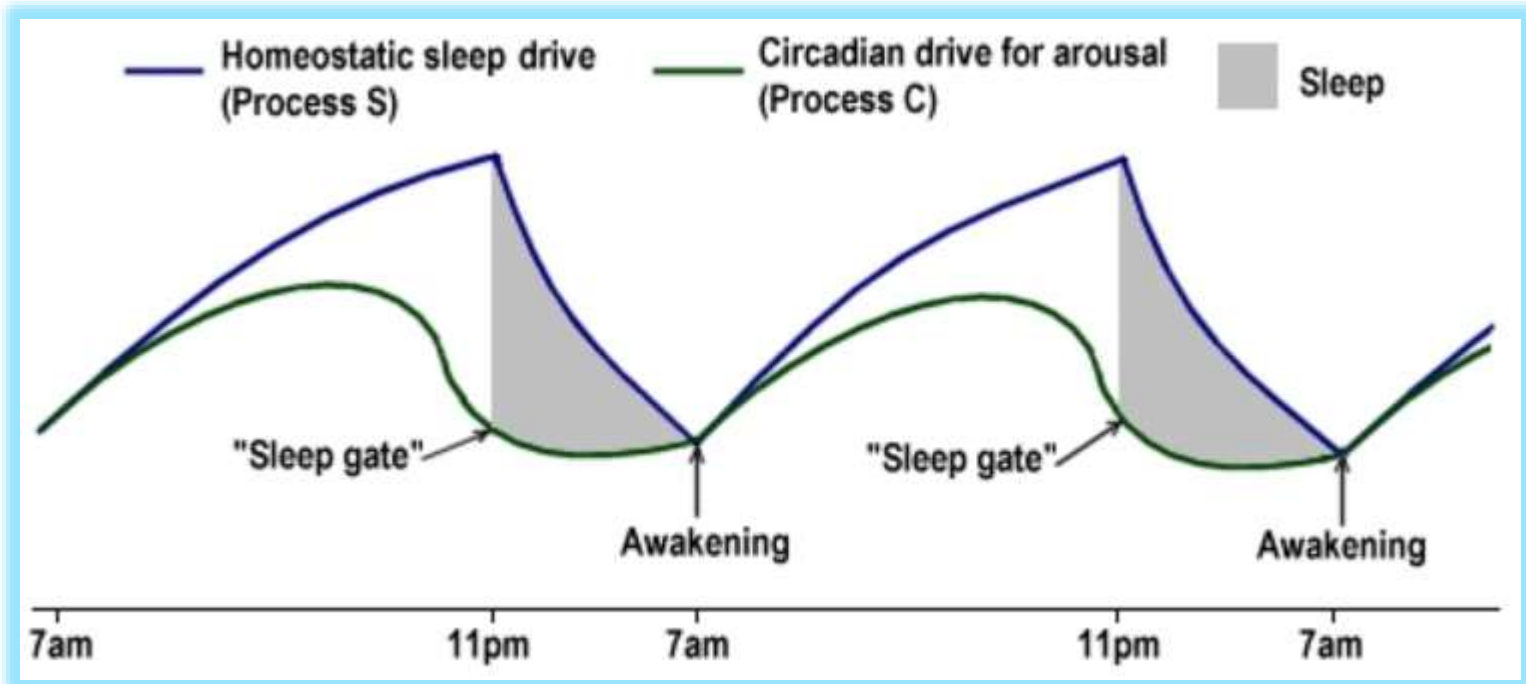


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# Two process model of sleep

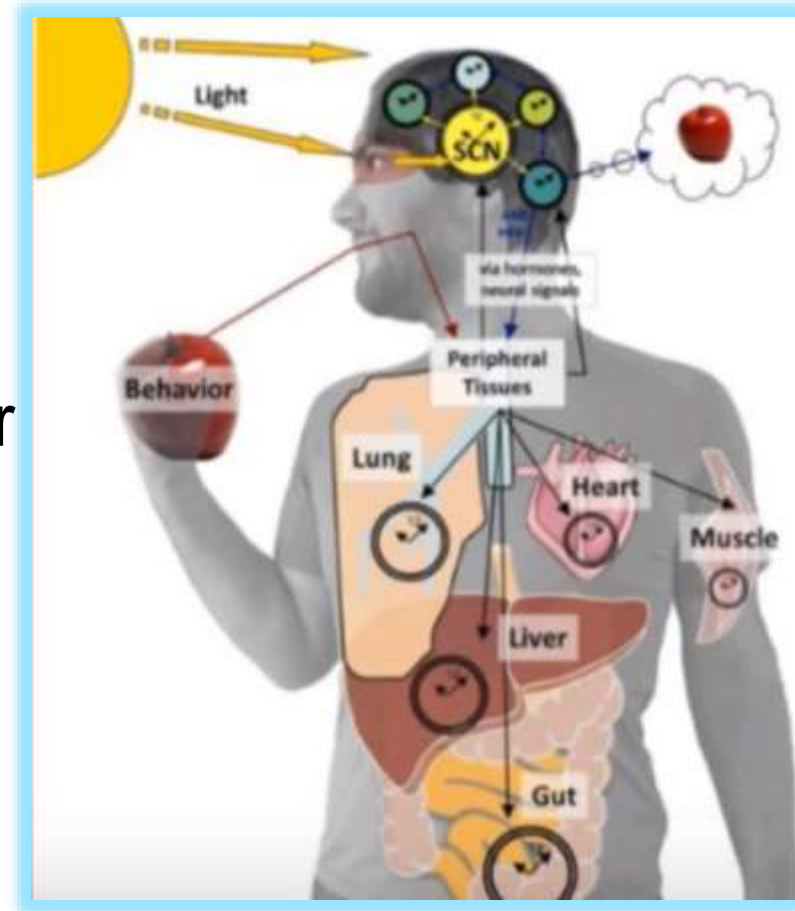
- Process S
- Process C



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# Circadian Rhythm

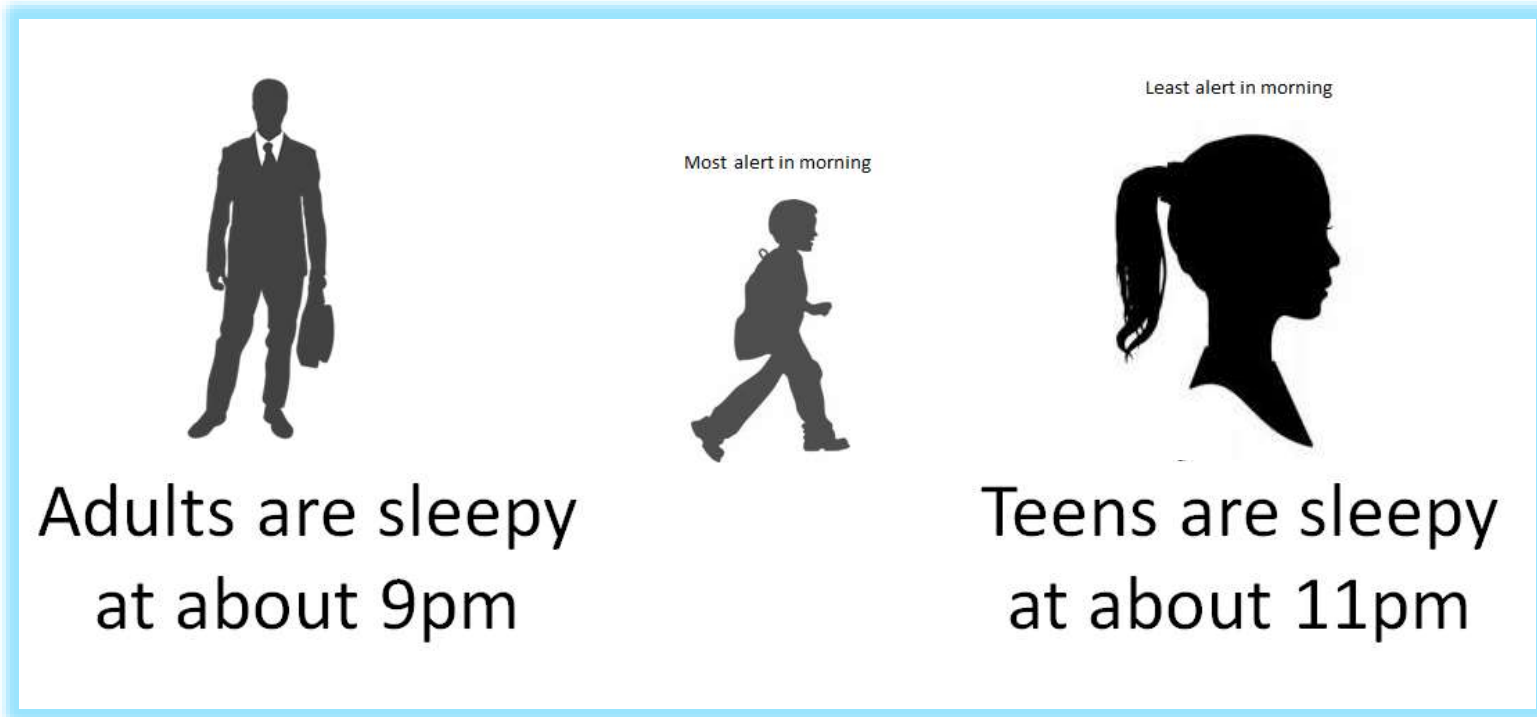
- “Master clock” in the brain
- Each cell possesses a “circadian clock”
- Synchrony with one another and the environment



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# Circadian delay with adolescence

- Teenagers are naturally “night owls”

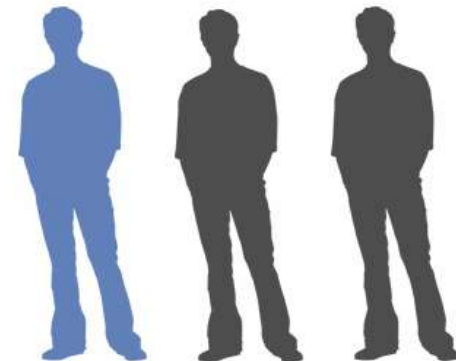
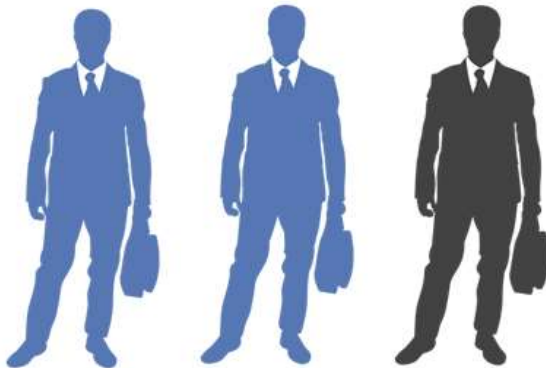


# Insufficient Sleep is a **REAL** Problem

Report of sufficient sleep nationwide

Adults  
**2/3rd**

Teenagers  
**Only 1/3rd**

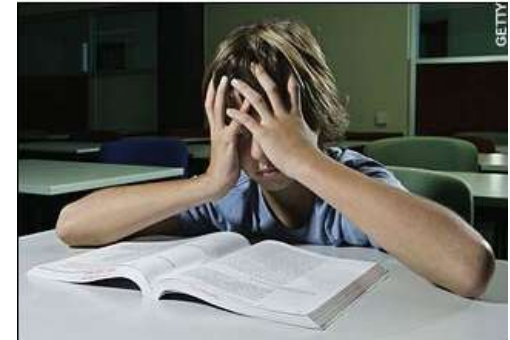


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# Impact of sleep disorders and insufficient sleep on neurocognition

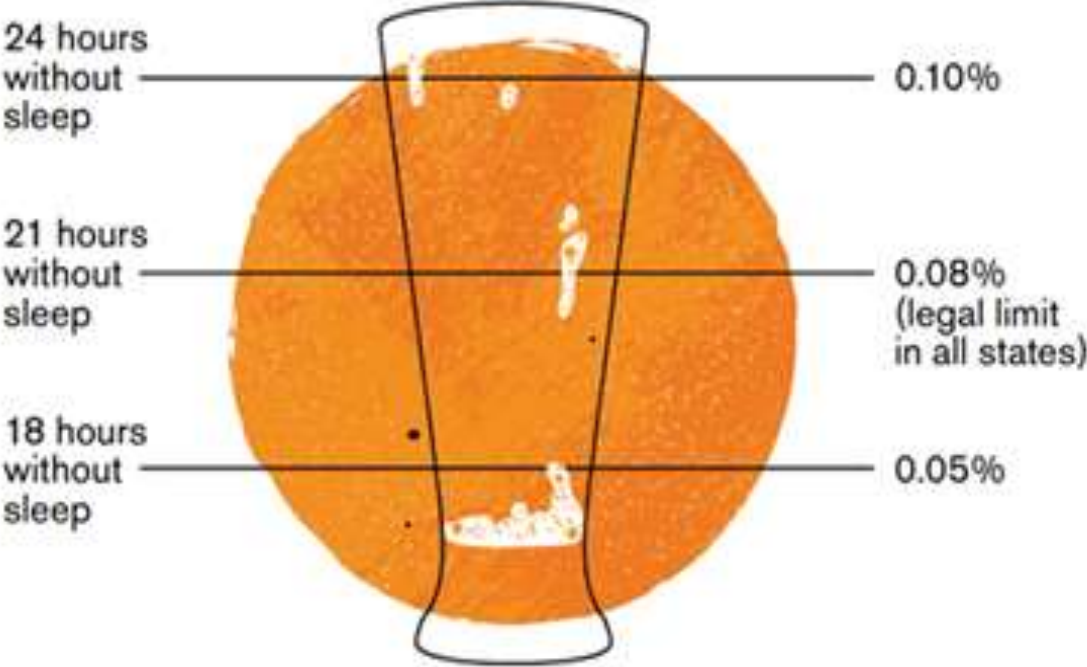
# Effects of Sleep Loss

- Learning and cognitive difficulties
- Impairment of attention
- Behavioral problems
- Anxiety and depression
- Obesity/poor growth
- Family distress



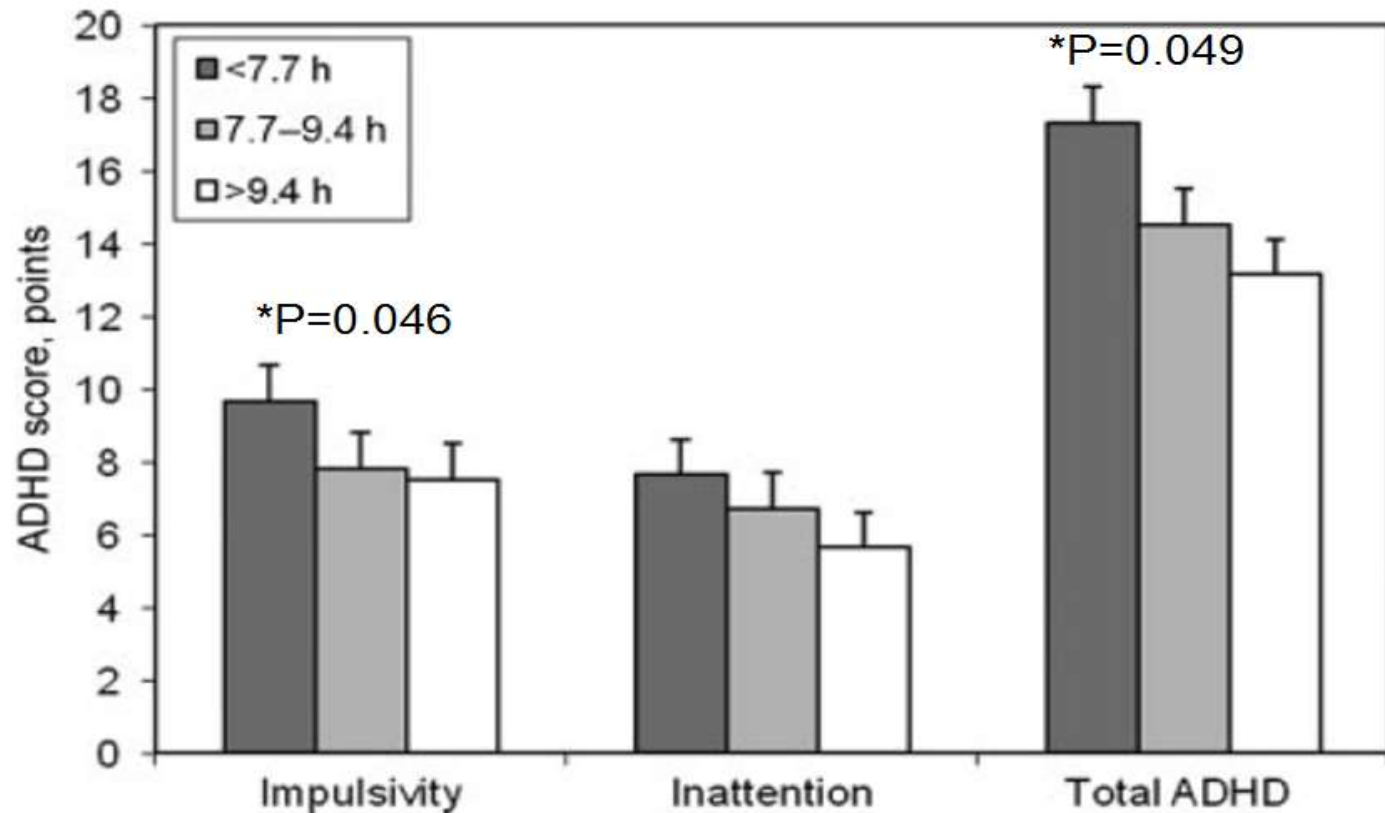
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# Lack of sleep mimics blood alcohol concentration



Governors Highway Safety Association

# Short sleep duration and behavioral symptoms of attention-deficit/hyperactivity disorder in healthy 7- to 8-year-old children



Paavonen EJ et al, Pediatrics 2009

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# TUCASA study

- Longitudinal association between short sleep, body weight, and emotional and learning problems in Hispanic and Caucasian children  
304 children from 6-12 years
- 3 groups:  $\geq 9$  hours vs.  $>7.5$  and  $< 9$ h vs.  $\leq 7.5$  h
- Outcomes: obese, learning problems, anxious/depressed 5 years later

- Silva GE et al, SLEEP 2011

# Sleep impacts mood and suicidal ideation

- Sleepless in Fairfax: The Difference One More Hour of Sleep Can Make for Teen Hopelessness, Suicidal Ideation, & Substance Use
- N=27,939 survey respondents to the 2009 Fairfax County Youth Survey (8,10,12<sup>th</sup> grade)
  - Average amount of sleep **6.5** hours
    - **Gender** differences
      - Females report less sleep than males
      - Differences more pronounced with age
    - **Racial** differences
      - Minority less than Caucasians (Asian<AA, Hispanics)
  - Compared students reporting 6-7 hours vs. 7-8 hours sleep

Reports of concerning behaviors reduced among those getting 7-8 hours sleep compared to 6-7 hours (note dose response)

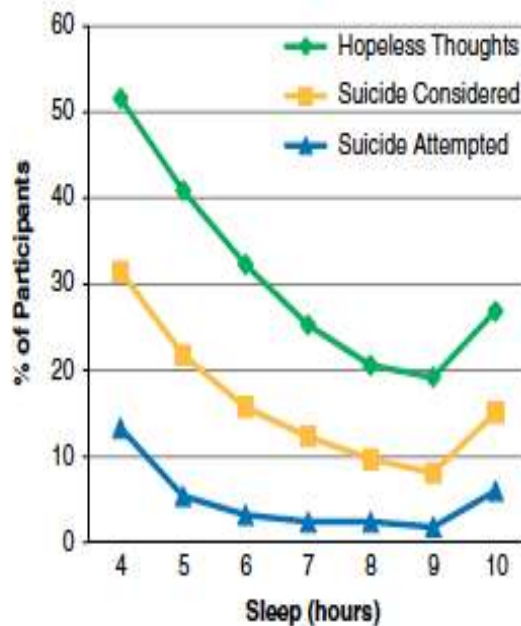


Fig. 3 Hopelessness and suicide by reported number of hours of sleep. *Note:* Each hour less of sleep is associated with a significant increase in odds of the outcome,  $p$ 's < .001

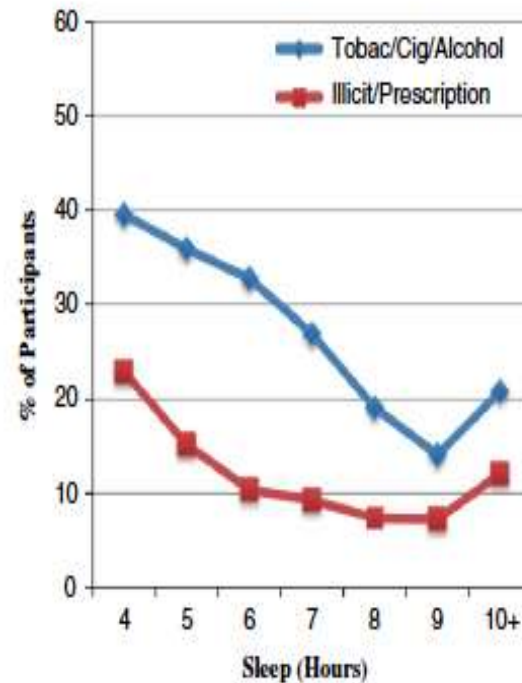


Fig. 4 Substance use by hours of sleep. *Note:* Each hour less of sleep is associated with a significant increase in odds of the outcome,  $p$ 's < .001

# Insufficient sleep and mood disorders

- For each 1 hour less sleep, 38% increase in the odds of feeling sad and hopeless
- Parent enforced bedtime
  - 10 pm bedtime vs midnight or later, 24% less risk of depression
- Teens sleeping <8 hours on a school night were more likely to experience symptoms of stress
- Teens with low stress are almost 2x more likely than teens with high stress to say they get enough sleep

# Factors contributing to insufficient sleep



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# AAP recommendations for later school start time

- Published in 2014 recommending **8:30 am or later** for secondary students
  - Reduced anxiety and depression
  - Less risk taking behavior (i.e. substance use)
  - Less tardiness and school absences
  - Improved driver safety
  - Improved alertness to facilitate peak academic performance

# Common causes for excessive sleepiness in childhood

