2020

# EXAMINING START TIMES AMONG SCHOOLS IN NEW YORK STATE: PATTERNS, RATIONALE, AND IMPLICATIONS

Danielle Lundgren

EXAMINING START TIMES AMONG SCHOOLS IN NEW YORK STATE:
PATTERNS, RATIONALE AND IMPLICATIONS

A dissertation submitted in partial fulfillment

of the requirements for the degree of

DOCTOR OF PSYCHOLOGY

to the faculty of the

DEPARTMENT OF PSYCHOLOGY

of

ST. JOHN'S COLLEGE OF LIBERAL ARTS AND SCIENCES

at

ST. JOHN'S UNIVERSITY
New York
by
Danielle Lundgren

Date Submitted _____      Date Approved _____


_____      _____

Danielle Lundgren      Mark D. Terjesen

# ABSTRACT

EXAMINING START TIMES AMONG SCHOOLS IN NEW YORK STATE:
PATTERNS, RATIONALE AND IMPLICATIONS

Danielle Lundgren

School start times have a significant impact on students' academic (Keller et al., 2015; Kelley et al., 2017; Lewin et al., 2017), social/emotional (Wahlstrom et al., 2017), and behavioral functioning (Keller et al., 2017). This present study examined the patterns, rationale, and implications for school start times among schools within New York State (NYS). School principals/CEOs completed a survey that included various questions about their school and start times, with additional data collected from the NYS Education Department website.

Overall, this study found that a majority of schools in NYS start before 8:30 a.m. Factors rated to contribute most greatly to start times were found to be consistency and bus schedule/transportation. A majority of participants were in agreement with a position statement advocating for later start times, however less than half reported to be likely or very likely to make a start time change. Surprisingly, most principals/CEOs reported having only a little knowledge on sleep and sleep research, and a vast majority of schools do not teach sleep hygiene. There were also some findings with links between earlier school start times and higher suspension rates, an overall higher proportion of economically disadvantaged students, and lower performance on a couple of NYS assessments. This research is an essential addition to understanding school start times,

and will hopefully create a greater discussion regarding the importance and benefit of start time change to ultimately increase student well-being and success.

ACKNOWLEDGEMENTS

I would like to thank my mentor, Dr. Mark Terjesen for all of his help these past five years, particularly for the many meetings, phone calls, and emails to support and mentor me throughout my dissertation. I truly believe all of our hard work will help create a positive impact and I am thankful to have been able to work on this together. I would also like to thank my committee members, Dr. Marlene Sotelo-Dynega and Dr. Samuel Ortiz for taking the time to help me with my dissertation work. Thank you to my two research assistants, Kathleen Everson and Brooke Alpert for all of their hard work, I am very grateful for all of their help.

I would like to give a big thank you to my cohort. We have all grown so very close over these past several years and I could honestly rely on each and every one of them to have my back, just as I have theirs. I'm lucky to begin my career knowing I have such a great team of colleagues entering the field with me

Thank you to my wonderful family for helping me and supporting me every step of the way. I would like to thank my mom in particular for being unbelievably supportive and listening to me vent day after day even when she had so much already on her own plate. She is truly a super mom and I would have never been able to make it through this program without her. I would also like to thank my grandma who has helped raise me and fostered my love of learning from a very young age as she would sit with me for hours as I begged her to complete more and more pages of the workbooks she bought for me.

I'd also like to thank my two adorable nephews, Robbie and Evan, because anytime I felt overwhelmed and needed a break, spending time with them always put a smile on my face. A huge thank you to my boyfriend, Guy for being there for me, always

making me laugh and feel so happy no matter what kind of long, busy, tough day or week I have had. I am so very thankful to have had such incredible support, and I am excited to see what the future holds.

TABLE OF CONTENTS

LIST OF TABLES

**Chapter 1**

**Literature Review**

School start times may have a significant impact on the well-being of students in a variety of realms. It is critical to assess the implications that start times may have on youth, so we can understand how we may be able to circumvent these problems through school start time change. It is also important to have an understanding of the reasoning behind these start times as it can help aid in the planning to overcome possible barriers to start time change. Early school start times have been challenged as being problematic to students as many students encounter sleep difficulties (Mindell & Owens, 2015), and early start times may also cause students to not obtain enough sleep due to poor alignment with students' circadian rhythms (Crowley et al., 2007; Lewin et al., 2017). Early school start times have been found to lead to negative repercussions on students' well-being academically (Keller et al., 2015; Kelley et al., 2017; Lewin et al., 2017), socially/emotionally (Wahlstrom et al., 2017), and behaviorally (Keller et al., 2017). Therefore, looking more in depth at school start times among schools in New York State (NYS) will allow us to best help students, and encourage a change in school start time policy.

**Defining Sleep Problems**

Nearly 25% of all children experience some form of sleep problem, which may range from more mild sleep difficulties such as trouble falling asleep to more serious sleep disorders (Mindell & Owens, 2015). Over one-third of elementary school aged children and 40% of adolescents have reported substantial sleep complaints (Mindell & Owens, 2015). Sleep difficulties including both medically and behaviorally based sleep

disorders occur frequently in youth. Common sleep complaints include difficulties such as trouble falling asleep, snoring, night waking, excessive daytime sleepiness, and poor daytime functioning (Meltzer et al., 2010). There are various sleep disorders that children and adolescents may be suffering from that are contributing to the high rates of sleep problems experienced amongst today's youth.

According to reports by parents and primary care physicians, behaviorally based sleep disorders such as insomnia, are the most frequently occurring sleep disorders across all age groups (Honaker & Meltzer, 2016). Furthermore, Roberts et al. (2008) had found that more than one-fourth of adolescents had reported at least one symptom of insomnia, with approximately 5% of adolescents meeting the criteria for insomnia. Narcolepsy is a neurological disorder depicted by extreme daytime sleepiness with quick entry into rapid eye movement (REM) sleep, sleep paralysis, hypnagogic hallucinations, and disrupted nighttime sleep (Maski & Owens, 2016). The onset of narcolepsy is usually in children and adolescents and young adults, with the first peak of onset occurring between the ages of 15 and 25 years old, with the highest severity being when onset is abrupt in children (American Psychiatric Association, 2013).

Parasomnias are another sleep disorder youth may encounter that can impact their ability to attain adequate sleep. In children, sleep terrors occur in about 3% of youth and sleepwalking occurs occasionally in 20-40% of children, and often in 3-4% of children (Stores, 2009). Obstructive Sleep Apnea (OSA) is another sleep problem experienced by some youth. The prevalence of OSA in children and adolescents is found to occur in approximately 0%-5.7% of youth (Marcus et al., 2012). Restless leg syndrome, another sleep disorder faced by youth, has a prevalence of approximately 1.9% in children and

2% in adolescents (Picchietti, et al., 2007). However, in some children and adolescents, clinical sleep disturbance can occur for months or even years before the full diagnostic exhibition of restless leg syndrome, with the average interval of time between the initial sleep difficulty and the development of restless legs syndrome being 4.4 years (Picchietti & Stevens, 2008).

Circadian rhythm disorders are characterized by a poor synchronization between an individual's sleep pattern and the sleep pattern that is desired or deemed to be the societal norm (Dagan, 2002). One of the common circadian rhythm disorders is delayed sleep phase syndrome. Delayed sleep phase syndrome is described as a history of a delay in the timing of the major sleep period of usually more than two hours, in relation to the preferred sleep and rise time, leading to symptoms of insomnia and excessive sleepiness (American Psychiatric Association, 2013). There is a higher prevalence of delayed sleep phase syndrome in adolescents than in the general population with a frequency of more than 7% of adolescents facing this disorder (American Psychiatric Association, 2013).

In addition to the high prevalence of sleep disorders, many youth experience sleep difficulties due to the use of technology and media. Fuller et al. (2017) found a significant association between the average hours of sleep and technology use before bedtime, such that children 8-17 years old who watched television at bedtime were reported to receive 30 minutes less sleep than their counterparts who did not watch television at bedtime. Additionally, youth who used their phones during bedtime were reported to sleep for nearly one hour less than those who did not use their phones. Video game playing at bedtime was shown to decrease the amount of sleep reported by youth by 30 minutes, and they were more likely to have difficulty staying asleep. Furthermore,

children who used a computer at bedtime were more likely to have trouble falling asleep, and were reported to have approximately 60 minutes less sleep than those who did not use a computer at bedtime (Fuller et al., 2017).

Cain and Gradisar (2010) conducted a systematic review of 36 research studies investigating technology use in children and adolescents and have concluded that later bedtimes and shorter total sleep time have been consistently related to excessive media use. The use of media impacts the sleep of children and adolescents due to time displacement as they are spending more time in front of the screen, therefore allowing less time for sleep. Additionally, sleep may be hindered due the social interaction aspect of media use, and the impact of light on an individual's circadian rhythm and alertness (Hale & Guan, 2015).

**Sleep Problems Related to Academic Functioning**

The lack of adequate sleep such as sleep restriction, defined as "partial sleep deprivation, sleep loss, insufficient or deficient sleep" (Minges & Redeker, 2016) is a pervasive problem among youth today. The consequences of not obtaining enough sleep can be profound, leading children and adolescents to face academic difficulties, as well as concerns with their social, emotional, and behavioral functioning. Approximately one third of youth have reported experiencing daytime sleepiness (Perfect et al., 2014). The relationship between sleep and cognition as well as school performance may potentially be due to shortness or disturbances of sleep, which may then diminish the essential overnight brain activity that is necessary for neurocognitive functioning (Dewald et al., 2010). Additionally, researchers report that there is a vital need for an individual to sleep prior to learning for effective next-day learning to take place (Walker, 2009). A review of

studies conducted by Kopasz et al. (2010) concluded that a majority of the studies supported the hypothesis that in children and adolescents, sleep assists in memory encoding, working memory, as well as long-term memory consolidation. Reported sleep problems have also been linked with lower effortful control and identified regulation, such as considering schoolwork as important and valuable to oneself, which was related to poorer academic performance among adolescents (Wong et al., 2014).

Adolescents who had difficulty sleeping reported having trouble inhibiting their behavior, controlling their attention, and beginning activities that they were not interested in doing (Wong et al., 2014). Additionally, in fifth grade children, short sleep duration on school nights was linked to poor attention (Lehto & Uusitalo-Malmivaara, 2014). Even one night of restricted sleep in children between the ages of 10-14 years old led to cognitive deficits, particularly on children's verbal creativity and abstract thinking/concept formation (Randazzo et al., 1998). Healthy school aged children with restricted sleep for one week had higher teacher ratings of academic difficulty in the classroom, greater school-related attention problems, took longer to process new information, and were more forgetful (Fallone et al., 2005). Furthermore, in children aged 9-17 years old, sleep problems predicted poorer grades, youth's perceptions that they were having difficulty in school, as well as negative outlooks youths had regarding their teacher and school (Perfect et al., 2014).

**Sleep Problems Related to Social/Emotional Functioning**

For students between 11-15 years old, higher reported levels of daytime sleepiness have been related to more negative outcomes including lower school achievement, higher rates of being absent, lower levels of school enjoyment, and more

frequent illness (Drake et al., 2003). There is an association between short sleep duration and a greater negative affective response in children 8-12 years of age (Vriend et al., 2012). Among youth, reduced sleep has been strongly related to negative health outcomes including increased feelings of sadness and hopelessness, reports of serious suicidal ideation and having already attempted suicide, as well as increased odds of the use of tobacco, alcohol, marijuana, and illicit/prescription drugs (Winsler et al., 2015). Further, adolescents receiving an inadequate amount of sleep of less than 8 hours have been found to have greater daytime tiredness, less behavioral persistence, and a less optimistic attitude towards life (Perkinson-Gloor et al., 2013).

Adolescents in grades 7-12 with depression and suicidal ideation are reported to have later bedtimes and shorter sleep durations, and adolescents with earlier bedtimes set by their parents have been shown to have a significantly decreased likelihood of having depression and suicidal ideation (Gangwisch et al., 2010). Additionally, youth who reported shorter total sleep time also reported suffering more emotional problems including feelings of inadequacy (Perfect et al., 2014). Research by Alfano et al. (2009) found that depressive symptoms were a significant predictor of adolescent sleep problems, and that for children under 12 years old, anxiety was a significant predictor of children's sleep difficulties.

**Sleep Problems Related to Behavioral Functioning**

Adolescents who reported obtaining a deficient amount of sleep were also shown to participate in more risk-taking behaviors in comparison to their peers who reported attaining a sufficient amount of sleep (O'Brien & Mindell, 2005). Inadequate sleep among high school students has been linked to higher odds of the student engaging in

health-risk behaviors including current sexual activity and physical fighting (McKnight-Eily et al., 2011). There has been a relationship found between bullying and sleep problems such that bullies have more irregular sleep schedules and obtain less sleep during the school week, and sleep duration has been shown to have a moderating effect on the level of aggression that is displayed by bullies (Kubiszewski et al., 2014). In a nationally representative sample of high school students, those with insufficient sleep had increased odds of carrying out most of the examined school violence related behaviors such as a higher risk of a male carrying a weapon on school property in the past 30 days, as compared to their peers with adequate sleep (Hildenbrand et al., 2013).

Sleep difficulties may present youth with serious consequences in their behavioral functioning. There was found to be a significant relationship between low true sleep time and externalizing symptoms including significant correlations between true sleep time and aggressive and delinquent behaviors, attention problems, somatic complaints, and social problems as reported by teachers in youth 7-12 years old (Aronen et al., 2000). Furthermore, low sleep duration and parent-reported sleeping difficulties have both been associated with greater behavioral symptoms of Attention Deficit Hyperactivity Disorder (ADHD) in children (Paavonen et al., 2009).

**Sleep and School Start Times**

According to the National Sleep Foundation, the recommended amount of sleep for school aged children is at least 9-11 hours, and for adolescents 8-10 hours of sleep per night (Hirshkowitz et al., 2015). These recommendations have primarily been broadened for a majority of the age groups from the previous recommended sleep durations, and were developed through work with experts from various fields, with a thorough review of

published studies on the topics of sleep and health (National Sleep Foundation, n.d.-b). However, it should be noted that many of the recommendations made for sleep durations from various sources do not regularly indicate the details or references by which the recommendations for the sleep durations were established for the various age groups. It is possible that these recommendations were based on research and evidence, however the evidence supporting these sleep durations have not been specified in the proposed guidelines (Matricciani et al., 2013).

According to the National Sleep Foundation 2014 poll (National Sleep Foundation, 2014), 8% of children 6-11 years old sleep seven hours or less per night and 23% sleep only eight hours per night. In considering adolescents, of those 12-14 years of age, 29% receive seven hours or less sleep nightly and 42% receive only eight hours of sleep per night. The lack of the recommended number of hours of sleep becomes even more pronounced among adolescents aged 15-17, with 56% sleeping seven hours or less per night, and only 10% sleeping nine hours or more per night. While there are a myriad of reasons as to the lack of sufficient sleep among children and adolescents, including the various sleep problems such as sleep difficulties and sleep disorders that approximately a quarter of all youth experience (Mindell & Owens, 2015), and the late night use of electronics and media (Cain & Gradisar, 2010; Fuller et al. 2017), part of the problem may be due to early school start times. Early school start times cause these students to wake up early, and without a change in bedtime would logically result in less sleep. Therefore, early school start times and the subsequent sleep deprivation it may cause can then lead to numerous difficulties these students may encounter.

Many school districts in the United States begin school earlier during academic transitions, for instance from elementary school to junior high school, and from junior high school to high school (Wolfson & Carskadon, 1998). Adolescents are prone to stay up later and wake up later than their preadolescent counterparts (Giannotti et al., 2002). During adolescence, youth go to bed later due to factors such as computer use and social activities, which are strong predictors of the time an adolescent goes to sleep, as well as factors such as television watching and working which have been shown to have moderate effects on delaying the time an adolescent goes to sleep (Knutson & Lauderdale, 2009). Adolescents also go to bed later due to changes in their circadian timing system, with the shift of adolescents' inclination for evening possibly suggesting that there are underlying changes to mechanisms regulating the sleep/wake cycle in their puberty development (Crowley et al., 2007). A study by Kim et al. (2002), found that younger children have more of a morning time of day preference while older children have more of an evening preference, with the shift to an evening time of day preference happening at approximately 13 years of age.

Insufficient sleep is particularly a problem among adolescents due to pubertal changes in their circadian rhythms leading to an ideal bedtime of after 10:30 p.m., and rise time optimally after 7:30 a.m. (Lewin et al., 2017). In a subsample of adolescents derived from a nationally representative survey of adolescents in the United States (U.S.), those who attended schools that started later were found to go to sleep later on school nights, but were also found to generally acquire more sleep (Paksarian et al., 2015). Therefore on school days, early school start times, which is a key predictor of early rising times, clashes with the circadian rhythm of adolescents (Knutson & Lauderdale, 2009).

Currently, adolescents may be going to sleep at a later time due to their circadian timing preference, however by having early school start times, this does not enable them to achieve a sufficient amount of sleep due to having to wake up early for school. Thus, shifting the time school starts to a later time would be more in sync with adolescents' sleep schedules, as they will be able to go to bed later and can wake up later if schools started at a later time. A review of the literature by Minges and Redeker (2016) concluded that later school start times can lead to beneficial outcomes including increased total sleep time, improved health outcomes such as reducing depression and use of caffeine, reducing daytime tiredness, and improving academic outcomes such as punctuality and students staying awake in class.

**Impacts of School Start Times**

Earlier school start times have been associated with lower academic performance in elementary schools containing middle and upper class students, and it has been suggested that schools with a greater percentage of children of lower socioeconomic status may not show better school performance with later start times, due to the greater overall risk factors poorer students may encounter (Keller et al., 2015). A large study conducted on middle school students found that students with earlier school start times were at a higher risk of reduced sleep duration, as well as lower academic performance and academic effort (Lewin et al., 2017). Additionally, a study looking at adolescent students entering their freshman year in the U.S. Air Force Academy, of comparable age to high school seniors, found that earlier school start times had a negative impact on academic achievement. Those students assigned to a first period class earned lower

overall grades in their courses as compared to those without a first period class who started their day 50 minutes later (Carrell et al., 2011).

Earlier school start times have also been linked with increased behavioral problems in elementary schools including greater overall disciplinary actions, behavioral incidents, in-school removals, number of students suspended and expelled, and higher rates of harassment (Keller et al., 2017). Relatedly, Wahlstrom et al. (2017) found that adolescents who attended high schools with later start times reported waking up later as well as obtaining a longer sleep duration, with greater sleep duration being found related to fewer reports of mental health and substance use issues. In addition, there was a lower incidence of the use of alcohol, cigarettes and other substances with students who acquired more sleep, and for each extra hour of sleep reported by these adolescent students, there was a 28% decrease in the adjusted odds of a student reporting that they felt unhappy, sad, or depressed (Wahlstrom et al., 2017). Additionally, a study conducted by Wheaton et al. (2016), reviewed several studies that compared adolescent vehicle crashes in terms of school start times with an overall trend of findings indicating that adolescent vehicle crashes were higher for schools with earlier start times as compared to those that started later. Thus, early school start times can also be seen as a safety concern for adolescents who may be driving themselves to school.

Given the link between school start time and student sleep duration and academic and behavioral performance, it may be important to consider a dosage effect. That is, just how late should schools start to have a positive impact on students. As an example, students who attended schools with a 20 minute later start time reported attaining 16 extra minutes of sleep on school nights, which was also related to less daytime tiredness

(Perkinson-Gloor et al., 2013). McKeever and Clark (2017) found that both high school graduation rates and attendance rates significantly increased after the implementation of a delayed school start time of later than 8:30 a.m. Furthermore, Kelley et al. (2017), argue for an even later school start time of 10:00 a.m., reporting that with a change to a later high school start time of 10:00 a.m., there was a decrease in the rates of absence from illness in students between the ages of 13-16 years old, and there was an increase in the academic performance in students 14-16 years of age. The researchers report that when returning the school start times back to 8:50 a.m., absences from illness increased and there was a decrease in academic performance.

**Advocating for Later Start Times**

To address the widespread issue of insufficient sleep, particularly among adolescents, over the years schools have attempted to change school start times to begin later in the morning in order to be more in accordance with adolescents' circadian rhythms, environmental and social pressures, as well as to improve their academic performance (Minges & Redeker, 2016). The American Academy of Sleep Medicine (AASM), a renowned professional society devoted to improving sleep, recently advocated through a position statement that middle school and high school start times should begin at 8:30 a.m. or later to support a variety of factors including an adequate opportunity for sleep, optimal alertness in the classroom to assist in academic performance, decreasing student lateness and absences, supporting mental and psychological health, as well as adolescent driving safety (Watson et al., 2017). Additionally, the American Academy of Pediatrics (2014), has also recommended that the start times for most middle and high school districts should begin no earlier than 8:30

a.m. to circumvent adolescent sleep deficiency and tiredness. California's Senate and State Assembly had passed a bill, SB328, delaying the start times of both middle schools and high schools to 8:30 a.m. or later (American Academy of Sleep Medicine, 2018). However, this bill was vetoed by Governor Brown, and thus was not put into effect as Governor Brown believed that decisions for school start times should be made by the school's local community (Racker, 2018).

Recently, in the 2016-2017 school year, the Seattle school district began a start time change from 7:50 a.m. to 8:45 a.m. for secondary schools. A study was carried out which compared pre and post differences in the start time change for students, and found that the delay in start time led to a median of 34 more minutes of sleep on school days, found greater student attendance and punctuality for the economically disadvantaged high school in the study, and found that later school start times were also related to heightened academic performance (Dunster et al., 2018). However, the Center for Disease Control and Prevention (2015) reports on the results from the 2014 School Health Policies and Practices Study, which found that 77.8% of elementary schools, 82.8% of middle schools, and 92.7% of high schools in the U.S. started before 8:30 a.m.

**Barriers to School Start Time Change**

While there are many benefits to delaying school start times, there are possible barriers and challenges schools may encounter when trying to change their start time, deterring them from making this change. Barriers to school start times include less time for sports practice, the impact on the scheduling of sports games, the effect on parent/family schedules, difficulty in finding childcare for younger siblings, decreased employment hours for students with after school jobs, and difficulties regarding

transportation (American Academy of Pediatrics, 2014). Further, there is a financial cost associated with changing school start times which may be related to multiple factors such as bus schedules/policies, the geographical distribution of the student population, amount of schools in the district, and various inter-district differences which contribute to the expense of delaying school start times. However, the most often referenced financial expense related to changing school start times is the cost of changing bus schedules, which can vary drastically amongst various districts (Kirby et al., 2011).

The National Sleep Foundation (n.d.-a) identified potential solutions to some of the major challenges to delaying school start times. To avoid transportation from being a barrier, the National Sleep Foundation (n.d.-a) suggests to simply flip elementary and high school start times, as elementary school aged children are more inclined to wake earlier in the morning. They also report another solution would be for older students to take public transportation to school, which may be limited in certain communities. This is similar to suggestions made by Owens et al. (2014), who reported on lessons learned from other school districts, that a strategy that has been used to combat transportation obstacles was to flip high school schedules with those of elementary schools, and also suggested that other methods be considered such as car pools and incentives for public transportation use.

In terms of after school activities, the National Sleep Foundation (n.d.-a) proposes that this barrier can be overcome by rescheduling sports practice times and installing lights enabling practice to run later. Additionally, Meltzer et al. (2017) found that school start time change made in one school district had overcome the athletics barrier by meeting with the athletes' parents to understand and respond to their concerns, and to

inform them of the positive impact that increased sleep may have on the athletes'

performance. Owens et al. (2014), had noted that several districts had actually found that

there was an increased number of students who were involved in athletics after the

change in start times, and that there had been improved performance for their teams as

well.

Regarding after school employment, the National Sleep Foundation (n.d.-a)

reports that studies have shown that employers reported that extra help is not needed

typically until after school, so they can adjust to the new school schedule.  For non-sports

related after school activities, delaying start times and allowing students to sleep longer

may lead students to be more capable of completing their homework quicker, leaving

extra time to participate in such activities. The concern of changes in specific school

levels and their programs, such as how a change in start times for high schools may

impact the schedule of younger students has been resolved in many communities who

have been able to find solutions such as organizations to provide childcare (National

Sleep Foundation, n.d-a). Furthermore, another school district had tackled this concern by

starting school-based care programs before and after school to address the issue of

childcare, as well as having some of their schools work with groups in the community to

provide activities for students after school that would be low cost or free (Meltzer et al.,

2017).

The National Sleep Foundation (n.d.-a) mentions that the barrier of reduced time

to access public resources may not be an issue, as students tend to work more

resourcefully when they get an adequate amount of sleep, allowing them to use their time

more wisely. Another potential obstacle to changing school start times is the perceived

negative impact that it may have on teachers. However, the National Sleep Foundation (n.d.-a) offers the solution that teachers can keep their schedules unchanged by doing their planning before school, and note that delaying start times can also allow teachers to sleep longer, leading them to work more successfully in the classroom. Owens et al. (2014), also reported that school districts looking to create a start time change should also reflect on the opinions of teachers and staff when making these changes to do so in a way that can help them to better acclimate to the changes being made.

Changing school start times has also been seen to be potentially stressful for families, however the National Sleep Foundation (n.d-a) emphasizes the significance of giving families both time and resources to get ready for the start time change, and allowing them to communicate their concerns. In regards to the community not being informed of the rationale for a change being seen as a barrier, the National Sleep Foundation (n.d.-a) proposes that this challenge can be overcome by creating a presentation to share with the community to educate the members of the community who will be impacted by the start time change. Finally, in regard to students' resistance to start time change being a challenge, this can be overcome by teaching students about the positive effects delaying school start times will have on their well-being.

Similarly to these suggestions made by the National Sleep Foundation (n.d.-a) to help families, the community, and students adjust to the start time change, Owens et al. (2014), also provides some information on this aspect. They suggest that school districts making a start time change should provide the students, parents, teachers, and school nurses with information regarding sleep, allowing them time to express their concerns and answer any questions they may pose, and that schools should consider incorporating

sleep education into their curriculum. Additionally, informing other members of the community and organizations such as libraries, parks, and employers is important so that they are given time to become accustomed to this new change as well (Owens et al., 2014).

In sum, sleep difficulties including sleep disorders are frequently experienced by children and adolescents. Additionally, the use of technology and media has also been impeding the sleep received by youth. Sleep problems have been linked to difficulties with academic functioning, social/emotional functioning, and behavioral functioning. Early school start times lead to youth waking early in the morning, resulting in insufficient sleep, and therefore these students may experience various difficulties associated with lack of adequate sleep. This is particularly a problem amongst adolescents who experience pubertal changes in their circadian rhythms, such that they have a preference for staying up later and going to bed later while having to wake early for school. While there have been organizations and individuals advocating for later school start times, a majority of schools in the U.S. continue to start before the recommended time of 8:30 a.m. Having a greater understanding as to the serious implications waking up early with a lack of sleep may have on youth, it is critical for schools to recognize these harmful effects and to consider changing their start times for by doing so, they have the ability to reduce these negative impacts.

In this current study, the start times for schools across NYS were assessed. All school principals/CEOs within NYS were surveyed and asked about their individual schools' start time, as well as their professional opinions related to factors impacting school start time and school start time change. Additionally, other school variables

beyond those included in the survey were assessed from the NYS Education Department website. The overall goal of this study was to gain a better understanding of school start times across NYS to see the rationale behind these start times, the implications they may have for students, with the aim to encourage a policy for schools in NYS to delay their start times.

# Chapter 2

## Research Questions and Exploratory Analyses

**Research Questions**

To understand barriers as they relate to changing school start times, this research aimed to answer the following question.

1. Which factors are most highly endorsed by principals/CEOs as contributing to the reasoning behind their current school start time?

This research also aimed to better assess the start times of schools within NYS, and addressed a couple of questions related to school start times.

2a. Do a majority of schools within NYS begin their school day before 8:30 a.m.?

2b. Is there a significant difference between start times for different school types?

The results of this study were used to gain a better understanding of academic performance as it relates to school start times, and aimed to answer the following question.

3. Is there any link between school start times and NYS assessment results?

Furthermore, the work of this research was used to look at school start times in the context of suspension and attendance rates, by answering a couple of questions related to these areas.

4a. Is there an association between school start times and student suspension rates?

4b. Does a relationship exist between school start times and school attendance rates?

**Exploratory Analyses**

A series of exploratory analyses examined which factors are the greatest predictors of school start times, as well as if there were differences between school types and factor ratings. The exploratory analyses explored the most common bus pick up time and the most common school start time, as well as how many schools teach sleep hygiene. Additional analyses were conducted to assess the degree to which principals/CEOs have knowledge on sleep and sleep research, the degree to which principals/CEOs understand the reasoning behind their school start time, and to see if there were differences in economic status and high school graduation rates for various school start times. Furthermore, exploratory analyses discovered the degree to which school principals/CEOs agreed with the AASM position statement, the likelihood school principals/CEOs reported they would consider changing their start times, and the percentage of principals/CEOs who visited the webpage on the steps and procedures to implement a change in school start times.

## Chapter 3

## Methods

**Participants**

  The participants for this study consisted of the school principals/CEOs for all schools within NYS. Principals/CEOs across all grades (pre-school through high school) and school types (public, non-public, charter, BOCES) were offered the opportunity to participate in this study. The full list of all NYS schools and principals/CEOs was located from the NYS Education Department Reference database (http://eservices.nysed.gov/sedreports/list?id=1).

  The survey was distributed to 6,679 principals/CEOs as located from the NYS Education Department Reference database to those with an email contact. Unfortunately, a number of emails were unable to be delivered, and for those emails that had contact information for another individual in their stead, an attempt was made to contact that individual. Data from a total of 1,007 schools were used in this study, of which each had at least identified their school start time and had the school type based on grades entered. If the survey data was provided for an entire school district, data was entered for each of the schools comprising the district. For the schools that had multiple surveys completed, potentially as a result of the reminder survey email, the survey that was completed at a later date was deleted as to avoid duplicate data, unless the survey completed later had a much greater number of items (approximately double or more) completed.

**Procedure**

  All of the school principals/CEOs in NYS were emailed a consent form (Appendix A), and if they agreed to participate, they were then redirected to a survey

(Appendix B) with items regarding their school start times, including the rationale for their start times, and encouraged to understand the implications their school start times may have. Each principal/CEO filled out the items based on their specific school. Items the principals/CEOs completed on the survey included the name of their school, the grades taught at their school, the time of their first bus pick up, the time their academic school day begins and how long their school day has started at this time, when and what was their previous start time, if sleep hygiene is taught at their school and the extent of their knowledge on sleep and sleep research, and their understanding of their school start time in addition to the extent various factors contribute to their school start time.

After the principals/CEOs responded to these survey items asking about their specific schools, the AASM position statement on school start times was displayed, stressing that both middle school and high school start times should begin at 8:30 a.m. or later in order to allow adolescents to attain adequate sleep, and to increase student functioning and well-being. The principals/CEOs were then asked if they agreed with the AASM position statement, and if they would consider changing their school's start time. At the end of the survey, the principal/CEO participants were offered a link to a webpage they could visit providing them with steps and procedures they could use to help overcome any barriers or difficulties they may face when trying to implement start time change.

For those principals/CEOs who responded to the survey, if they provided the name of their school, they were searched for on the New York State Education Department (NYSED) website (https://data.nysed.gov) for additional variables to be assessed. If the schools were able to be found on the website page, the additional

variables that were assessed included the school's demographic information (total enrollment, percentage of males/females, percentage of different ethnic groups, percentage of students with disabilities, percentage of English Language Learners, percentage of economically disadvantaged students), state assessment data, student attendance rates, student suspension rates, and high school graduation rates.

When running analyses utilizing data provided on the NYSED webpage, only schools who reported having their start time since 2017-2018 (and 2016-2017 for suspension rate data) were included in the analysis, as this was the school year for which this data was provided on the webpage at time of data entry. Those coded with start time history being unknown were included in this analysis and were set to be under the assumption that they have had their start time for at least five school years (the mode of that survey item), as the researchers decided it was unlikely participants would respond unknown if the start time had just changed the year prior (or even two years prior for suspension rate data). If start time history was left blank, the school's data was not utilized in this analysis. Cases for each analysis were removed as necessary to allow appropriate Post Hoc tests to run.

In addition to analyzing the variables from the surveys completed by the principals/CEOs as well as the variables obtained from the NYSED website, the webpage providing the principal/CEO participants with information and guidelines on the procedures of implementing school start time change was tracked via Google Analytics. Tracking this webpage allowed for the assessment of the percentage of principals/CEOs who actually visited the page, taking the initiative to better understand how to implement a change in school start times.

**Chapter 4**

**Statistical Analyses**

To analyze the results of this study, various statistical analyses were performed to assess the outcomes of the proposed research questions and exploratory analyses. Descriptive statistics assessed the percentage of schools starting before 8:30 a.m., the percentage of schools teaching sleep hygiene, as well as the percentage of principals/CEOs who visited the webpage on the steps and procedures to implement school start time change. Additionally, descriptive statistics were carried out to determine the most common bus pick-up time and most common school start time for schools in New York. Descriptives were also run on several other survey items (school type, start time history, additional start time factors, entity responsible for start time change, rationale for disagreement with the AASM position statement) as well as on the variables pulled from the NYSED webpage (demographics, attendance rates, suspension rates, and graduation rates).

Furthermore, Chi Square Goodness of Fit Tests were run in addition to descriptive statistics on a number of variables of interest to gain a better understanding of the endorsements of each variable, as well as to assess if any significant differences existed in terms of the way in which responses were made on each item. Such analyses were run on the following survey items: principals/CEOs extent of knowledge on sleep and sleep research, the degree to which principals/CEOs reported to understand the reasoning behind their school start time, the likelihood school principals/CEOs rated they would consider changing their school start times, and the degree to which school principals/CEOs agreed with the AASM position statement.

Descriptive statistics were also run to assess which of the various factors contributing to school start times were most highly endorsed. Additionally, to assess which factors were the best predictors of school start times, a simultaneous regression was conducted for overall school start times, as well as separate regressions run to assess predictors for elementary schools, middle schools, and high schools. An analysis of variance (ANOVA) was conducted to determine if there were significant differences as to the factor ratings given by the principals/CEOs for the reasons contributing to their school start time as a function of school type.

Furthermore, an ANOVA assessed if there was a significant difference between the start times for different school types. ANOVAs were run to determine if there were significant differences between school types and their agreement with AASM position statement and their reported likelihood to change school start times. ANOVAs were also conducted to determine if there were any significant differences between different school start times and NYS assessment results, as well as if there were any relationships between school start times and student suspension and attendance rates. Finally, ANOVAs were also run to determine if there was a significant difference in the high school graduation rates and economic status of students for different school start times.

# Chapter 5

# Results

## Schools in this Study

Data from a total of 1,007 schools were used in this study, of which each had at least identified their school start time and had their school type based on grades entered. In total, there were 46 pre-school/kindergarten only schools (4.6%), 340 elementary schools (33.8%), 120 middle schools (11.9%), 169 high schools (16.8%), 186 combined elementary/middle schools (18.5%), 63 combined middle/high schools (6.3%), and 83 schools encompassing all grades, approximately K-12th (8.2%).

## Bus Pick-up Times

In terms of morning bus pick-up times, these times ranged from 5:00-5:30 a.m. up until 8:37-9:07 a.m. (see Table 1). For those schools that provided an actual bus pick-up time, the time provided most often (mode) was within the 6:33-7:03 a.m. timeframe (20.8%, $n = 206$). A total of 36.2% ($n = 359$) of participants reported their first bus pick-up time to be 7:03 a.m. or earlier. Additionally, some schools replied that their bus pick-up time was unknown, or provided the time their bus leaves the garage or had listed a time that appeared to be for afternoon bus pick-up times, while others noted it was not applicable, and for a few, noted that they only have buses for their special education students with hardly any of these schools providing a bus pick-up time for this specific student population (33.9%, $n = 335$).

Table 1
*Bus Pick-up Times*

| Pick-up time | Percent | Frequency |
|---|---|---|
| 5:00-5:30 a.m. | 0.8% | 8 |
| 5:31-6:01 a.m. | 2.0% | 20 |
| 6:02-6:32 a.m. | 12.6% | 125 |

| | | |
|---|---|---|
| 6:33-7:03 a.m. | 20.8% | 206 |
| 7:04-7:34 a.m. | 13.3% | 132 |
| 7:35-8:05 a.m. | 11.1% | 110 |
| 8:06-8:36 a.m. | 4.4% | 44 |
| 8:37-9:07 a.m. | 0.9% | 9 |
| Unknown/inaccurate/not applicable | 33.9% | 335 |

**Start Times and Start Time History**

Each school reported on the time in which their school day begins ranging from 6:45-7:05 a.m. to 9:12 a.m. or later (see Table 2). Overall, for those schools that provided a school start time, the time provided most often (mode) was within the 7:48-8:08 a.m. timeframe (30.2%, $n = 304$). A majority of schools reported beginning before 8:30 a.m. (64.3%, $n = 647$). Start times were also assessed in regard to each school type, see Table 2 for the full breakdown. Overall, in regard to each school type, a majority of middle schools (86.6%), high schools (79.9%), combined elementary/middle schools (74.7%), and combined middle/high schools (85.6%) reported having start times before 8:30 a.m. Nearly half of elementary schools (48.5%) and schools encompassing all grades, approximately K-12th (48.2%) reported start times prior to 8:30 a.m. In terms of preschool/kindergarten only schools, 21.8% reported start times before 8:30 a.m.

Table 2
*School Start Times*

| Overall school start times | Percent | Frequency |
|---|---|---|
| 6:45-7:05 a.m. | 0.3% | 3 |
| 7:06-7:26 a.m. | 2.5% | 25 |
| 7:27-7:47 a.m. | 11.4% | 115 |
| 7:48-8:08 a.m. | 30.2% | 304 |
| 8:09-8:29 a.m. | 19.9% | 200 |
| 8:30-8:50 a.m. | 19.8% | 199 |
| 8:51-9:11 a.m. | 10.2% | 103 |
| 9:12 a.m. or later | 2.7% | 27 |
| Multiple start times | 3.1% | 31 |

| Pre-school/kindergarten only school start times | Percent | Frequency |
|---|---|---|
| 6:45-7:05 a.m. | 0% | 0 |
| 7:06-7:26 a.m. | 0% | 0 |
| 7:27-7:47 a.m. | 0% | 0 |
| 7:48-8:08 a.m. | 10.9% | 5 |
| 8:09-8:29 a.m. | 10.9% | 5 |
| 8:30-8:50 a.m. | 43.5% | 20 |
| 8:51-9:11 a.m. | 17.4% | 8 |
| 9:12 a.m. or later | 8.7% | 4 |
| Multiple start times | 8.7% | 4 |
| Elementary school start times | Percent | Frequency |
| 6:45-7:05 a.m. | 0% | 0 |
| 7:06-7:26 a.m. | 0.6% | 2 |
| 7:27-7:47 a.m. | 3.5% | 12 |
| 7:48-8:08 a.m. | 26.2% | 89 |
| 8:09-8:29 a.m. | 18.2% | 62 |
| 8:30-8:50 a.m. | 25.6% | 87 |
| 8:51-9:11 a.m. | 19.7% | 67 |
| 9:12 a.m. or later | 5% | 17 |
| Multiple start times | 1.2% | 4 |
| Middle school start times | Percent | Frequency |
| 6:45-7:05 a.m. | 0% | 0 |
| 7:06-7:26 a.m. | 3.3% | 4 |
| 7:27-7:47 a.m. | 32.5% | 39 |
| 7:48-8:08 a.m. | 32.5% | 39 |
| 8:09-8:29 a.m. | 18.3% | 22 |
| 8:30-8:50 a.m. | 9.2% | 11 |
| 8:51-9:11 a.m. | 3.3% | 4 |
| 9:12 a.m. or later | 0% | 0 |
| Multiple start times | 0.8% | 1 |
| High school start times | Percent | Frequency |
| 6:45-7:05 a.m. | 1.8% | 3 |
| 7:06-7:26 a.m. | 8.9% | 15 |
| 7:27-7:47 a.m. | 20.1% | 34 |
| 7:48-8:08 a.m. | 28.4% | 48 |
| 8:09-8:29 a.m. | 20.7% | 35 |
| 8:30-8:50 a.m. | 11.8% | 20 |
| 8:51-9:11 a.m. | 4.7% | 8 |
| 9:12 a.m. or later | 1.8% | 3 |
| Multiple start times | 1.8% | 3 |
| Combined es/ms school start times | Percent | Frequency |
| 6:45-7:05 a.m. | 0% | 0 |
| 7:06-7:26 a.m. | 0% | 0 |

| | | |
|---|---|---|
| 7:27-7:47 a.m. | 7% | 13 |
| 7:48-8:08 a.m. | 39.2% | 73 |
| 8:09-8:29 a.m. | 28.5% | 53 |
| 8:30-8:50 a.m. | 19.4% | 36 |
| 8:51-9:11 a.m. | 2.2% | 4 |
| 9:12 a.m. or later | 0.5% | 1 |
| Multiple start times | 3.2% | 6 |
| Combined ms/hs school start times | Percent | Frequency |
| 6:45-7:05 a.m. | 0% | 0 |
| 7:06-7:26 a.m. | 6.3% | 4 |
| 7:27-7:47 a.m. | 19% | 12 |
| 7:48-8:08 a.m. | 46% | 29 |
| 8:09-8:29 a.m. | 14.3% | 9 |
| 8:30-8:50 a.m. | 9.5% | 6 |
| 8:51-9:11 a.m. | 1.6% | 1 |
| 9:12 a.m. or later | 0% | 0 |
| Multiple start times | 3.2% | 2 |
| All grades (K-12th) school start times | Percent | Frequency |
| 6:45-7:05 a.m. | 0% | 0 |
| 7:06-7:26 a.m. | 0% | 0 |
| 7:27-7:47 a.m. | 6% | 5 |
| 7:48-8:08 a.m. | 25.3% | 21 |
| 8:09-8:29 a.m. | 16.9% | 14 |
| 8:30-8:50 a.m. | 22.9% | 19 |
| 8:51-9:11 a.m. | 13.3% | 11 |
| 9:12 a.m. or later | 2.4% | 2 |
| Multiple start times | 13.3% | 11 |

School principals/CEOs were asked to report on how long their school day has started at the present time (see Table 3). A majority of schools reported having started at their current start time since 2013-2014 or prior, which was for at least the past five school years at the time in which the survey was administered (66.6%, $n = 665$). While a majority have started at their start time for at least several years, sixty-seven schools (6.7%) reported having only just started at their current start time that particular school year in which the survey was administered (2018-2019). However, follow-up analyses revealed that of those schools who reported just starting at their current start time that

school year, excluding those who did not report a previous start time or reported their

school was new or had multiple start times, only 23.2% had made a later start time

change.

Table 3
*School Start Time History*

| Year current start time began | Percent | Frequency |
|---|---|---|
| 2018-2019 | 6.7% | 67 |
| 2017-2018 | 3.5% | 35 |
| 2016-2017 | 3.4% | 34 |
| 2015-2016 | 5.0% | 50 |
| 2014-2015 | 3.5% | 35 |
| 2013-2014 or prior | 66.6% | 665 |
| Unknown | 11.3% | 113 |

**Understanding of School Start Time and Factors Contributing to Start Time**

School principals/CEOs were asked to report their agreement with the statement:

"I understand the reasoning behind my school's start time" (see Table 4). Overall, a

majority of school principals/CEOs reported agreeing or strongly agreeing with the

statement, indicating that they understand the reasoning behind their school's start time

(88.7%, $n = 817$), which is consistent with the Chi Square Goodness of Fit Test finding a

significant difference in the responses to this item, $X^2$ (3, $N = 921$) $= 713.96$, $p < .001$.

Table 4
*Understanding School Start Times*

| Degree of agreement with understanding start time | Percent | Frequency |
|---|---|---|
| Strongly disagree | 5.2% | 48 |
| Disagree | 6.1% | 56 |
| Agree | 59.2% | 545 |
| Strongly agree | 29.5% | 272 |

The respondents also rated various factors that may contribute to their school's

start time (see Table 5). A majority of participants reported that before school

programs/activities (71.1%, *n* = 631), after school programs/activities (39.7%, *n* = 355),

and parent work schedule (32.8%, *n* = 296) do not contribute at all to their start time. In

contrast, a majority of respondents rated bus schedule/transportation reasons (39.8%, *n* =

363) and consistency, that their school has started at this time for a while (33.9%, *n* =

305), to contribute very much to their start time. In terms of the mean ratings, consistency

(*M* = 3.42, *SD* = 1.49), followed closely by bus schedule/transportation reasons (*M* =

3.39, *SD* = 1.62) had the highest means out of all the presented start time factors.

Table 5
*Factors Contributing to School Start Times*

| Factor | Mean (*SD*) | Not at all % (*n*) | Only a little % (*n*) | To some extent % (*n*) | Rather much % (*n*) | Very much % (*n*) |
|---|---|---|---|---|---|---|
| Before school programs/activities | 1.63 (1.16) | 71.1% (631) | 10.1% (90) | 9.2% (82) | 3.7% (33) | 5.7% (51) |
| After school programs/activities | 2.62 (1.56) | 39.7% (355) | 10.0% (89) | 17.3% (155) | 14.3% (128) | 18.7% (167) |
| Bus schedule/transportation | 3.39 (1.62) | 23.5% (215) | 8.2% (75) | 13.4% (122) | 15.1% (138) | 39.8% (363) |
| Consistency | 3.42 (1.49) | 18.3% (165) | 9.2% (83) | 18.4% (166) | 20.2% (182) | 33.9% (305) |
| Parent work schedule | 2.67 (1.47) | 32.8% (296) | 14.6% (132) | 21.6% (195) | 14.4% (130) | 16.5% (149) |

Additionally, the participants had the option to fill in any additional factors they

believe may contribute to their school start time (see Table 6). A majority wrote in a

factor that already fell into one of the categories on the survey (32.6%, *n* = 211). In terms

of a newly listed factor, district/other schools in the district/shared buildings/other

districts'/schools' influence (11.4%, *n* = 74) had the greatest frequency, followed closely

by curriculum time/instructional schedule/length of day/extended

day/policies/regulations/mandates (11.1%, *n* = 72).

Table 6

*Additional Factors Contributing to Start Times*

| Additional factor | Percent | Frequency |
|---|---|---|
| None/not applicable/unknown | 14.1% | 91 |
| Factor already listed on survey | 32.6% | 211 |
| District/other schools in the district/shared buildings/other districts'/schools' influence | 11.4% | 74 |
| Curriculum time/instructional schedule/length of day/extended day/policies/regulations/mandates | 11.1% | 72 |
| Family related reasons (e.g., children in multiple schools, after school sibling care) | 4.0% | 26 |
| Teachers, teacher unions and contracts | 7.6% | 49 |
| Best time of day for students and sleep needs | 5.6% | 36 |
| Multiple factors | 3.2% | 21 |
| Other | 10.4% | 67 |

To predict school start times based on the presented factors contributing to school

start times, a simultaneous regression was performed (see Table 7). Schools with multiple

start times were removed from this analysis to allow for more accurate results. The

prediction model was statistically significant, $F_{(5, 831)} = 12.64$, $p < .001$ ($n = 837$), and

accounted for approximately 7.1% of the variance of school start times ($R^2 = .071$). Three

of the factors were found to be significant: after school programs/activities ($p < .001$),

consistency ($p = .01$), and parent work schedule ($p = .001$). Surprisingly, bus

schedule/transportation was not a predictor, however it should be noted that there was a

low correlation between school start times and transportation as there was a bi-modal

distribution in terms of the way in which the participants responded to this item, which

led to the non-significant finding. The semi-partial correlations revealed that after school

programs/activities accounted for 4.8% of the variance, consistency accounted for 0.8%

of the variance, and parent work schedule accounted for 1.3% of the variance of school

start times.

Table 7
*Simultaneous Regression of Factors Predicting Start Times*

| Model | B | Beta | t | Significance | Semi-partial correlation |
|---|---|---|---|---|---|
| Constant | 5.297 | | 32.684 | < .001* | |
| Before school programs/activities | .082 | .068 | 1.880 | .060 | .063 |
| After school programs/activities | -.215 | -.241 | -6.530 | < .001* | -.218 |
| Bus schedule/transportation | .002 | .002 | .051 | .960 | .002 |
| Consistency | .087 | .092 | 2.589 | .010* | .087 |
| Parent work schedule | -.115 | -.121 | -3.364 | .001* | -.113 |

*Note. * p < .05*

Furthermore, analyses were run to assess how the factors predicted school start

times as a function of school type. Additional regressions were conducted for the three

main school types, elementary schools, middle schools, and high schools, again with

those coded as having multiple start times removed from these analyses. In terms of

elementary schools, the model was significant, $F(5, 279) = 5.43$, $p < .001$ ($n = 285$) and

was found to account for 8.9% of the variance in school start times ($R^2 = .089$), with bus

schedule/transportation ($p = .001$) and parent work schedule ($p = .001$) being found as significant predictors. In regard to middle schools, the model was also significant, $F(5, 96) = 5.61$, $p < .001$ ($n = 102$), and accounted for 22.6% of the variance ($R^2 = .226$) with the before school programs/activities factor ($p = .008$) and bus schedule/transportation factor ($p = .003$) being found as significant predictors. For high schools, the model was again significant, $F(5, 137) = 4.56$, $p = .001$ ($n = 143$) and accounted for 14.3% of the variance in school start times ($R^2 = .143$) with two of the factors, after school programs/activities ($p = .015$) and bus schedule/transportation ($p = .002$) being found to significantly predict school start times.

The factor ratings were also compared by each school type, to assess for significant differences that may exist in regard to the way in which the different school types rated each factor as contributing to their start time. The ANOVA findings revealed a significant difference for after school programs/activities, $F(6, 887) = 16.29$, $p < .001$ ($n = 894$), consistency $F(6, 894) = 2.66$, $p = .015$ ($n = 901$), and parent work schedule, $F(6, 895) = 6.63$, $p < .001$ ($n = 902$) as a function of school type.

The Test of Homogeneity of Variances was significant for the after school programs/activities factor, and therefore the Dunnett T3 Post Hoc Test was used. The results of the Post Hoc test revealed a number of significant differences between different school types in how they rated the degree to which after school programs/activities contribute to their start time. Overall, primarily schools containing older grades rated after school programs/activities to be a greater contributor to their start time than schools of younger grades (see Table 8).

Table 8

*Differences in After School Programs/Activities Factor Ratings by School Type*

| School type comparison | Mean difference | Significance |
|---|---|---|
| Pre-school/kindergarten only – elementary | -1.076* | < .001 |
| Pre-school/kindergarten only – middle | -1.821* | < .001 |
| Pre-school/kindergarten only – high | -1.774* | < .001 |
| Pre-school/ kindergarten only – combined es/ms | -.804* | < .001 |
| Pre-school/ kindergarten only – combined ms/hs | -1.981* | < .001 |
| Pre-school/ kindergarten only – all grades (K-12th) | -1.086* | < .001 |
| Elementary – middle | -.745* | < .001 |
| Elementary – high | -.699* | < .001 |
| Elementary – combined es/ms | .271 | .751 |
| Elementary – combined ms/hs | -.905* | .001 |
| Elementary – all grades (K-12th) | -.010 | 1.000 |
| Middle – high | .046 | 1.000 |
| Middle – combined es/ms | 1.017* | < .001 |
| Middle – combined ms/hs | -.160 | 1.000 |
| Middle – all grades (K-12th) | .735* | .032 |
| High – combined es/ms | .970* | < .001 |
| High – combined ms/hs | -.207 | 1.000 |
| High – all grades (K-12th) | .689* | .036 |
| Combined es/ms – combined ms/hs | -1.177* | < .001 |
| Combined es/ms – all grades (K-12th) | -.281 | .984 |
| Combined ms/hs – all grades (K-12th) | .895* | .015 |

*Note.* * $p < .05$

In determining if there were differences in terms of the consistency factor ratings as a function of school type, the Test of Homogeneity of Variances was not significant, and thus the Bonferroni Post Hoc Test was utilized. However, there were no significant differences between school types revealed with this Post Hoc analysis.

Parent work schedule as a factor for school start times was examined for differences in ratings as a function of school type. The Test of Homogeneity of Variances was not significant for parent work schedule and thus the Bonferroni Post Hoc Test was used. The Post Hoc Test revealed some significant differences between school types in how they rated parent work schedule to contribute to their start times, with combined elementary/middle schools rating it to be more of contributing factor as compared to elementary schools ($p = .023$), middle schools ($p = .006$), high schools ($p < .001$), combined middle/high schools ($p = .004$), and schools across all grades ($p = .001$).

**Webpage on Steps and Procedures for Start Time Change**

At the end of the survey, the school principals/CEOs were provided with the link to a webpage offering them the opportunity to learn more information on the steps/procedures for changing school start times to increase their knowledge, as well as to potentially inform and educate their district to overcome barriers that may impede school start time change. As assessed via Google Analytics approximately five months after the survey was dispersed to the principals/CEOs, there were only about 70 visits to the webpage, accounting for only approximately 7% of the respondents.

**Perceived Knowledge on Sleep and Sleep Hygiene School Instruction**

The school principals/CEOs reported on the knowledge they believe they have on sleep and sleep research as early school start times may lead to a lack of sleep for students (see Table 9). Overall, most principals/CEOs indicated that they believe they have either little or no knowledge on sleep and sleep research (59.8%, $n = 551$), which is in accordance with the finding of the Chi Square Goodness of Fit Test, that there was a

significant difference in the principal/CEO reported knowledge on sleep and sleep research $X^2$ (3, $N = 921$) = 463.12, $p < .001$.

Table 9
*Principal/CEO Perceived Knowledge on Sleep and Sleep Research*

| Degree of knowledge | Percent | Frequency |
|---|---|---|
| No knowledge | 10.3% | 95 |
| A little knowledge | 49.5% | 456 |
| A fair amount of knowledge | 34.1% | 314 |
| A lot of knowledge | 6.1% | 56 |

Principals/CEOs also reported on whether or not sleep hygiene is taught in their schools. Two hundred ninety-four (29.5%) principals/CEOs responded that sleep hygiene is taught in their schools, while a vast majority, 702 (70.5%) principals/CEOs reported that sleep hygiene is not taught in their schools.

**Decision to Change Start Times**

Participants were asked to rate the likelihood that they would change their school start time if the decision were up to them (see Table 10). The findings of this survey item indicated that 56.7% ($n = 521$) of the participants would not be likely or would be very unlikely to change their school start time if the decision were up to them, which aligns with the results of the Chi Square Goodness of Fit Test which found a significant difference in the responses made by the participants in terms of their likelihood to make a school start time, $X^2$ (3, $N = 919$) = 81.14, $p < .001$.

Likelihood of changing school start times was also assessed in regard to each school type (see Table 10). Approximately half of elementary schools (47.9%), middle schools (49.6%), and high schools (49%) reported being very likely or likely to change their start time. Over half of combined middle/high schools (57.4%) reported being likely

or very likely to change their start time. In terms of the other school types, responses of

being very likely or likely to change their school start time were in the minority:

preschool/kindergarten only (16.3%), combined elementary/middle schools (33.3%),

schools encompassing all grades, approximately K-12th (30.2%).

Table 10
*Decision to Change School Start Times*

| Overall degree of likelihood to change start time | Percent | Frequency |
|---|---|---|
| Very likely | 19.8% | 182 |
| Likely | 23.5% | 216 |
| Not likely | 37.5% | 345 |
| Very unlikely | 19.2% | 176 |
| Pre-school/kindergarten only degree of likelihood to change start time | Percent | Frequency |
| Very likely | 4.7% | 2 |
| Likely | 11.6% | 5 |
| Not likely | 62.8% | 27 |
| Very unlikely | 20.9% | 9 |
| Elementary school degree of likelihood to change start time | Percent | Frequency |
| Very likely | 21.7% | 67 |
| Likely | 26.2% | 81 |
| Not likely | 36.2% | 112 |
| Very unlikely | 15.9% | 49 |
| Middle school degree of likelihood to change start time | Percent | Frequency |
| Very likely | 25.7% | 29 |
| Likely | 23.9% | 27 |
| Not likely | 39.8% | 45 |
| Very unlikely | 10.6% | 12 |
| High school degree of likelihood to change start time | Percent | Frequency |
| Very likely | 29.5% | 44 |
| Likely | 19.5% | 29 |
| Not likely | 29.5% | 44 |
| Very unlikely | 21.5% | 32 |

| Combined es/ms degree of likelihood to change start time | Percent | Frequency |
|---|---|---|
| Very likely | 11.9% | 20 |
| Likely | 21.4% | 36 |
| Not likely | 38.1% | 64 |
| Very unlikely | 28.6% | 48 |
| Combined ms/hs degree of likelihood to change start time | Percent | Frequency |
| Very likely | 19.7% | 12 |
| Likely | 37.7% | 23 |
| Not likely | 32.8% | 20 |
| Very unlikely | 9.8% | 6 |
| All grades (K-12$^{th}$) schools degree of likelihood to change start time | Percent | Frequency |
| Very likely | 10.5% | 8 |
| Likely | 19.7% | 15 |
| Not likely | 43.4% | 33 |
| Very unlikely | 26.3% | 20 |

An ANOVA was conducted to assess for significant differences between school types and likelihood to change start times. There were 919 schools included in this analysis. The ANOVA revealed a significant finding $F(6, 912) = 6.92$, $p < .001$. The Test of Homogeneity of Variances was significant, and thus Post Hoc Tests using Dunnett T3 were carried out. The results of the Post Hoc Tests found various significant differences between the likelihood of changing school start times for different school types. Overall, elementary schools, middle schools, combined middle/high schools, and high schools were found to be more likely to change their start times compared to pre-school/kindergarten only schools ($p = .001$, $p < .001$, $p = .001$, and $p = .003$, respectively), as well as more likely than combined elementary/middle schools ($p = .002$, $p = .002$, $p = .008$, and $p = .017$, respectively), and besides high schools, these school

types were also found to be more likely to change their start times compared to schools

across all grades, approximately K-12$^{th}$ ($p$ = .032, $p$ = .011, and $p$ = .023, respectively).

The survey also assessed who would be responsible for setting a policy change for

school start times with the options of principal, superintendent, board of education,

and/or other (see Table 11). Overall, a majority of participants reported that a policy

change in their school start time would be the responsibility of the principal (22%, $n$ =

202).

Table 11
*Entity Responsible for School Start Time Policy Change*

| Entity responsible | Percent | Frequency |
|---|---|---|
| Principal | 22.0% | 202 |
| Superintendent | 7.4% | 68 |
| Board of education | 11.4% | 105 |
| Other | 10.1% | 93 |
| Principal and superintendent | 4.7% | 43 |
| Principal and board of education | 1.5% | 14 |
| Superintendent and board of education | 18.1% | 166 |
| Principal, superintendent, and board of education | 7.8% | 72 |
| Other and (principal and/or superintendent and/or board of education | 16.9% | 155 |

For those who selected 'Other,' whether they selected simply this response or if it

was selected along with any other options listed, they were able to fill in a response for

'Other' to indicate who else they believed to be responsible for a start time change (see

Table 12). A majority (20.3%, $n = 47$) filled in a specific person to be responsible such as

founder of school/director/president.

Table 12
*Other Entity Entered as Responsible for Start Time Change*

| Other entity | Percent | Frequency |
|---|---|---|
| Other specific person in charge (e.g., founder of school/director/president) | 20.3% | 47 |
| Entity already listed on survey | 1.3% | 3 |
| Staff/faculty/teachers/UFT | 14.3% | 33 |
| Parents/families/community/stakeholders | 15.6% | 36 |
| Group of authority (e.g., board of directors) | 14.7% | 34 |
| Transportation company/public school district/county | 12.6% | 29 |
| Multiple entities | 10.0% | 23 |
| Other | 11.3% | 26 |

**Position Statement Agreement**

After being presented with the AASM position statement advocating for later start

times for middle schools and high schools, the participants were asked to what degree

they were in agreement with this policy (see Table 13). The results clearly indicated that

the majority of participants agreed or strongly agreed with the position statement (85.8%,

$n = 786$). This is consistent with the Chi Square Goodness of Fit result finding a

significant difference in the way in which participants responded to this item in terms of

their agreement with the AASM position statement $X^2$ (3, $N = 916$) = 585.34, $p < .001$.

Agreement with the position statement was also assessed in regard to each school

type (see Table 13). A majority of pre-school/kindergarten only schools (92.8%),

elementary schools (88.8%), middle schools (82.1%), high schools (79.9%), combined

elementary/middle schools (84.8%), combined middle/high schools (88.5%), and schools

encompassing all grades, approximately K-12th (86.7%) responded that they either agreed

or strongly agreed with the position statement advocating for later middle and high

school start times. An ANOVA was also carried out to assess if there were any significant

differences between school types in terms of their agreement with the AASM position

statement. There were 916 schools in this analysis. However, the ANOVA was found to

be insignificant, $F(6, 909) = 1.27, p = .27$.

Table 13
*Agreement with American Academy of Sleep Medicine Position Statement*

| Overall degree of agreement with position statement | Percent | Frequency |
|---|---|---|
| Strongly disagree | 6.9% | 63 |
| Disagree | 7.3% | 67 |
| Agree | 55.5% | 508 |
| Strongly agree | 30.3% | 278 |
| Pre-school/kindergarten only degree of agreement with position statement | Percent | Frequency |
| Strongly disagree | 0% | 0 |
| Disagree | 7.1% | 3 |
| Agree | 57.1% | 24 |
| Strongly agree | 35.7% | 15 |
| Elementary school degree of agreement with position statement | Percent | Frequency |
| Strongly disagree | 7.1% | 22 |
| Disagree | 4.2% | 13 |
| Agree | 56.4% | 176 |
| Strongly agree | 32.4% | 101 |
| Middle school | Percent | Frequency |

| degree of agreement with position statement | | |
|---|---|---|
| Strongly disagree | 7.1% | 8 |
| Disagree | 10.7% | 12 |
| Agree | 59.8% | 67 |
| Strongly agree | 22.3% | 25 |
| High school degree of agreement with position statement | Percent | Frequency |
| Strongly disagree | 8.1% | 12 |
| Disagree | 12.1% | 18 |
| Agree | 44.3% | 66 |
| Strongly agree | 35.6% | 53 |
| Combined es/ms degree of agreement with position statement | Percent | Frequency |
| Strongly disagree | 6.7% | 11 |
| Disagree | 8.5% | 14 |
| Agree | 60.0% | 99 |
| Strongly agree | 24.8% | 41 |
| Combined ms/hs degree of agreement with position statement | Percent | Frequency |
| Strongly disagree | 3.3% | 2 |
| Disagree | 8.2% | 5 |
| Agree | 57.4% | 35 |
| Strongly agree | 31.1% | 19 |
| All grades (K-12th) schools degree of agreement with position statement | Percent | Frequency |
| Strongly disagree | 10.7% | 8 |
| Disagree | 2.7% | 2 |
| Agree | 54.7% | 41 |
| Strongly agree | 32.0% | 24 |

For those who selected that they disagreed or strongly disagreed with the position statement ($n = 134$), they were presented with an opportunity to report on why they disagreed. Forty-six (34.3%) participants reported that they accidentally clicked the wrong button and in fact were in agreement with position statement or had written a response that sounded as though they were in agreement with the position statement, even

if they did not clearly state an error occurred. Only for those participants who clearly

articulated that their response to the previous item was incorrect, had their response

changed to the agreement version of the answer choice they selected. Additionally, 21

(15.7%) participants responded in an unclear manner or noted that it was because they

work with younger grades, seven (5.2%) reported they disagreed because of the time

needed for the school schedule/activities and issues for working parents, siblings, and

daycare needs.

Furthermore, 21 (15.7%) stated that they disagreed with the position statement

because children should be going to bed earlier and/or if the start time is later, students

will go to sleep later, as well as identifying screens and electronics as factors keeping

students up late at night. Eight (6.0%) participants noted that a change in start time will

create no differences in lateness, absences, or performance, three (2.2%) reported being

unfamiliar with the research, eight (6.0%) noted multiple reasons, and 20 (14.9%) were

classified as 'Other' as they did not fall into any of these categories.

**Differences between Start Times by School Type**

Analyses were conducted to assess for any significant differences in school start

times across the different school types. Schools coded as having multiple start times were

removed from this analysis to allow for a more valid assessment. There were a total of

976 schools included in this analysis. In assessing significant differences between school

start times by school type, the ANOVA revealed a significant difference, $F(6, 969) =$

39.41, $p < .001$. The Test of Homogeneity of Variances was significant, and thus Post

Hoc Tests using Dunnett T3 were carried out. The results of the Post Hoc Tests found

various significant differences between the start times for different school types (see

Table 14). Overall schools with younger grades were found to start later than schools

encompassing older grades.

Table 14
*Differences in Start Times by School Type*

| School type comparison | Mean difference | Significance |
|---|---|---|
| Pre-school/kindergarten only – elementary | .568 | .060 |
| Pre-school/kindergarten only – middle | 1.948* | < .001 |
| Pre-school/kindergarten only – high | 1.795* | < .001 |
| Pre-school/kindergarten only – combined es/ms | 1.313* | < .001 |
| Pre-school/kindergarten only – combined ms/hs | 1.958* | < .001 |
| Pre-school/kindergarten only – all grades (K-12th) | .802* | .013 |
| Elementary – middle | 1.380* | < .001 |
| Elementary – high | 1.226* | < .001 |
| Elementary – combined es/ms | .744* | < .001 |
| Elementary – combined ms/hs | 1.390* | < .001 |
| Elementary – all grades (K-12th) | .233 | .974 |
| Middle – high | -.153 | 1.000 |
| Middle – combined es/ms | -.635* | < .001 |
| Middle – combined ms/hs | .010 | 1.000 |
| Middle – all grades (K-12th) | -1.147* | < .001 |
| High – combined es/ms | -.482* | .008 |
| High – combined ms/hs | .163 | 1.000 |
| High – all grades (K-12th) | -.993* | < .001 |
| Combined es/ms – combined ms/hs | .646* | .002 |
| Combined es/ms – all grades (K-12th) | -.511 | .062 |
| Combined ms/hs – all grades (K-12th) | -1.157* | < .001 |

*Note.* * $p < .05$

**Start Times and Assessment Data**

Analyses were conducted to assess if there were any significant differences for schools start times in terms of ELA and Math assessment results, looking at those who received proficient scores on the assessments (Levels 3 and 4). ANOVA findings revealed a significant difference for 5th grade ELA, $F(5, 185) = 3.51$, $p = .005$ ($n = 191$), 3rd grade Math $F(5, 198) = 2.43$, $p = .036$ ($n = 204$), and 5th grade Math $F(5, 185) = 3.57$, $p = .004$ ($n = 191$) assessment results. The Test of Homogeneity of Variances was significant for 5th grade ELA and thus the Dunnett T3 Post Hoc Test was used, whereas the Test of Homogeneity of Variances was not significant for 3rd grade Math and 5th grade Math, and Bonferroni Post Hoc Tests were used. In terms of the 5th grade ELA assessment and 3rd grade Math assessment, Post Hoc Tests revealed no significant findings. In regards of the 5th grade Math assessment, significant findings were revealed such that students with start times between 7:48-8:08 a.m. had lower assessment results than those starting at 9:12 a.m. or later ($p = .046$). No other grades were found to have any significant differences in their assessment results in terms of school start times.

Analyses were also conducted to assess for any significant differences for schools start times in terms of Regent exam proficiency scores (Levels 3 and Above). ANOVA findings revealed a significant difference for the English Regent exam, $F(6, 105) = 2.78$, $p = .015$ ($n = 112$), as well as the Algebra I Regent exam, $F(6, 179) = 5.61$, $p < .001$ ($n = 186$). The Test of Homogeneity of Variances was significant for both Regents exams, and therefore Dunnett T3 Post Hoc Tests were run. Post Hoc Tests revealed no significant differences for the English Regent exam, however there was a significant difference

found for the Algebra I Regent, with students at start times between 7:06-7:26 a.m. scoring significantly lower than those with a start time of 7:27-7:47 a.m. ($p = .025$).

**Start Times and Attendance and Suspension Rates**

An ANOVA was conducted to see if there was any relationship between school start times and student attendance rates. There were a total of 401 schools included in this analysis. The ANOVA revealed no significant findings, $F(6, 394) = 2.09$, $p = .054$.

Analyses were also carried out to assess if there was any association between school start times and suspension rates. There were a total of 390 schools included in this analysis. The ANOVA revealed a significant difference between school start times and student suspension rates, $F(6, 383) = 3.98$, $p = .001$. The Test of Homogeneity of Variances was significant, and therefore Post Hoc Tests were carried out using Dunnett T3. The Post Hoc Test revealed that schools starting between 7:27-7:47 a.m. had significantly higher suspension rates then schools starting at 8:51-9:11 a.m. ($p = .014$).

**Start Times and High School Graduation Rates**

An ANOVA was conducted to assess if there was any relationship between school start times and high school graduation rates. For this analysis, only those schools coded purely as high schools were included. In total 63 schools were part of this analysis. The ANOVA revealed an overall significant finding, $F(5, 57) = 7.69$, $p < .001$. The Test of Homogeneity of Variances was significant, and thus a Dunnett T3 Post Hoc Test was used, however there were no significant Post Hoc findings in terms of school start times in terms of high school graduation rates.

**Start Times and Economically Disadvantaged Students**

Percentage of economically disadvantaged students was also assessed in relation to school start times. There were a total of 400 schools included in this analysis. The ANOVA carried out revealed a significant difference between school start times and percentage of economically disadvantaged students, $F(6, 393) = 6.71$, $p < .001$. The Test of Homogeneity of Variances was significant; therefore, a Dunnett T3 Post Hoc Test was run. The Post Hoc Test concluded that schools starting at 7:27-7:47 a.m. had significantly fewer economically disadvantaged students than schools starting at 7:48-8:08 a.m. ($p <$ .001) and schools starting at 8:09-8:29 a.m. ($p = .002$). Schools starting between 7:48-8:08 a.m. were found to have significantly higher percentages of economically disadvantaged students than those schools starting between 8:30-8:50 a.m. ($p = .014$) and schools starting at 8:51-9:11 a.m. ($p = .001$). Lastly, schools starting between 8:09-8:29 a.m. had significantly higher percentages of economically disadvantaged students than schools starting between 8:51-9:11 a.m. ($p = .004$).

**Overall School Demographics, Attendance, Suspension, and Graduation Rates**

For schools that were able to be located on the NYSED webpage, some demographic variables were assessed. Overall, for those schools located, the data that was on the NYSED webpage at time of data entry was from the 2017-2018 school year, (and 2016-2017 in terms of suspension rates) and was averaged across all of the schools. See Table 15 for the presented findings including all cases in which data was located and provided on the NYSED webpage, without the removal of any cases as had been done previously for some of the other analyses.

Table 15

*Overall School Demographics, Attendance, Suspension, and Graduation Rates NYSED Webpage Data*

| Webpage variable | Mean (*SD*) | Frequency |
|---|---|---|
| Total enrollment | 548.5 (363.3) | 445 |
| Males | 51.2% (6.0) | 445 |
| Females | 48.8% (6.0) | 445 |
| Ethnicity- American Indian or Alaskan Native | .8% (1.8) | 281 |
| Ethnicity- Black or African American | 15.6% (22.7) | 427 |
| Ethnicity- Hispanic or Latino | 20.1% (21.4) | 442 |
| Ethnicity- Asian or Native Hawaiian/Other Pacific Islander | 6.7% (11.3) | 410 |
| Ethnicity- White | 56.1% (35.3) | 442 |
| Ethnicity- Multiracial | 2.9% (2.7) | 415 |
| English language learners | 9.6% (9.9) | 285 |
| Students with disabilities | 17.4% (10.1) | 439 |
| Economically disadvantaged | 52.6% (26.9) | 437 |
| Student attendance rate | 94.0% (3.6) | 439 |
| Student suspension rate | 2.8% (4.2) | 443 |
| High school graduation rate | 85.1% (21.1) | 74 |

**Summary of Findings**

Overall, the results of this study found interesting findings regarding school start times for schools across NYS. All of the presented research questions were addressed. See Table 16 for an overview of the findings for each research question.

Table 16

*Overview of Research Question Findings*

| Research Question | Brief Overview of Finding |
|---|---|
| 1. Which factors are most highly endorsed by principals/CEOs as contributing to the reasoning behind their current school start time? | The most highly endorsed factors (based upon mean response) were rated to be consistency, that their school has started at that time for a while, followed by bus schedule/transportation reasons. |
| 2a. Do a majority of schools within NYS begin their school day before 8:30 a.m.? | Overall, a majority of schools reported starting prior to 8:30 a.m. |

| | |
|---|---|
| 2b. Is there a significant difference between start times for different school types? | Overall, schools with younger grades were found to start later than schools encompassing older grades. |
| 3. Is there any link between school start times and NYS assessment results? | Some overall significant differences were found, however upon more specific analyses comparing the assessment results between each start time, only the 5th grade Math assessment and Algebra I Regent exam had significant findings, indicating that students starting school earlier scored lower than those students attending schools with later start times. |
| 4a. Is there an association between school start times and student suspension rates? | In terms of school start times and student suspension rates, there was a significant finding for which schools of an earlier start time had significantly higher suspension rates than those schools with a later start time. |
| 4b. Does a relationship exist between school start times and school attendance rates? | For this present study, no relationship was found between school start times and student attendance rates. |

**Chapter 6**

**Discussion**

This discussion section will be broken down as follows. A brief overview of the data collection procedures will be presented. Next, the proposed research questions will be addressed in terms of each of their findings as well as any relevant links to research in the literature. There will then be a similar following for the exploratory analyses which will also be discussed in terms of their findings, and relevant links to the literature. A discussion of the limitations for this particular study will then take place, followed by implications for future research.

Participants included in this study consisted of the school principals/CEOs for schools in NYS across all grades (pre-school through high school) and all school types. All of the principals/CEOs were emailed a survey link including various questions about school start times. There were a total of 1,007 survey responses utilized in this study, for which each had at least identified their school start time and had their school type based on grades entered. For those principals/CEOs who responded to the survey, if possible, additional data was obtained from the NYSED website.

This study found very interesting results to aid in the understanding of school start times for schools across NYS. Firstly, looking at the breakdown of the different school types included in this study, overall a majority were found to be elementary schools (33.8%) as compared to middle schools (11.9%) and high schools (16.8%). This is comparative to data found on the NYSED webpage on the education statistics for NYS for the 2018-2019 school year, which found that in terms of these school types, approximately 54.7% of schools were elementary, 11.4% were middle schools or junior-

high schools, and 16.7% were high schools, with overall approximately 15% of schools in NYS being accounted for in this study (New York State Education Department, 2019). This indicates that the schools used in this study were fairly representative of the distribution of schools and school types in NYS.

In terms of the first research question, understanding which factors are most highly endorsed by the principals/CEOs as contributing to the reasoning behind their school start time, the most highly endorsed factors (based upon mean response) were rated to be consistency, that their school had started at this time for a while, followed by bus schedule/transportation reasons. Transportation has been noted in the literature as being a barrier to start time change and has been regarded as being the most frequently referenced financial expense to start time change (American Academy of Pediatrics, 2014; Kirby et al., 2011). While transportation may be a bit more complex of a barrier to resolve, consistency, that their school has started at this time for a while, is not a very viable reason to remain at the same time. Consistency is not indicative that the start time is the most effective or beneficial start time for the students, but rather simply what has been accustomed to by students, teachers, and parents for being the same time for quite a while. Creating a start time change requires a deal of effort, especially on the part of school administrators, after a school has been consistently starting at the same time for a number of years. However, schools should be focused on finding ways in which they could improve the well-being of their students rather than simply sticking with the status quo.

While consistency and bus schedule/transportation reasons had the highest mean ratings, it would have been interesting to see how the participants would have ranked the

five start time factors they were presented with. By having the participants rank order the five factors, we would be able to more clearly see across all schools in NYS, and even within the specific school types, which factors the participants believe contribute the most to the least in terms of their school start times.

The second research question aimed at discovering if a majority of schools within NYS begin their school day prior to 8:30 a.m., as well as assessing for any significant differences in terms of start times between different school types. Overall, a majority of schools reported starting prior to 8:30 a.m. More specifically, a majority of middle schools, high schools, combined elementary/middle schools, and combined middle/high schools reported starting prior to 8:30 a.m., close to half of elementary schools and schools encompassing all grades, approximately K-12th had start times prior to 8:30 a.m., while pre-school/kindergarten only schools had a minority of their schools beginning before 8:30 a.m. This was consistent with findings in the literature, indicating that a majority of schools have start times before 8:30 a.m. (Center for Disease Control and Prevention, 2015).

In regard to significant differences between school types in relation to start times, overall, there appeared to be the pattern of schools containing older grades starting earlier compared to schools encompassing younger grades. This corroborates with previous research which noted many U.S. school districts start school earlier at points of academic transitions such as from elementary school to junior high school, and junior high school to high school (Wolfson & Carskadon, 1998). Results from the 2015-16 National Teacher and Principal Survey found that the average school start time for primary schools was 8:17 a.m., with middle schools and high schools starting even earlier, at an average of

8:04 a.m. and 7:59 a.m. respectively (Taie & Goldring, 2017). This may help to explain why the AASM position statement advocates for start times of 8:30 a.m. or later for middle schools and high schools, as research has shown that these age groups may be more impacted by earlier start times due to changes in their circadian rhythm leading to a later bedtime preference (Crowley et al., 2007; Lewin et al., 2017), and are the school types that most commonly have earlier start times.

The third research question intended to assess any link between school start times and assessment results, however no strong relationship was found in this study with only significant differences for 5th grade ELA assessment results, 3rd grade Math assessment results, 5th grade Math assessment results, English Regent exam results, and Algebra I Regent exam results found. Upon more specific analyses comparing the assessment results between each start time, only the 5th grade Math assessment and Algebra I Regent exam had significant findings, indicating students starting at earlier times scored lower than those students attending schools with later start times.

While these results are discrepant from previous studies which found a stronger overall link between earlier start times and weaker academic performance (Carrell et al., 2011; Dunster et al., 2018; Keller et al., 2015; Kelley et al., 2017; Lewin et al., 2017), it should be noted that this current study was looking at state wide assessments as an indicator of performance. If academic performance was looked at in the context of overall classroom academic performance, such as report card grades, the results may have differed. For those students taking the ELA and Math state assessments, students are allowed the opportunity to opt out of these exams. Therefore, it may be the case that those students who participated in taking the exams did not represent the full student

population. It is possible that those who opted to take the exam were those students who were performing exceptionally well. Additionally, in terms of the Regent exams, again looking at student performance on just these exams may not give the most accurate perception of student academic achievement. A few months prior to the exams, students may spend much additional time outside of school hours preparing specifically for these exams by working with tutors or using practice exam books to focus on the particular content of the exams, as they understand the importance of passing these tests. Thus, a more global picture of student performance in their school coursework, or even their overall performance in these particular subjects or classes would be a more telling indicator of their academic performance.

Additionally, it would have been interesting to look at the time in which these subjects are taught during the school day, specifically in relation to students' academic performance. This would be helpful to enable schools to have a better understanding of the best time of day to teach these subjects for their students' optimal learning and performance in school, and allow them to see if it is feasible to have these subjects taught to students at these most beneficial times of the school day.

The fourth research question looked at school start times in the context of student attendance and suspension rates to see if any relationship or association exists. For this present study, no relationship was found between school start times and student attendance rates, which is discrepant from previous studies which found that later school start times were associated with increased attendance rates (Dunster et al., 2018; McKeever & Clark, 2017). While this relationship was not found to be significant, the significance level was just on the border of being a significant finding. Additionally, it is

important to recognize that attendance rates do not take into account tardiness rates. There could perhaps be a great deal of latenesses amongst students with earlier start times, but if these students are eventually showing up to school, they may still be marked as in attendance. Tardiness, especially high levels or frequent tardiness, could be disruptive not only to the tardy student's learning, but by entering the classroom in the midst of a lesson, could impact the learning of other students as well. In terms of school start times and student suspension rates, there was a significant finding, with more specific analyses revealing that schools starting between 7:27-7:47 a.m. had significantly higher suspension rates than schools starting at 8:51-9:11 a.m. This finding, that schools at this earlier start time had higher suspension rates, corroborates with that of previous research (Keller et al., 2017).

There were also a series of exploratory analyses performed, which yielded interesting findings. One such analysis conducted further explored the start time factors the participants were presented with by comparing the factor ratings by school type. It was found that in terms of the after school programs/activities factor, overall, school types with older grades rated this factor as contributing more to their start time compared to schools with younger grades. This finding is logical as often the number of after school activities tends to increase as a student progresses through their school years, such as after school teams and clubs that are typically not as prevalent during the earlier school years. The National Household Education Survey Program of 2005 found that the percentage of students involved in after school activities increased from Kindergarten through 2nd grade, to 3rd through 5th grade, to 6th through 8th grade in terms of after school volunteer work or community service (7%, 16%, and 32% respectively), academic

activities such as tutoring and math lab (8%, 17%, and 21% respectively), and after school clubs (5%, 12%, 20% respectively) (Carver & Iruka, 2006).

An overall opposite finding was revealed for the parent work schedule factor, in which combined elementary/middle schools, besides rating parent work schedule as being more influential to their start time compared to elementary schools, had rated parent work schedule as contributing more greatly to their start time as compared to schools with older grades. This finding also seems rational for when students are younger, they require more reliance on their parents, and thus parental work schedule may cause more of an impact on start times during these earlier school years. While an overall difference was found for the consistency factor, no individual significant differences between school types were found, and no other factors were revealed to be significantly different based upon school type.

Another exploratory analysis examined which factors predicted school start times. All of the factors besides before school programs/activities and bus schedule/transportation reasons were found to be significant predictors of school start times. Interestingly, while the overall model did not find transportation to significantly predict school start times, when looking at each of the main school types (elementary schools, middle schools, and high schools), each had found that bus schedule/transportation reasons was a significant predictor. In addition to the bus schedule/transportation factor, elementary schools also found parent work schedule to be a significant predictor with high schools also finding after school programs/activities to be a significant predictor. This parallels with the trend of findings discussed in the paragraphs above, which found that parent work schedule was overall rated as

contributing more to school start times for younger grades and after school

programs/activities overall being rated as more influential to start times for older grades.

In terms of middle schools, in addition to bus schedule/transportation reasons, the before

school programs/activities factor was also a significant predictor, which was not one of

those factors found to be a significant predictor in the overall model.

Additionally, other exploratory analyses explored the degree to which

principals/CEOs reported understanding the reasoning behind their school start time.

Overall, a majority of school principals/CEOs indicated that they agreed or strongly

agreed that they understood the reasoning behind their school's start time. In terms of the

most common bus pick-up times and school start times, the most common bus pick-up

time was revealed to be within the 6:33-7:03 a.m. timeframe, with the timeframe of 7:48-

8:08 a.m. being the most common school start time. Therefore, while most schools are

starting at the early time of 7:48-8:08 a.m., this does not take into consideration the actual

time these students must be rising out of bed to get ready to first transport to school.

Those taking the bus most commonly need to be ready to head out the door by 6:33-7:03

a.m., yet some students may need to be ready to be picked up by bus as early as 5:00-5:30

a.m.

Exploratory analyses also assessed the teaching of sleep hygiene in schools as

well as principal/CEO knowledge of sleep and sleep research. Surprisingly, most

principals/CEOs reported having only a little knowledge on sleep and sleep research, and

a vast majority of schools do not teach sleep hygiene. Sleep can have profound impacts

on one's functioning, and it is something that occurs for every single student daily, yet

there is a lack of knowledge in this very critical area on the part of students and educators

alike. If principals/CEOs are unaware of the impacts sleep and school starts times have on their students' academic, behavioral, and emotional well-being, it may decrease their motivation to consider changing their start time.

Analyses were also conducted to explore for differences in students' economic status for various school start times. The findings of this analysis concluded that significant differences do exist between school start times and population of economically disadvantaged students. Overall, besides the 7:27-7:47 a.m. timeframe, schools that started earlier had a greater proportion of economically disadvantaged students compared to schools with later start times. This is important to be aware of because although it had been suggested that schools with a large, low socioeconomic population may not show better performance with later start times due to other risk factors (Keller et al., 2015), another study found that a delay in school start times led to higher student attendance and punctuality for the economically disadvantaged students (Dunster et al., 2018). Therefore, pushing back school start times for students who are economically disadvantaged may be particularly beneficial for as this current study found, these students tend to already have earlier start times.

In terms of the analysis exploring if there were any significant differences in high school graduation rates in relation to school start times, while an overall significant difference was found, follow-up analyses revealed no specific significant differences between school start times and high school graduation rates. However, aforementioned research in the literature had found a link between later school start times and increased graduation rates (McKeever & Clark, 2017).

Additional analyses that were set to be explored included the degree to which school principals/CEOs agreed with the AASM position statement and their reported likelihood of changing their start times. No significant findings between school types were found in terms of their agreement with the AASM position statement, however there were significant differences between school types and reported likelihood to change start times. Interestingly, while 85.8% agreed or strongly with the AASM position statement, less than half (43.3%) of the participants reported to be likely or very likely to change their start time. Perhaps the rationale to explain why a great number agreed with the statement but did not report being likely to change their start time could be due to the difficulties or barriers to changing school start times. To aid in the circumvention of this possibility and to help support schools that may be interested in changing their start times, there was a webpage link at the end of the survey with information on the steps/procedures for changing school start times such as how to overcome barriers that may impede start time change. However, disappointingly, only approximately 7% of the principals/CEOs chose to access this webpage link.

Furthermore, another disappointment was that of those schools who reported having started at their current start time beginning that academic school year in which the survey was administered (2018-2019), a majority had made a start time change in the negative direction, as they changed to an earlier start time. While most of the schools who had recently made a start time change had done so in the opposite direction, it is hopeful that these schools, as well as other schools in this study, may now have a different perspective or may have had their thoughts about school start times challenged

after completing this survey and responding to thought provoking questions regarding their start times, with an emphasis on the importance of later start times for students.

On a more positive note, while looking more extensively at the specific school types who reported being likely or very likely to change their start time, those with the three highest percentages were combined middle/high schools (57.4%), middle schools (49.6%), and high schools (49%). These were also the same school types with the greatest percentages of schools starting prior to 8:30 a.m. A majority of these school types (along with all of the other school types) also had reported to be in agreement with the AASM position statement advocating for later start times. It is promising to see that these school types that had the highest amount of schools starting prior to the recommended time of 8:30 a.m. or later, are those with the greatest reported likelihood to change their start times, hopefully to be more in alignment with the recommendations made by the AASM, as a majority were in agreement with this position statement.

**Limitations**

While this study aided in a better understanding of school start times for schools across NYS, there were some limitations. One such limitation was the lack of ability to contact some of the school principals/CEOs. More specifically, some of the emails sent to the email contacts for the principals/CEOs were unable to be delivered. Additionally, some of those who were sent the survey replied that their school was no longer open, that they were not a brick and mortar school, or that they were not in fact a principal/CEO, but rather a service provider. Furthermore, there were some school principals with an interim principal at the moment or contact information for who to reach out to in their absence. Therefore, while a contact attempt was made to these individuals, some of the

surveys may then have not been completed by the regular, permanent principal of the school who may have had a different knowledge-set about school start times. Moreover, for those that were completed by a CEO of an entire district, the data from the NYSED webpage was entered for each of the schools comprising the district, and the survey information was copied for each school. Thus, if the survey was completed by each individual school, the responses for each survey may have differed.

Furthermore, while overall the response rate was positive, there were some principals/CEOs who only responded to a few items on the survey. Unfortunately, when participants omitted certain survey items, it led to their exclusion from some of the analyses. Additionally, there may have been potential errors in the responses made by the principals, for on one survey item, which asked principals about their agreement with the AASM position statement, a number responded that they were in disagreement. However, when asked why they were in disagreement, they reported they made an error and meant to select that they were in agreement with the position statement. Therefore, while the responses for this specific item were able to be changed by the researcher after being made aware of the error, it is possible that there may have been errors on other items that were unable to be detected due to no follow up questions on the items. Another limitation in this study was that while there were some duplicate responses made, for which a rule was established to keep only one of the responses, for those participants who did not enter their school name, there was no way to distinguish if any of the responses were perhaps duplicates as well.

Furthermore, another limitation was in regard to entering the additional variables for each school from the NYSED webpage. This was a challenge as some

principals/CEOs did not enter their school name or their school was unable to be located on the NYSED webpage, and therefore the additional variables were unable to be pulled. For some of the schools, it was a bit unclear based off the name they had entered as to which school from the NYSED webpage was the correct match. The researcher attempted to do research to identify which appeared to be the best the match, and used her judgement to either enter the data, or did not enter the information if there was no way of telling which school was being referred to (e.g., same exact school name and same grade levels taught).

Another area of limitation was in terms of the data that needed to be coded for the analyses. The way in which some of the variables were to be coded was a bit ambiguous, and therefore the researcher used her best judgment in consultation with her faculty advisor when coding such variables when there was no clear cut manner in how to do so. Moreover, another limitation was that for some of the survey responses in which the school was located on the NYSED webpage, the grades on the webpage differed from that of the survey. In these cases, the school type was coded based upon the grades listed on the NYSED webpage, and the data, particularly assessment data, which was broken down into specific grades, was entered according to that of the NYSED webpage.

Another challenge in terms of the data was that the variables entered from the NYSED webpage were only included in the analyses of school start times in relation to the NYSED variable of interest if the school reported having their start time since 2017-2018 (and since 2016-2017 for the suspension rates analyses) or selected unknown. If start time history was left blank, the school's data was not utilized in these analyses, but fortunately there were only a minimal amount of schools for which this was the case. At

the time of data entry and subsequent analyses, that was the most recent school year data found on the NYSED webpage. However, this consequently meant that some schools were left out of the analyses if their current start time was not in effect during the year of the available webpage data at that time, such that their current start time was set the year in which the survey was distributed (2018-2019).

**Future Directions**

It would be beneficial to conduct this study on a broader scale, such as across various states in the U.S., to determine if there is a similar pattern of findings in regards to school start times, principals' opinions such as on factors contributing to their start time, agreement with the AASM position statement and likelihood to change start times, and the implications of school start times on students. It would also be interesting to assess the relation of school start times to student tardiness levels, which was a variable not included in this particular study, as well as time of day certain subjects are taught in schools in relation to student performance.

Additionally, it would be wonderful to not only assess the principals' opinions on school start times, as was done in this current study, but to also discover the student, parent, and educator perspective as well. For instance, it would be helpful to gauge how students, parents, and educators feel about their current school start time and their preference for a start time change. In addition to evaluating their opinions on this matter, it would be valuable to also assess students' social/emotional functioning, and to see how this compares to their school start time, as well as in relation to other variables in this study.

While barriers or difficulties to implementing a start time change may be preventing more schools from changing their start times, there have been schools that have been successful in making this change. If schools who have changed their start times could be partnered to collaborate with those who may be on the fence about making this change, to aid in guiding them through the process, perhaps this would help foster more start time change by having this added support. Additionally, it would be helpful to develop a greater emphasis on the importance of sleep, such as requiring a minimum amount of sleep hygiene instruction in schools to aid in the knowledge of students and educators, which could reinforce the crucial reason behind this push for start time change, to allow children and adolescents the opportunity for more sleep.

Overall, the advocation for later start times is to help students have the most successful experience in school in terms of their academic, social/emotional, and behavioral well-being. Therefore, by increasing student and staff education about the importance of sleep and understanding the impact start times have on students, it could help drive this change. By hearing from the students themselves, and assessing their social/emotional functioning, we would be able to more clearly see how school start time change could be beneficial for students' success. While there are certainly challenges to be overcome, the safety and well-being of students is the ultimate goal we should all be striving to achieve.

**Chapter 7**

**Implications for School Psychologists**

Understanding the patterns, rationale, and implications school start times have on students is critical to the professional practices of school psychology. A school psychologist's duty is to ensure the academic, social, emotional, and behavioral well-being of the student population they serve, all aspects of which are affected by school start times. As noted in the literature, school start times may have profound implications on students. While this study mainly addresses principal/CEO opinions on start times, there is a glimpse into some student related variables as well. However, in terms of this particular study, what perhaps may be of quite great importance in relation to school psychologists, is the lack of knowledge of sleep and sleep research on the part of students and the educators/administrators in schools. Lack of sleep can quite greatly exacerbate many of the areas school psychologists target and work on with their students. By helping eliminate lack of sleep by delaying start times, there could potentially be students who no longer require extra support in school, as the difficulties they may have been facing were due to sleep deficiency. Additionally, for those students with more severe needs in any of these domains (academic, social, emotional, behavioral), there could be a significant decrease in their level of impairment, and a better ability for these students to overcome the challenges they are facing.

Furthermore, by developing a greater understanding of barriers to start time change, school psychologists can work alongside those responsible for start time decision making to help educate and inform them on the significance of sleep on student functioning, and how start time change could have beneficial impacts. School

psychologists can be an additional support in helping to make this change by reaching out to parents, students, and the community in a collaborative effort to educate and bridge the gap between their thoughts and opinions and students' needs to be most successful in all realms of school- academically, socially, emotionally, and behaviorally.

**References**

Alfano, C. A., Zakem, A. H., Costa, N. M., Taylor, L. K., & Weems, C. F. (2009). Sleep problems and their relation to cognitive factors, anxiety, and depressive symptoms in children and adolescents. *Depression and Anxiety*, *26*(6), 503-512. https://doi.org/10.1002/da.20443

American Academy of Pediatrics (2014). School start times for adolescents. *Pediatrics, 134*, 642–649. https://doi.org/10.1542/peds.2014-1697

American Academy of Sleep Medicine (2018, September 4). Bill to delay school start times passes in California. https://aasm.org/bill-to-delay-school-start-times-passes-in-california/

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.

Aronen, E. T., Paavonen, E. J., Fjällberg, M., Soininen, M., & Törrönen, J. (2000). Sleep and psychiatric symptoms in school-age children. *Journal of the American Academy of Child and Adolescent Psychiatry*, *39*(4), 502-508. https://doi.org/10.1097/00004583-200004000-00020

Cain, N., & Gradisar, M. (2010). Electronic media use and sleep in school-aged children and adolescents: A review. *Sleep Medicine, 11,* 735-742. https://doi.org/10.1016/j.sleep.2010.02.006

Carrell, S. E., Maghakian, T., & West, J. E. (2011). A's from zzzz's? The causal effect of school start time on the academic achievement of adolescents. *American Economic Journal: Economic Policy, 3,* 62-81. https://doi.org/10.1257/pol.3.3.62

Carver, P.R., & Iruka, I.U. (2006). *National household education surveys program of 2005 after-school programs & activities: 2005.* National Center for Education Statistics. https://nces.ed.gov/pubs2006/2006076.pdf

Center for Disease Control and Prevention. (2015). *Results from the school health policies and practices study 2014* [PDF file]. https://www.cdc.gov/healthyyouth/data/shpps/pdf/shpps-508-final_101315.pdf

Crowley, S. J., Acebo, C., & Carskadon, M. A. (2007). Sleep, circadian rhythms, and delayed phase in adolescence. *Sleep Medicine*, *8*(6), 602-612. https://doi.org/10.1016/j.sleep.2006.12.002

Dagan, Y. (2002). Circadian rhythm sleep disorders (crsd). *Sleep Medicine Reviews, 6*(1), 45-55. https://doi.org/10.1053/smrv.2001.0190

Dewald, J. F., Meijer, A. M., Oort, F. J., Kerkhof, G. A., & Bögels, S. M. (2010). The influence of sleep quality, sleep duration and sleepiness on school performance in children and adolescents: A meta-analytic review. *Sleep Medicine Reviews*, *14*(3), 179-189. https://doi.org/10.1016/j.smrv.2009.10.004

Drake, C., Nickel, C., Burduvali, E., Roth, T., Jefferson, C., & Badia, P. (2003). The pediatric daytime sleepiness scale (pdss): Sleep habits and school outcomes in middle-school children. *Sleep: Journal of Sleep and Sleep Disorders Research*, *26*(4), 455-458.

Dunster, G. P., de la Iglesia, L., Ben-Hamo, M., Nave, C., Fleischer, J. G., Panda, S., & de la Iglesia, H. O. (2018). Sleepmore in seattle: Later school start times are associated with more sleep and better performance in high school students. *Science Advances, 4*(12), 1-7. https://doi.org/10.1126/sciadv.aau6200

Fallone, G., Acebo, C., Seifer, R., & Carskadon, M. A. (2005). Experimental restriction of sleep opportunity in children: Effects on teacher ratings. *Sleep*, *28*(12), 1561-1567. https://doi.org/10.1093/sleep/28.12.1561

Fuller, C., Lehman, E., Hicks, S., & Novick, M. B. (2017). Bedtime use of technology and associated sleep problems in children. *Global Pediatric Health, 4*, 1-8. https://doi.org/10.1177/2333794X17736972

Gangwisch, J. E., Babiss, L. A., Malaspina, D., Turner, J. B., Zammit, G. K., & Posner, K. (2010). Earlier parental set bedtimes as a protective factor against depression and suicidal ideation. *Sleep*, *33*(1), 97-106. https://doi.org/10.1093/sleep/33.1.97

Giannotti, F., Cortesi, F., Sebastiani, T., & Ottaviano, S. (2002). Circadian preference, sleep and daytime behaviour in adolescence. *Journal of Sleep Research*, *11*(3), 191-199. https://doi.org/10.1046/j.1365-2869.2002.00302.x

Hale, L., & Guan, S. (2015). Screen time and sleep among school-aged children and adolescents: A systematic literature review. *Sleep Medicine Reviews, 21,* 50-58. https://doi.org/10.1016/j.smrv.2014.07.007

Hildenbrand, A. K., Daly, B. P., Nicholls, E., Brooks-Holliday, S., & Kloss, J. D. (2013). Increased risk for school violence-related behaviors among adolescents with insufficient sleep. *The Journal of School Health*, *83*(6), 408-414. https://doi.org/10.1111/josh.12044

Hirshkowitz, M., Whiton, K., Albert, S. M., Alessi, C., Bruni, O., DonCarlos, L., Hazen, N., Herman, J., Adams Hillard, P. J., Katz, E. S., Kheirandish-Gozal, L., Neubauer, D. N., O'Donnell, A. E., Ohayon, M., Peever, J., Rawding, R., Sachdeva, R. C., Setters, B., Vitiello, M. V., & Ware, J. C. (2015). National sleep

foundation's updated sleep duration recommendations: Final report. *Sleep Health,*

*1*, 233-243. https://doi.org/10.1016/j.sleh.2015.10.004

Honaker, S. M., & Meltzer, L. J. (2016). Sleep in pediatric primary care: A review of the

literature. *Sleep Medicine Reviews, 25*, 31-30.

https://doi.org/10.1016/j.smrv.2015.01.004

Keller, P. S., Gilbert, L. R., Haak, E. A., Bi, S., & Smith, O. A. (2017). Earlier school

start times are associated with higher rates of behavioral problems in elementary

schools. *Sleep Health*, *3*(2), 113-118. https://doi.org/10.1016/j.sleh.2017.01.004

Keller, P. S., Smith, O. A., Gilbert, L. R., Bi, S., Haak, E. A., & Buckhalt, J. A. (2015).

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.

https://doi.org/10.1037/a0037195

Kelley, P., Lockley, S. W., Kelley, J., & Evans, M. R. (2017). Is 8:30 a.m. still too early

to start school? A 10:00 a.m. school start time improves health and performance

of students aged 13–16. *Frontiers in Human Neuroscience*, *11,* 588-597.

https://doi.org/10.3389/fnhum.2017.00588

Kim, S., Dueker, G., Hasher, L., & Goldstein, D. (2002). Children's time of day

preference: Age, gender and ethnic differences. *Personality and Individual*

*Differences, 33*(7), 1083-1090. https://doi.org/10.1016/S0191-8869(01)00214-8

Kirby, M., Maggi, S., & D'Angiulli, A. (2011). School start times and the sleep-wake

cycle of adolescents: A review and critical evaluation of available evidence.

*Educational Researcher, 40*(2), 56-56.

https://doi.org/10.3102/0013189X11402323

Knutson, K. L., & Lauderdale, D. S. (2009). Sociodemographic and behavioral predictors

of bed time and wake time among us adolescents aged 15 to 17 years. *The Journal*

*of Pediatrics, 154*(3), 426-430. https://doi.org/10.1016/j.jpeds.2008.08.035

Kopasz, M., Loessl, B., Hornyak, M., Riemann, D., Nissen, C., Piosczyk, H., &

Voderholzer, U. (2010). Sleep and memory in healthy children and adolescents —

a critical review. *Sleep Medicine Reviews*, *14*(3), 167-177.

https://doi.org/10.1016/j.smrv.2009.10.006

Kubiszewski, V., Fontaine, R., Potard, C., & Gimenes, G. (2014). Bullying, sleep/wake

patterns and subjective sleep disorders: Findings from a cross-sectional

survey. *Chronobiology International*, *31*(4), 542-553.

https://doi.org/10.3109/07420528.2013.877475

Lehto, J., & Uusitalo-Malmivaara, L. (2014). Sleep-related factors: Associations with

poor attention and depressive symptoms. *Child: Care, Health and*

*Development, 40*(3), 419-425. https://doi.org/10.1111/cch.12063

Lewin, D. S., Wang, G., Chen, Y. I., Skora, E., Hoehn, J., Baylor, A., & Wang, J. (2017).

Variable school start times and middle school student's sleep health and academic

performance. *Journal of Adolescent Health*, *61*(2), 205-211.

https://doi.org/10.1016/j.jadohealth.2017.02.017

Marcus, C. L, Brooks, L. J., Davidson Ward, S., Draper, K. A., Gozal, D., Halbower, A.

C., Jones, J., Lehmann, C., Schechter, M. S., Sheldon, S., Shiffman, R. N., &

Spruyt, K. (2012). Diagnosis and management of childhood obstructive sleep

apnea syndrome. *Pediatrics, 130*(3), 714-755. https://doi.org/10.1542/peds.2012-1672

Maski, K., & Owens, J. A. (2016). Insomnia, parasomnias, and narcolepsy in children: Clinical features, diagnosis, and management. *The Lancet Neurology,15*(11), 1170-1181. https://doi.org/10.1016/S1474-4422(16)30204-6

Matricciani, L., Blunden, S., Rigney, G., Williams, M. T., & Olds, T. S. (2013). Children's sleep needs: is there sufficient evidence to recommend optimal sleep for children? *Sleep*, *36*(4), 527–534. https:doi.org/10.5665/sleep.2538

McKeever, P. M., & Clark, L. (2017). Delayed high school start times later than 8:30am and impact on graduation rates and attendance rates. *Sleep Health*, *3*(2), 119-125. https://doi.org/10.1016/j.sleh.2017.01.002

McKnight-Eily, L. R., Eaton, D. K., Lowry, R., Croft, J. B., Presley-Cantrell, L., & Perry, G. S. (2011). Relationships between hours of sleep and health-risk behaviors in us adolescent students. *Preventive Medicine*, *53*, 271-273. https://doi.org/10.1016/j.ypmed.2011.06.020

Meltzer, L. J., Johnson, C., Crosette, J., Ramos, M., & Mindell, J. A. (2010). Prevalence of diagnosed sleep disorders in pediatric primary care practices. *Pediatrics, 125*(6), 1410-1418. https://doi.org/10.1542/peds.2009-2725

Meltzer, L. J., McNally, J., Plog, A. E., & Siegfried, S. A. (2017). Engaging the community in the process of changing school start times: Experience of the cherry creek school district. *Sleep Health, 3*, 472-478. https://doi.org/10.1016/j.sleh.2017.08.005

Mindell, J. A., & Owens, J. A. (2015). *A clinical guide to pediatric sleep: Diagnosis and management of sleep problems* (3ʳᵈ ed.). Philadelphia, PA: Wolters Kluwer.

Minges, K. E., & Redeker, N. S. (2016). Delayed school start times and adolescent sleep: A systematic review of the experimental evidence. *Sleep Medicine Reviews*, *28,* 86-95. https://doi.org/10.1016/j.smrv.2015.06.002

National Sleep Foundation. (n.d.-a). *Eight major obstacles to delaying school start times.* https://www.sleepfoundation.org/sleep-news/eight-major-obstacles-delaying-school-start-times

National Sleep Foundation. (n.d.-b). *National sleep foundation recommends new sleep times*. https://www.sleepfoundation.org/press-release/national-sleep-foundation-recommends-new-sleep-times

National Sleep Foundation. (2014). *2014 Sleep in america poll: Sleep in the modern family*. https://www.sleepfoundation.org/sleep-polls-data/sleep-in-america-poll/2014-sleep-and-family

New York State Education Department (2019, October 17). *Education statistics for new york state*. http://www.p12.nysed.gov/irs/statistics/public/

O'Brien, E. M., & Mindell, J. A. (2005). Sleep and risk-taking behavior in adolescents. *Behavioral Sleep Medicine, 3*(3), 113-133. https://doi.org/10.1207/s15402010bsm0303_1

Owens, J., Lewin, D., Drobnich, D., & Baylor, A. (2014, April 15). *School start time change: An in-depth examination of school districts in the united states* [PDF file]. Start school later.

https://www.startschoollater.net/uploads/9/7/9/6/9796500/blueprint-change-school-start-time-change-reportfinal4-14-14.pdf

Paavonen, E. J., Räikkönen, K., Lahti, J., Komsi, N., Heinonen, K., Pesonen, A., Järvenpää, A., Strandberg, T., Kajantie, E., & Porkka-Heiskanen, T. (2009). Short sleep duration and behavioral symptoms of attention-deficit/hyperactivity disorder in healthy 7- to 8-year-old children. *Pediatrics*, *123*(5), 857-864. https://doi.org/10.1542/peds.2008-2164

Paksarian, D., Rudolph, K. E., He, J., & Merikangas, K. R. (2015). School start time and adolescent sleep patterns: Results from the us national comorbidity survey--adolescent supplement. *American Journal of Public Health*, *105*(7), 1351-1357. https://doi.org/10.2105/AJPH.2015.302619

Perfect, M. M., Levine-Donnerstein, D., Archbold, K., Goodwin, J. L., & Quan, S. F. (2014). The contribution of sleep problems to academic and psychosocial functioning. *Psychology in the Schools*, *51*(3), 273-295. https://doi.org/10.1002/pits.21746

Perkinson-Gloor, N., Lemola, S., & Grob, A. (2013). Sleep duration, positive attitude toward life, and academic achievement: The role of daytime tiredness, behavioral persistence, and school start times. *Journal of Adolescence*, *36*(2), 311-318. https://doi.org/10.1016/j.adolescence.2012.11.008

Picchietti, D., Allen, R. P., Walters, A. S., Davidson, J. E., Myers, A., & Ferini-Strambi, L. (2007). Restless legs syndrome: Prevalence and impact in children and adolescents- the peds rest study. *Pediatrics, 120*(2), 253-266. https://doi.org/10.1542/peds.2006-2767

Picchietti, D. L., & Stevens, H. E. (2008). Early manifestations of restless legs syndrome in childhood and adolescence. *Sleep Medicine, 9,* 770-781. https://doi.org/10.1016/j.sleep.2007.08.012

Racker, M. (2018, September 20). California gov. jerry brown rejects bill to prohibit schools from starting before 8:30a.m. *Los Angeles Times*. https://www.latimes.com/politics/la-pol-ca-school-start-time-vetoed-20180921-story.html

Randazzo, A. C., Muehlbach, M. J., Schweitzer, P. K., & Walsh, J. K. (1998). Cognitive function following acute sleep restriction in children ages 10-14. *Sleep*, *21*(8), 861-868.

Roberts, R. E., Roberts, C. R., & Duong, H. T. (2008). Chronic insomnia and its negative consequences for health and functioning of adolescents: A 12-month prospective study. *Journal of Adolescent Health, 42*, 294-302. https://doi.org/10.1016/j.jadohealth.2007.09.016

Stores, G. (2009). Aspects of parasomnias in childhood and adolescence. *Archives of Disease in Childhood, 94*(1), 63-69. https://doi.org/10.1136/adc.2007.131631

Taie, S., & Goldring, R. (2017). *Characteristics of public elementary and secondary schools in the united states: Results from the 2015–16 national teacher and principal survey first look.* National Center for Education Statistics. https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2017071

Vriend, J. L., Davidson, F. D., Corkum, P. V., Rusak, B., McLaughlin, E. N., & Chambers, C. T. (2012). Sleep quantity and quality in relation to daytime

functioning in children. *Children's Health Care*, *41*(3), 204-222.

https://doi.org/10.1080/02739615.2012.685039

Wahlstrom, K. L., Berger, A. T., & Widome, R. (2017). Relationships between school

start time, sleep duration, and adolescent behaviors. *Sleep Health*, *3*(3), 216-221.

https://doi.org/10.1016/j.sleh.2017.03.002

Walker, M. P. (2009). The role of sleep in cognition and emotion. *Annals of The New*

*York Academy of Sciences*, *1156,* 168-197. https://doi.org/10.1111/j.1749-

6632.2009.04416.x

Watson, N. F., Martin, J. L., Wise, M. S., Carden, K. A., Kirsch, D. B., Kristo, D. A.,

Malhotra, R. K., Olson, E. J., Ramar, K., Rosen, I. M., Rowley, J. A., Weaver, T.

E., & Chervin, R. D. (2017). Delaying middle school and high school start times

promotes student health and performance: An american academy of sleep

medicine position statement. *Journal of Clinical Sleep Medicine, 13*(4), 623-625.

https://doi.org/10.5664/jcsm.6558

Wheaton, A. G., Chapman, D. P., & Croft, J. B. (2016). School start times, sleep,

behavioral, health, and academic outcomes: A review of the literature. *Journal of*

*School Health*, *86*(5), 363-381. https://doi.org/10.1111/josh.12388

Winsler, A., Deutsch, A., Vorona, R. D., Payne, P. A., & Szklo-coxe, M. (2015).

Sleepless in fairfax: The difference one more hour of sleep can make for teen

hopelessness, suicidal ideation, and substance use. *Journal of Youth and*

*Adolescence, 44*(2), 362-378. https://doi.org/10.1007/s10964-014-0170-3

Wolfson, A. R., & Carskadon, M. A. (1998). Sleep schedules and daytime functioning in

adolescents. *Child Development*, *69*(4), 875-887. https://doi.org/10.2307/1132351

Wong, M. M., Rowland, S. E., & Dyson, R. B. (2014). Sleep problems, academic

performance and substance use among adolescents. *North American Journal of

Psychology*, *16*(3), 629-648.

**Appendix A**

**Consent Form**

My name is Danielle Lundgren and I am a doctoral student in the St. John's University School Psychology program. I am conducting my dissertation study on school start times across schools in New York State. This study is designed to examine and understand school start times across all grades (pre-school through high school) and school types (public, non-public, charter, BOCES). Your cooperation and honest responses in completing the questionnaire are earnestly appreciated. The responses you make will be held in strictest confidence; only the researchers will see your responses. No St. John's University students or faculty outside of those involved in the study will be told your answers. We expect to also examine a number of other school-based data culled from the NYS webpage: https://data.nysed.gov/.

Your participation in this study is completely voluntary. You may refuse to participate or to terminate your participation at any time during the study. The results of the study will examine school start time patterns and their relation to school/student performance.

There are no perceived risks to this study. You will be asked to respond to items pertaining to your school, and the degree to which you agree with a few statements regarding your school's start time. The entire process should take approximately 5-10 minutes. Please respond to every item.

Please contact the researchers Danielle Lundgren (Danielle.lundgren15@stjohns.edu) or Mark D. Terjesen, Ph.D. at (718)990-5926 or Dr. Raymond DiGiuseppe, the chair of the St. John's University Institutional Review Board at (718)990-1955 if you have any questions or concerns. Thank you for your time and consideration.

Date

_____

I have read the above information and consent to participate in this research.

Agree

Disagree

**Appendix B**

**Survey Questions**

What is the name of the school you work in?

_____

What grades does your school teach? (Select all that apply)
Pre-school
Kindergarten
1st grade
2nd grade
3rd grade
4th grade
5th grade
6th grade
7th grade
8th grade
9th grade
10th grade
11th grade
12th grade

What time is your school's first bus pick-up? (If your school does not have scheduled buses, please write "N/A" in the blank below)

_____

Approximately what percentage of your students take the bus to school? (This item is referring to school buses not public transportation. If your school does not have scheduled buses, please write "N/A" in the blank below)

_____

Do students who receive special education services who are educated in your school setting have a different means of transportation (i.e., take different buses, different bus schedules)?
Yes
No

If selected Yes → routed to a question asking…
Please briefly describe how the students in your school who receive special education services get transported to school.

_____

What time does your academic school day for students begin?

_____

How long has your school started at this time?
Just started at this time this school year (2018-2019)
Started at this time since last school year (since 2017-2018)
Started at this time for the last 2 school years (since 2016-2017)
Started at this time for the last 3 school years (since 2015-2016)
Started at this time for the last 4 school years (since 2014-2015)
Started at this time for at least 5 school years (since 2013-2014 or prior)
Unknown

If your school started at this time for 5 or more school years (since 2013-2014 or prior) please indicate approximately when the current school start time began.
_____

Prior to your current start time, what time did your academic school day begin?
_____

What year did your school day start at that time?
_____

Is sleep hygiene taught in your school?
Yes
No

If selected Yes → routed to a question asking…
Please briefly describe where it is taught, by whom, and what is the degree of time that it is taught (e.g., one class meeting, one unit in health education, etc.).
_____

How much knowledge do you believe you have on sleep and sleep research?
No knowledge
A little knowledge
A fair amount of knowledge
A lot of knowledge

To what degree do you agree with the following statement:

I understand the reasoning behind my school's start time.
Strongly disagree
Disagree
Agree
Strongly agree

On a scale from 1 (not at all) to 5 (very much), how much do you believe each of the following factors contribute to the reason for your school's start time:

Before school programs/activities
1 (not at all)     2  (only a little)    3  (to some extent)    4  (rather much)    5 (very much)

After school programs/activities
1 (not at all)     2  (only a little)    3  (to some extent)    4  (rather much)    5 (very much)

Bus schedule/transportation reasons
1 (not at all)     2  (only a little)    3  (to some extent)    4  (rather much)    5 (very much)

Consistency (has started at this time for a while)
1 (not at all)     2  (only a little)    3  (to some extent)    4  (rather much)    5 (very much)

Parent work schedule
1 (not at all)     2  (only a little)    3  (to some extent)    4  (rather much)    5 (very much)

What (if any) are other factors that you believe contribute to the reason for your school's start time?
 _____

Using the above scale: 1 (not at all)      2  (only a little)    3  (to some extent)    4  (rather much)    5 (very much)
To what extent do you believe these additional factors contributed to the reason for your school's start time?
 _____

If the decision were up to you, how likely would it be that you would consider changing your school's start time?
Very likely
Likely
Not likely
Very unlikely

Recognizing that making procedural decisions (i.e., changing school start times) can be a challenge, please indicate who would be responsible for setting a policy change as to school start times for your school (Select all that apply):
Principal
Superintendent
Board of Education
Other _____

**Below is The American Academy of Sleep Medicine (AASM) Position Statement:**

The AASM asserts that middle school and high school start times should be 8:30 AM or later to support:

- An adequate opportunity for adolescents to obtain sufficient sleep on school nights
- Optimal alertness in the classroom environment to facilitate peak academic performance
- Reduced tardiness and school absences to foster improved opportunities for learning
- Adolescent mental health and psychological well-being
- Adolescent driving safety

To what degree do you agree with this policy?
Strongly disagree
Disagree
Agree
Strongly agree

If selected disagree/strongly disagree → routed to a question asking…

Why do you disagree with the American Academy Sleep Medicine Position?
_____

If you are interested in learning more information on the steps/procedures for changing your school's start time to increase your own knowledge, as well as to potentially inform and educate your district to overcome barriers that may impede changing school start times, please feel free to access this webpage from the link below for more information.

*Link*

Vita

| | |
|---|---|
| Name | *Danielle Lundgren* |
| Baccalaureate Degree | *Bachelor of Arts, Adelphi University, Garden City Major: Psychology* |
| Date Graduated | *May, 2015* |
| Other Degrees and Certificates | *Master of Science, St. John's University, Jamaica, Major: School Psychology* |
| | *Provisional Certificate in School Psychology (2018)* |
| Date Graduated | *May, 2018* |