Keller, P.S., Gilbert, L.R., Haak, E.A., Bi, S., and Smith, O.A. (2017). Earlier school start times are associated with higher rates of behavior problems in elementary schools. *Sleep Health.* National Sleep Foundation.

Summary: The design of the study was correlational, and the authors were careful to point out that it could not be concluded that the earlier start times caused more behavior issues. The sample (state of Kentucky) was also predominately white, with less than ten percent African American and less than five percent Hispanic. (Same sample and statistical methods as 2014 study.)

"Earlier school start times were related to greater behavioral problems in schools, with some associations only found for non-Appalachian elementary schools" (p.5)

"However, some of the associations between school start times and disciplinary issues were significantly moderated by Appalachian school location" (p.5)

"…we cannot infer that early school start times were the cause of school performance measures." (p.6)

"Finally, findings may not generalize to other states, especially to states that have varying levels of poverty or more racial diversity than Kentucky." (p.6)

Keller, P.S., Smith, O.A., Gilbert, L.R., Bi, S., and Haak, E.A. (2014). Earlier school start times as a risk factor for poor school performance: An examination of public elementary schools in the commonwealth of Kentucky. *Journal of Educational Psychology, 107*(1), 236-245.

Summary: The design of the study was correlational, and the authors were careful to point out that it could not be concluded that the earlier start times caused lower test scores. The sample (state of Kentucky) was also predominately white, with less than ten percent African American and less than five percent Hispanic. (Same sample and statistical methods as 2017 study.) The findings did not hold true for low-SES schools.

"The current study is also limited by its cross-sectional design and data from only one state. Although we controlled for a number of potential confounding factors, including the racial composition of the schools and teacher–student ratio, we cannot infer that early school start times were the cause of school performance measures." (p.243)

"…there are associations between early school start times and school performance, *particularly among elementary schools serving middle and upper class students*." (p. 243)

"Significant relations between early school start times and poor school performance were found only for schools with a lower percentage of students qualifying for free and reduced-cost lunches (e.g., for schools with a wealthier student population). In other words, schools with economically disadvantaged students were unlikely to show better school performance if their start times were later." (p. 242)

"What we found, however, was early start times were associated with worse performance in schools in more affluent districts—that is, those with fewer kids getting free or reduced-cost lunches," Keller said. "For schools with more disadvantaged students, later start times did not seem to make a difference in performance, possibly because these children already have so many other risk factors." (Interview with Psychology Today)

Dupuis, D.N. (2015). ***The association between elementary school start time and students' academic achievement in Wayzata Public Schools.*** **Center for Applied Research and Educational Improvement, College of Education and Human Development, University of Minnesota.**

Summary: "The results suggest that the association between school start time and elementary students' academic achievement in Wayzata Public Schools is small to non-existent, particularly when controlling for student demographic characteristics, grade, and school. Whether controlling for student demographic characteristics, grade, and school or not, the mean difference between students in the early start time schools and students in the late start time schools is never more than five points (out of 98 points). The non-statistically significant interactions indicate that the small effect of school start time is the same for all student subgroups examined." (p. 6)

Hanover Research. (2013). ***Impact of School Start Time on Student Learning.***

Summary: "While research on start times for young students is sparse, it has shown elementary school students do not benefit from a later state time. Some experts suggest academic achievement of elementary school students would not be adversely impacted by an earlier state time, as young students are alert earlier in the day than adolescent students and state school at a later time than secondary students." (p.4)

Wahlstrom, K.L. (1998). ***Elementary feedback on school start times.*** **Center for Applied Research and Educational Improvement, College of Education and Human Development, University of Minnesota.**

Summary: "Teachers from the three elementary schools that moved from 8:40 to 7:40 commented on a number of positive effects due to the 7:40 start. Children appeared to be more alert at the beginning of the day and stayed more energized throughout the day. Students experienced fewer morning transitions (i.e., going directly from home to school) and were more ready to learn. Teachers perceived themselves and their students to be more patient and productive in the afternoon." (p. 4)

Edwards, F. (2012). Early to rise? The effect of daily start times on academic performance. ***Economics of Education Review, 31*****, 970-983.**

Summary: "If elementary students are not affected by later start times (which cannot be definitively determined from my data), it may be possible to increase test scores for middle school students at zero cost by having elementary schools start first." (p. 983)

"Start times had no effect on elementary students regardless of the specification used." (p. 980)