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Date this evidence summary was written:

September 2017

Later school start times for supporting the education, health, and well-being of high school students: Evidence and implications for public health

Review on which this evidence summary is based:

Marx, R, Tanner-Smith, EE, Davison, CM, Ufholz, LA, Freeman, J, Shankar, R, et al. (2017). **Later school start times for supporting the education, health, and well-being of high school students**. *Cochrane Database of Systematic Reviews*, *2017*(7), CD00946.

Review Focus

P High school students (age 13 to 19 years)

I Later school start times (8:00am-10:30am; start time delayed by 60-90 minutes)

C Early school start times (7:00am-7:30am)

O ***Primary Outcomes:*** Student academic outcomes, amount or quality of sleep, mental health, truancy/attendance, alertness.
Secondary Outcomes: outcomes related to health behaviours (e.g. BMI score, waist circumference, body fat percentage), health and safety indicators (e.g. vehicular accidents), social outcomes (social support, peer relationships), family outcomes, school outcomes, community outcomes, adverse events/unintended consequences.

Review Quality Rating: 9 (strong) *Details on the methodological quality are available here.*

Considerations for Public Health Practice

Conclusions from Health Evidence™	General Implications
This systematic review is based on 11 unique studies with 297 994 participants. Of the 11 studies, one was a cluster-randomized controlled trial. All included studies have a high risk of bias on at least one risk of bias domain. Only two of the included studies were appropriate to perform a meta-analysis on four outcomes; these were non-randomized cross-over trials. **Later school start times for young people 13-19 years of age are:** • Significantly associated with longer sleep duration on school-nights (MD 1.39 [CI 0.38, 2.39]) • Significantly associated with a decrease in body fat (MD -1.45 [CI -2.63, -0.27])* • Non-significantly associated with lower body mass index (MD -0.08 [CI -0.30, 0.13])* • Non-significantly associated with a decrease in waist circumference (MD -1.14 [CI -3.34, 1.06])*	Later-school start times may have several potential benefits; however, as a result of the small and inconsistent evidence base currently available, the beneficial or adverse effects of delayed school start times on adolescents' health, education, and well-being cannot be determined with any confidence. More high-quality primary studies of standard later school start time interventions on standardized outcomes are needed to explore the potential effects of later school start times on high school students' health, education, and well-being. Public health should be cautious when interpreting these results due to study heterogeneity and the very low quality evidence.

**It is important to note that three of the four meta-analyses are within-study outcomes from two independent samples embedded in one study.*	

Evidence and Implications	
What's the evidence?**	**Implications for practice and policy**
Student academic outcomes (4 studies, 254 743 participants) *Quality of the evidence = very low* Four studies looked at the association between later school start times and student academic outcomes: • Two studies reported significant positive associations (b= 1.78 [CI 1.19, 2.34]; b=0.98 [CI 0.28, 1.68]) • One study reported a non-significant negative association (b= -0.02 [CI -0.28,0.18]) • One study reported a significant negative association (MD -0.32 [CI -0.48, -0.16])	**Student academic outcomes** There is mixed evidence concerning later school start times and student academic outcomes suggesting more research is needed.
Amount or quality of sleep (8 studies, 52 340 participants; 2 from meta-analyses) *Quality of the evidence = very low* • One study reported a significant lower risk of losing sleep (RR 0.41 [CI 0.28, 0.62]) • One study reported a significant increase in sleep duration (MD 57 [CI 47, 67]) • One study reported a significant association between a delayed start time and getting adequate sleep (OR 2.48 [CI 1.89, 3.24]) • Standardized effect sizes for three of the studies could not be calculated	**Amount or quality of sleep** Currently available evidence suggests a positive relationship between later school start times and amount or quality of sleep. However, due to the very-low quality of the evidence these findings should be interpreted with caution. More high quality research is needed.
Mental Health Outcomes (1 study, 1200 participants) *Quality of the evidence = very low* One study looked at the association between later school start times and mental health outcomes and reported • Significant differences in self-reported depression symptoms for students in later starting schools (07:25 and 08:30) than earlier starting schools (07:15) • No significant differences between students starting school at 08:30 versus students starting school at 07:25	**Mental Health Outcomes** There is limited evidence concerning the association between later school start times and mental health outcomes suggesting more research is needed
Truancy or attendance outcomes (4 studies, 255 122 participants) *Quality of the evidence = very low* Four studies looked at the association between later school start times and truancy or attendance outcomes: • One study reported a significant increase in attendance • One study reported a non-significant increase in attendance	**Truancy or attendance outcomes** Generally the evidence suggests later school start times are associated with increased attendance, although the effect was not statistically significant in all studies. More high quality research is needed

• One study reported a significant increase in attendance for two of six schools and non-significant effects for the other four schools	
Alertness (4 studies, 2735 participants) *Quality of the evidence = very low* Four studies looked at the association between later school start times and alertness outcomes: • Two studies found an association between later school start times and day-time sleepiness • One study found no difference • One study reported a significant increase in attention levels and a non-significant increase in concentration levels	**Alertness** There is mixed evidence concerning the association between later school start times and student reports of alertness or sleepiness suggesting more research is needed
Legend: MD – Mean Difference; b – regression coefficient; RR – Risk Ratio; CI – Confidence Interval; OR – Odds Ratio **For definitions see the healthevidence.org glossary at http://www.healthevidence.org/glossary.aspx*	
**** Note: Only the primary outcomes from each study are addressed in this evidence table.**	

Why this issue is of interest to public health:

Sleep is a critical component of children and adolescents' healthy development[1]. However, over the last century, children and adolescents have been continuously getting less and less sleep.[2] Inadequate sleep may have negative effects on an individual's emotional and mental health (e.g. depression, anxiety, suicidal thoughts), education (e.g. concentration, academic performance), and physical health (e.g. obesity, high blood pressure, immune function).[3] The Canadian 24-hour movement guidelines suggest that children (5-13 years old) need 9-11 hours of uninterrupted sleep each night and adolescents (14-17 years old) need 8-10 hours.[4] However, the evidence shows that at least one third of adolescent students do not get a minimum of 8-9 hours of sleep on school nights.[3] The hypothesized conflict between teenagers' delayed circadian rhythms and school schedules is considered an important factor contributing to a lack of sleep among adolescents.[3] Therefore, there is a need to explore how school start times affect high school students sleep, health, education, and well-being.

1. Chaput, J.P. & Janssen, I. (2016). *Sleep duration estimates of Canadian children and adolescents*. J Sleep Res, 25: 541–548. doi:10.1111/jsr.12410.
2. Matricciani, L., Olds, T., & Petkov, J. (2012*). In search of lost sleep: Secular trends in the sleep time of school-aged children and adolescents. Sleep Medicine Reviews, 16(3)*, 203-211. doi:10.1016/j.smrv.2011.03.005
3. Gariépy, G., Janssen, I., Sentenac, M., & Elgar, F.J. (2017). *School start time and sleep in Canadian adolescents.* Journal of sleep research, 26(2), 195-201.
4. Tremblay, M. S., Carson, V., Chaput, J. P., Connor Gorber, S., Dinh, T., Duggan, M. & Janssen, I. (2016). *Canadian 24-hour movement guidelines for children and youth: an integration of physical activity, sedentary behaviour, and sleep.* Applied Physiology, Nutrition, and Metabolism, 41(6), S311-S327.

*Other quality reviews on this topic are available on **www.healthevidence.org**.*

Suggested citation:

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