Student, Parent, and Teacher Perspectives to Inform and Strengthen School-based Sleep Promotion

By

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ABSTRACT

Sleep deprivation is a public health concern among school-aged children. Schools are an ideal setting to influence children's sleep behaviours as children spend a significant amount of time at school during key developmental periods, and programs that influence students' overall wellbeing also benefit students' academic achievement. Comprehensive School Health (CSH) is an internationally recognized approach that prioritizes school, home, and community partnerships and supports the development of health behaviours, including sleep, across environments where children live, learn, and play. School-based sleep promotion is an approach to inform and strengthen school and home efforts to improve students sleep behaviours. School-based sleep promotion can build on existing health promotion efforts in schools to enhance school, home, and community collaboration to support healthy sleep. There is a need to understand how to build on existing strengths within school communities to promote healthy sleep behaviours. The purpose of this research was to explore the perspectives of students, parents, and teachers regarding school-based sleep promotion. Throughout this thesis, 'teacher' will refer to teachers and school administrators, as all teachers and school administrators interviewed held teaching certificates. Qualitative methods were used to (1) explore teacher perspectives on sleep behaviours and their role in school-based sleep promotion, and (2) integrate multiple partner perspectives to inform how school-based sleep promotion can be strengthened when taking a CSH approach.

Objective 1 used interpretive description as a guiding method and semi-structured interviews as a data generating strategy. Teachers (n = 19) were recruited from the greater Edmonton area, Alberta, Canada and participated in one-on-one virtual interviews. Interviews were professionally transcribed, and themes were identified using inductive descriptive thematic

analysis. Three themes related to teachers' perspectives on sleep behaviours and school-based sleep promotion were identified: the importance of sleep, prioritizing sleep as part of teaching and learning, and a culture of healthy sleep habits. Teachers considered sleep to be essential for elementary students' academic success and wellbeing, and a whole school approach was necessary to support a healthy sleep culture in schools.

Objective 2 was a secondary qualitative analysis of student (n=45), parent/guardian (n=24), and teacher (n=19) interviews from participants representing schools and communities in Alberta, Canada. Data were examined using an a priori framework in alignment with the four components of CSH: social and physical environment, teaching and learning, policy, and partnerships and services. Inductive content analysis was used to develop categories and subthemes. The following subthemes were identified within each CSH component: social and physical environment (culture of healthy sleep habits; students influence each other), teaching and learning (formally integrate sleep into curriculum; school, teacher, and parents/guardian collaboration), policy (sleep-positive classroom policies), and partnerships and services (community partnerships; school-home collaboration). These findings can support school partner efforts to foster a school culture of healthy sleep habits leading to improvements in students sleep behaviours.

This thesis provides novel insights into teacher's perspectives on promoting healthy sleep behaviours in schools and multiple partner (student, parent, and teacher) perspectives on how school-based sleep promotion can be strengthened using a CSH approach. Findings inform future research, practice, and policy related to school-based sleep promotion in Canada. Future school-based sleep promotion should build on existing school strengths including the social and physical environment, teaching and learning, policy, and partnerships and services. Overall, school-based

sleep promotion was valued by students, parents, and teachers and future school-based sleep promotion interventions would benefit from taking a whole school approach. This research has the potential to inform and strengthen school-based sleep promotion when taking a CSH approach and be a potential solution to overcome existing challenges in teaching students healthy sleep behaviours.

PREFACE

This Masters thesis is original work produced by Pamela Mellon. Ethics approval was received from the University of Alberta Human Research Ethics Board under the project name "Sleeping soundly: Understanding the translation of sleep promotion at school to sleep behaviours at home" No. Pro00078831. The original ethics approval was obtained on February 15, 2018 (with subsequent annual renewals). Ethics approval to work with students, parents, and teachers in Edmonton Public Schools was received by the University of Alberta Faculty of Education Cooperative Activities Program on November 15, 2018, with subsequent amendments in 2019 to recruit parents and in 2020 to recruit teachers.

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LIST OF ABBREVIATIONS

CIHR: Canadian Institutes of Health Research

WCHRI: Women and Children's Health Research Institute

CSH: Comprehensive School Health

SPH: School of Public Health

SIRCLE: Settings-based Intervention Research through Changes in Lifestyles & Environments

24-Hour Movement Guidelines: The Canadian 24-Hour Movement Guidelines for Children and Youth: An Integration of Physical Activity, Sedentary Behaviour, and Sleep

PSG: Polysomnography

ADHD: Attention-Deficit Hyperactivity Disorder

OSA: Obstructive Sleep Apnea

SDB: Sleep Disordered Breathing

BMR: Basal Metabolic Rate

T2D: Type 2 Diabetes

CDI: Children Depression Inventory

PAPA: Preschool-Aged Psychiatric Assessment

TA: Tonsillectomy and/or Adnoidectomy

RLS: Restless Leg Syndrome

GERD: Gastroesophageal Reflux

DISE: Drug-Induced Sleep Endoscopy

CPAP: Continuous Positive Airways Pressure

RCTs: Randomized Control Trials

HSBC: Canadian Health Behaviour of School-Aged Children

SES: Socioeconomic Status

CBT-I: Cognitive Behavioural Therapy – Insomnia

OTC: Over-The-Counter

BNBD: Better Nights Better Days

M-PS: Miyake Primary School

DSPS: Delayed Sleep Phase Syndrome

ACES: Australian Centre for Education in Sleep

SFS: Sleep for Success

CBPR: Community-based Participatory Research

ENSOM: ENfant (child in French), SOMmeil (sleep in French)

WSCC: Whole School, School Community, Whole Child Model

HPS: Health Promoting Schools

JCSH: Joint Consortium for School Health

DPA: Daily Physical Activity

ID: Interpretive Description

KTA: Knowledge-to-Action

CHAPTER 1: INTRODUCTION

1.1 Overview

This chapter will establish the thesis purpose and outline. Additionally, this chapter will illustrate the need to address Canadian children's sleep due to the short and long-term repercussions of sleep deprivation on children's health and academic potential. This includes demonstrating that diverse stakeholders' perspectives are needed to inform school-based sleep promotion and that Comprehensive School Health (CSH) is a viable approach to support and inform children's sleep behaviours. This chapter will provide an overview of the research objectives, thesis organization, and attributions.

1.2 Sleep Behaviour in Canadian Children and School-based Health Promotion

Sleep is essential for children's health and well-being; however, global trends indicate a decline in children's sleep quantity (Matricciani, Bin, Lallukka et al., 2017), making insufficient sleep a public health concern (Chattu, Manzar, Kumary et al., 2018; Liew & Aung, 2020; Matricciani et al., 2017; Michaud & Chaput, 2016). According to the 2022 ParticipACTION Report Card, 30% of school-aged children and youth in Canada are not meeting recommended hours of sleep for their age (Tremblay, Carson, Chaput et al., 2016), which is an increase from 25% of school-aged children and youth in 2018 (ParticipACTION, 2018, 2020). The resulting physical and psychosocial impacts of sleep deprivation in our youth include obesity, diabetes, anxiety, depression, and poorer overall health and immune function (Garaulet, Ortega, Ruiz et al., 2011; Keyes, Maslowsky, Hamilton et al., 2015; Lopes, Boronat, Wang et al., 2016; Matricciani et al., 2017; Matricciani, Bin, Lallukka et al., 2018; Ruan, Xun, Cai et al., 2015). Children who get adequate sleep benefit from higher self-esteem and improved social

relationships (Gordon, Carrillo, & Barnes, 2021; Thumann, Börnhorst, Michels et al., 2019). Due to the impacts of inadequate sleep our youth are also struggling academically (Astill, Van Der Heijden, Van Ijzendoorn et al., 2012; Dewald, Meijer, Oort et al., 2010; Gomez Fonseca & Genzel, 2020; Schmidt & Van Der Linden, 2015; Taras, 2005; Tremblay et al., 2016). Teachers regularly experience and manage the behavioural outcomes of children's sleep deprivation (Amschler & McKenzie, 2005; McDowall, Galland, Campbell et al., 2017; Rhodes, Guerrero, Vanderloo et al., 2020). Given that healthy students learn better, schools have been identified as ideal settings for health promotion which serve to influence children's health and well-being, including their sleep behaviours (Epstein, 2011; JCSH, 2018) which all support students' educational outcomes. Sleep impacts every aspect of a child's life. Thus, inadequate sleep is a public health issue that requires attention to decrease the sleep-deprived burden on Canadian children's health, well-being, and future success.

Home and school are ideal environments to impact children's sleep behaviours due to the amount of time children spend in these settings (Epstein & Sanders, 2006; Rhodes et al., 2020; Rigney, Watson, Gazmararian et al., 2021). However, there is a lack of evidence on the role of schools, particularly teachers' role in promoting sleep. Teachers' perspectives on sleep promotion (including aspects of teaching and learning around sleep) are under-represented, especially in elementary schools, as previous research has focused on high school and adolescents (Cassoff, Knäuper, Michaelsen et al., 2013; Gruber, 2017). A large portion of existing school-based sleep research focuses on the impact of puberty on children's sleep cycle and the resulting delayed sleep phase in adolescence (Chung, Chan, Lam et al., 2017; Rigney et al., 2021). It is arguably more productive to establish healthy sleep behaviour with elementary students to prevent sleep problems/challenges in adolescents than to attempt to correct sleep

problems during adolescence (Maeda, Oniki, & Miike, 2019; Rey, Guignard-Perret, Imler-Weber et al., 2020; Wolfson & Carskadon, 2003).

To date, school-based sleep interventions have been inconsistent and ineffective (Blunden, 2017; Blunden, Chapman, & Rigney, 2012; Gruber, 2017), as the majority of interventions do not see improvements in sleep behaviours upon follow up (Blunden & Rigney, 2015; Rigney et al., 2021) and interventions are not sustainable without the ongoing presence of a research team (Gruber, 2017). Additionally, most school-based sleep interventions focus on students' education alone (Gruber, 2017) and do not address the complex relationships that inform students' sleep including the influence of adults on students' schedules (parents, school staff, coaches) (Rigney et al., 2021). Nor do the interventions address busy schedules or societal perceptions that disregard sleep (Gruber, 2020; Rigney et al., 2021). Thus, it can be said that the majority of school-based sleep interventions do not have impact beyond school walls (Rigney et al., 2021). In other words, students are unable to change their sleep behaviours at home based on information learned at school due to a myriad of factors which could include home environments that are not conducive to healthy sleep behaviours (Bird, McKernan, Montemurro et al., 2021). In comparison to other school-based health promotion interventions which have proven effective at improving healthy eating and physical activity (Dabravolskaj, Montemurro, Ekwaru et al., 2020; Ofosu, Ekwaru, Bastian et al., 2018), a significant challenge for school-based sleep promotion is understanding how to translate a behaviour learned at school that is only practiced at home.

Recent research advocates for home-school partnerships to address inadequate sleep in children (Bird, McKernan, et al., 2021; Blunden & Rigney, 2015; Rigney et al., 2021). School partner perspectives (i.e., students, parents, teachers) are essential in understanding how to

strengthen and inform school-based sleep promotion. To date, existing school-based sleep interventions are primarily focused on education alone (i.e., sleep education on duration and hygiene), which include in-class educational components and behavioural change strategies (Ashton, 2017; Gruber, Somerville, Bergmame et al., 2016; Rey et al., 2020; Rigney et al., 2021). In contrast, school-based sleep promotion takes a whole school approach, fostering a school culture that promotes healthy sleep behaviours and includes the home, school, and community. The purpose of this research is to explore teacher perspectives on sleep behaviours and their role in school-based sleep promotion, and to integrate multiple partner perspectives to inform how school-based sleep promotion can be strengthened when taking a CSH approach.

1.3 Comprehensive School Health in Canada

In Canada, schools have embraced the CSH approach (JCSH, 2019), also recognized internationally as Health Promoting Schools and Whole School, Whole Community and Whole Child Model (Centers for Disease Control and Prevention, n.d.; World Health Organization, 2017). CSH is a framework that takes a whole school approach and engages the whole school community (home, school, and community) to improve student well-being and educational outcomes (JCSH, 2016). Programs that take a CSH approach have been successful at improving health behaviours (Dabravolskaj et al., 2020; Langford, Bonell, Jones et al., 2015) and academic performance (Centeio, Somers, Moore et al., 2021; Murray, Low, Hollis et al., 2007). It has also been shown that health behaviours learned at school are translated to the home environment (Bird, McKernan, et al., 2021; McKernan, Montemurro, Chahal et al., 2019). Therefore, CSH is a potential solution to address sleep concerns in Canadian youth, leading to improvements in educational, social, and wholistic health outcomes. Ultimately, healthy students have improved

learning outcomes, and better-educated individuals are healthier (Faught, Qian, Carson et al., 2019). Thus, addressing students' health (including their sleep) in school settings has the potential of improving their future quality of life (Faught et al., 2019).

1.4 Rationale

The CSH approach empowers and enables school staff and students to improve their overall health and well-being through strategies that promote physical activity, healthy eating, mental health, and sleep. Despite the increasing rates of sleep-deprived children and the resulting physical and psychosocial impacts, little research has been done to improve sleep behaviours through elementary school-based sleep promotion (Rigney et al., 2021). To understand whether school-based sleep promotion is warranted, it is necessary to understand the perspectives of three key partners impacted by school-based health promotion – students, parents, and teachers.

Our team has interviewed students and parents within schools promoting healthy sleep behaviours (Bird, 2020). Students' sleep behaviours were explored using student-led photovoice in a CSH setting following a schoolwide sleep campaign (Bird, McKernan, et al., 2021). Parents' perspectives on student sleep behaviours and how parenting practices facilitate and support, or act as a barrier, to their children's healthy sleep behaviours were examined using one-on-one qualitative interviews (Bird, 2020). With exception to these two research studies conducted in CSH settings, there is minimal research on promoting sleep using a CSH approach. Combined with these two previous studies, investigating teacher perspectives provides a novel opportunity to inform how to meaningfully improve school-based sleep promotion in practice. Additionally, there is a benefit to conducting a secondary analysis of student, parent, and teacher interviews, as it provides an opportunity to collectively understand student, parent and teacher perspectives on

school-based sleep promotion using the lens of CSH. Thus, this research will provide a comprehensive view of strategies to promote healthy sleep behaviours using a CSH approach.

1.5 Research Purpose and Objectives

The purpose of this research is to understand teacher perspectives of school-based sleep promotion and identify school partners (students, parents, and teachers) insights to strengthen and inform school-based sleep promotion in Canada. This research will specifically address the following two objectives:

Objective 1: To explore teacher perspectives on sleep behaviours and their role in school-based sleep promotion.

Objective 2: To integrate multiple partner perspectives to inform how school-based sleep promotion can be strengthened when taking a CSH approach.

1.6 Thesis Attributions

This original research is a component of my Master of Science in Health Promotion and Socio-Behavioural Sciences from the University of Alberta School of Public Health (SPH). Completed with the support of my supervisor Dr. Kate Storey and her research lab, SIRCLE (Settings-based Intervention Research through Changes in Lifestyles & Environments) housed within the SPH. This research aims to further school-based sleep promotion using a CSH approach, as the findings of this thesis will inform the planning and implementation of school-based sleep promotion. The first objective of this thesis research (Objective 1) used interpretive description to provide rich and detailed descriptions applicable to school-based health promotion settings (Thorne, 2008). Interviews were an appropriate data generating strategy to understand

teachers' first-hand knowledge of sleep promotion in elementary schools and teacher perspectives on improving school-based sleep promotion.

Objective 2 provided an opportunity to analyze student, parent, and teacher interviews through the lens of the four components of CSH, allowing for comparison across partner groups as well as a broad perspective when implementing school-based sleep promotion in the context of CSH. Secondary analysis allows for novel insights from school partners to improve sleep behaviours in children and youth.

This research project was original work completed with guidance from my supervisor (Dr. Kate Storey) and my committee members (Dr. Lauren Sulz and Brian Torrance). With the support of my committee, I helped conceptualize the research study, including the overarching methods that informed the work. I maintained ethics approval, completed all data generation, analysis, writing, and presented the research at three academic conferences (Thinking Qualitatively, Campus Alberta Student Conference on Health, and the Canadian Public Health Association Conference). Additionally, I was privileged to present at the Shaping the Future Conference in 2021 and 2022 and was invited to present at the APPLE Schools Knowledge Exchange Events in Spring 2021, Edmonton Public Library spring 2022, and for school health champions at Palliser School District in collaboration with the School Health and Wellness Promotion team at Alberta Health Services. I was also a finalist for the University of Alberta 3-Minute Thesis competition in 2022.

1.7 Thesis Organization

This thesis is organized into five chapters. Chapter two provides a thorough review of relevant research to situate objectives 1 and 2 in the existing literature. The literature review

covers the existing problem (sleep-deprived Canadian children), previous attempts to address the problem, existing novel opportunities to address the problem (CSH), and how school, home and community collaboration is necessary to improve children's sleep behaviours. Chapters three and four address objectives 1 and 2, respectively, including methods, data generation, analysis, rigour, results, implication, and strengths and limitations. Chapters three and four will be submitted as original academic manuscripts for publication. Chapter five summarizes the research findings, implications, and further directions of this research. References and appendices are located at the end of the thesis.

CHAPTER 2: LITERATURE REVIEW

The purpose of this literature review is to review existing evidence regarding Canadian children's sleep status, school-based sleep promotion in Canada, and the role of school partners in school-based sleep promotion. This literature review starts with Canadian children's sleep status and the detrimental impacts of childhood sleep deprivation, followed by how pediatric sleep problems have been addressed to date (clinically and in schools). Lastly, the literature review covers the CSH approach, and how CSH can be used as a framework to promote healthy sleep behaviours for children and youth.

2.1 Inadequate Sleep in Canadian Children and a Practical Solution

Globally, sleep is essential for children and youth's mental, emotional, and physical development (Belmon, Busch, Van Stralen et al., 2020). Approximately 30% of Canadian children and adolescents are not meeting sleep recommendations for their age (Chaput & Janssen, 2016; ParticipACTION, 2020, 2022), resulting in an array of adverse health consequences. These health outcomes include increased rates of obesity, diabetes, anxiety, depression, and poorer overall health and immune function (Garaulet et al., 2011; Keyes et al., 2015; Lopes et al., 2016; Matricciani, Olds, & Petkov, 2012; Ruan et al., 2015). The rates of sleep-deprived children and youth have been increasing globally by 0.75 minutes per year since 1905 (Matricciani et al., 2017; Matricciani et al., 2012), leading to a greater burden of disease on our health care system (Hafner, Stepanek, Taylor et al., 2017; Matricciani et al., 2017).

Inadequate sleep has been linked to poor school performance (Astill et al., 2012; Berger, Diaz, Valiente et al., 2018; Perfect, Levine-Donnerstein, Archbold et al., 2014; Rey et al., 2020) and poor school performance predicts health-compromising behaviours and physical, mental, and

emotional problems (Murray et al., 2007). Given that healthy students learn better, schools have been identified as ideal health promotion settings to influence children's health and wellbeing, including their sleep behaviours (Epstein, 2011; JCSH, 2016; Jourdan, Gray, Barry et al., 2021). However, school-based sleep promotion cannot be improved without the support, interest, and uptake of school partners (Gruber, 2020; Gruber, Somerville, & Finn, 2019).

2.1.1 Canadian Sleep Recommendations and Current Status

The Canadian 24-hour Movement Guidelines for Children and Youth were released in 2016; these guidelines are the first to provide movement behaviour recommendations for the entire day, including sleep (Tremblay et al., 2016). The 24-hour Movement Guidelines state that 5 to 13-year-olds require 9 to 11 hours of uninterrupted sleep per night, and 14 to 17-year-olds require 8 to 10 hours per night, with consistent bed and wake-up times (Tremblay et al., 2016). Including sleep in the 24-hour Movement Guidelines increases the ability and opportunity to promote the sleep of Canadian youth (Faulkner, White, Riazi et al., 2016; Latimer-Cheung, Copeland, Fowles et al., 2016). Guidelines provide a baseline for population surveillance, and they help inform public policies, interventions, as well as provide information to the public about healthy sleep behaviours (Michaud & Chaput, 2016).

Over the past century, research demonstrates that the sleep of children and youth worldwide has been decreasing by 0.75 minutes per year (Matricciani et al., 2017; Matricciani et al., 2012). A common perception among scientific and popular literature is that as access to technology increases, the quantity of sleep by children and adolescents decreases (Matricciani et al., 2017; Matricciani, Olds, & Williams, 2011). "Given the importance of sleep duration to health, concerns have been raised that insufficient sleep is pervasive and inevitable in today's 24-hour society" (Matricciani et al., 2017, p. 317). The modern way of living includes artificial

light, late-night screen use, caffeine use, and no bedtime rules in the household (Gruber, Carrey, Weiss et al., 2014). According to the 2022 ParticipACTION report card and the Canadian Health Measures Survey, 67-73% of Canadian children and youth aged 5-17 are meeting sleep recommendations (ParticipACTION, 2022). Meaning that approximately 30% of children and youth aged 5-17 are not getting enough sleep (ParticipACTION, 2022). Although sleep recommendations have been in place since 2016 as part of the 24-hour Movement Guidelines, the amount of Canadian youth meeting sleep recommendations has not improved (ParticipACTION, 2016, 2018, 2020, 2022).

Research has also demonstrated that it is not just the duration, but also the quality of sleep that is important (Phillips, Johnson, Shirey et al., 2020). Dewald et al. (2010) define sleep quality as how sleep is experienced including the feeling of being rested when waking up and satisfaction with sleep. Phillips et al. (2020) highlighted that there is a paucity of research on sleep quality in pediatrics and the lack of research is potentially due to the inconsistencies in sleep quality definitions limiting the ability to measure sleep quality in school-aged children. Therefore, Phillips et al. (2020) completed a concept analysis to define specific attributes of sleep quality and identify the instruments capable of accurate measurement for school-aged children. According to the concept analysis, Phillips et al. (2020) defined sleep quality in school-aged children as "an all-encompassing term for children ages 6-12 going to bed at a consistent time and sleeping for 9 to 12 hours with minimal delay between getting into bed and falling asleep, limited sleep disturbances, and absence of daytime dysfunction due to sleepiness" (p.56). Sleep quality is important because it encompasses one's overall sleep including objective and subjective measures such as sleep latency (the time it takes to fall asleep), sleep duration, sleep efficiency (total time spent asleep versus the total time in bed), sleep disturbances during or

before sleep that lead to arousal, night awakenings, wake after sleep onset, bedtime resistance, daytime sleepiness/dysfunction, and bedtime (Phillips et al., 2020).

2.1.2 Sleep Hygiene

Sleep hygiene refers to creating an optimal environment for sleep and performing practices that promote sleep (Jan, Owens, Weiss et al., 2008); therefore, sleep hygiene is key to resolving behaviour-related causes of insomnia (Janjua & Goldman, 2016). Addressing sleep hygiene is often seen as the ideal place to start when addressing childhood sleep problems, as recommendations to address sleep problems in children often begin with behavioural interventions (Medalie, Dang, & Casnar, 2021; Medalie & Gozal, 2018). These sleep hygiene behaviour interventions can solve many sleep challenges in children and include creating a consistent bedtime routine, getting off screens an hour before bed, and doing something relaxing before bed. Sleep hygiene helps the family and child maintain consistent sleep schedules and helps families understand the importance of the physical environment being cool, dark, and quiet to support children's healthy sleep behaviours (ParticipACTION, 2018). The following sleep hygiene recommendations have been included from the ParticipACTION Report Card (2018):

- Go to bed and wake up at the same time every day
- Avoid caffeine starting in the late afternoon
- Expose yourself to bright light in the morning
- Make sure your bedroom is a sleep promoting environment (i.e., dark, quiet, comfortable and cool)
- Have a comfortable sleeping space (i.e., mattress, pillow, blankets)
- Don't go to bed hungry, but don’t eat a heavy meal right before bed
- Come up with a bedtime routine (i.e., bathing, music, reading)

- Reserve your bedroom for sleeping only – keep screens out of the bedroom (i.e., cell phones, computers, iPads, televisions, video games)
- Get regular exercise during the day
- No pets in the bedroom

Overall, sleep and attentiveness represent opposing processes, and reducing responsiveness to the environment with the help of sleep hygiene facilitates the attainment of sufficient and good-quality sleep (El-Sheikh & Kelly, 2017).

2.2 Consequences of Inadequate Sleep

Inadequate sleep (duration and quality) in Canadian children is a public health concern due to the detrimental physical and psychosocial outcomes that present (Michaud & Chaput, 2016). The literature in this section will cover the impact of poor/inadequate sleep on children's physical and psychosocial functioning, as there is a large base of literature illustrating the physical, cognitive, behavioural, and emotional consequences of poor sleep in children (Deng, He, He et al., 2021; Matricciani, Paquet, Galland et al., 2019; Palmer, Bower, & Alfano, 2020). However, the majority of existing research on children's sleep has only examined sleep duration and has not considered the complexities beyond the quantity of sleep (Phillips et al., 2020). Sleep problems can be viewed on a continuum ranging from short sleep duration and/or daytime sleepiness to sleep disorders, such as sleep disordered breathing (SDB), and insomnia (difficulty initiating and maintaining sleep) (Perfect et al., 2014). Sleepiness is defined as an increased tendency to fall asleep, often considered the opposite of alertness. While daytime sleepiness is generally in response to insufficient sleep (reduced sleep quantity) or disrupted sleep (reduced

sleep quality). Daytime sleepiness can be considered excessive when it interferes with daytime work, school, or social activities in a significant manner (Blunden, Hoban, & Chervin, 2006).

2.2.1 Impact of Inadequate Sleep on Children's Physical Wellbeing

Sleep is essential for children's healthy development and is required for physical health, however, insufficient sleep duration has become common in today's society (Chaput, Gray, Poitras et al., 2016). When children sleep less than their recommended 9-11 hours (ages 5-13 years) they are exposed to a range of health concerns. Some of which include low energy, morning headaches, fatigue, hyperactivity (Chan, Au, Li et al., 2022), increased sedentary behaviour (Jindal, Puyau, Adolph et al., 2021), and weight gain (Hanlon, Dumin, & Pannain, 2019; Jindal et al., 2021). While others include long-term health concerns such as migraines (Pavkovic & Kothare, 2020), obesity (Chaput, 2016; Deng et al., 2021; Hanlon et al., 2019), diabetes (Dutil, Walsh, Featherstone et al., 2018), and hypertension (DelRosso, Mogavero, & Ferri, 2020; Ingram, Singh, Ehsan et al., 2017; Matthews & Pantesco, 2016).

A topical review by Pavkovic and Kothare (2020) on migraines and sleep in children, highlights the bidirectional relationship between migraine and sleep disorders in childhood. Sleep disorders are the most common comorbidity with migraine in children (Pavkovic & Kothare, 2020), due to the common cerebral structures, networks, and neurochemical systems that are involved in migraines and the regulation of sleep. As a result, disturbed sleep is the most common trigger for migraines in children (Pavkovic & Kothare, 2020). A study by Albers, von Kries, Heinen et al. (2015) assessed secular trends of headaches in school-aged children over the last decade and identified that migraine prevalence has been increasing for children, but not adults, over time. Pavkovic and Kothare (2020) acknowledged that multiple factors are likely at

play contributing to an increase in children's migraines, however, they strongly believe that sleep is one of the contributors.

Researchers have identified that short sleep duration plays a role in increasing obesity rates in children and adolescents (Currie & Cappuccio, 2007; Deng et al., 2021; Olds, Maher, & Matricciani, 2011). According to Jindal et al. (2021) children (ages 5-11) who are not getting adequate sleep have lower basal metabolic rates (BMR; the rate the body uses energy at rest), lower physical activity, and higher levels of sedentary time. Jindal et al. (2021) also found that short sleep, late sleep timing (going to bed late and waking up late), and higher rates of sedentary behaviour may result in heightened risk for weight gain over time. Further, a systematic review by Chaput et al. (2016) found that longer sleep duration was associated with lower adiposity indicators and better health/well-being. To date all endocrine and molecular mechanisms involved are not thoroughly understood; however, several studies have found ghrelin, leptin, and growth hormone production to be impacted by sleep restriction (Currie & Cappuccio, 2007; Deng et al., 2021; Olds et al., 2011). Leptin and ghrelin hormonal rhythm changes have the potential to decrease energy expenditure and increase appetite, leading to weight gain (Currie & Cappuccio, 2007; Deng et al., 2021; Olds et al., 2011). Short sleep duration decreases growth hormone production, a hormone that stimulates lipolysis (the breakdown of fats into energy) leading to an increase in fat mass (Deng et al., 2021). In addition, children with short sleep duration tend to be less physically active and consume greater quantities of high-calorie foods and beverages (Currie & Cappuccio, 2007; Olds et al., 2011). In a meta-analysis by Deng et al. (2021), their key finding from 33 articles involving more than 57,000 youth was that short sleep duration can increase the risk of obesity in children and adolescents, especially for children and youth aged 3-13. Two possible explanations provided by Deng et al. (2021) include children with

short sleep duration could disrupt the physiological timing of hormones and inflammatory factors (metabolic imprinting) or the lack of control by children and/or their parents of children's sleep patterns gradually dominates sleep deficiency (Deng et al., 2021).

A narrative review by Dutil and Chaput (2017) was the first to provide an overview of the literature on inadequate sleep as a contributor to type 2 diabetes (T2D) in children and adolescents. The review states that there is compelling evidence that there is an association between sleep duration and T2D in children and adolescents, despite some of the 23 studies having conflicting findings (Dutil & Chaput, 2017). In 2020, a study analysed sleep and insulin levels of 3900 children aged 2-15 years and did not confirm the association between sleep duration and insulin resistance independent of abdominal obesity (Thumann, Michels, Felső et al., 2020). However, Thumann et al. (2020) did confirm that longer sleep duration positively influences insulin resistance through its beneficial impacts on abdominal obesity. To date literature in adults has confirmed the contribution of inadequate sleep on the development of T2D (Lee, Ng, & Chin, 2017; Shan, Ma, Xie et al., 2015), while further research is required to understand the link between inadequate sleep and the development of T2D in children (Dutil & Chaput, 2017). Further studies should include measuring sleep quality in addition to sleep quantity as the suppression of slow wave sleep and rapid eye movement sleep have been shown to be associated with insulin resistance (Dutil & Chaput, 2017).

Existing research demonstrates that sleep disorders, poor sleep quality, and sleep deprivation lead to hypertension and increases cardiovascular risk in adults (DelRosso et al., 2020; Ingram et al., 2017; Liew & Aung, 2020). Hypertension, also called high blood pressure (CDC, 2021), is a risk factor for cardiovascular disease (CDC, 2019a). A systematic review by Sun, Wang, Yang et al. (2020) identified 37 reviews/meta-analyses on the association between

sleep duration and cardiovascular risk factors (i.e., obesity, blood pressure, blood lipids, glucose metabolism and inflammation) in children and adolescents. Sun et al. (2020) found strong evidence for an association between short sleep duration and increased blood pressure. A 5-year longitudinal study by Archbold, Vasquez, Goodwin et al. (2012, p. 6) followed 334 children from age 6 to 11 and "found that increases in blood pressure from childhood to adolescence were related to increasing body mass index and reduction in sleep." The study also found that SDB had a link to increases in blood pressure (Archbold et al., 2012). Obstructive sleep apnea (OSA), the most common SDB diagnosis affects 1-5% of all children (Ingram et al., 2017). Pulmonary hypertension is a severe potential complication of OSA, yet there is limited evidence addressing this important relationship (DelRosso et al., 2020; Ingram et al., 2017). Pulmonary hypertension is when "the pressure in the blood vessels leading from the heart to the lungs is too high (CDC, 2019b)." An enumerative review of 39 studies and 16 longitudinal studies (age range 0-29) by Matthews and Pantesco (2016) assessing the associations of cardiovascular risk factors and sleep characteristics in children and adolescents revealed evidence of associations with sleep characteristics is most consistent for obesity, then glucose and insulin metabolism followed by blood pressure. Overall, researchers call for further research to understand the impact of inadequate sleep on children's blood pressure and cardiovascular health (DelRosso et al., 2020; Ingram et al., 2017; Sun et al., 2020).

2.2.2 Impacts of Inadequate Sleep on Children's Psychosocial Wellbeing

Reviews over the past decade highlight concurrent, longitudinal, and bidirectional links between sleep problems and children and adolescents' psychosocial wellbeing (Alvaro, Roberts, & Harris, 2013; Gregory & Sadeh, 2012, 2016; Marino, Andrade, Campisi et al., 2021; Sadeh, Tikotzky, & Kahn, 2014; Tesler, Gerstenberg, & Huber, 2013). Research has demonstrated that

compromised sleep is associated with internalizing (i.e., anxiety, depression) and externalizing problems (i.e., opposition, hyperactivity, inattention, aggression, risk-taking) in children and adolescents (Sadeh et al., 2014). While a meta-analysis of 8608 adults from 65 trials have found that improving participants sleep quality led to improvements in participants mental health (Scott, Webb, Martyn-St James et al., 2021). The following research will provide an overview of children's psychosocial wellbeing and their sleep related behaviours.

2.2.2.1 Anxiety

Children's sleep patterns are important to consider when considering anxiety in children as a majority of anxious children experience sleep complaints (i.e., bedtime resistance, challenges initiating sleep, inconsistent sleep, poor sleep quality) (Alfano, Pina, Zerr et al., 2010; Clementi, Alfano, Holly et al., 2016) and sleep disturbances increase symptoms of anxiety and decreases daytime functioning (Meir, Alfano, Lau et al., 2019). Sleep problems are also part of the diagnostic criteria for generalized anxiety disorder and separation anxiety disorder (SAD), however, sleep impacts all youth with anxiety disorders (Alfano, 2018). Up to 85% of parents of youth with anxiety disorders report sleep problems (Chase & Pincus, 2011). In regards to the bidirectional relationship between anxiety and sleep, there is more robust data demonstrating the impact of inadequate sleep on the development of anxiety in later years as opposed to anxiety causing sleep problems (Alfano, 2018; Crowe & Spiro-Levitt, 2021; Leahy & Gradisar, 2012).

Anxiety impacts self-reports of sleep quality, which is often difficult to explain with objective measures (Crowe & Spiro-Levitt, 2021). Some research suggests that anxious youth report poorer quality of sleep due to self-report bias and negative affect. Other researchers theorize that due to overactive sympathetic nervous systems during the day anxious youth are more tired and sleep is less restorative (Crowe & Spiro-Levitt, 2021). Some research on sleep

architecture suggests that anxious youth spend less time in slow wave sleep compared to non-anxious peers (Forbes, Bertocci, Gregory et al., 2008). Irrespective of sleep architecture, objective measures of sleep, and polysomnography (PSG), anxious youth report higher levels of daytime sleepiness than typically developing peers (Clementi et al., 2016).

A growing body of research illustrates that anxiety and sleep problems are associated with suicidal ideation (Liu, 2004; Meir et al., 2019; Wong & Brower, 2012; Wong, Brower, & Zucker, 2011). However, research on children's sleep problems, anxiety, and risk of suicidal ideation is limited. Therefore, Meir et al. (2019) conducted a longitudinal study with 71 children aged 7-11 that had clinical and subclinical anxiety symptoms to determine rates of suicidal ideation (M = 3.3 years later). No participants reported self-harm or suicidal ideation at baseline. Sixteen participants (22.54%) reported suicidal ideation between time 1 and time 2. "A significant interaction emerged between time 1 sleep and anxiety symptoms (p = 0.008, 95% CI: 0.17, 1.16), where anxiety predicted a greater likelihood of reporting suicidal ideation at time 2 for those with high levels of subjective sleep disturbances (p_{high} = 0.016, 95% CI_{high}: 1.14, 11.42; p_{low} = 0.19, 95% $CI_{low:}$ -7.39, 1.44)." The second significant interaction presented from parent-reported sleep onset delay and anxiety symptoms (p = 0.025, 95% CI: 1.12, 16.93), where anxiety predicted suicidal ideation at time 2 for youth with a longer sleep onset delay (p_{long} = 0.25, 95% CI_{long}: -.99, 15.11; p_{short} = 0.59, 95% CI_{short}: -4.54, 2.59). Overall, Meir et al. (2019) found that children's sleep problems, specifically parent reported sleep disturbances, combined with children's anxiety increased risk of suicidal ideation later in life. Meir et al. (2019) highlighted that anxiety and sleep problems can be improved to decrease risk of suicidal ideation in children and adolescents.

Additional longitudinal studies (Gregory et al., 2005; Greene, Gregory, Fone, & White, 2015) suggested that sleep problems contributed to the presentation of emotional disorders. For instance, in the study by Gregory et al., (2005) 46% of children with sleep problems developed anxiety by the age of 21. While in the study by Greene et al., (2015) severe sleep problems at age 5 increased the risk of depression after 30 years of age.

2.2.2.2 Depression

Sleep disturbances are considered to be a modifiable risk factor for depression in children and youth (Marino et al., 2021). Sleep disturbances are symptoms included in the Diagnostic Statistical Manual of Mental Disorders that individuals may or may not have that contribute to diagnosis of a depressive disorder (Baglioni, Battagliese, Feige et al., 2011). In a systematic review and meta-analysis of disturbed sleep and depression in children and youth (aged 5-24), Marino et al. (2021) defined disturbed sleep to include insomnia or sleep disturbances. Sleep disturbances included patterns of increased/decreased/fragmented sleep duration, poor sleep quality, daytime sleepiness, nightmares/terror attacks, circadian disturbances, bedwetting, bruxism and/or night walking/talking (Marino et al., 2021). From 22 studies (n=28,895 participants) of which 16 studies (n=27,073 participants) were included in the meta-analysis, Marino et al. (2021) found a small but "significant effect size indicating an association between sleep disruption and depressive symptoms in children and youths" (p.2). The meta-regression found that children with disturbed sleep were equally as vulnerable to later depression as youth. This finding informs timing of prevention strategies as childhood sleep problems are underdiagnosed and rarely treated, leaving children vulnerable to depression (Marino et al., 2021).

In a study of 524 children (mean age:10.29 years) conveniently sampled from four elementary schools in Mexico, children's sleep habits and sleep problems were observed to determine associated rates of depressive symptoms (Moo-Estrella, Arankowsky-Sandoval and Valencia-Flores (2022). Using the Children's Depression Inventory (CDI) and a sleep habits and sleep problems questionnaire the study found that 20% of children presented with symptoms of depression. Sleep related factors that were identified to increase likelihood of depressive symptoms included little sleep, lower hours of sleep during the week, and earlier wake-up time on weekdays. These sleep related factors resulted in increased scores on the CDI scale from 2.07 to 13.50. The associated sleep problems were nocturnal awakenings, nightmares, and difficulty waking up (Moo-Estrella et al., 2022). This study also found that inadequate sleep hygiene increased depressive symptoms in participants. Thus, based on their findings it was recommended that psychoeducational interventions should be provided covering sleep habits and sleep hygiene to prevent childhood depression (Moo-Estrella et al. (2022).

A prospective longitudinal study by Whalen, Gilbert, Barch et al. (2017) assessed 292 preschool-age children (ages 3-6) to observe their sleep behaviours, in particular sleep onset latency, refusal to sleep alone, and nighttime awakenings to asses rates of anxiety and depression over the following six years (9-13 years). Children's psychiatric symptoms were parent-reported at baseline using the Preschool-Age Psychiatric Assessment (PAPA) and follow up clinical interviews were conducted annually using the Childhood and Adolescent Psychiatric Assessment (CAPA). Whalen et al. (2017) found that sleep onset latency and refusal to sleep alone were independent predictors of major depressive disorder and anxiety severity, however, they were not a predictor of Attention-deficit Hyperactivity Disorder (ADHD) severity over time even after controlling for confounding variables (i.e., family income-to-needs ratio, maternal anxiety).

Based on these findings, Whalen et al. (2017) encouraged further screening of sleep disturbances during preschool years. Whalen et al. (2017) also supported the improvement of parent education on the benefits of sleep, sleep routines, and sleep hygiene to prevent the continuation of sleep problems from preschool into school age and on. Addressing sleep problems at a young age can help decrease the impact that sleep has on emotion functioning (Whalen et al., 2017).

2.2.2.3 Stress

In a systematic review of the association between sleep health and stress biomarkers in children (0-12 years), Ordway, Condon, Basile Ibrahim et al. (2021) reviewed 68 studies from 1977 to 2021. The majority of the studies were published after 2010 and 63% of studies conducted with school-aged children. This review found that shorter sleep duration led to increased rise in cortisol upon awakening in all but one study. The review did not support an association between sleep duration and blood pressure as an indicator of stress in children. This is consistent with previous literature, as this relationship in children is not well understood despite there being a clear association in adults. Three studies did explain high blood pressure in children due to adiposity (Ordway et al., 2021) Another three studies within the review found an association between poor sleep and poor autonomic function (increased sympathetic nervous system and decreased parasympathetic nervous system activity) in children, which is similar to findings from studies in adults. Findings from this review also supported evidence that sleep regularity had an influence on children's stress response (Ordway et al., 2021). Overall, Ordway et al. (2021) called for more research to better understand the association between sleep health and children's physiologic stress response. This included longitudinal studies beginning early in life, further representation in research studies (socioeconomic, race/ethnicity, age, sex), and further collection of sleep health dimensions (i.e., regularity, alertness, satisfaction).

2.2.2.4 Coping

"Coping has been defined as the effort to regulate one's emotions, cognition, behaviour, physiology, and environment in response to challenging experiences" (Lokhandwala, Holmes, Mason et al., 2021, p. 1). Previous research has demonstrated that coping skills in childhood influence later mental and emotional health (Compas, Connor-Smith, Saltzman et al., 2001; Röll, Koglin, & Petermann, 2012; Sandler, Tein, & West, 1994). Additional research suggested that children's coping skills were impacted by children's sleep behaviours (Bates, Viken, Alexander et al., 2002; Berger, Miller, Seifer et al., 2012; Cremone, Kurdziel, Fraticelli-Torres et al., 2017; Schumacher, Miller, Watamura et al., 2017). For instance, when children were sleep deprived they were less capable of self-regulating and children were more likely to display negative coping mechanisms (i.e., crying, screaming, blaming others, doing nothing, giving up) (Lokhandwala et al., 2021). Sleep affects mood and behaviour, and stress and behaviour affect sleep. This bidirectional relationship highlights how stressful circumstances can cause poor sleep, while protective coping mechanisms such as reaching out for social support can protect sleep (Lokhandwala et al., 2021). However, across the breadth of sleep research there is minimal research on sleep's impact on coping skills, and even less with school-aged children. One study by El-Sheikh, Kelly, Sadeh et al. (2014) examined the role of support coping strategies and sleep across 235 children (mean age = 11.33 years). Parents reported on family income, children reported their coping skills, and actigraphy was used to track children's sleep for one week. This study found that children's tendency to seek social support when presented with a stressor (support coping strategies) played a protective role against sleep problems despite risk factors (i.e., ethnic minority status, economic adversity). The authors therefore stated that children's

support coping strategies are a potential target for intervention to improve children's sleep behaviours (El-Sheikh et al., 2014).

Another study on coping and sleep used actigraphy to measure 16 preschool-aged children's (mean age = 56.4 months) sleep and to see how prior coping skills (positive coping, negative coping-emotional expression or negative coping-emotional inhibition) influenced their sleep behaviours following a stressful event (i.e., the COVID-19 pandemic) (Lokhandwala et al., 2021). The study found that children that woke early before and during the pandemic were more likely to have negative expression of coping skills. During the pandemic, children who were engaged in online learning but slept longer had improved coping skills. Another study with 256 ethnic/racial minority adolescents (mean age = 14.72 years) used daily dairies and two weeks of actigraphy to determine how the previous night's sleep (duration and quality) moderated the following day's coping skills (i.e., problem solving, peer support seeking) following ethnic/racial discrimination (Wang & Yip, 2020). The study found that sleep helped adolescents navigate discrimination by facilitating coping skills (Wang and Yip 2020).

2.2.2.5 Emotional Regulation

Childhood is a critical time for developing emotional regulation skills, therefore, it is essential to understand the impact of sleep on children's emotions (Vriend, Davidson, Rusak et al., 2015). Research to date generally suggests that inadequate sleep increases negative affect (anxiety, depression, stress, sadness, worry, guilt, shame, anger, and envy) and reactivity, alters the neural processing of emotional stimuli, decreases positive affect and emotion regulatory ability (Palmer et al., 2020). Palmer et al. (2020) suggested that sleep-emotion relations take root in early life (Berger et al., 2012; Covington, Patterson, Hale et al., 2021; Falch-Madsen, Wichstrom, Pallesen et al., 2021; Newton, Honaker, & Reid, 2020). In a micro-longitudinal

study by Könen, Dirk, Leonhardt et al. (2016), 110 school-aged children (8-11 years old) reported the prior night's sleep and reported their affect at four different times in the day at school and home for 31 consecutive days. The study found that students self-reported sleep quality was associated with next day affect. Students who reported high quality of sleep also reported high positive affect at morning and noon (Könen et al., 2016). However, they found no statistically significant associations between sleep quantity and students affect (Könen et al., 2016). A longitudinal study by Foley and Weinraub (2017) used archived data from the US National Institute of Child Health and Development Study of Early Child Care and Youth Development to asses sleep problems, anxious-depressed symptoms and social functioning of 1,057 children between the ages of 4.5 to 10.5 years. The study found that sleep problems in childhood predicted later emotional expressivity in preadolescence.

One of the few existing reviews examining emotions and sleep in childhood is a recent systematic review covering the associations of sleep and emotion regulation processes in healthy childhood and adolescence (Lollies, Schnatschmidt, Bihlmeier et al., 2022). Lollies et al. (2022) stated that the relevance of sleep to emotional regulation has been well established (Beattie, Kyle, Espie et al., 2015; Palmer & Alfano, 2017), however gaining an understanding of children and adolescent's sleep and emotional regulation and their impact on developmental processes is more complicated because emotional regulation is a poorly defined construct. Lollies et al. (2022) categorized 33 studies on sleep and emotional regulation in children and adolescents into 6 different groups: (1) effects of sleep on attentional processing linked to emotion regulation, (2) effects of sleep on reasoning processes linked to emotion regulation, (3) effects of sleep on biological cues linked to emotion regulation, (4) effects of sleep on coping processes linked to emotion regulation, (5) effects of sleep on emotion expression, and (6) the interconnectedness of

sleep and development of emotion regulation competence. These six groups represent the complexity that is the concept emotional regulation. Despite the broad array of studies that exist on sleep and emotional regulation in children and adolescents, Lollies et al. (2022) identified three practice points (1) "sleep supports processing of emotional stimuli, obvious in physiological and physiological measures," (2) "sleep deprivation impairs affect processing, measured by subjective and objective measurements of affective reactions towards visual and auditory emotion eliciting stimuli," and (3) "longer sleep duration, as well as undisturbed sleep enhances the experience of positive emotions, as well as the capacity of emotional reasoning, behavioural responding and regulation" (p.508).

2.2.2.6 Attention/ADHD

Currently, 3.4% of children worldwide have been diagnosed with ADHD (Buhr, Moschko, Eppinger Ruiz De Zarate et al., 2022), and 25-50% of children diagnosed with ADHD report sleep disturbances (Gruber, 2012). A diagnosis of ADHD is based on developmentally inappropriate symptoms of inattention, hyperactivity, and/or impulsivity, and impaired functioning in two or more settings (Buhr et al., 2022; Gruber, 2012). Research has also shown that sleep-deprived children exhibit cognitive and behavioural changes that can mimic ADHD (Astill et al., 2012; Paavonen, Räikkönen, Lahti et al., 2009; Rey et al., 2020). Buhr et al. (2022) explained self-regulation to be dimensional with high ADHD symptoms on one side and high self-regulation on the other side. This dimensional look at ADHD symptoms helps explain how sleep deprived children without ADHD diagnoses can exhibit ADHD symptoms. A meta-analysis of 13 published studies by Lundahl, Kidwell, Van Dyk et al. (2015) assessed the effect of experimental sleep restriction on youth's (under 18 years) attention and hyperactivity and found that "sleep-restricted youth had significantly worse attention outcomes than youth with

extended sleep" (p.104). In addition, the results suggested that the effect of sleep restriction on attention is dose-respondent, as researchers found significant differences in attention outcomes when comparing extended sleep with restricted sleep as opposed to comparing restricted sleep to typical sleep (Lundahl et al., 2015). According to Lundahl et al. (2015) a possible explanation for these findings was the impact of short sleep on brain function as these findings are consistent with research that indicates prefrontal cortex impairment due to restricted sleep may mimic ADHD symptoms present in youth. Restricted sleep has been predicted to impact brain maturation and sleep is necessary for alertness and daytime functioning. Therefore, restricted sleep may impair daytime functioning, specifically in the area of the brain responsible for executive functioning (i.e., the prefrontal cortex). These two factors likely build on each other leading to the observed effects on attention (Lundahl et al., 2015). Based on their findings, Lundahl et al. (2015) advocate for the prevention and treatment of sleep problems to prevent future attention problems and prevent attention problems from persisting into adolescence and adulthood.

2.2.3 Impact of Inadequate Sleep on Children's Academic Performance

In regard to children's academic performance, research shows that short sleep impairs children's (age 5-13) cognitive abilities including their executive functions and their performance on tasks requiring multiple cognitive domains (i.e., school performance) (Astill et al., 2012; Dewald et al., 2010; Short, Blunden, Rigney et al., 2018). Executive functions (i.e., the mental processes that allow us to plan, focus, use memory recall, and multi-task) have garnered significant attention as they monitor subprocesses that regulate one's thoughts and actions (Friedman, Corley, Hewitt et al., 2009; Gruber et al., 2014). A possible explanation for the association between sleep and cognition and therefore school performance, is the idea that

inadequate sleep reduces necessary overnight brain activity that is needed for neurocognitive functioning (Dewald et al., 2010). A meta-analysis by Dewald et al. (2010) stated that higher order neurocognitive functioning (i.e., abstract thinking, creativity, integration, and planning) was characterized by an involvement of the prefrontal cortex, which is known to be sensitive to sleep.

Many cognitive abilities play into academic success; however, Gruber, Wiebe, Wells et al. (2010) stated that school performance required executive function, learning, memory, and self-regulation for academic success. According to the review by Spruyt (2019) executive function skills, reasoning, and problem-solving appear to be most sensitive to poor sleep. A systematic review and meta-analysis by Short et al. (2018) on cognition and objectively measured sleep in children found that longer sleep duration was associated with better cognitive functioning, in particular verbal IQ was significantly associated with sleep loss. However, the systematic review did not find an association between sleep loss, memory, fluid IQ, processing speed, or attention (Short et al., 2018). Current research findings for sleep and academic performance are inconsistent as there are different forms of measurements for sleep quantity, sleep quality, academic success (i.e., standardized tests, school grades), and sleep has been measured independently in various fields (i.e., medical, psychological and academic research) (Gruber et al., 2010). Overall, research to date highlights that the role of sleep and its impact on academic performance during childhood is a significant issue requiring public health intervention (Spruyt, 2019). Improving sleep quality and duration could be an effective means to maximize the ability of our youth to fulfill their academic potential while also improving their physical and psychosocial wellbeing**.**

2.3 Environmental Determinants of Healthy Sleep Habits

The following section was influenced by the consensus statement on the role of the family in the physical activity, sedentary, and sleep behaviours for children and youth (Rhodes et al., 2020). Consensus statement: "families can support children and youth in achieving healthy physical activity, sedentary and sleep behaviours by encouraging, facilitating, modelling, setting expectations and engaging in healthy movement behaviours with them. Other sources of influence are important (e.g., child care, school, health care, community, governments) and can support families in this pursuit (Rhodes et al., 2020)." Therefore, the following section covers research available specifically to the influence of the home environment (i.e., parent-child relationships and parenting practices) and the community environment on child and youth sleep.

2.3.1 Home Environment

The home environment is perhaps the most significant setting that impacts children's sleep, as families can support children and youth in achieving healthy sleep behaviours by encouraging, facilitating, modelling, setting expectations, and engaging in healthy movement behaviours with them (Rhodes et al., 2020). Research by McDowall, Elder and Campbell (2017) uncovered that parents with increased knowledge of sleep benefits reported earlier bedtimes and more consistent sleep routines for their children compared with parents with less knowledge. Of note, parents overestimate their child's sleep time by approximately 24 minutes per night (Nelson, Lundahl, Molfese et al., 2014), as many parents assume that their child is asleep once left alone in their room. The physical home environment can help foster children's sense of safety as well as cue them for sleep through parenting-practices such as bedtime routines, monitoring screen time, and sleep hygiene practices (Jarrin, Abu Awad, Rowe et al., 2020; Varma, Conduit, Junge et al., 2021). The social environment of the home is largely shaped by

parent-child relationships and parenting practices (Cimon-Paquet, Tétreault, & Bernier, 2019). This section summarizes evidence on how the home environment can support the development of healthy sleep behaviours or be a significant contributor to sleep problems in children.

2.3.1.1 Parent-Child Relationships

Children's sleep is affected by their relationship with their parents from an early age, as a sense of safety and emotional security allows for decreased vigilance, which is essential to the process of falling asleep (Cimon-Paquet et al., 2019). Therefore, the quality of the parent-child relationship significantly influences the development of children's sleep patterns (Cimon-Paquet et al., 2019). Research shows that high-quality parent-child relationships foster children's emotional security (Covington et al., 2021; Kim, Boldt, & Kochanska, 2015), whereas negative, conflictual relationships between parent and child relates to insecurity (Covington et al., 2021; Dubois-Comtois, Cyr, & Moss, 2011). In turn, school-age children's feelings of security in the parent-child relationship have been observed to promote healthy sleep habits (Cimon-Paquet et al., 2019; El-Sheikh & Kelly, 2017).

A systematic review by Newton et al. (2020) organized risk and protective factors of children's sleep (1-10 years) from 98 articles. Well established risk factors that impact children's sleep included negative parenting style (i.e., lax or permissive parenting), parental presence at bedtime, internalizing psychopathology (i.e., symptoms of anxiety, depression), externalizing psychopathology (i.e., symptoms of opposition, hyperactivity, inattention), and electronics use (Newton et al., 2020). Protective factors included older child age and consistent bedtime routines. Emerging risk factors included higher parental mental health problems, marital conflict, nighttime light exposure, nighttime noise exposure, and cognitive processes around sleep (Newton et al., 2020).

El-Sheikh and Kelly are authors of many articles related to family functioning and children's sleep (El-Sheikh & Kelly, 2017). Some of which include marital conflict and children's sleep (Kelly & El-Sheikh, 2011), children's emotional security and sleep (Keller & El-Sheikh, 2011), parental depressive symptoms and children's sleep (El-Sheikh, Kelly, Bagley et al., 2012), and parent-child conflict and children's sleep (Kelly, Marks, & El-Sheikh, 2014). In the study on marital conflict and children's sleep, Kelly and El-Sheikh found that conflict and aggression between parents impacted family sleep schedules and sleep problems (Kelly & El-Sheikh, 2011). Children that experienced emotional insecurity due to parent's marital conflict had increased likelihood of sleep-wake problems (Keller & El-Sheikh, 2011), and when mothers exhibited hostility towards fathers there was an association with infant and children having difficulty maintaining sleep (Rhoades, Leve, Harold et al., 2012). Lastly, parents' depressive symptoms were associated with sleep problems among children (de Jong, Cremone, Kurdziel et al., 2016; El-Sheikh et al., 2012). These unstable environments high in conflict and stress led children to maintain vigilant states that directly opposed sleep processes, leading to disruption in children's sleep (Acosta, Parent, Dimarzio et al., 2021; El-Sheikh & Kelly, 2017). On the other hand, mothers' perception of higher social support, fathers' perception of less parenting stress and fathers' perception of higher marital satisfaction predicted young children sleeping for longer bouts of uninterrupted sleep at night (Bernier, Belanger, Bordeleau et al., 2013). El-Sheikh and Kelly (2017) called for family functioning to be studied as a longitudinal predictor of children's sleep rather than a correlate, as much of their work on various family processes longitudinally predicted sleep in elementary school-aged children.

2.3.1.2. Parenting Practices

Parenting practices have been found to support children's sleep behaviours and include parents monitoring sleep-wake activities (Acosta et al., 2021; Gunn, O'Rourke, Dahl et al., 2019; McDowall, Galland, et al., 2017). Additionally, a lack of consistent limit setting (i.e., bedtime routines) by parents has been associated with youth bedtime resistance, difficulty initiating sleep, and nightmares (Acosta et al., 2021; Newton et al., 2020). A study by Acosta et al. (2021) examined the longitudinal nature of relations between 292 parents and their children (ages 3-14), and how those longitudinal relationships impacted youth's sleep problems. Based on research to date, Acosta et al. (2021) predicted that positive (i.e., warmth and supportiveness) and emotionally supportive parenting practices would longitudinally predict lower levels of sleep problems in youth at all ages. Acosta et al. (2021) also predicted that negative (i.e., hostility and laxness) and emotionally unsupportive parenting practices would longitudinally predict higher levels of sleep problems in youth across age groups. The study by Acosta et al. (2021) identified three parenting profiles which were characterized as (1) optimal, (2) intermediate, and (3) maladaptive. The optimal profile reported the highest levels of proactiveness, positive reinforcement, warmth, supportiveness, emotion- and problem-focused reactions, and expressed encouragement by parents. This optimal profile also reported the lowest levels of hostility, physical control, lax control, and destressed, punitive, minimizing reactions to youth distress. The maladaptive parent profile predicted the highest levels of sleep problems in youth and was characterized as having the lowest levels of proactiveness, positive reinforcement, warmth, supportiveness, emotion- and problem-focused reactions, and expressed encouragement, and the highest levels of hostility, physical control, lax control, and high levels of distressed, punitive, minimizing reactions to youth distress (Acosta et al., 2021). The intermediate profile was the

most common and was labeled ‘intermediate’ as parents had moderate levels of positive and negative parenting practices and the resulting sleep problems were less than the maladaptive profile and more than the optimal parenting profile (Acosta et al., 2021). Acosta et al. (2021) called for further research on family functioning and youth’s sleep to better understand how parent-youth relationships shift and impact youth sleep across development. This study also found that fathers were more likely than mothers to be in the maladaptive parenting profile, which reinforced the need to increase efforts of recruiting mothers and fathers when measuring parenting practices (Acosta et al., 2021).

Parenting practices are influenced by the family context in which they exist, for instance a child’s sleep problems may disrupt their parents sleep resulting in increased parent stress or increased negative parenting practices (Varma et al., 2021). At the same time, negative parenting practices translate to poor sleep in children due to children experiencing increased vigilance (Varma et al., 2021). This bidirectionality in sleep between parents and children highlights the role that parents play in helping their children establish regular sleep patterns (Bacaro, Feige, Ballesio et al., 2019). As children are dependent on parents to understand their developmental sleep needs, to identify sleep problems, and seek support or interventions from appropriate healthcare providers (McDowall, Galland, et al., 2017).

2.3.2 Community Environment

Relevant factors in the community environment that influence children and youth’s sleep include school, extracurricular activities, and the neighborhood that they live in (Meltzer, Williamson, & Mindell, 2021). Adolescents’ natural sleep cycles make them prone to going to bed late (after 11p.m.) and waking up late (after 8 a.m.) and this sleep-wake ‘phase delay’ does not align with many school start times (Biller, Molenda, Obster et al., 2022; Gradisar, Gardner,

& Dohnt, 2011; Patte, Qian, Cole et al., 2019). Therefore, one of the most direct ways schools impact student's sleep behaviours are through school start times (Biller et al., 2022; Marx, Tanner-Smith, Davison et al., 2017; Patte et al., 2019). Existing research and recommendations advocate for schools to start after 8:30 a.m. as delayed school start times better align with students' natural sleep cycles (Au, Carskadon, Millman et al., 2014; Langford et al., 2015; Patte et al., 2019; Storey, 2020; Watson, Martin, Wise et al., 2017). Extracurricular activities also influence students sleep schedules, as some sports and recreation occur in the morning before school (i.e., swimming, volleyball, basketball) or end late at night (i.e., hockey, soccer, dance) (Copenhaver & Diamond, 2017). Gruber and Bergmame (2013) advocate for extracurricular activities to end by 9 p.m. for adolescents and earlier for children.

Due to structural inequities in society, community factors that increase children's likelihood of inadequate sleep include living in low socioeconomic status (SES) households and neighbourhoods (Bagley, Kelly, Buckhalt et al., 2015; El-Sheikh, Bagley, Keiley et al., 2013; Hale, James, Xiao et al., 2019; Mayne, Mitchell, Virudachalam et al., 2021; Tomfohr-Madsen, Cameron, Dhillon et al., 2020). SES generally refers to family income, parent education, and occupation status and has implications for child health and wellbeing (Poulain, Vogel, & Kiess, 2020). El-Sheikh et al. (2013) found that children in low-income homes had increased reports of sleep problems. Mezick, Matthews, Hall et al. (2008) found that children from lower SES households (lower family income and parent education) may experience delayed bedtimes, increased variability in sleep onset, and decreased total sleep duration. Another study by Billings, Hale and Johnson (2020) found that youth who live in urban or densely populated areas had shorter sleep duration, higher likelihood of inadequate sleep and higher rates of SDB than youth living in less dense areas. Billings et al. (2020) suggested that these trends might be a result of

exposure to neighborhood violence, exposure to air pollution causing physiologic changes to the airways, and obesogenic environments that promote weight gain and sedentary behaviour. Billings et al. (2020) review of physical environment (urban density, recreational facilities, green space, mixed land use, and healthy food stores), neighborhood deprivation (disadvantage and disorder) and social environment (social cohesion, safety, and stigma), highlighted that policies to improve environmental conditions, from reducing air pollution to improving neighborhood safety, may reduce sleep health disparities and improve population sleep health for children and adults (Billings et al., 2020). In another study, El-Sheikh et al. (2013) acknowledged that poverty is a proxy to environmental risks such as substandard housing and low sense of neighborhood safety. El-Sheikh et al. (2013) suggested that some children have longer busing routes or have to arrive at school early to receive the free breakfast at school, which in turn impacted their sleep behaviours. Lastly, El-Sheikh et al. (2013) highlighted the association between maternal education and SES, as parents with higher education may be more aware, more proactive, and better prepared to handle children's sleep problems.

A systematic review by Mayne et al. (2021) included four studies assessing neighborhood environment impacts on children and adolescents sleep in Canada (Brouillette, Horwood, Constantin et al., 2011; Cote-Lussier, Knudby, & Barnett, 2020; Mackinnon, Tomfohr-Madsen, & Tough, 2021; Patte, Qian, & Leatherdale, 2017). Brouillette et al. (2011) observed 436 children (300 with OSA, 136 without OSA) in Montreal and found that children with OSA were more likely to live in low SES neighborhoods. Brouillette et al. (2011) suggested that these rates could be due to decreased access to high-quality medical care (availability of physicians and physicians ability to recognize OSA), parents may not recognize OSA and seek medical attention, parents may have competing priorities leading to delayed medical attention, and

disadvantaged neighborhoods may have characteristics directly responsible for OSA (i.e., poor indoor air quality, passive smoking, population density-related exposure). Brouillette et al. (2011) advocated for further studies to examine the neighborhoods impact on OSA. Cote-Lussier et al. (2020) studied a novel low-cost method to measure nighttime lighting (NTL) pollution, as NTL has been shown to predict child health-related outcomes (safety, sleep duration, and self-reported health). "Artificial light at night has been identified as a potential detrimental neighbourhood feature in terms of its impact on sleep quality, endocrine system profiles, metabolic function, and obesity" (Cote-Lussier et al., 2020, p. 1). Unfortunately, Cote-Lussier et al. (2020) was unable to confirm the association between NTL and health-related outcomes such as sleep. The COMPASS study used three consecutive years of the Canadian Health Behaviour of School-Aged Children (HSBC) survey to study Alberta and Ontario youth (45,298 secondary students, grades 9-12) sleep trends over time (Patte et al. 2017). They found that almost one third of Alberta and Ontario youth failed to meet sleep recommendations, which is similar findings to US and European youth sleep trends (Patte et al., 2017). The team Patte et al. (2017) also used the HSBC data to create cross-sectional regression models to test student-level (race/ethnicity, grade, sex) and school-level (school area urbanicity and median household income) to identify subgroups at greater risk of inadequate sleep. They found that low-income urban non-white students (not inclusive of Indigenous students) were at a greater risk of inadequate sleep and highlighted the mechanisms proposed for increased sleep deprivation in lower SES population included greater stress, poor sleep hygiene, and more chaotic households due to overcrowding, noise exposure, and fewer resources such as childcare. The authors called for further exploration and surveillance in the Canadian context to identify high-risk subgroups and to monitor trends to inform the integration of sleep into comprehensive health promotion strategies alongside other

lifestyle behaviours (Patte et al., 2017). The finding that family and neighborhood socioeconomic status were factors that increased children's likelihood of inadequate sleep highlighted the need to consider environment in school-based sleep interventions.

2.4 How Poor Sleep in Children has Been Addressed in the Past

The majority of pediatric sleep research available today focuses on identifying and treating sleep disorders and sleep problems in children. Rather than diagnosis and treatment, researchers are calling for the prevention of childhood sleep problems (Chaput, 2019). Increasing physician competence in providing sleep hygiene recommendations has been one approach to support sleep promotion (Gruber, Constantin, Frappier et al., 2017); however, reinforcing healthy sleep habits (sleep hygiene and duration) in other settings (i.e., schools, community agencies, physical activity clubs) can benefit child, adolescent, and adult sleep (Gruber & Bergmame, 2013; ParticipACTION, 2020). The below sections summarizes both clinical and settings-based approaches that have been taken to address adequate sleep in children and youth and highlights the need for more upstream approaches to create environments and communities that support healthy sleep habits.

2.4.1 Sleep Disorders that Require Clinical Intervention

A sleep disorder or sleep-wake disorder is considered by the American Psychiatric Association to "involve problems with the quality, timing, and amount of sleep, which result in daytime distress and impairment in functioning (American Psychiatric Association, 2020)." Throughout sleep research the term sleep problem is regularly used to replace sleep disorder, therefore sleep problem and sleep disorder will be used interchangeably throughout this section. Sleep disorders that require clinical intervention include insomnia as well as SDB, which

includes a set of breathing disorders ranging from snoring to OSA. However, in many children, inadequate sleep presents as hyperactivity, problems with attention, concentration, mood, fatigue, or academics. It is important to remember that insufficient sleep in children regularly presents as hyperactivity compared to lethargy as seen in adolescents and adults (Astill et al., 2012; Medalie et al., 2021). Approximately 25% of children will have a sleep disorder in childhood, while only 3.7% are diagnosed in pediatric centers in North America (Baddam, Canapari, Van de Grift et al., 2021; Corkum, Weiss, Hall et al., 2019). Rates of diagnosis are due to low levels of screening as well as scarce training opportunities for pediatric sleep medicine and, therefore, there are few pediatric sleep specialists (Baddam et al., 2021; Corkum et al., 2019; Katz, Weiss, & Fleetham, 2019). In addition, parent knowledge about sleep is typically poor (i.e., sleep requirements, sleep hygiene, signs of sleep problems/disorders) (Jarrin et al., 2020; McDowall, Galland, et al., 2017). Parent knowledge about typical and atypical children's sleep is an important prerequisite for sleep problems to be recognized and referred appropriately, as it is not uncommon for SDB to go untreated as parents do not report SDB symptoms to a healthcare provider (McDowall, Galland, et al., 2017).

In Canada, families first point of contact to the healthcare system is often a family physician, general practitioner, or nurse practitioner. However, 14.5% of Canadians 12 and older do not have a regular health care provider (Statistics Canada, 2020). This is a concern, as a regular health care provider is required for referrals to see a pediatric sleep specialist. Additionally, these practitioners may or may not be covered by public healthcare or private health insurance (Corkum et al., 2019). Families may also pay out of pocket at a private sleep clinic or hire a sleep consultant if services are available in their area (Corkum et al., 2019). Canadian sleep clinics can assess and treat respiratory sleep problems such as OSA, while many

are unable to address behavioural insomnia. Meanwhile, sleep consultants are unregulated and can have significant costs associated (Corkum et al., 2019). For those with a regular health care provider, parents/caregivers will often not discuss sleep concerns unless the physician asks questions about their child's sleep (Corkum et al., 2019). When parents do attempt to access help from their family physician for their child's sleep problems, they will often receive general advice, support and reassurance without any advice, less frequently they will receive a referral, or they will receive a suggestion of over-the-counter products (e.g. melatonin) or a prescription (Gruber et al., 2017).

A survey of Canadian sleep physicians in 2014 identified that there was one sleep physician per 167,000-282,000 children depending on province (Katz, Witmans, Barrowman et al., 2014), with average wait times of 5 months up to 2 years (Katz et al., 2019). Recently in 2018, the Royal College of Physicians of Canada established a program to certify and maintain physician competence in sleep disordered medicine (Katz et al., 2019, p. 38). This is the first formal pathway or specific requirements for pediatric sleep disorder medicine training in Canada (Katz et al., 2019; Katz et al., 2014). Therefore, it is not surprising that there is no published protocol for the referral, treatment and diagnosis of children's sleep problems.

In the United States, Baddam et al. (2021) stated that screening in pediatric clinics is essential and therefore proposed having an open-ended sleep question in initial clinical paperwork that, if positive, can lead to BEARS screening. BEARS stands for bedtime problems, excessive daytime sleepiness, awakenings and abnormal behaviours at night, regularity and duration of sleep, and snoring. BEARS does not require additional training, unlike other screening tools, and will help practitioners identify whether the child and family require a referral to a sleep specialist (Baddam et al., 2021; Himelfarb & Shatkin, 2021). Screening

questionnaires are available for the assessment of daytime sleepiness, sleep hygiene/environment, and sleep disorders, however, require training to score and interpret. Baddam et al. (2021) encouraged the use of sleep logs in primary mental health and pediatric clinics as they can aid identification of sleep hygiene and sleep duration difficulties, which can be corrected with sleep hygiene education. Overall, Baddam et al. (2021) recommend an in-depth clinical evaluation by a sleep specialist for snoring, excessive daytime sleepiness, abnormal movements during sleep, and sleep disturbances not improved by sleep hygiene recommendations.

2.4.1.1 Insomnia

Insomnia is the most common sleep disorder in children (Corkum, Reid, Hall et al., 2018; Medalie et al., 2021; Medalie & Gozal, 2018) and the recommended interventions for pediatric insomnia are behavioural treatments such as Cognitive Behavioural Therapy for Insomnia (CBT-I) (Medalie et al., 2021). "CBT-I is an evidence-based intervention that utilizes several well-established behavioural techniques to improve sleep onset latency and sleep efficiency" (Medalie et al., 2021, p. 336), including consistent bedtime routines, standard or gradual extinction, and positive reinforcement (Medalie et al., 2021). However, few practitioners are trained to facilitate CBT-I for children (Medalie et al., 2021; Medalie & Gozal, 2018). Physicians are encouraged to provide education about sleep hygiene as the first-line treatment (Medalie et al., 2021), as sleep hygiene provides behavioural, environmental and cognitive modifications to improve sleep (i.e., limiting noise, light, screens, and caffeine, regular exercise, and keeping a regular sleep-wake cycle) (Hall & Nethery, 2019; Mead & Irish, 2020; Nikles, Mitchell, De Miranda Araújo et al., 2020). Nevertheless, 40% of practitioners have recommended melatonin as the first line of defence rather than behavioural interventions (Gruber et al., 2017). While a review of

pediatrician and family physician prescribing practices for pediatric sleep problems in Ontario found that 30% recommended over-the-counter (OTC) medication or prescriptions including melatonin (73%), OTC antihistamines (41%), antidepressants (37%), and benzodiazepines (29%) (Bock, Roach-Fox, Seabrook et al., 2016). Notably, there are no approved pharmaceutical treatments for pediatric insomnia (Bock et al., 2016; Corkum et al., 2018; Ekambaram & Owens, 2021). However, melatonin is becoming a popular choice of parents/caregivers and practitioners to address pediatric sleep problems, including insomnia, despite an absence of pediatric guidelines and unregulated melatonin production (Ekambaram & Owens, 2021; The Medical Letter on Drugs and Therapeutics, 2020). Melatonin has been found effective in children with autism or ADHD as a sleep aid; however, it has not been approved for typically developing children (Ekambaram & Owens, 2021; Janjua & Goldman, 2016; The Medical Letter on Drugs and Therapeutics, 2020). Short-term use of melatonin with children appears to have minimal side-effects; however, long-term use is unknown. Side effects have included fatigue, increased bedwetting, headache, dizziness, diarrhea and rash. Melatonin supplements have also been suspected of delaying puberty due to impacting the natural shift of melatonin production at the onset of puberty (The Medical Letter on Drugs and Therapeutics, 2020).

Due to a shortage of available behavioural treatments for insomnia, very few children will receive recommended treatment for insomnia despite robust evidence supporting behavioural interventions effectiveness (Corkum et al., 2018). Therefore, an eHealth program called Better Nights Better Days (BNBD) has been developed and is in the process of being evaluated for typically developing children and children with neurodevelopmental disorders (Better Nights Better Days, 2021; Corkum, Lingley-Pottie, Davidson et al., 2016; Corkum et al., 2018). BNBD is an intervention for primary caregivers of 1- to 10-year-olds with insomnia (Corkum et al.,

2016). By providing BNBD virtually, families will be able to access behavioural sleep interventions despite services not being provided locally (Corkum et al., 2018).

2.4.1.2 Sleep Disordered Breathing

SDB includes a set of breathing disorders ranging from snoring to OSA (Heath, El-Hakim, Al-Rahji et al., 2021). OSA in children presents due to enlarged adenoids and tonsils, craniofacial abnormalities, obesity, abnormal muscle tone of the upper airway, and abnormal drive to breathe (Heath et al., 2021). Due to the range of causes of OSA, there are often challenges and delays while determining which specialist the child should be referred to (Heath et al., 2021). The most common cause of OSA is adenoid and tonsil hypertrophy (overgrowth) (Heath et al., 2021). Tonsillectomy and/or adenoidectomy (TA) by an otolaryngologist is the most common treatment for OSA (Cousineau, Prévost, Battista et al., 2021). Comorbidities that may present in children with OSA include allergic and non-allergic rhinitis, restless leg syndrome (RLS) and gastroesophageal reflux (GERD). Due to the comorbidities and overlapping causes of OSA respirologists may also see and treat OSA patients (Heath et al., 2021). According to Heath et al. (2021) "wait-times for patients can be reduced by identifying which specialty the OSA patient should be referred to first" (p.2). Tonsil size and adenoid size may help determine which children are TA surgical candidates. Therefore, Heath et al. (2021) used data from their pediatric OSA clinic in Edmonton, Alberta to create an algorithm for triaging patients to either pediatric respirology or otolaryngology.

Recommendations prior to OSA diagnosis is laboratory-based polysomnography (PSG), but it is performed in less than 10% of patients prior to surgery (Cousineau et al., 2021). TA is the first treatment recommended by the American Academy of Pediatrics and the American Academy of Otolaryngology for pediatric OSA and adenotonsillar hypertrophy. Unfortunately,

the condition persists after surgery in approximately 34% of cases (Cousineau et al., 2021). Ineffective surgeries are documented in children with tonsils of all sizes meaning other areas may be responsible for OSA (Cousineau et al., 2021). Studies done in the United States in 2004 and 2012 showed that pediatric otolaryngologists rarely use PSG prior to TA and rely mostly on symptoms and physical exam for treatment and management decisions (Mitchell, Pereira, Friedman, 2006; Friedman, Perkins, McNair, 2013). Drug-induced sleep endoscopy (DISE) is a diagnostic tool increasingly used to assess pediatric OSA, but it is not standard practice (Cousineau et al., 2021). A Canada-wide survey of 109 pediatric otolaryngologists found that otolaryngologists recommend DISE when the child had non-hypertrophic tonsils and a mismatch between clinical findings and severity of apnea (Cousineau et al., 2021). A study by Gazzaz, Isaac, Anderson et al. (2017) showed that proceeding with DISE in surgically naive children changed the surgical plan in 35% of cases. Therefore, DISE could help identify the children with OSA that will not benefit from surgery (Cousineau et al., 2021), leading children more rapidly to non-surgical options such as continuous positive airways pressure (CPAP), weight loss, positional therapy, e.g. (Cousineau et al., 2021). The Canadian-wide survey by Cousineau et al. (2021) highlighted a lack of consensus in the management of pediatric OSA and the use of DISE. At this point in time, DISE is a newer technology with questions remaining including the ideal timing in order to eventually avoid unnecessary AT (Cousineau et al., 2021).

2.4.2 Sleep Interventions in Schools

Schools have emerged as a setting to address inadequate sleep in children as current clinical interventions are unable to meet the demand or prevent pediatric sleep problems (Corkum et al., 2019). Schools provide children equitable access to health interventions (Jourdan et al., 2021), healthy students learn better (Basch, 2011), and school-based health promotion

using a CSH approach has been demonstrated to improve health behaviours in children (Dabravolskaj et al., 2020; Fung, Kuhle, Lu et al., 2012; Neely, Montemurro, & Storey, 2020; Storey, Montemurro, Flynn et al., 2016; Vander Ploeg, Maximova, McGavock et al., 2014). Therefore, schools provide an opportunity to reach all children and address their health wholistically, including children's sleep behaviours (Gruber et al., 2019; Rigney et al., 2021).

2.4.2.1 Delayed School Start Times

Adolescents natural sleep cycles (bed after 11 p.m. and wake after 8 a.m.) are at odds with many school start times (Biller et al., 2022; Gradisar et al., 2011; Patte et al., 2019). Leading to sleep deprivation on school days and making up sleep debt on the weekend, leading to 'social jetlag' (Biller et al., 2022). Social jetlag is considered to be a sleep timing difference between weekdays and weekends, a constant jetlag induced by social schedules (Biller et al., 2022). This sleep wake phase delay begins following puberty most often between 11-12 years of age, but can start as young as 8 years of age (Kuula, Pesonen, Merikanto et al., 2018) with varying presentation in each child due to hormones and individual chronotype (i.e., preference for going to bed and waking up earlier or later) (Lucien, Ortega, & Shaw, 2021). One of the most direct ways to address students' social jetlag is by delaying school start times (Biller et al., 2022; Marx et al., 2017; Patte et al., 2019). To date, some schools in Canada have delayed junior high and high school start times to later than 8:30 a.m. based on recommendations from the American Academy of Pediatrics, to better align with adolescents' natural sleep cycles (American Academy of Pediatrics adolescent sleep working group, 2014; Gariépy, Janssen, Sentenac et al., 2017; Patte et al., 2019; Storey, 2020; Watson et al., 2017). In 2014, the American Academy of Pediatrics released a policy statement recommending that middle school and high schools start after 8:30 a.m., as early school start times are a key modifiable contributor to insufficient sleep

which affects adolescents health and safety (Au et al., 2014). Consequently, many organizations have followed suit including the American Academy of Sleep Medicine and the American Psychological Association (American Psychological Association, 2014; Watson et al., 2017). Canadian organizations and societies have yet to follow suit, despite talks on school start times being included at the Canadian Paediatric Society's 2015 annual conference (Gariépy et al., 2017).

In a comprehensive assessment of school start times across Canada of 362 schools from all provinces and territories including 29,635 students in grades 6-10, Gariépy et al. (2017) found that on average schools started at 8:43a.m., students slept an average of 8.36 hours and 69% of students met sleep duration recommendations. However, 60% of students reported feeling tired in the morning (Gariépy et al., 2017). Gariépy et al. (2017) also found that "students from schools that started later slept longer, were more likely to meet sleep recommendations and were less likely to report feeling tired in the morning" (p.195). The study found that with every 10-minute delay of school start time corresponded with 3.2 minutes of additional sleep and students had 1.6% greater probability of getting sufficient sleep and a 2.1% smaller probability of feeling tired at school in the morning (Gariépy et al., 2017). A longitudinal study with over 27,000 Ontario high school students (Patte et al., 2019) found that delayed school start times are a promising intervention to improve sleep deprivation among youth. Patte et al. (2019) identified that school start time delays as small as 10-minutes were associated with longer sleep durations (23.7 minutes), without any negative changes to student's screen time or physical activity levels.

A recent study by Meltzer, Wahlstrom, Plog et al. (2021) in the United States observed approximately 28,000 students following changes in school start times in elementary school (60 min earlier), middle school (40-60 min later), and high schools (70 min later) over a 2 year

period. Elementary students sleep quantity and quality did not change, while middle school and high school students reported a significant increase in sleep duration and a clinically significant decrease in daytime sleepiness (Meltzer, Wahlstrom, et al., 2021). All results were maintained at the 2-year follow-up. Meltzer, Wahlstrom, et al. (2021) advocate for all schools to start after 8:30 am, however, this school jurisdiction required elementary schools to start earlier due to transportation schedules. As a result, Meltzer, Wahlstrom, et al. (2021) advocate for further research to understand the optimal start time for elementary students and a uniform later school start time when logistically and financially feasible.

Despite the mounting evidence advocating for later school start times, a Cochrane review by Marx et al. (2017) highlighted that existing evidence is of low-quality due to a lack of standard intervention conditions such as school start time, number of minutes of the delay, and a range of intervention durations. Therefore, further high-quality evidence is needed to inform schools and communities of the beneficial and adverse effects of later school start times to then support policy change and changes in school start times (Marx et al., 2017; Storey, 2020). Delaying school start times alone is unlikely to resolve sleep problems as healthy sleep is multifaceted and requires adequate and consistent duration, quality, and timing (Gruber et al., 2019). Researchers advocate for school-based interventions that empower students to adopt healthy lifestyles in which their daily choices allow for sleep of consistent duration, quality, and timing (Gruber et al., 2019).

In an expert commentary on the Cochrane review of existing research on delayed school start times in high schools (Marx et al., 2017), Storey (2020) recommends further research on the complex relationships between sleep, nutrition, physical activity, and sedentary time. Storey (2020) highlighted that many of the studies in the Cochrane review did not include screen time

due to being conducted over a decade ago. Therefore, current screen time use is not reflected in the Cochrane review (Marx et al., 2017). Storey (2020) recommended considering the complex relationships between technology, sleep, and academics. A limitation identified in the Cochrane Review by Marx et al. (2017) and Storey (2020) was the lack of research available on the process of delaying school start times. Storey (2020) stated that understanding the process is essential for the success of school-based health promotion interventions, including delayed school start times, and that future interventions would benefit from taking a whole school approach such as CSH. A whole school approach would help shift the school culture to one that supports and promotes healthy sleep habits (Storey, 2020; Storey et al., 2016) Due to difficulties in conducting experimental and prospective studies in schools, Storey (2020) encouraged the use of natural experiments and different ways of knowing as highly controlled studies do not account for the reality of school environments. Storey (2020) stated that "solution-oriented and strengths-based approaches, which consider school assets and needs, as opposed to focusing on deficits, are warranted and are more likely to be translated into practice." Overall, if schools are supportive of delayed school start times they are a solution-oriented approach to address youth's sleep deprivation (Storey, 2020).

2.4.2.2 School-based Sleep Education Interventions

School-based sleep interventions have historically attempted to apply randomized control trials (RCTs) in school settings (Gruber, 2020), focused primarily on adolescents, used subjective measurements, and not engage parents/families or go beyond the classroom setting (Rigney et al., 2021). When researchers design research-informed interventions with the goal of integrating them into real life, they must consider real-life issues (Gruber, 2020). These real-life issues are key factors that influence whether schools are receptive to implementing an

intervention. In school environments, if the research design comes in conflict with real life issues, schools will often have to prioritize real life issues potentially at the detriment of the intervention (Gruber, 2020). A study by Rigney et al. (2021) examined 32 school-based sleep interventions conducted between 2007 and 2020 with children aged 5-18 years. Inclusion criteria for the review specified that interventions were required to be in a school setting, have pre- and post-measures of at least one sleep-related domain (i.e., sleep hygiene, sleep knowledge, daytime sleepiness), be original research, published in a peer-reviewed journal and written in English (Rigney et al., 2021). From the 32 school-based sleep interventions, five interventions were conducted in elementary schools in the following countries Japan (Maeda et al., 2019; Tamura & Tanaka, 2014), France (Rey et al., 2020), United Kingdom (Ashton, 2017) and Canada (Gruber et al., 2016) between 2014-2020 which are summarized below.

In Japan, an RCT by Tamura and Tanaka (2014) provided a 45-minute sleep education lesson and self-help treatment to 148 children in grades 4, 5 and 6 health classes at two different Hiroshima schools (intervention group) and followed another 76 grade 4, 5 and 6 students as their control group. The sleep education lesson was created specifically for each grade to reflect cognitive abilities (Tamura & Tanaka, 2014). During this RCT students picked a practice to improve their sleep and then tracked their sleep habits for two weeks (Tamura & Tanaka, 2014). The following measures were tracked in a sleep diary: bedtime, light-off time, wake-up time, mood at awakening and sleepiness during class. The school principal and teachers supported students reliability in tracking their sleep habits by checking their sleep diaries every morning at school for two weeks (Tamura & Tanaka, 2014). Following the two-week sleep education with self-help treatment (intervention), students sleep knowledge increased ($p = 0.002$), students' bedtimes advanced on average 17 minutes and sleep duration increased by 14 minutes. Follow

up two weeks later demonstrated further bedtime advances of 30 minutes for grade 4 students ($p = 0.006$) (Tamura & Tanaka, 2014). Prior to the sleep intervention 38% of students had a set rising time every morning, following the intervention 63.4% of students had a set rising time. In addition, post intervention fewer students took naps after school compared with pre-treatment ($p = 0.055$; $p = 0.094$). Frequency of irritability pre-treatment was 41.7% and 26.4% post treatment and compared to the control group ($p = 0.001$). The number of students complaining about poor sleep significantly decreased in the treatment group ($p = 0.017$). Lastly, the number of students in a bad mood in the morning significantly decreased in the treatment group ($p = 0.002$). There were no significant changes found for sleepiness (59.7% before treatment to 52.8% after treatment), motivation (44.4% to 40.3%), concentration (20.8% to 18.1%), being unhappy at school (43.1% to 38.9%), inattention (36.1% to 37.5%), memory (44.4% to 48.6%), confidence (48.6% to 44.4%), tiredness (65.3% to 55.6%) and shoulder stiffness (31.9% to 26.4%). For ethical reasons, researchers provided sleep education for parents and teachers of the control group following the conclusion of the elementary school sleep education intervention (Tamura & Tanaka, 2014).

The second school-based sleep intervention conducted in Japan was a sleep education program with the aim of improving students lifestyles and preventing future school refusal that presented upon entering junior high (Maeda et al., 2019). Maeda et al. (2019) conducted the intervention in Fukui with grade 1 through grade 6 students at Miyake primary school (M-PS). Students tracked their bedtime and wake-up time for two weeks at two different times in the school year and were then classified in categories A-D based on their sleep habits. Students and guardians of category D were interviewed to address poor “daily life rhythms,” received lectures on the importance of “daily life rhythms,” and were provided with 45 minutes of classroom work

(Maeda et al., 2019). Maeda et al. (2019) stated that "children who exhibit school refusal behavior had symptoms consistent with circadian rhythm sleep disorders, mainly delayed sleep phase syndrome (DSPS)" (Hochadel, Frölich, Wiater et al., 2014; Hysing, Haugland, Stormark et al., 2015; Sivertsen, Pallesen, Stormark et al., 2013; Tomoda, Miike, Uezono et al., 1994, p. 1036). Circadian rhythm disorders occurred due to chronic sleep deprivation, night-shift lifestyle, which is often caused in children and youth through nighttime screen use, late sports activities, and homework, leading to impairment in brain function (Baud, Parafita, Nguyen et al., 2016; Hysing, Harvey, Linton et al., 2016; Komada, Inoue, Hayashida et al., 2008; Miike, Tomoda, Jhodoi et al., 2004; Ukai, Kobayashi, Nagano et al., 2007). Rates of school refusal of M-PS students were 10% (3 times higher than the national average) upon entering Kaminaka junior high school (Maeda et al., 2019). Maeda et al. (2019) decided to test the hypothesis that preventing chronic sleep deprivation and the resulting DSPS leads to decreased school refusal rates. Maeda et al. (2019) found that following the implementation of the sleep education program for all grades in 2009 students sleep onset time improved every year (2009 $p = 0.053$; 2010 $p = <0.001$; 2011 $p = 0.005$; 2012 $p = 0.008$; $p = <0.001$), students sleep duration was extended (2009 $p = 0.329$; 2010 $p = 0.016$; 2011 $p = 0.081$; 2012 $p = <0.001$) and school refusal rates decreased every year (2005-2007, $10.46 \pm 0.56\%$; 2008-2014, $1.77 \pm 1.35\%$; $p < 0.001$). Maeda et al. (2019) encourages sleep and lifestyle education for all elementary school grades to decrease school refusal rates.

In the United Kingdom, Ashton (2017) conducted a quasi-experimental study with 9-10 year old students (n=220; n=107 intervention, n=113 control), whereas they adapted the Australian Centre for Education in Sleep (ACES) program. The control group received the intervention upon completion of the study. Students received three 50-minute lessons and

completed a student project. Lessons covered sleep facts, causes and effects of poor sleep, common sleep problems and sleep hygiene (Ashton, 2017). To engage students, sleep diaries, group discussion, case studies and web-based activities were completed. Sleep duration was recorded in sleep diaries and actigraphy data was collected for four consecutive nights at three different time periods (Ashton, 2017). Sleep diaries were often incomplete (missing a time period); therefore, data sets were available for only 7 students from the intervention group and 20 students in the control group. Overall, students sleep knowledge increased (pre intervention $p = 0.017$; post intervention $p = 0.008$), however, the increase in their sleep duration was not significant ($p = 0.342$) and was no longer present at follow up (8-12 weeks later) (Ashton, 2017).

Sleep for Success (SFS) is a school-based sleep education program that is the first to provides insight into the role of sleep interventions using community-based participatory research (CBPR) in the school setting (Gruber et al., 2016). SFS was created using CBPR by bringing together researchers, teachers, and community members. The intervention occurred in 2016, included 7-11 year-old students and included modules for children, family, community, school staff and decision-makers (Gruber et al., 2016). Including diverse partners that can influence children's sleep, providing the intervention to elementary students and using non-randomized controlled before-and-after study groups was a novel approach for school-based sleep interventions (Gruber et al., 2016). These alternative approaches led to positive results, including an increase in children's sleep duration by 18.2 minutes per night ($p < 0.009$), sleep efficiency improved by 2.3% ($p < 0.03$), sleep latency (the time it takes to fall asleep) was improved by 2.3 minutes ($p < 0.001$) and report card grades in mathematics ($p < 0.004$) and English ($p < 0.05$) improved significantly (Gruber et al., 2016). Sleep for Success was the first school-based sleep intervention to use objective sleep measures, to include measures for sleep

duration and sleep efficiency, to use class grades to determine program impact, to create the school-based sleep education program using CBPR and an experimental learning approach, to tailor the program for specific developmental learning styles and ages, and include teachers, administrators, parents, and children in the intervention program.

ENSOM (ENfant, child in French, SOMmeil, sleep in French), was a multidisciplinary and collaborative elementary sleep intervention conducted in France with 130 grade three students aged 8-9 years from five different elementary schools. ENSOM is an elementary school-based sleep intervention that used objective sleep measures, examined the impact of the intervention on sleep duration and sleep efficiency, measured academic performance, engaged community members in the process of development of the intervention, and documented significant improvements in sleep duration (Rey et al., 2020). ENSOM was a collaborative study between researchers, students, teachers, and parents. "The overall aim of this study was to evaluate the beneficial effect of a school-based sleep education program conducted by teachers without sleep expert's intervention on children sleep and on their cognitive and academic performance" (Rey et al., 2020, p. 5). Topics covered included sleep rhythms, role of sleep, need for sleep, and foes and friends of sleep. Researchers found that ENSOM was successful at improving students sleep habits and improving cognitive and academic performance. Students sleep duration was extended on average 31 minutes per night ($p < 0.001$), sleep efficiency improved by 2.9% ($p < 0.001$), sleep latency was decreased by 7.7 minutes ($p < 0.001$), and wake after sleep onset was decreased by 4.5 minutes ($p < 0.001$) following ENSOM. Parents also reported a significant increase in their sleep knowledge (Rey et al., 2020).

The increase in sleep duration made by ENSOM and SFS is contradictory to the majority of existing school-based sleep interventions (Rigney et al., 2021). Rey et al. (2020)

acknowledged that their sleep intervention (ENSOM) was likely quite similar to others; however, they believed they had success improving students sleep duration primarily due to collecting objective measures through actigraphy. Subjective measures such as sleep diaries and questionnaires are introspective and, therefore, have potential to miss information collected by actigraphy. Of the five elementary school-based sleep interventions, three measured sleep duration objectively with actigraphy (Ashton, 2017; Gruber et al., 2016; Rey et al., 2020). Of these, two interventions were successful at improving sleep duration (Gruber et al., 2016; Rey et al., 2020) and one intervention was effective at improving sleep duration at follow-up, one year later (Rey et al., 2020). However, Rey et al. (2020) was the only elementary school-based sleep intervention to do a follow-up beyond 12 weeks after the intervention.

In order to improve students sleep behaviours and extend students sleep time, Gruber et al. (2016) chose to work with elementary aged children due to the following: (1) lifestyle habits likely cause poor sleep habits in children, and bedtimes are often influenced by the world around them, both of which can be addressed by school-based sleep education that influences lifestyle habits; (2) sleep deprived children will benefit physically, emotionally and academically from healthier sleep habits; (3) elementary-aged children are more receptive to advice from adults (i.e., parents and teachers); and (4) developing healthy habits at a young age creates a foundation for healthy habits later in life, which could allow for an easier transition to adolescence. In addition future studies aiming to integrate sleep education into the curricula may benefit from CBPR, as input from teachers, community member and relevant experts allowed SFS to include teaching methods that were developmentally appropriate and matched teachers preferred teaching styles (Gruber et al., 2016).Taking a CBPR approach (e.g., SFS) and/or a multidisciplinary and collaborative approach (e.g., ENSOM) allowed SFS and ENSOM to avoid

some of the common barriers experienced by previous school-based sleep interventions (Gruber et al., 2016; Rey et al., 2020). Gruber et al. (2016) was the first study to make an effort to address social systems and cultural values that effect children's sleep habits while developing their school-based sleep intervention. They did this by addressing student and parent knowledge, habits, family environment, social systems and cultural values related to sleep. Despite the success of SFS, there are no published reports of school communities successfully sustaining a sleep education program beyond the study period (Gruber, 2017). Rey et al. (2020) was the first to prove sustainability at follow-up a year later. Overall, SFS and ENSOM highlighted the need to work with community partners (e.g., teachers, school administrators) to help identify the best ways to address inadequate sleep in children and youth. Therefore, researchers advocate for a comprehensive approach to school-based sleep promotion (Bird, McKernan, et al., 2021; Corkum et al., 2019; Rey et al., 2020).

2.5 How to Address Poor Sleep in Children Moving Forward

2.5.1 Recommendations from the 24-hour Movement Guidelines for Children and Youth

While the evidence-based 24-hour Movement Guidelines for children and youth provide Canadians with information on how much physical activity, sedentary time, and sleep children should be getting (Faulkner et al., 2016), there is a need to move these guidelines into practice. Of note, practitioners and other partners (e.g., parents, teachers, exercise professionals, pediatricians and youth) have identified schools as ideal settings to disseminate and promote the guidelines (Faulkner et al., 2016). School partners are vital knowledge users of the 24-hour Movement Guidelines, as schools act as informational hubs to supplement parent/caregiver and

children's existing knowledge and awareness. Given that children and youth spend a third of their day in school, schools are ideal settings to educate youth about the 24-hour Movement Guidelines, help youth understand the value of attaining the guidelines, and provide youth with the skills to meet the guidelines throughout their lives (Faulkner et al., 2016). However, there are barriers to operationalizing guidelines in a school community and there needs to be multi-sectoral collaboration to be successful (Faulkner et al., 2016).

To further awareness and practice of sleep guidelines, ParticipACTION (2020) recommended the development of a national media campaign to shift societies perception of sleep from a waste of time towards sleep being part of a healthy lifestyle; making sleep comparable to healthy eating or physical activity. Further recommendations included delayed school start times, eliminating daylight savings time, and ending extracurricular activities at a reasonable time per age group (i.e., ending at 9 p.m. for adolescents). Lastly, ParticipACTION (2020) recommended that sleep health literacy be included in school curriculums, to support the development of the foundation for life-long health. Bonuck, Schwartz and Schechter (2016) defined sleep health literacy as "the knowledge, motivation, and competencies to promote healthy sleep and to recognize a sleep problem."

Latimer-Cheung et al. (2016) acknowledged that schools are capable of passively disseminating the guidelines through print resources to students, parents, and staff; however, it is active dissemination that would provide greater awareness and uptake of the guidelines. Active dissemination would require integration of the 24-hour Movement Guidelines into the physical education, health education and home economics curricula, as well as professional development for teachers to understand and apply the 24-hour Movement Guidelines (Latimer-Cheung et al., 2016). Including sleep recommendations into the 24-hour Movement Guidelines for children and

youth is a good start, however, researchers are still working on how recommendations can best be used to improve the sleep status of Canadian children (ParticipACTION, 2020).

One possible solution to operationalize and embed the promotion of healthy sleep habits into school culture, is by taking a CSH approach. As such, the CSH approach and its applicability to promoting healthy sleep habits are reviewed below.

2.5.2 Comprehensive School Health

CSH is an approach that aims to improve "students' educational outcomes while addressing school health in a planned, integrated and holistic way (JCSH, 2016)." CSH addresses the whole school community through four interrelated components: (1) social and physical environment, (2) teaching and learning, (3) policy, and (4) partnerships and services. These components foster collaboration between the home, school, and community to address children's health behaviours as well as modifying the environments where children live, learn, and play (JCSH, 2006). CSH focuses on the whole school community by incorporating individual, interpersonal, community, and organizational factors to foster a healthy school culture (JCSH, 2019). Internationally, CSH is also known as Health Promoting Schools and the Whole School, Whole Community, Whole Child Model (WSCC) (Centers for Disease Control and Prevention, n.d.; World Health Organization, 2017). The Health Promoting Schools (HPS) framework was developed by the World Health Organization in the 1980s to foster the reciprocal relationship between health and education beyond schools (Langford et al., 2015). School communities that take a CSH approach have demonstrated to be effective at improving health behaviours including physical activity, healthy eating and mental health (Dabravolskaj et al., 2020; Vander Ploeg et al., 2014), which have also lead to improvements in academic performance (Faught, Montemurro, Storey et al., 2017; Faught et al., 2019).

CSH is not a standardized program or intervention to be replicated in every school; instead, CSH allows for flexibility and school-specific autonomy to shape the intervention in a way that works for that specific school community (Neely et al., 2020). The goal of taking a CSH approach is to change the school culture towards a school community that "promotes the health of students, staff and the community as part of a community-wide population health approach" (JCSH, 2006, p. 1). Embedding CSH into the day-to-day functioning of the school allows health promotion to become the norm, which decreases the resources (i.e., staff hours, finances, equipment) required to foster the development of a health-promoting school, also leading to sustainability of the CSH approach (Gugglberger & Dür, 2011).

The CSH approach is a novel approach to address inadequate sleep in Canadian children as CSH fosters partnerships between the home, school, and community to support students' health, wellbeing, and success. Partnerships between the home, school, and community are necessary to address student and family sleep behaviours given that sleep occurs in the home and sleep behaviours are influenced by the socioecological context where families live, learn, and play (Rhodes et al., 2020). Working collectively to address student sleep behaviours has the potential to improve students' health, educational outcomes, and future quality of life, as healthy students learn better and educated individuals are healthier (Faught et al., 2017; Sosso, Holmes, & Weinstein, 2021). School, home, and community directly and indirectly, affect children's sleep behaviours (Grandner, 2019; Rhodes et al., 2020). Schools can impact children and youth sleep through policies (i.e., delayed start times, physical activity) (Bowers & Moyer, 2017; Marx et al., 2017) and school-related stress (i.e., academic commitments) (Holland, Courtney, Vergara et al., 2021). The home environment plays a significant role in shaping children's sleep behaviours through both the social and physical environment including parent-child

relationships, parenting practices, and the family home environment (Acosta et al., 2021; Jarrin et al., 2020; Spilsbury, Storfer-Isser, Drotar et al., 2005). Community factors include socioeconomic status of the family and neighbourhood SES (Mayne et al., 2021; Tomfohr-Madsen et al., 2020). This section will describe relevant literature on how CSH can impact child and youth sleep by working collaboratively across the home, school, and community through the four components of CSH. Understanding how these components and settings influence children's sleep is essential to inform school-based sleep promotion using a CSH approach.

2.5.2.1 Components of Comprehensive School Health

CSH is a planned, integrated, and wholistic approach to address school health (JCSH, 2016). Therefore, all components are necessary when aiming to transform a school culture to support positive health practices (i.e., healthy eating, physical activity, sleep). To further support the implementation of CSH, Storey et al. (2016) developed the essential conditions for the implementation of CSH to achieve changes in school culture and improvements in health behaviours of students. The essential conditions were developed from a multitude of partner perspective (45 teachers, 46 principals, 34 school health facilitator), they include core conditions (students as change makers, school-specific autonomy, demonstrated administrative leadership, higher-level support, dedicated champion(s) to engage school staff, community support, quality and use of evidence, professional development) and contextual conditions (time, prior community connectivity, readiness and understanding, and funding and project support) (Neely et al., 2020). The essential conditions allow for further understanding of CSH leading to successful implementation demonstrated by a shift in school culture towards a health promoting school. The following section summarizes the components of CSH and how collectively they can support school-based sleep promotion.

2.5.2.1.1 Social and Physical Environment

Within the CSH approach, the social environment includes the quality of relationships among and between staff and students, the emotional well-being of students, relationships with families and community, and a supportive environment for the school community to make healthy choices (JCSH, 2016). While the physical environment includes the physical structures and spaces where students spend their time (i.e., buildings, grounds, playgrounds), basic amenities (i.e., sanitation, air, healthy food), safe spaces designed for connectedness and injury prevention, and a safe, accessible and supportive environment for all members of the school community to make healthy choices (JCSH, 2016). The social and physical environments are key components of the school culture, also known as the school ethos.

School staff, particularly teachers and administrators, constantly shape the social and physical environments of the school community (Hamilton, Goodman, Roberts et al., 2021). As a result, teacher-student relationships are a foundational component of students' social and physical school experience (Hamilton et al., 2021; Tilga, Hein, Koka et al., 2020). Research has demonstrated that teacher-student relationships are a key factor in fostering student health and academic outcomes (Conner, Miles, & Pope, 2014; Hamilton et al., 2021; Tilga et al., 2020). It has also been found that tired students experience less student-teacher closeness and conflict between students and teacher impact students sleep habits (Holdaway & Becker, 2018). When students believe that their teacher cares and that they have an adult confidant in their school environment, students experience less academic anxiety and physical problems (Conner et al., 2014).

Another part of a teacher's role in a school taking a CSH approach is being a role model (Storey, Spitters, Cunningham et al., 2011). A study by Cargo, Salsberg, Delormier et al. (2006)

interviewed 30 teachers, 2 administrators, and one physical education teacher to understand the social context of the Kahnawake Schools Diabetes Prevention Project. From these interviews teachers explained role modelling as “setting a positive example for children and in doing so reinforcing intervention messages” (Cargo et al., 2006, p. 91). “For many teachers, their actions were examples of what they taught” (Cargo et al., 2006, p. 91). More recent research demonstrating teachers as role models in health behaviours include a study on students sugar sweetened beverage consumption, which found that when teacher’s drink water in front of their students it influenced students water consumption (Laguna, Hecht, Ponce et al., 2020). Therefore, when teachers implement school-based sleep promotion their actions can be an example of what they taught about sleep.

While teachers significantly influence students experience of the school environment, principals are the gatekeepers for program implementation at the school (Fullan, 1992; Roberts, McLeod, Montemurro et al., 2016). A study by Roberts et al. (2016) used grounded ethnography to explore the role of a principal in the implementation of the CSH approach to foster a healthy school community. They found five instrumental aspects of the principals' role:

> "principals (i) primed the cultural change; (ii) communicated the project's importance to others; (iii) negotiated concerns and collaboratively planned; (iv) held others accountable to the change, while enabling them to take ownership and (v) played an underlying supportive role, providing positive recognition and establishing ongoing commitment (Roberts et al., 2016)."

Therefore, principals interested in school-based sleep promotion are an essential partner for uptake using a CSH approach. Demonstrated administrative leadership is also one of the

essential conditions for the implementation of CSH to achieve changes in the school culture (Storey et al., 2016).

While teachers and staff play a key role in shaping the social and physical environment of the school, students enthusiasm and energy drive school-based health promotion initiatives forward (Storey et al., 2016). Students who are "enthusiastic and energized by the project are more likely to accept and engage within the project, and to communicate the CSH message beyond the school walls, propelling the project forward" (Storey et al., 2016, p. 4). Students are the drivers of change in a school, change makers, as new initiatives in a school are difficult to move forward without student interest (Storey et al., 2016). Students thrive in leadership opportunities, including advocating for what students want their school to be physically and socially (Griebler, Rojatz, Simovska et al., 2017). A systematic review by Griebler et al. (2017) analyzed existing evidence for the effects of student participation in designing, planning, implementing and/or evaluating school health promotion measures. They found that student participation in health promotion program implementation lead to (1) personal effects on students (increased ownership, motivation, positive attitudes, skills, competencies and knowledge, personal development, health-related effects, and influence on student perspective); (2) effects on the school as an organization (school culture and social climate, rules and policies, and physical infrastructure); (3) improved interactions and social relationships in school (among peers and between students and adults) (Griebler et al., 2017). Student involvement in school-based sleep promotion implementation has the potential to increase student and school staff uptake, student autonomy for their sleep behaviours, integration of sleep promotion into the school culture, and improve student relationships as well as relationships between students and staff. The social and physical environment of the school influences student's health and well-

being often through ‘hidden’ or ‘informal’ curriculum. This informal curriculum is shaped by the values and attitudes promoted within the school (Langford et al., 2015).

2.5.2.1.2 Teaching and Learning

Within the CSH approach, teaching and learning "encompasses formal and informal curriculum, resources and associated activities (JCSH, 2016).” Which includes the “knowledge, understanding and skills for students to improve their health and well-being and enhance their learning outcomes (JCSH, 2016)." Additionally, this component includes professional development for staff related to health and well-being. Student wellness such as healthy eating, physical activity, and mental health fall under the provincial curriculum (LearnAlberta, 2022). However, the extent to which students learn about wellness is significantly influenced by the teacher (Hamilton et al., 2021; Tilga et al., 2020) and the school (Griebler et al., 2017). For instance, sleep is not a stand-alone outcome within the health curriculum, rather an example listed for learning outcomes associated with personal health choices and behaviours. Therefore sleep is a topic that teachers can cover if they choose (Alberta Learning, 2002; LearnAlberta, 2022). Integrating the 24-hour Movement Guidelines for children and youth into the school environment requires active dissemination such as being included in the physical education, wellness, and home economics curriculum, professional development for teachers, administrators, and schools staff, integration into new teacher training, and policy change (i.e., school start times, sitting time, physical activity time) (Latimer-Cheung et al., 2016). According to Latimer-Cheung et al. (2016) successful implementation of the 24-hour Movement Guidelines would look like stretch breaks, non-sitting time, physical activity movement bursts throughout the day other than physical education or recess, school start times that allow adequate sleep patterns, cross curricular teaching of the 24-hour Movement Guidelines (i.e., math class, science

class), and increased active school travel. Creators of the 24-hour Movement Guidelines encourage collaborative interventions between CSH and the 24-hour Movement Guidelines to support healthy movement behaviours of children and youth (Latimer-Cheung et al., 2016).

Previous studies that examined school-based health promotion programs indicated that principals and other school partners perceived teachers' understanding and competence in facilitating the school-based health program as invaluable (Storey et al., 2016; Tjomsland, Iversen, & Wold, 2009). School partners also highlighted teachers' enthusiasm and engagement in the program to play a major role in the maintenance and sustainability (Storey et al., 2016). While there is a lack of evidence regarding the role of teachers in school-based sleep promotion, it is known that teachers are essential for any school-based health promotion initiative to succeed (Snelling, Ernst, & Belson, 2013; Storey et al., 2011). A study conducted in Finland analysed health education teachers' methods of teaching students information-seeking, evaluation, and critical thinking skills (Nygård, Hirvonen, Räisänen et al., 2020). Nygård et al. (2020) highlighted that teachers act as role models, information gatekeepers, and trustees who guide students to choose credible health information sources. While a study on the teachers role in addressing the childhood obesity epidemic found that teachers can develop the confidence and conviction to include health across the curriculum and positively impact student and teacher health outcomes (Snelling et al., 2013). According to Snelling et al. (2013), when teachers are provided with professional development and employee wellness programs, teachers have the ability to become role models of healthy behaviours and integrate healthy living into daily instruction. “The continual contact that teachers, administrators, and staff maintain with students from preschool through high school creates a sustained opportunity to provide education or support for positive healthy choices in creative ways” (Snelling et al., 2013, p. 56).

2.5.2.1.3 Policy

Within CSH, policy is described as "policies, guidelines and practices that promote and support student well-being and achievement, and shape a respectful, welcoming and caring school environment for all members of the school community (Ever Active Schools, n.d.)." According to Jourdan et al. (2021) policy is one of the levers required to make change in schools in order to promote the health of all students (i.e., school jurisdiction wellness policies, provincial school wellness policies, school nutrition policy, daily physical activity policy and delayed school start times policy). Schools have been mandated by the government to help improve population health since the origin of the contemporary school system (i.e., hygiene, tuberculosis, alcoholism) (Jourdan et al., 2021). School health promotion looks different today as many schools take a whole school approach (i.e., CSH, HPS, WSCC) that recognizes that school culture influences students and staff's wellbeing (Jourdan et al., 2021; Langford et al., 2015). However, indicators of school performance rarely include health, or health education, as a key measure (Jourdan et al., 2021). Canada does not have a federal policy implementing CSH (McIsaac, Hernandez, Kirk et al., 2016). However, the Pan-Canadian Joint Consortium for School health (JCSH) is a partnership between the provincial, territorial, and federal governments that was established in 2005 to provide leadership and support for the implementation of CSH across Canada (JCSH, 2018; McIsaac et al., 2016). Whole school approaches look different across Canada, however, JCSH supports provinces, territories, and school jurisdictions to use a comprehensive approach that addresses the barriers to creating a healthy school environment.

Top-down policy implemented by school jurisdictions or provincial government has been shown to be a facilitator for successful implementation of taking a CSH approach (McIsaac,

Read, Veugelers et al., 2017). However, collaboration and teamwork are necessary to translate and integrate health promotion policy into practice (McIsaac et al., 2016). The results from the scoping review of 41 interventions implementing HPS internationally suggest that policy that support HPS in partnership with resources at the school-level help to facilitate commitment to the HPS approach (e.g., through personnel resources, frameworks, tailored support with quality control, information and knowledge, financial resources and opportunities for collaboration and exchange). Policy and resources provided at the school level help facilitate health promotion in "schools as many teachers are trained to teach academic outcomes and lack of guidance and resources for schools can limit their ability to embrace a HPS approach" (McIsaac et al., 2016, p. 19). For instance, provincial government or school jurisdictions creating policy to delay school starts until after 8:30 a.m. would support school-based sleep promotion as the province or the school jurisdictions would illustrate that sleep is important. Another policy that schools or school jurisdictions could establish to support healthy sleep habits would be policies around physical activity hours for youth (end by 9 p.m. for high school students) (Gruber & Bergmame, 2013). As sleep currently resides in the health education curriculum, establishing instructional time requirements for health education may increase accountability for schools to teach about healthy sleep behaviours (Robinson, Sulz, Morrison et al., 2023).

To understand partner perspectives of the essential conditions (Storey et al., 2016), Neely et al. (2020) interviewed partners implementing policies or programs which take a CSH approach from across Canada. From these interviews, several participants highlighted the importance of policy at the school jurisdiction and ministerial levels around CSH. Participants thought that, with a policy in place there would be accountability for school boards and school communities to follow through with implementing CSH. However, participants highlighted the importance of

maintaining a balance between a top down and bottom up approach in order to safeguard schools' autonomy while also building accountability around CSH. As a result, higher-level support was created as a new core condition for the essential conditions (Neely et al., 2020). Therefore, higher-level support will be necessary for the success of school-based sleep promotion.

According to a study of physical activity and physical education policies from 421 elementary schools across the US (Calvert, Turner, Leider et al., 2020) and a study of 151 school wellness policies in Connecticut (Schwartz, Henderson, Falbe et al., 2012), school policies are more likely to be implemented if comprehensive, written clearly with strong word choice as opposed to vague and open to interpretation. Comprehensive, clear, and strong policies make it easier for policies to be practiced effectively both at the school jurisdictions and school levels. “Policies that are clear, but flexible, can promote accountability and lend credibility and direction to bolster implementation” (Neely et al., 2020, p. 12). In 2021, the Canadian Healthy Schools Alliance built off the essential conditions to develop the Canadian Healthy School Standards, which provide a pan-Canadian perspective and enable the opportunity for consistent monitoring (Canadian Healthy Schools Alliance, 2021). The Healthy School Standards also have the potential to support implementation and monitoring of school-based sleep promotion across Canada.

Another school policy that influences children sleep is physical activity policies (i.e., daily physical activity (DPA) or quantity of physical education), as schools help students meet the 24-hour Movement Guidelines (Tremblay et al., 2016). When schools foster physical activity opportunities within school hours and after school hours they help improve the wellbeing of students, including improving their sleep behaviours as regular physical activity helps students sleep better (ParticipACTION, 2016). In addition, ParticipACTION (2020) and Gruber and

Bergmame (2013) advocate for improvement in timing of physical activity opportunities to allow students to attain adequate quantity and quality sleep.

In a study of 734 grade 5 Chinese students (mean age = 10.8 years), researchers evaluated whether sleep hygiene can increase sleep duration in children with heavy homework loads. Sun, Spruyt, Chen et al. (2014) found that the students homework determined their amount of sleep and that students with more homework had poorer sleep hygiene. In a study of over 19,000 Chinese students aged 5 to 12, students with heavy homework schedules of 2 hours or more were more likely to experience delayed bedtimes and sleep loss (Li, Yang, Chen et al., 2014). In Canada, studies assessing the impact of homework on sleep duration is primarily conducted with high school students (Bartel, Williamson, Van Maanen et al., 2016; Patte, Qian, & Leatherdale, 2018). However, a study conducted in the United States with grade 3-6 students surveyed students, parents and teachers to understand multiple factors including the relationships between homework and the emotional health, sleep habits, and parent-child relationships (Holland et al., 2021). Holland et al. (2021) found that homework modestly impacts child well-being including sleep, emotional health, and parent/child relationships. Schools policies, guidelines, or practices around homework load (i.e., academic commitments) have the potential to support healthy sleep habits or overwrite the benefits of sleep hygiene on sleep duration (Sun et al., 2014). Holland et al. (2021) call for continued advocacy for "evidence-based homework policies that support children's overall well-being" (p.631).

2.5.2.1.4 Partnerships and Services

According to the JCSH, partnerships and services within CSH encourage health, education, and other sectors to work together to advance school health (JCSH, 2016). Partnerships are considered connections and relationships between schools and communities

(i.e., parents, families, community organizations, Elders, local recreation facilities) and services are described as supports offered by health professionals or social service providers (i.e., immunizations, teacher training, presentations, resources, coaching) (Alberta Health Services, n.d.). Research shows that family and community involvement is important for student success in school (Epstein, 2013). While community involvement has been shown to be a fundamental component of school health programs (McMullen, George, Ingman et al., 2020; Neely et al., 2020; Storey et al., 2016). Research shows that strong collaborative relationships between schools and families benefit everyone (Epstein, 2018; Jones, 2020; Miller, Coleman, & Mitchell, 2018). In regard to sleep, research shows that parent knowledge of sleep and monitoring of children's bedtime increased students' likelihood of meeting sleep recommendations (Bird, McKernan, et al., 2021; McDowall, Galland, et al., 2017). While existing school-based sleep interventions had more success when partnering with school partners (Gruber et al., 2016; Rey et al., 2020).

Despite research demonstrating the benefit of partnerships there is a gap between knowing and doing (Epstein, 2018). Epstein (2018) states that future teachers are inadequately prepared to conduct effective partnership programmes with all students' families and preparing future teachers to foster partnerships with families and communities falls on teacher education and professional development trainings (Epstein, 2013, 2018). Miller et al. (2018) advocates for interprofessional education for teachers as the school community includes many professionals across departments and beyond school walls. Teacher collaboration with other professionals and families would foster communication and support for families to understand the importance of sleep and for children to meet their sleep recommendations. Professionals across departments that provide important services to students, families, teachers, and the school are school

psychologists or counsellors, speech pathologists, occupational therapists, social workers, nurses, and many others. These partners as well as family physicians or nurse practitioners are necessary to support children and families with understanding and practicing healthy sleep behaviours but also identifying sleep disorders (i.e., SDB, insomnia) and connecting families to sleep specialists (Corkum et al., 2019). By educating teachers to understand and use school, family, and community partnerships, teachers will be prepared to connect with parents and other partners to support students' education, including sleep education/promotion (Epstein, 2018).

Partnerships between schools and community are seen to be mutually beneficial, as schools benefit from community organizations collaborating to support students and staff health and learning, while communities benefit from staff, students, and their families contributing to the community through service-learning, sharing school facilities, and engaging with the community at large (McMullen et al., 2020). Due to the momentum that builds with the support of the community, community involvement is considered a catalyst for health promotion in school settings (McMullen et al., 2020). Therefore, community support of school-based sleep promotion could build support and community action/advocacy for delayed school start times (Gruber, 2022). Community support could also help improve scheduling of children's extracurricular activities to allow children to meet the recommended amount of sleep for their age.

Community support is considered an essential condition for the successful implementation of CSH (Storey et al., 2016). Through interviews with school partners, it was found that having strong community connections strengthened the type of programs that schools can offer and enhanced the social environment of the school community (Storey et al., 2016). Upon further verification of the essential conditions by Neely et al. (2020), an additional 83

school health partners from across Canada supported community support as an essential condition and advocated for the inclusion of parents and families in the definition. Parents and families are a critical piece of community support, however, there are not always considered in the term 'community.' Therefore, Neely et al. (2020) defined community support as:

> Establishing strong internal and external relationships and building partnerships with the community play a key role in the success of taking a CSH approach, especially before and during implementation. Community connections (including parents/families) can help strengthen the type of programs schools can offer (p.5).

The 83 participants from across Canada involved in policies or programs that take a CSH approach perceived community support to be crucial for CSH success and sustainability. One participant shared that "the more people that you're involving in the conversations, the better this will be for everyone (P39) (Neely et al., 2020)." Therefore, the more people involved in the conversations about healthy sleep habits the more children and adults who will prioritize sleep and meet the sleep recommendations for their age.

Supporting the development of healthy sleep behaviours in students by taking a CSH approach, students will have more knowledge, understanding, and skills about healthy sleep habits to then improve their health and wellbeing and enhance their learning outcomes. For school-based sleep promotion to be successful researchers advocate for school-based sleep promotion to be comprehensive due to previous school-based sleep education being viewed as an add-on, typically facilitated by external partners and unsustainable without the research team (Gruber, 2017). Without integration into the school ethos and training for school staff to facilitate the school-based intervention, the intervention will not be sustainable as school staff will feel burdened by another program (Bentsen, Bonde, Schneller et al., 2020). Jourdan et al. (2011)

highlight that health promotion programs have an increased likelihood of success if integrated into the school's mission, if the program makes sense to teachers' educational perspectives, and if the program is responsive to school needs.

2.6 Study Significance

Within Canada, school-aged children (ages 6-12) require sleep for health, educational outcomes, and overall success (Michaud & Chaput, 2016). Alarmingly, it was found that 30% of Canadian children and youth are not meeting national recommendations (ParticipACTION, 2020, 2022). This literature review has illustrated the consequences of inadequate sleep in childhood and highlighted the gaps in how we are attempting to address inadequate sleep. Thus, it was suggested that implementing school-based sleep promotion through a CSH approach is an effective strategy to address child sleep, health, and academic outcomes (Bird, 2020; Bird, McKernan, et al., 2021). The research in this thesis aims to fill the identified gaps and will: (1) explore teachers' perspectives on sleep behaviours and their role in school-based sleep promotion; and (2) to integrate multiple partner perspectives to inform how school-based sleep promotion can be strengthened when taking a CSH approach. The findings from this research will integrate relevant literature to provide research, policy, and practice recommendations for school-based sleep promotion that aims to improve the sleep behaviours of school-aged children.

CHAPTER 3: "YOUR KID HAS POTENTIAL, BUT THEY NEED SLEEP." TEACHER PERSPECTIVES ON SCHOOL-BASED SLEEP PROMOTION IN ALBERTA, CANADA

3.1 Introduction

Sleep is essential for healthy development, and 30% of Canadian children are not meeting sleep recommendations based on the Canadian 24-hour Movement Guidelines for children and youth. These guidelines state that children aged 5-13 require 9-11 hours of sleep per night and youth aged 14-17 require 8-10 hours per night (Chaput & Janssen, 2016; ParticipACTION, 2020, 2022). Children and youth are experiencing increased physical and psychosocial consequences from inadequate sleep, including obesity, diabetes, anxiety, depression, and poorer overall health and immune function (Deng et al., 2021; Gordon et al., 2021; Keyes et al., 2015; Liew & Aung, 2020; Lopes et al., 2016; Matricciani et al., 2019; Ruan et al., 2015; Spruyt, 2019). Due to the impacts of inadequate sleep, youth are also struggling academically (Dewald et al., 2010; Rey et al., 2020; Schmidt & Van Der Linden, 2015; Tremblay et al., 2016). Given that healthy students are better learners (Bonell, Humphrey, Fletcher et al., 2014) and schools can reach almost all children during critical periods of development (Jourdan et al., 2021); schools have been identified as ideal health promotion settings to influence children's health and well-being, including their sleep behaviours (Epstein, 2011; JCSH, 2016).

In Canada, many schools have embraced a CSH approach (JCSH, 2019). CSH is an internationally recognized framework that takes a whole school approach and engages the whole school community (home, school, and community) to improve student well-being and educational outcomes (Centers for Disease Control and Prevention, n.d.; JCSH, 2016). Addressing school health through a whole school approach is achieved through 4 components:

social and physical environment, teaching and learning, healthy school policy, and partnerships and services. The CSH approach empowers and enables school staff and students to "support improvements in students' educational outcomes while addressing school health in a planned, integrated and holistic way" (JCSH, 2016, p. 1). The CSH approach or its equivalencies (e.g., HPS, WSCC) have proven successful at improving children's health behaviours (Dabravolskaj et al., 2020; Vander Ploeg et al., 2014), and academic performance (Centeio et al., 2021; Murray et al., 2007). McKernan, Gleddie and Storey (2020) found that health behaviours learned at school translate to the home environment, while Bird, McKernan, et al. (2021) found that sleep is rooted in the home, and "parents must be involved for learning from school-based sleep promotion to translate home" (p.82). For the purposes of this paper, the term "school-based sleep promotion" will refer to approaches that align with CSH and take a whole school approach.

CSH has proven effective at impacting health behaviours such as physical activity and healthy eating (Dabravolskaj et al., 2020), which have also led to improvements in academic performance (Faught et al., 2017; Faught et al., 2019), there is less known about the effectiveness of school-based sleep promotion in improving children's sleep behaviours and academic achievement. Existing school-based sleep interventions prioritize sleep education, which include in-class educational components and behavioural change strategies (Ashton, 2017; Gruber et al., 2016; Rey et al., 2020; Rigney et al., 2021). According to a systematic review by Rigney et al. (2021) on school-based sleep education programs, sleep researchers often attempt to apply randomized control trials (RCTs) in school settings, focus primarily on adolescents, use subjective measurements, and do not engage parents/families or go beyond the classroom setting. Exposure to school-based sleep education programs regularly increased sleep knowledge;

however, they were largely ineffective at improving students' sleep behaviours (Gruber, 2017, 2020; Rigney et al., 2021).

Existing school-based sleep education programs are typically facilitated by external partners and are unsustainable without continued presence of the research team (Gruber, 2017). Therefore, sleep education researchers advocate for school-based sleep education to be comprehensive (Gruber, 2017), facilitated by teachers (Rey et al., 2020), integrated into existing health education curricula time (Chaput, Gariepy, Pendharkar et al., 2022), and in collaboration with community partners (i.e., parents/guardians, teachers, principals, school administrators, and community agencies) (Gruber, 2020; Gruber et al., 2019). While some research exists related to teachers' perspectives on creating healthy school communities using a CSH approach (i.e., healthy eating, physical activity) (Roberts et al., 2016; Storey, Cunningham, Spitters et al., 2012; Storey et al., 2011; Sulz, Gibbons, Naylor et al., 2016), to date no studies have examined teachers' perspectives on promoting healthy sleep behaviours in schools. Understanding teachers' perspectives on promoting healthy sleep behaviours and school-based sleep promotion can provide insight into opportunities to improve students sleep behaviours and academic performance. Thus, the purpose of this research was to explore teacher perspectives on sleep behaviours and their role in school-based sleep promotion.

3.2 Methods

Qualitative research methods provided an in-depth and contextual understanding of teachers' perspectives on school-based sleep promotion. This research was approached from a constructivist perspective which is rooted in relativist ontology and subjectivist epistemology, meaning there are multiple and shared realities from which the researcher and teacher co-

constructed knowledge (Mayan, 2009). In applied health settings, such as school-based health promotion interpretive description (ID) methodology is an approach to optimize qualitatively derived knowledge with applied implications (Thorne, 2008; Thorne, Kirkham, & O'Flynn-Magee, 2004). The goal of ID is to understand complex interdisciplinary issues. School-based sleep promotion is a complex interdisciplinary issue as various partners (i.e., teachers, parents/guardians, administrators, community partners, healthcare providers, policymakers, researchers, funders) are needed for the improvement and success of proposed interventions. ID allowed teachers to share knowledge based on their individualized roles and contexts, generating credible and defensible new knowledge that is meaningful and relevant to school health.

3.2.1 Participants

Fifteen elementary (Kindergarten – grade 6) teachers and 4 elementary school administrators (i.e., principals, assistant principals) were purposively sampled from the Greater Edmonton Area, Alberta, Canada. For this paper, the term teacher refers to both teachers and school administrators interviewed as all teachers and school administrators held teaching certificates. Recruitment posters were shared with 14 elementary schools. Sixteen teachers were recruited through schools and 3 teachers were recruited through personal networks. Two teachers identified as male, while the remaining 17 identified as female. The average age for all participants was 41 years, with a standard deviation of 10.4 years (range: 28-59). On average teachers had been teachers/administrators for 15 years (range: 1-36 years). Recruitment occurred between April 2020 and November 2020, with delays due to summer break and COVID-19. Due to COVID-19 restrictions, all interviews were conducted virtually (via phone or Zoom). All participants provided verbal consent prior to the interview.

3.2.2 Procedure

Each teacher participated in a 1-on-1 semi-structured interview conducted by the first author (PM). At the time of the study, PM was a graduate trainee with experience working with a local health authority to support health promotion in schools, including facilitating sleep education presentations. Interviews centred around teachers' perspectives on sleep behaviours, teacher's role in promoting sleep, school's role in promoting sleep, current sleep promotion efforts, and barriers to supporting students' sleep. The interview guide was informed by key knowledge users, researchers, and practitioners within the field of school-based health promotion.

3.2.3 Data Analysis

Interviews were audio-recorded and transcribed verbatim. Data were analyzed concurrently after each teacher interview, initial thoughts and interpretations were recorded. ID guided and informed creation of an interpretive account through informed questioning, reflexivity, and critical examination (Thorne, 2008). Inductive descriptive thematic analysis was used to identify codes, meaning units, categories, and themes (Clarke & Braun, 2013; Thorne, 2008). All interviews were read and reread to promote familiarity with the data. Interviews were imported into NVivo12 software (Richards, 1999) to code and organize into meaning units (terms to represent multiple codes) (Clarke & Braun, 2013). Meaning units were organized into categories, representing groups of similar ideas. Categories were organized into themes (e.g., meaningful patterns within the data) (Clarke & Braun, 2013). Themes allowed for further understanding of teacher perspectives on sleep behaviours and school promotion of sleep.

3.3 Results

The current study explored teachers' perspectives on sleep behaviours and their role in school-based sleep promotion. The following three themes were identified: 1) the importance of sleep, 2) prioritize sleep as part of teaching and learning and 3) a culture of healthy sleep habits. Teachers believed sleep to be essential and felt there was an opportunity to improve school-based sleep promotion.

3.3.1 The importance of sleep

Across all interviews, teachers expressed and emphasized a view that sleep was essential for student engagement and success at school. Teachers considered sleep to be part of the foundation that children need to learn and grow academically, physically, and socially. According to teachers, establishing healthy sleep behaviours decreased barriers to students' success in elementary school and the future as healthy sleep habits are a life skill to be learned. Teachers highlighted how they felt a lack of parental involvement at bedtime led to poor sleep behaviours in students, as students were left to put themselves to bed.

Day to day, teachers perceived that poor sleep habits in students affected the whole classroom, including peer relationships, student engagement, attention, and learning. As one teacher explained, "it's a daily thing, right, if students aren't working or sleeping and they're bringing their tired, angry, grouchy, you know, non-functioning bodies to school every day. You know that affects your whole classroom environment" (T6). Teachers shared how they observed sleep deprivation in their classrooms and how this varied depending on grade levels. In grades 1-3, sleep deprivation often presented as behavioural (i.e., disrupting the class, outbursts, crying) and impacted students' ability to cope with daily challenges (i.e., resilience, attention, concentration, mood), while in grades 4-6, sleep deprivation presented as disruptive behaviour,

being disengaged, or falling asleep at their desk. One grade 5 teacher shared how “kids that aren’t getting enough sleep aren’t typically the big engagers. Which I think affects their relationships with their peers, as well as their contribution to class activities and participation” (T8).

Teachers observed that students who consistently did not have their basic needs met (i.e., food, sleep), often had poor engagement leading to long-term impact on academic success:

> I’m a kid who’s not being fed well, I’m in charge of my sleep patterns. By the time I get up in grades, I develop poor school habits. I don’t pay attention well; I don’t complete my work. I’m average or below average. I tend to struggle. So, sleep plays into it because food and sleep are what that student can control for themselves. So, if their parents aren’t in or supporting, it becomes evident. (T1)

Teachers perceived that inadequate sleep increased students’ challenges with class assignments and impacted students' enjoyment of learning. As one teacher expressed, “the kids that I know that aren't getting enough sleep are often the kids that are either below grade level or struggling to maintain grade-level work” (T8). According to teachers, sleep is part of the foundation students learn from, as students are unable to learn if they did not get enough sleep. One teacher summarized this concept below:

> …things like teaching about sleep and nutrition, mental health, and regulation; is not an extra. It's what you serve - it's the foundation. …you can't have the math and the science and language arts if they don't have all of this at the bottom. (T13)

When students came to school sleep-deprived, teachers acknowledged it was best to let them sleep if possible as they often woke up refreshed and in a better mood. On the other hand,

teachers shared that chronic sleep deprivation gradually builds up and is often a cause of poor school attendance, which impacts academic achievement:

> As a former junior high teacher, you can see the kids who don't get regular sleep or have broken up sleep patterns are the ones who are more frequently away from school. And the more you're away from school, the bigger those gaps get as the years go along. (T15)

3.3.2 Prioritize sleep as part of teaching and learning

Teachers described how they promoted sleep through two subthemes: 1) how teachers promote sleep with students, and 2) how teachers promote sleep with parents. However, teachers recognized that current sleep education is reactive rather than proactive. Many teachers shared that seeing tired students in their classrooms led them to have a conversation about sleep or teach a lesson on healthy sleep habits. As one teacher described, "if I saw a bunch of kids yawning in my class, I'd be like, 'Oh, we really need to talk about sleep.' So, I guess we are responding rather than being proactive" (T2). Teachers acknowledged that sleep education or health education regularly "gets bumped" (T1) for school assemblies, other classwork, presentations, or other needs that arise. Teachers recognized they are meant to teach sleep education as it is part of teaching life skills and study skills. However, teachers perceived there never to be enough time to cover the whole curriculum.

One of the biggest barriers to students getting enough sleep, according to teachers, is a lack of awareness of how much sleep they need and how important sleep is for their academic achievement and overall well-being. Teachers advocated for more resources and professional development to understand how to help students learn the importance of sleep. For instance,

some teachers wanted to help students notice how good their bodies felt when well-rested and how things are harder when sleep deprived. As one teacher shared:

> …even teaching kids and say, “How are you feeling right now? How are you physically feeling? How are you emotionally feeling?” We talk a lot about emotions, but how do we say, "I want you to stop and listen to your body for a minute. How alert do you feel? How lethargic do you feel?” (T2)

Another barrier observed by teachers included parent/guardian awareness of the importance of sleep; teachers observed many parents/guardians seeming to be overwhelmed with life demands and not prioritizing sleep:

> Parents just aren't aware. I'm sure a lot of cases, or they're so caught up in other issues of just getting bills paid and our jobs and everything and getting the kids off to school. That they don't realize it [sleep] is a priority for their learning until someone points it out. (T4)

Some teachers found opportunities to increase parent/guardian awareness through informal conversations during pick-up or parent-teacher interviews. All teachers supported the idea of a school-wide sleep awareness event (i.e., community night, whole school challenge, family night, healthy day, open house) to help improve student and parent/guardian awareness of the importance of sleep.

3.3.2.1 How teachers promote sleep with students

Across all interviews, teachers perceived their role included decreasing barriers to student success; whether providing food, physical activity, emotional support, or support towards getting enough sleep. As such, teachers acknowledged they had a role in supporting healthy sleep habits among students. Teachers also acknowledged sleep happens in the home and felt parents/guardians are students’ primary resource and role model regarding sleep habits. Teachers

observed that many tired students and families are unable to get enough sleep or are unaware of the importance of getting enough sleep. Therefore, teachers perceived promoting sleep at school as necessary, including talking about sleep in health class, having informal conversations as needed, and providing parents/guardians with knowledge and resources on sleep.

Teachers shared that one of the ways they supported healthy sleep habits in the home was by demonstrating the power and importance of routine. Teachers advocated for routine by establishing healthy routines in the classroom and teaching older students how to establish their own routines:

> It follows the curriculum for Alberta that kids in grade 5 or 6 need to be able to set up a schedule and achieve short-term and long-term goals…And so I always go with that; I kind of talk about setting routines. When you have a routine and stick with it, you're able to achieve your goals easily. So having sleep be in that routine because if you're not getting all the sleep that you need, it's a lot harder for you to do these things that you'd like to check off your to-do lists. (T8)

By talking with students, teachers learned that many students put themselves to bed and when a family is struggling to meet their needs, sleep is not a priority. One teacher explained how they help students set up their own healthy sleep habits:

> Honestly, for some of our kids, they are doing it on their own. They are getting themselves up for school; they are putting themselves to bed. They're getting their sibling to school. So, some of it is helping them understand what a good routine looks like. We've bought alarm clocks for some of our kids because they can actually tell the time and get to bed and get themselves up for school. So, it's a lot of informal conversations. They have class conversations about it too, especially in health. But I think there's lots of

> informal conversations that happen. Especially when you notice they're not regulated. "What's going on, honey? How can I help you? What happened last night? How much sleep did you get?" And then talking to them about it. When you get enough sleep, you feel better. It's also pointing out to those kids when they come to school, and they are well-rested. You can point out and say, "Look at what a great difference it [a good night's sleep] is making for you. Look at how successful you are being." (T17)

Many students openly shared their sleep habits with teachers, and teachers observed improvements in students' daily functioning after helping students establish bedtime routines. Despite older students establishing healthy sleep routines, teachers observed students often needed a caring adult or school staff to help them prioritize sleep through check-ins.

3.3.2.2 How teachers promote sleep with parents

Through conversations with students, teachers learned about various barriers that prevented students from getting enough sleep. These barriers included busy schedules, screens, and busy/noisy sleep environments (rooms, homes, neighbourhoods). Teachers advocated for parent/guardian education to increase awareness of the importance of sleep and increase parent/guardian knowledge on healthy sleep habits. Teachers stated they hoped this would lead to increased parent/guardian involvement in bedtime and establishment of healthy sleep habits for students as teaching students about healthy sleep habits at school is not enough:

> Educating the parents, because really, as a teacher, I can educate the kid, but the kid's probably not going to be able to change much at home, in some situations, right? It's really the parents that we need to educate and help them, and it helps too if the kid knows because then they might choose to turn off the TV a little bit earlier, or they might choose not to have their phone in their room. (T18)

Teachers advocated for both student and parent sleep education driven by the school, as teachers felt that many students were unable to overcome barriers to healthy sleep habits without support from parents/guardians – and parents/guardians would otherwise not have the resources or awareness to support their children.

Opportunities teachers found available to connect with parents/guardians about sleep included pick up and drop off for younger students, parent-teacher interviews, phone calls, emails, newsletters, and the school website. Teachers shared they often reached out to parents/guardians about sleep habits when students fell asleep in class or had not completed their schoolwork due to tiredness. One teacher shared when they reached out to parents/guardians:

> I could tell when they [students] haven't had sleep, that it's [school's] a struggle for them. So, if they didn't get this done or somethings not getting done, I'd want them [parents] to know that their kids have a lot of potential, but they need sleep. (T11)

In-person parent-teacher conversations about the importance of sleep were perceived by teachers to be the most effective for families that were struggling. Teachers also prioritized connecting with students first, depending on their grade and ability to influence their own sleep habits. As older students were more likely to change their sleep behaviours if they were involved in the decision-making process, as illustrated by the following example:

> I even had a student in my class last year that was coming into class grumpy and dysregulated, and when I asked her about it, she said that she is staying up pretty late on her iPad. So, I just asked, "Well, what time are you going to bed?" I can't even remember exactly what time she said, but then I asked, "Well, what time do you think you should be going to bed?" and she's like, "Oh, maybe like 8:30 or 9", and I was like, "Well, I think that's a pretty good idea. So, if you want to be going to bed at that time, what time do you

> think you need to put your iPad away, so you could start relaxing?" So, she was coming up with these solutions by herself, and then all we had to do is, I just talked to the parents. I said, "I had a conversation with this child. This is what she suggested. Could you just help her stay on track?" (T3)

Establishing and maintaining pathways for communication with parents/guardians for future collaboration if a concern arose was encouraged by teachers, as supporting healthy sleep habits can be a game-changer for student well-being and learning. "Some of my conversations with parents are around sleep, around routines. But when they see the difference, it's huge for them" (T17).

3.3.3 Culture of healthy sleep habits

Across all interviews, teachers acknowledged school-based sleep promotion could improve to wholistically support students sleep behaviours. More conversations about sleep with all school partners (i.e., teachers, students, parents/guardians, administrators, and school support staff) was suggested by teachers. As teachers perceived that the more sleep was discussed, the more it was on students' radars and, therefore, a priority for the entire school community. This is illustrated through two sub-themes presented below, 1) role models and 2) healthy sleep talk. When asked if they felt that the school had a role in promoting healthy sleep habits, one teacher responded:

> I think so because it's part of a school culture, right? The more that they're hearing about these different things from different adults that are in their lives, then the more reinforced that becomes. So, if the teacher's the only person talking about it to them, then they're just

> maybe isn't as much credit there as if it’s part of the school's culture and it's something that everybody's talking about. (T3)

Teachers observed that school-wide initiatives such as monthly campaigns and awareness days increased conversations and brought attention to the topic. Teachers perceived when schools put time and energy into an initiative, it helped students see the initiative as important. School assemblies, bulletin boards, announcements, and receiving the same message from multiple adults helped students integrate what they were learning. Teachers recognized students receiving the same messaging from multiple adults as a way to incorporate healthy sleep habits into the school culture.

3.3.3.1 Role models

Teachers described themselves as role models, as the amount of time they spend with students allowed them to influence students' perspectives and behaviour. Teacher and administrator roles allowed teachers to build relationships with students and parents/guardians, which provided opportunities to influence students' sleep behaviours. Teachers described how sharing stories helped teach healthy sleep habits and how student-teacher trust supported establishing healthy sleep habits:

> …kids really love to hear stories, like personal stories. So, I'll always use a story as a teachable moment like “Oh, this happened to me, and what do you think I could have done?” or “If I'm feeling this way, this is what I do.” So yeah, just that conversation, and I think our morning meeting and just having a softer start in the morning, has made a difference… they trust me, so when I say, you need to go to bed by nine o'clock, they are more willing to listen to me because we have a relationship. (T13)

Overall, teachers acknowledged their privileged relationship with students and families, and shared how they had opportunities to influence students' sleep behaviours.

Teachers highlighted how students are also role models. When students shared their sleep habits, they influenced their peers and younger students. Teachers celebrated when students learned healthy sleep habits from each other, whether through bulletin boards, class discussions, or peer conversations. One teacher described how students made a bulletin board on sleep and shared their sleep habits:

> The kids would put things about their own sleep habits up on the board and then write their name on it because most of these younger kids recognize the grade fives, so they read it and go, “Oh, I can’t believe so and so sleeps this long,” and it’s kind of like a leadership activity for them to show the school. (T8)

During class discussions about sleep, students often shared their sleep habits, and teachers found students were more likely to try a new tip to help them sleep that worked for their classmates.

3.3.3.2 Healthy sleep talk

Teachers shared that healthy sleep talk (informal conversations about sleep) happened throughout school days and was an important component of creating a healthy school culture that promotes sleep. These conversations would happen after announcements that mentioned sleep, when examining bulletin boards on sleep, or during monthly campaigns on sleep. Healthy sleep talk also happened when students were late to school, fell asleep in class, or when there was a test the next day. Some teachers saw these moments as opportunities to learn about students' sleep habits, help students come up with solutions to being tired in class, help students understand why sleep is essential, and celebrate when students got enough sleep. For example, one grade 6 teacher explained how they talk about sleep with their students:

> We'll have a little discussion about ways they might be able to improve their sleep. How we can improve those habits, how we can have a balanced lifestyle, how that affects our day-to-day abilities to retain information and learn, and even just emotional regulation. (T18)

A few teachers highlighted how we live in a culture of being busy and busy schedules are a barrier to healthy sleep habits. To overcome busy schedules and unhealthy sleep habits, teachers advocated for normalizing talking about sleep; normalizing that sleep is important and should be made a school priority. One teacher encouraged "making sleep a player. It's not a player unless it gets introduced all the time" (T12). This teacher encouraged frequently talking about sleep and making students think about their sleep habits. Another teacher shared their perspectives on the benefit of monthly campaigns, as monthly campaigns help make sleep a priority in the school for the month:

> I think monthly campaigns are a really good way to do it because everybody's getting the same message, and we are all using the same language… I feel like having that monthly campaign kind of like pulled it together. Then everybody was focused on the same thing; we always have a bulletin board for that. I think it would be useful. I think sometimes people do those morning announcements, and it's a time when the kids are quiet, and they're listening, and it's a perfect time to fill them with positive things that they could be doing in their life. (T13)

Teachers encouraged using announcements and monthly campaigns to promote healthy sleep habits as monthly campaigns help the topic "ripple across the whole school" (T13).

Teachers observed how certain times of year naturally brought up more conversations about sleep with students and parents. Healthy sleep talk was often led by teachers; however,

students also had informal conversations about sleep as “kids might even be talking about [sleep], amongst themselves because it’s a theme at school. They can’t help but talk about what’s going on in their environment every day” (T5). Teachers also shared how healthy sleep talk happened with parents at pick up, drop off, and parent-teacher interviews, “I find when I have the parent-teacher interview. That’s when I speak with their parents about it [sleep], …many parents are just shocked that the child needs ten to twelve hours” (T16).

3.4 Discussion

The current study explored teachers’ perspectives on sleep behaviours and their role in school-based sleep promotion. Understanding teachers' perspectives on school-based sleep promotion is necessary as teachers can be the champion of school programs (Storey et al., 2012; Storey et al., 2011), principals are gatekeepers for program implementation in schools (Fullan, 2002; Fullan, 1992; Roberts et al., 2016), and teacher support is invaluable to the sustainability school programs (Roberts et al., 2016; Scheirer, 2005; Storey et al., 2012). Across 32 school-based sleep education programs (age 5-18) reviewed by Rigney et al. (2021), empowering teachers to learn about sleep and deliver sleep education programs was believed to be the most sustainable solution to integrate sleep into the curriculum. According to Gruber (2017) and Rigney et al. (2021) partnerships between sleep researchers, schools, and teachers, and collaboration beyond the study time frame have been missing in school-based sleep education programs. Therefore, Gruber (2017) and Rigney et al. (2021) advocated for implementation of a knowledge-to-action approach to partnership and collaboration with teachers and schools to support school communities to make sleep education sustainable within schools.

This study found that school-based sleep promotion through a CSH approach can build on existing strengths and resources in school environments, including role modelling, routines, informal conversations, monthly campaigns, parent-teacher relationships, and health education. CSH allows flexibility and school-specific autonomy to shape the intervention in a way that works for that specific school community (Neely et al., 2020). By taking a whole school approach where health promotion initiatives are integrated into school culture, sustainability of school-based sleep promotion is viable as the whole school is actively engaged in the initiative (Olson, Hegbloom, & Egan, 2021).

Research examining CSH has demonstrated effectiveness at improving student's physical activity and healthy eating (Centeio et al., 2021; Dabravolskaj et al., 2020; Langford et al., 2015; McKernan et al., 2019). However, sleep is underrepresented in CSH research despite being included in the 24-hour Movement Guidelines for children and youth (ParticipACTION, 2016). Existing barriers to sleep promotion in school communities include teachers' inability to physically role model healthy sleep behaviours and students lack of opportunity to practice healthy sleep behaviours at school. Despite these challenges, teachers interviewed in this research study shared many ways they supported healthy sleep habits among their students, including healthy sleep talk. Rather than role-modelling healthy sleep behaviours at school similar to healthy eating or physical activity, teachers were able to role model a healthy relationship with sleep through healthy sleep talk. According to social learning theory, individuals learn from each other through observation and modelling (Bandura, 1971). Observational learning "does not limit itself to observing a live model, but it can also involve a 'verbal instructional' model (descriptions and explanations of the behaviour) or a 'symbolic' model (children observing characters demonstrating the behaviour in books, films, television or

other media)" (Rumjaun & Narod, 2020, p. 87). Therefore, healthy sleep talk is a form of observational learning through a verbal instructional model. Healthy sleep talk and the verbal instructional model are important as it reinforces that schools can play a role in promoting healthy sleep behaviours in students (Bandura, 1971). Additionally, sleep intervention research by Rey et al. (2020) and Rigney et al. (2021) highlight that teachers do not need to be sleep experts to talk about sleep with students and parents/guardians.

In this study, teachers acknowledged sleep happens in the home and schools have a role to play in promoting healthy sleep habits. Despite teachers sharing many ways they supported healthy sleep habits among students, teachers also advocated for parent involvement in establishing children's healthy sleep behaviours. Specifically, teachers emphasized the importance of schools providing student and parent education on healthy sleep habits as many students were unable to overcome existing barriers to healthy sleep habits without the support of their parents/guardians. Research examining the essential conditions for successful implementation of CSH found that parental support was a facilitator of CSH and parents were often difficult to engage (Storey et al., 2016). These essential conditions encourage engaging parents through students, as students are drivers of change in the home (Storey et al., 2016). Sleep, compared to other health behaviours, has fewer opportunities for reinforcement in schools; therefore, school, home and community collaboration is even more imperative for influencing student's sleep behaviours. Thus, it is recommended that parents are engaged via students as well as directly through parent education, school-wide sleep-related initiatives, healthy sleep talk, and purposeful conversations with parents about sleep as needed.

3.4.1 Strengths and Limitations

Recruitment was conducted in 2020, following school closures due to COVID-19 while teachers were navigating online learning, new masking, social distancing, and cleaning protocols, among other changes. Teachers' level of interest in students' sleep may have increased or decreased depending on individual circumstances. We recognize that teachers who prioritized students' sleep were more likely to follow up to be interviewed. However, teachers interested in promoting healthy sleep habits in schools met our requirement for participants that were knowledgeable of the phenomenon of interest. Teachers may have been subject to desirability bias. It should also be acknowledged the primary researcher's positionality is situated within a westernized lens and current sleep practice guidelines best suit a Eurocentric worldview. Children's sleep is shaped by various socio-political and environmental factors (e.g., socio-economic status, race/ethnicity, gender, cultural, family traditions) which were not explored in this study. The qualitative nature of the research allowed for an in-depth understanding of the lived experiences of teachers. There is a paucity of school-based sleep promotion research; as a result, there is minimal research highlighting the voice of teachers on school-based sleep promotion. Our study addresses knowledge gaps giving considerable depth and understanding into the nuanced perspectives of teachers on students' sleep behaviours and their role in promoting healthy sleep behaviours in schools.

3.4.2 Conclusions and Implications

This study provides further insight for future school-based sleep promotion initiatives and illuminates teachers' knowledge and experience with promoting elementary students' healthy sleep behaviours. According to teachers, students attaining adequate sleep is necessary for their

success in the school environment. Teachers described how sleep can be prioritized as part of teaching and learning, and how schools can foster a culture of healthy sleep habits. Teachers recommended that schools prioritize sleep as part of teaching and learning through multiple methods, including health education, monthly campaigns, parent education, role modelling, and healthy sleep talk. These suggested methods could increase student and parent awareness of the importance of sleep. Including parents in school-based sleep promotion would increase students' support to practice healthy sleep behaviours as there are barriers to healthy sleep habits that many students are unable to overcome without support from their parents. Additional research is required to better understand the effectiveness of role modelling and healthy sleep talk to support students' healthy sleep behaviours as part of school-based sleep promotion through a CSH approach. In particular, whether healthy sleep talk and role modelling allow teachers to prioritize sleep as part of teaching and learning, and whether healthy sleep talk and role modelling help teachers overcome the crowded curriculum to support students healthy sleep behaviours.

CHAPTER 4: INTEGRATING MULTIPLE PERSPECTIVES TO INFORM AND STRENGTHEN SCHOOL-BASED SLEEP PROMOTION WHEN TAKING A COMPREHENSIVE SCHOOL HEALTH APPROACH: A SECONDARY ANALYSIS

4.1 Introduction

Sleep is a biological imperative that is required for health (Cirelli & Tononi, 2008), yet we live in a society that competes against this biological drive (Grandner, 2017). Inadequate sleep is so pervasive in our society that it is regularly overlooked as the potential cause, barrier or comorbid factor of presenting health concerns (Chaput et al., 2022; Institute of Medicine (US) Committee on Sleep Medicine and Research, 2006). Rates of insomnia in Canada have doubled in the past 20 years (Chaput et al., 2022), with 50% of adult Canadians regularly struggling to fall asleep or stay asleep (Chaput, Wong, & Michaud, 2017). Children and adolescents are not exempt from this 'sleepidemic' (ParticipACTION, 2016), as approximately 30% of Canadian children and youth are not meeting sleep recommendations according to the 24-hour Movement Guidelines for children and youth, which recommends that children aged 5-13 sleep 9-11 hours per night and 14-17 year-olds sleep 8-10 hours per night (ParticipACTION, 2022). Inadequate sleep impacts children and youth's learning, school performance, emotional regulation, and physical health (Matricciani, Paquet, Galland, Short, & Olds, 2019). Inadequate sleep in childhood has the potential to jeopardize children and youth's academic, vocational, and physical potential (Chaput et al., 2022; Matricciani et al., 2019).

Adequate sleep is essential for learning and academic success in children, and schools can play a significant role in promoting healthy sleep behaviours among students (Chaput et al., 2022). CSH or it’s equivalencies (e.g., HPS or WSCC) is an internationally recognized approach

to promoting healthy behaviours in schools that has already been embraced by many Canadian schools (JCSH, 2006, 2016, 2018, 2019; Langford, Bonell, Jones et al., 2014). Existing CSH efforts have proven effective at improving children's healthy eating and physical activity behaviours (Dabravolskaj et al., 2020); however, sleep promotion is behind (Chaput et al., 2022). CSH provides the opportunity to address inadequate sleep among children and youth through a whole school approach which includes the school, home, and community environments (JCSH, 2016). CSH addresses health behaviours through four components: social and physical environments, teaching and learning, policy, and partnerships and services (JCSH, 2016). Bird, McKernan, et al. (2021) found that as sleep happens in the home, parent involvement is necessary for school-based sleep promotion to be successful. Additionally, Bird, Neely, Montemurro et al. (2021) found that parents are willing to be involved in school-based sleep promotion and see school-based sleep promotion as a strategy to reach families that do not promote healthy sleep behaviours at home. Lastly, Mellon, Montemurro, Sulz et al. (2023) found that teachers (teachers and school administrators) are supportive of home-school collaboration to promote healthy sleep behaviours for students. For the purposes of this paper, the term "school-based sleep promotion" will refer to strategies that support positive sleep behaviours for children and families that originate in schools.

Understanding student, parent, and teacher perspectives regarding school-based sleep promotion would provide a nuanced understanding of the school's role in promoting healthy sleep behaviours in students. While understanding student, parent, and teacher perspectives on school-based sleep promotion through a CSH approach would allow school-based sleep promotion to be understood through a common framework. CSH is already recognized across Canada and internationally, there is less known about how the CSH approach can be used to

promote healthy sleep behaviours. Specifically, how different partners view, understand, and apply school-based sleep promotion using a CSH lens. Aligning school-based sleep promotion with the CSH approach would provide a common understanding, practical strategies, and insight into implementing school-based sleep promotion in school communities across Canada. To address this gap, the objective of this research was to integrate multiple partner perspectives to inform how school-based sleep promotion can be strengthened when taking a CSH approach. Using a secondary analysis of qualitative interview data, we sought to understand how different school partners (students, parents, teachers) perceived school-based sleep promotion with specific attention to alignment with the four components of CSH (social and physical environments, teaching and learning, policy, and partnerships and services). Data from three previously published studies with different participant groups (Bird, McKernan, et al., 2021; Bird, Neely, et al., 2021; Mellon et al., 2023) were analysed with a goal to inform and strengthen school-based sleep promotion through the identification of existing beliefs, behaviours, practices, strategies, or recommendations to promote healthy sleep behaviours in students.

4.2 Methods

4.2.1 Data Collection

Secondary analysis is an established methodological practice in quantitative research and is becoming more prevalent in qualitative research (Heaton, 2008; Irwin & Winterton, 2011). Qualitative secondary analysis can be used to investigate new or additional research questions from pre-existing data sets. Data sets can be acquired through formal data sharing (public or institutional archives), informal data sharing between researchers, or research teams can re-use their own data (Heaton, 2008). For this qualitative secondary analysis, our research team utilized

previously collected interview data generated from the project entitled ‘Sleeping Soundly’ (www.katestorey.com/our-projects/sleeping-soundly/, Principal Investigator: KS). ‘Sleeping Soundly’ was a project which examined 1) how students translate school-based sleep promotion home, 2) parents’ perspectives on sleep behaviours and their role in promoting healthy sleep behaviours, 3) teachers’ perspectives on sleep behaviours and their role in school-based sleep promotion, and 4) school-based sleep promotion when taking a CSH approach. Three separate studies examining different partner (i.e., student, parent, teacher) perspectives of school-based sleep promotion were combined and examined to inform and strengthen school-based sleep promotion when taking a CSH approach. Each of the three studies was driven by community-based participatory research, which has its origins in ethnography (Mayan, 2009) and are therefore aligned methodologically. The purpose of each study differed, however, the overarching objective of all studies was to understand how to improve students sleep behaviours. As datasets were methodologically aligned, all participants were purposively sampled, researchers were responsive and reflexive by revisiting themes, peer debriefing, and staying true to the iterative nature of the research. The three primary datasets are described briefly below.

4.2.2 Primary datasets: student, parent, and teacher interviews

Sleeping Soundly was composed of three separate studies, of which the datasets were used for the present research. The purpose of the first study was to explore "student's perceptions of sleep behaviour (how they understood and valued positive and negative sleep behaviours) and determined if and how students translate school-based sleep promotion to the home” (Bird, McKernan, et al., 2021, p. 588). Forty-five grade 4 and 5 (ages 9-11 years) students from three schools in Edmonton participated. The guiding method was focused ethnography, with photovoice as the data generating strategy. As per photovoice guidelines, semi-structured

interviews were conducted with all 45 youth. The purpose of the second study was to "explore parents' perspectives on sleep behaviours and responsiveness to school-based sleep promotion initiatives" (Bird, Neely, et al., 2021). Participants included 24 parents of school-aged children (ages 5-12 years) from across Alberta. This was a descriptive qualitative study in which semi-structured interviews were used as the data generating strategy. The third study was conducted with 19 elementary teachers from the greater Edmonton area. The teacher interviews used interpretive description as the guiding method to "explore teachers' perspectives on sleep behaviours and their role in school-based sleep promotion" (Mellon et al., 2023). All three studies aimed to understand partner perspectives of students' sleep behaviours and school-based sleep promotion initiatives. All participants were purposively sampled, all interviews were audio-recorded and transcribed verbatim by a professional transcriptionist, and all studies were granted ethical approval through the Human Research Ethics Board at the University of Alberta [Pro00078831] which included approval for secondary analysis. Participants were given a code to represent student, parent, or teacher interviews (e.g., S1, S2, P1, P2, T1, T2), all other identifying information (i.e., names, school names) was removed to ensure anonymity.

4.2.3 Secondary data analysis

All 88 interview transcripts were read and re-read by the first (PM) and second authors (SY) of this study. Data were then analysed using content analysis according to the steps outlined by Miles and Huberman: (1) data reduction, (2) data display, and (3) conclusion drawing/verification (Miles, Huberman, & Saldana, 2014). First using a deductive approach, transcripts were broadly coded into a matrix by PM and SY according to the four components of CSH (social and physical environment, teaching and learning, policy, and partnerships and services), while maintaining participant groups. This matrix informed initial interpretations and

prompted important early analytic debriefing between PM and SY. Early development and refinement of the matrix was supported by a reference table describing the key characteristics and published definitions for each of the four components of CSH (Alberta Health Services, n.d.; Ever Active Schools, n.d.; JCSH, 2016). As CSH components often overlap in school environments, distinct definitions of the components were necessary to support further deductive analysis. Using a deductive approach, data were further condensed (coded) according to the four components of the CSH approach and organized using NVivo 12 (QSR International Pty Ltd., 2018). Next, inductive content analysis was used to develop categories within the CSH components and participant groups (Miles et al., 2014). Inductive content analysis was used as it allowed new concepts to emerge from the student, parent, and teacher perspectives (Kyngäs, 2020). Categories were then merged across participant groups, leaving data grouped by the four CSH components. Inductive content analysis including data display (i.e., lists, infographics) were further used to develop subthemes and themes within each CSH component. Peer debriefing was used throughout analysis to support verification of categories, subthemes, and themes. The initial deductive approach provided a valuable method of organizing the data themes around the CSH components, while the inductive approach allowed for new insights to be found from students, parents/guardians, and teachers.

4.3 Results

The current study integrated student, parent, and teacher perspectives in order to inform and strengthen school-based sleep promotion when taking a CSH approach. The following subthemes were identified within the four CSH components: (1) social and physical environment (culture of healthy sleep habits; students influence each other), (2) teaching and learning

(formally integrate sleep into curriculum; school, teacher, and parents/guardian collaboration), (3) policy (sleep-positive classroom policies), and (4) partnerships and services (community partnerships; school-home collaboration).

4.3.1 Social and Physical Environment

The social and physical environment of a school plays an important role in establishing a healthy school culture, as culture is influenced by both the social (i.e., conversations, relationships, experiences, teaching, learning) and physical (i.e., facilities, classrooms, gymnasium, playground) environments. Teachers shared ways that they saw the school community building a culture of healthy sleep habits. Teachers, students, and parents/guardians all illustrated how students are change makers when it comes to healthy sleep behaviours in both the home and school environments. This theme is supported by two subthemes including: creating a culture of healthy sleep habits and students influence each other.

4.3.1.1 Creating a culture of healthy sleep habits

Teachers recognized themselves as role models and acknowledged how they talked about sleep influenced students' perspectives on sleep. For instance, teachers shared how they celebrated with the class when they got a good night's sleep and shared when they had a bad night's sleep. Some teachers brainstormed with students about how to get a better night's sleep. Through this brainstorming and conversations about sleep with students, teachers demonstrated that they valued sleep and felt their best when they got enough sleep:

> I'll tell them I'm kind of feeling tired cause I went to bed a little late or I couldn't sleep because this happened. But we'll kind of discuss it. In a lot of health classes, we start with just a discussion, whether it's about nutrition or sleep or fitness. And then they'll kind of share what they do. So, I have had discussion in my class about what kids do to fall

> asleep when they can't, some of them take their favourite teddy bear and cuddle it, or some of them read to fall asleep…I just think it's so important to help them [students] understand, maybe some of them are already doing that, or other kids can learn from what they're doing. (T11)

Teachers described many moments where they had informal conversations with students about sleep, for instance, when a student was late to school because they slept in or were falling asleep in class. Teachers shared how they connected with students first about their sleep habits, as older students were more likely to change their sleep behaviours if they were involved in the decision-making process. One teacher shared an example of a class discussion about why students want to be rested for school:

> On Friday, one of my students fell asleep, and she was sitting at the back, and I called on her. I didn't realize she was sleeping. One of the other students said, "Oh, she's sleeping." And so, we were like, okay, you got to make sure that you get enough sleep. The whole class was talking about it, but in a kind of supportive way. How we don't want to be falling asleep in class, we want to learn and not miss things. (T13)

Class discussions and informal conversations were observed by teachers to influence the social environment of the school, including students' perspectives on healthy sleep behaviours.

Teachers perceived monthly campaigns, which included bulletin boards, announcements, and lessons, to be a great way for the whole school to have the same language to talk about a concept like sleep. One teacher shared how monthly campaigns helped the topic to "ripple across the whole school" (T13). Teachers shared that when administrators promoted sleep-related schoolwide initiatives, they were perceived as sending a message that sleep is important:

If it's promoted schoolwide, it's continued. So, if you're showing as an administrator that it's important, if I'm showing it's important to me, and I believe it's important to kids, then I feel that belief is filtered down. (T7)

Teachers perceived bulletin boards as a great place to share fun facts about sleep, animal sleep, or student sleep habits. One teacher explained how older students in grades five and six shared how much sleep they get and their bedtime on the bulletin board, which inspired younger students to get more sleep. Bulletin boards and announcements also influenced the conversations that students had with each other. As one teacher put it, students can't help but talk about what's happening around them.

4.3.1.2 Students influence each other

Teachers observed how students played an important role in school-based sleep promotion, as older students taught younger students about healthy sleep habits through buddy classes (i.e., classes partnering up for a lesson(s)/activity) or bulletin boards. Students learned from each other about sleep habits through class discussions or informal conversations, and some students brought what they learned at school home to create healthy sleep habits:

[Interviewer]…do you share anything that you learned about sleep with anyone at home?

Well, kind of cause my sister she doesn't really want to go to bed when she's supposed to. I sometimes say it helps you sleep better. I kind of like tell her that she has to go to bed so she won't be grumpy in the morning and so she'll have a good day. That's what I say to her. So, she'll go to bed.

[Interviewer] So you want her to get a good night's sleep like you do, right?

Yeah, cause then, it makes her be nicer to me. (S32)

Teachers emphasized that students brought new ideas to life and drove initiatives forward. Parents/guardians and students recognized that students sometimes brought what they learned about sleep home. A few students, parents/guardians, and teachers explained how some students incorporated what they learned about sleep at school into their sleep habits. "I try to encourage myself to sleep better because I remember the lessons that we've had at school" (S51).

Teachers and students expressed how students influence each other, both positively and negatively, through interactions related to sleep. For instance, some students shared with one another unhealthy sleep habits like bringing screens to bed or staying up till 2:00 a.m. gaming. In contrast, other students shared their bedtime and encouraged each other to get to bed early so they could have fun together the next day. Students and teachers described sleep-related monthly campaigns (i.e., announcements, bulletin boards, lessons) and teachers emphasized how students "can't help but really just talk about what's going on in their environment every day" (T5). One student shared how monthly campaigns influenced conversations with their peers:

> [Interviewer] So when you were doing that [sleep] unit, were you guys talking quite a bit about sleep?
>
> Oh yeah
>
> [Interviewer] Yeah, did you learn a few things from your friends?
>
> Yeah, I kind of learned that I should make it a goal for myself to sleep earlier.
>
> [Interviewer] Did you teach anything to your friends, do you think?
>
> Umm, one thing that they've learned from me is to just remember…because they think they sleep early and some people they sleep earlier than others, so I think they make it a goal for themselves to have like a better sleep and different ways to influence themselves. (S51)

Teachers highlighted how students were more likely to try a sleep tip from a peer than an adult. Illustrated by one teacher who shared, "…with their friends, they think, okay, if that person's doing it, I could try it" (T11).

4.3.2 Teaching and Learning

Teaching and learning through the CSH approach includes formal and informal curriculum, resources, and associated activities. Rather than sleep being part of informal curricula like it is now, parents and teachers felt that sleep should be formally integrated into curriculum. Teachers and parents/guardians also supported the idea of collaboration between schools, teachers, and parents/guardians to support healthy sleep behaviours in students. According to students they learn about sleep from home and school. As such, this theme is composed of two subthemes: formally integrate sleep into curriculum and school, teacher, and parents/guardian collaboration.

4.3.2.1 Formally integrate sleep into curriculum

Teachers and parents/guardians viewed sleep as important and thought that sleep was already in the provincial curriculum or that sleep should be part of the provincial curriculum, "...it [sleep] should be in the curriculum, in the health curriculum too because sleep is important; even if it's just like a day of teaching about sleep...it should be part of the health curriculum. (P48)" One teacher stressed how sleep should be in the curriculum because it shows teachers that sleep is important and that they should make time for it, rather than letting health class or lessons on sleep "get bumped (T1)" for competing priorities:

> I'm sure it's [sleep's] part of the health curriculum, or you could find a connection to the health curriculum. But if they [teachers] don't feel it's important, they're not going to make time for it. (T7)

Currently, in schools, according to teachers, sleep is covered if the school or teacher sees sleep as a priority. As the previous quote illustrates, teachers "can find a connection to the health curriculum" if they want to. The following teacher acknowledged how not all teachers make the link in the health curriculum to sleep:

> I think right now I could see it [sleep] as just being important to the different teachers in the classes. So, if there's a teacher who's just teaching curriculum, then they may never talk about sleep with their kids or if there's a teacher who, like me, sees importance in it [sleep], so I talk to my kids about it [sleep], but maybe if it [sleep] wasn't important to me or wasn't on my mind I wouldn't share it [information on healthy sleep habits] with them. (T11)

4.3.2.2 School, teacher, and parents/guardian collaboration

Teachers and parents/guardians advocated for collaboration between schools, teachers, and parents/guardians to promote healthy sleep habits. While sleep happens at home, students spend many hours in the day at school learning and having conversations with fellow students, teachers, administrators, and other school staff. According to parents, collaboration between school and home allowed students to hear the same message from multiple adults, which reinforced the message that sleep is important. One parent explained how they think parents would benefit from that kind of support:

> I think if we're putting things like sleep or nutrition, these things as part of our health unit, it's really important, and I think that they're [students are] going to have a bigger buy-in hearing it from mom, dad, and teachers. There's a bigger buy-in, especially if it's told at school. It must be true…So yeah, I think parents need that kind of support. (P16)

Parents/guardians were supportive of teachers teaching about the importance of sleep and healthy sleep habits as teachers have influence with their children. Parents/guardians described how they have often told their children something, and then the child heard the same thing from their teacher, and it finally registered. One parent/guardian shared the benefit that they anticipate if schools educate students on healthy sleep behaviours:

> I think that would help the kids understand why we're making them go to bed at certain times or why we are shutting electronics off, or I think it'd be good for them to know. [Interviewer] Do you feel that schools have a responsibility to teach children about healthy sleep habits?
>
> I don't know if it's their responsibility. I think it's kind of up to the parents to teach that. But I know that a lot of kids don't get that from their parents, so I know that if the school were to help out a little bit teaching that, I think that it would be very good. (P49)

Teachers agreed that they have a role in promoting healthy sleep behaviours in schools. Teachers recognized that it has to be a team effort between students, parents, and teachers to improve students' sleep behaviours:

> I think that teachers absolutely do have a role. I don't know if I would say that we have the biggest role. I think a lot of that responsibility does have to stay with the family, but I do absolutely think that teachers have a role to be educating the students and then the students have a role in kind of taking responsibility for themselves to a certain degree. [Interviewer] Would you say that varies depending on the grade, like the student's role? Yeah, I would say so because the younger the student is, I don't think that they have as much kind of power over their own lives to be able to be in charge of something so big

and so important. So, I think especially the younger the child, the more that would rest on the parents to kind of guide them through that. (T3)

4.3.3 Policy

No formal school or school jurisdiction level policies were described by participants regarding sleep. Classroom policy related to sleep was touched on by the teachers interviewed, specifically as it related to letting students sleep when tired. This is described below.

4.3.3.1 Sleep-positive classroom policies

Across participants (students, parents/guardians, teachers), there was a clear understanding that tired students had increased difficulty learning, staying engaged, and interacting with their peers at school. Teachers shared how they let students sleep when possible as often students "need rest more than anything" (T13). Teachers acknowledged that students often fell asleep at their desks, slept in the sick room, or fell asleep after being sent to the office. Teachers perceived it to be best if students got enough sleep at home; however, that was not possible for all students. One teacher shared how allowing students to have a nap rather than sending them home meant that students had more opportunities to learn. Teachers recognized that students often woke up refreshed and better ready to learn and socialize at school. "If they're still sleeping and there's all this noise going on, they must need it" (T14). School practices shared by teachers that support healthy sleep behaviours in students included monthly campaigns on sleep and connecting with parents/guardians when students are dysregulated, falling asleep in class, or falling behind in schoolwork. Teachers encouraged connecting with parents if initial attempts with the student did not correct sleep behaviours or when students being dysregulated, sleepy, or falling asleep in class was a recurring problem.

4.3.4 Partnerships and Services

Partnerships and services available to support individual school communities depends on community context, however, partnerships are considered to be connections and relationships between schools and communities (i.e., parents, families, community organizations, Elders, local recreation facilities) and services are described as supports offered by health professionals or social service providers (i.e., immunizations, teacher training, presentations, resources, coaching) (Alberta Health Services, n.d.). According to parents and teachers, community partnerships that share resources and knowledge on healthy sleep behaviours are limited despite teacher and parent interest. Meanwhile, school-home collaboration is a critical partnership for healthy sleep according to parents and teachers as schools and the home influence children's sleep. This theme is supported by two subthemes: community partnerships and school-home collaboration.

4.3.4.1 Community Partnerships

Teachers and parents/guardians observed that schools are a hub for partnerships. However, sleep-related community partnerships and services to strengthen school-based sleep promotion were limited. Community partnerships mentioned by teachers that support teaching students and families healthy sleep behaviours included APPLE Schools (APPLE Schools, 2022), family school liaison workers, or community outreach staff at the school. Programs such as Leader in Me (Franklin Covey Company, 2022) and Zones of Regulation (Kuypers, 2011) were mentioned by teachers as providing opportunities to support promoting healthy sleep behaviours. While many other organizations had resources that teachers accessed through the internet (i.e., Alberta Health Services, Alberta Health, ParticipACTION, Canadian Sleep Society). Students also shared how after school sports or clubs helped to tire them out for

bedtime. Parents/guardians and teachers encouraged further engagement with partnerships and services to support school-based sleep promotion.

4.3.4.2 School-home collaboration

Teachers described existing school-home collaboration for healthy sleep habits to include parent-teacher interviews, newsletters, school website, parent council events, phone calls, and emails. However, parents/guardians and teachers encouraged more collaboration between school and home to teach students healthy sleep habits. For instance, some teachers wanted to know when students were having sleep problems so they could have more patience when the student was falling behind or misbehaving. Parents/guardians perceived teachers to be a great resource to help students understand that sleep is important. Parents and teachers shared that parent engagement in school-based sleep promotion could include schools sharing resources and community contacts with families to support students healthy sleep behaviours.

Parents/guardians encouraged schools to share resources and guide or nudge parents/guardians towards resources on children's healthy sleep behaviours:

> I think, if anything, the school could maybe try and guide the parents on where they could go to learn about these things when it comes to sleep or somebody to talk to, cause I don't think parents are just going to go do it on their own. (P52)

Other suggestions from teachers included a schoolwide sleep awareness event (i.e., family night, open house, resource fair). While both teachers and parents interviewed highlighted a need for parent education as many parents are unaware of how much sleep their children need:

> I really feel like there needs to be parent education as well as student education because something that I've noticed is it seems around this age, when they're in grade three and four, parents' kind of hand over the reins a little bit more to the students. Which is great

to be giving them more responsibility and things, but I also think they're not quite developed enough to really always be making those best choices. (T3)

Parents and teachers acknowledged that parents could learn about healthy sleep habits through school-home collaboration (i.e., emails, phone calls, parent teacher interviews, and students as change makers). Teachers encouraged parent involvement in school-based sleep promotion as teachers recognized that schools also educate parents/families. A handful of teachers recognized that partnerships between teachers and parents are necessary for parents to learn new things like the importance of sleep:

> I think if you don't have a connection with parents and families, then that is a big inhibitor to teaching positive sleep habits. Cause if that's not necessarily something that is cherished or valued in the home…So I think when trying to teach something that's a healthy habit, if I don't have the support or I don't feel like I'm close to the families, then it's tricky to make that kind of stick. (T8)

In regard to administration and parent partnership, administrators described how they had formal (phone calls), and informal conversations with parents about students' sleep habits, and some administrators shared resources on sleep with families. Teachers checked in with students and families when students were struggling:

> I think my role as a principal; I'm sure that teachers are having those conversations in class because, informally, they've mentioned it. But my role is figuring out when kids aren't regulated and they are having difficulty in school and figuring out those pieces of the puzzle. Why are they having difficulty in school? Why are they having such a hard time regulating? Why are they angry and yelling out? Needing breaks? It's my job to help them figure that out. And then that's conversations with parents, and we have those

> conversations often about sleep. When are kids going to bed? How much sleep are they getting? Is there a routine in place? So, I think it's just in a different context. So, yes, we are having those conversations. I'd say almost all my teachers have had those conversations in their class with their kids. Pretty informally, but yes. (T17)

Teachers highlighted how schools are a hub for the communities that they are in, providing opportunities for parents to connect and learn from each other (i.e., parent council, parent cafés, presentations).

4.4 Discussion

This secondary analysis summarized student, parent, and teacher beliefs, behaviours, practices, strategies, and recommendations to inform and strengthen school-based sleep promotion. The following themes and subthemes were identified within each CSH component: social and physical environment (culture of healthy sleep habits; students influence each other), teaching and learning (formally integrated sleep into curriculum; school, teacher, and parents/guardian collaboration), policy (sleep-positive classroom policies), and partnerships and services (community partnerships; school-home collaboration). These findings can be used to inform and strengthen school-based sleep promotion using a CSH approach. CSH is successful in shifting a school culture when all four components work collaboratively together (JCSH, 2016). Therefore, findings would best inform and strengthen school-based sleep promotion when implemented collectively across all four components of CSH.

A key finding from the present study was that schools fostered a sleep promoting social and physical school environment by creating a culture of healthy sleep habits and by students influencing each other. Findings from Mellon et al. (2023) supported the concept of a culture of

healthy sleep habits to improve students sleep behaviours as "teachers perceived that the more sleep was discussed, the more it was on students' radars and, therefore, a priority for the entire school community" (p.16). According to students', parents', and teachers' schools fostered a culture of healthy sleep habits through role modeling, informal conversations, class discussions, and monthly campaigns (i.e., bulletin boards, announcements, lesson). In a study examining teachers' perceptions of the implementation of a CSH project (APPLE Schools), teachers perceived that part of their role as a teacher was role modeling (Storey et al., 2011). While teachers in a school-based health intervention study by Cargo et al. (2006) described role modelling as "setting a positive example for children and in doing so reinforcing intervention messages" (p. 91). Teachers described their actions as an example of what they taught (Cargo et al., 2006).

In order to shift a school culture to one that is health promoting, Storey et al. (2016) and Neely et al. (2020) identified essential conditions for taking a CSH approach. Significant overlaps between the essential conditions and the results of this secondary analysis to inform and strengthen school-based sleep promotion are students as change makers (i.e., students influence each other); and community support (i.e., collaboration between schools, teachers, and parents/guardian to support healthy sleep habits; community partnerships; school-home collaboration is a critical partnership for healthy sleep). As sleep happens at home, community support (i.e., school-home collaboration) is essential for improving students sleep behaviours. The essential conditions (Neely et al., 2020; Storey et al., 2016) and Bird, McKernan, et al. (2021) also indicated that students are change makers in the school and home. Therefore, students as change makers and community support (i.e., school-home collaboration) are key

components in the successful implementation of school-based sleep promotion when taking a CSH approach.

The social and physical environment of the school influences student's health and well-being often through 'hidden' or 'informal' curriculum such as a culture of healthy sleep habits. This informal curriculum is shaped by the values and attitudes promoted within the school (Langford et al., 2015). Rather than only educating students about sleep through 'hidden' or 'informal' curriculum, parents and teachers encouraged formal integration of sleep into the formal provincial curriculum. Currently, sleep is not an organizing idea (category within a subject that spans multiple grades) or learning outcome (what students should know, be able to do or value after completing the course) within the physical education and wellness curriculum, therefore sleep is an example that teachers can cover (or ignore) if they choose (LearnAlberta, 2022). If sleep were to be formally integrated into the provincial curriculum, it would demonstrate that the province values sleep and sees the benefits that adequate sleep brings their students social, physical, and mental wellbeing as well as academic potential.

Another key finding from this secondary analysis was that teachers and parents/guardians advocated for collaboration between schools, teachers, and parents to support healthy sleep behaviours. Students shared how they learned about sleep from school and home. Parents and teachers also identified school-home collaboration as a critical partnership to achieve healthy sleep habits for students. Therefore, in alignment with research by Epstein (Epstein, 2018; Epstein & Salinas, 2004), collaboration between teachers and parents would support student engagement in learning, and foster partnerships and services to support the promotion of healthy sleep behaviours. Fostering home, school and community partnerships has been identified as a priority for school communities (Epstein, 2018; Epstein & Salinas, 2004), however, the means to

foster home-school collaboration is less clear. The partners in this secondary analysis recommended communication between teachers and parents when students were having sleep problems, schools teaching healthy sleep behaviours to support parents' efforts at home, schools sharing resources and contacts with parents to support healthy sleep habits, schoolwide sleep awareness events (i.e., family night, open house, resource fair), and parent education on sleep. Research shows that strong collaborative relationships between schools and families benefit everyone (Epstein, 2018; Jones, 2020; Miller et al., 2018) and that parent knowledge of sleep and monitoring of children's bedtime increased students' likelihood of meeting sleep recommendations (Bird, McKernan, et al., 2021; Bird, Neely, et al., 2021; McDowall, Galland, et al., 2017). Additionally, school-based sleep interventions had more success when partnering with school partners (Gruber et al., 2016; Rey et al., 2020). Findings from Storey et al. (2016) on the essential conditions highlighted "it was reported by participants that in order to truly shift a school culture, all members of the school community needed to play a role" (p.5).

4.4.1 Strengths and limitations

Common concerns regarding qualitative secondary analysis include researcher presence and reflexivity as well as the privileged relationship the primary researcher holds with the data (Irwin & Winterton, 2011). To ensure researcher presence and reflexivity, the researchers revisited themes and subthemes, cross-checked findings, and stayed true to the iterative nature of the research. In regards to the privileged relationships the primary researcher holds with the data, Irwin and Winterton (2011) argue that primary analysts "do not necessarily have a privileged claim on the arguments which can be made from the data" (p.8). Strengths of the present study include having two researchers (PM, SY) analyze the data into the four components of CSH as well as the sample size and span of partner perspectives. The sample size and span of partners

broadens the scope of potential impact of this research on school partners involved in the implementation of school-based sleep promotion. Given that this study is a secondary analysis, the interviewers did not specifically ask students, parents/guardians, or teachers about partnerships that support students' healthy sleep habits or about policies that help promote healthy sleep behaviours (i.e., delayed school start times, bus schedules). Therefore, limitations of this research were that there was not an accurate description of community partners available to support school-based sleep promotion and there was no engagement with higher level policy discussion. Further interviews with school jurisdiction leaders and superintendents may yield different insights related to community partners and school and school jurisdictions policies about sleep.

4.4.2 Conclusion and Implications for Practice

In order to inform and strengthen school-based sleep promotion when taking a CSH approach findings from this research have been used to inform five recommendations (subthemes and themes) that school partners (i.e., teachers, administrators, schools, school jurisdictions, parents, students) can implement in order to shift the school and community culture to promote healthy sleep habits; (1) foster school-home collaboration through parent education and supporting students as change makers to influence each other and family members sleep behaviours; (2) formally integrate sleep into the curriculum; (3) develop classroom, school, and school jurisdiction sleep positive policy; (4) foster collaborative teaching and learning of healthy sleep behaviours at school and home; and (5) find, foster, develop community partners that can support healthy sleep habits in school communities. This secondary analysis provides direction to inform and strengthen school-based sleep promotion, as the results share beliefs, behaviours, practices, strategies, and recommendations that are already happening in school communities or

are realistic shifts towards a school culture of healthy sleep habits. These tangible, realistic action-oriented results build on the strengths that already exist in the school communities including CSH, students as change makers, school partners, and informal classroom policy. By building on existing strengths in school communities, school-based sleep promotion when taking a CSH approach has the potential to improve students sleep behaviours.

CHAPTER 5: CONCLUSION

5.1 Summary of Findings

The overarching goal of this thesis was to inform and strengthen school-based sleep promotion. To achieve this goal the objectives of this research were:

Objective 1: To explore teacher perspectives on sleep behaviours and their role in school-based sleep promotion.

Objective 2: To integrate multiple partner perspectives to inform how school-based sleep promotion can be strengthened when taking a CSH approach.

These studies can be used to inform future school-based sleep promotion initiatives; collectively these studies fill gaps in knowledge of the role of school partners in promoting healthy sleep behaviours in students. For instance, the secondary analysis found that parents and teachers perceived schools to have a role in promoting healthy sleep behaviours, and students shared what they learned about sleep from school at home. The present thesis found that efforts made by school partners (i.e., informal conversations about sleep, lessons on sleep, bulletin boards, announcements, policies, partnerships) can all work comprehensively towards creating a culture of healthy sleep habits. Sleep researchers, public health experts, healthcare providers, and school partners are advocating for the integration of sleep education in school environments in alignment with the CSH approach (Chaput et al., 2022). Therefore, this research has the potential to inform and strengthen school-based sleep promotion when taking a CSH approach and be a potential solution to overcome existing challenges in teaching students healthy sleep behaviours.

5.1.1 Objective 1 summary

The purpose of objective 1 was to explore teacher perspectives on sleep behaviours and their role in school-based sleep promotion. Elementary teachers (n=19) were recruited from the

greater Edmonton area, and semi-structured interviews were virtually conducted (i.e., phone, zoom). Interpretive description was used as the guiding method to allow teachers to share their knowledge based on their individualized roles and contexts. Our results indicated three themes: (1) the importance of sleep, (2) prioritize sleep as part of teaching and learning, and (3) culture of healthy sleep habits.

Teachers shared their perspectives on "the importance of sleep" (theme 1) for student engagement and success at school, and that sleep is an essential foundational behaviour that students need to learn and grow. Students who were tired experienced more challenges with assignments and experienced less enjoyment with learning. Additionally, teachers indicated that tired students affected the whole classroom creating challenges with peer relationships, lack of student engagement, decreased attention, and decreased interest in learning. Teachers considered establishing healthy sleep behaviours as a way to decrease barriers to students' success now and in the future (i.e., elementary school, middle school, high school), as teachers considered healthy sleep habits to be a life skill that needed to be learned. Parent involvement at bedtime was perceived by teachers to increase the likelihood that students acquired adequate sleep for their age, while students who put themselves to bed were more frequently tired at school.

Teachers felt that "prioritiz[ing] sleep as part of teaching and learning" (theme 2) is needed as health education or sleep education regularly "gets bumped" (E1) for competing priorities. Current sleep education was considered to be reactive rather than proactive by teachers, but teachers recognized that teaching about healthy sleep habits is within their role, as it is part of life skills and study skills. Efforts to promote healthy sleep habits among teachers included informal conversations about sleep, lessons in health class, and talking to parents about students sleep as needed. Teachers advocated for resources and support to help students learn the

importance of sleep (e.g., help students understand how they feel well-rested versus sleep deprived), and supported the idea of schoolwide sleep promotion initiatives. Teachers also advocated for sleep education for parents to help them understand the importance of sleep and how to help their children establish healthy sleep habits. According to teachers, students are often unable to overcome certain barriers (i.e., busy schedules, noisy environments, screens) without the support of their parents. Establishing communication pathways between parents and teachers supported students learning, and teachers encouraged the use of these pathways to support healthy sleep.

Teachers acknowledged that school-based sleep promotion could improve and in order to improve, teachers perceived a need for more conversations about sleep in the school to foster a "culture of healthy sleep habits" (theme 3). When sleep is talked about in students' lives more regularly, teachers perceived that healthy sleep habits were reinforced and brought to students' awareness. Teachers also observed how monthly campaigns, announcements, bulletin boards, school assemblies, and awareness days increased conversations about sleep and demonstrated that sleep was a priority in the school. Findings from objective 1 identified that a 'culture of healthy sleep habits' was shaped by role modelling and healthy sleep talk. Teachers considered themselves to be role models due to the amount of time and influence they had with students, and their ability to build relationships with students and parents. Students were also considered to be role models of healthy sleep behaviours by teachers. Both teachers and students engaged in healthy sleep talk (informal conversations about sleep) to promote healthy sleep behaviours at various moments such as following announcements that mentioned sleep, when examining a bulletin board on sleep, or during a monthly campaign on sleep. Teachers also used healthy sleep talk when students were late to school, fell asleep in class, or when they had a test the following

day. Sometimes teachers engaged in healthy sleep talk with parents at pick up, drop off, and parent-teacher interviews. All these conversations together built and fostered a 'culture of healthy sleep habits.'

5.1.2 Objective 2 summary

The purpose of objective 2 was to integrate multiple partner perspectives to inform how school-based sleep promotion can be strengthened when taking a CSH approach. A secondary qualitative analysis of student (n=45), parent/guardian (n=24), and teacher (n=19) interviews was conducted using deductive and inductive analysis. Findings were organized thematically in alignment with the four components of CSH which are the social and physical environment, teaching and learning, policy, and partnerships and services. The following sub-themes were identified within each of the four components: social and physical environment (culture of healthy sleep habits; students influence each other), teaching and learning (formally integrated sleep into curriculum; school, teacher, and parents/guardian collaboration), policy (sleep-positive classroom policies), and partnerships and services (community partnerships; school-home collaboration).

5.1.2.1 Social and Physical Environment

Role modelling, informal conversations, class discussions, and monthly campaigns (i.e., bulletin boards, announcements) were ways that teachers influenced students sleep behaviours through the social and physical environment of the school, which supported the creation of a 'culture of healthy sleep habits.' Teachers observed how 'students influenced each other,' as students taught younger students about healthy sleep habits through buddy classes (i.e., classes partnering up for a lesson(s)/activity) and bulletin boards, and students learned from each other about sleep habits. Both teachers and students mentioned how monthly campaigns on sleep

influenced student conversations about sleep. Teachers, parents, and students explained how some students brought what they learned about healthy sleep habits at school home and some students used what they learned about sleep to improve their sleep behaviours.

5.1.2.2 Teaching and Learning

Parents and teachers considered sleep to be important and thought that it was already part of the learning outcomes in the provincial curriculum or that it should be part of the learning outcomes of the provincial curriculum. Therefore, teaching and learning healthy sleep behaviours as a school community can be strengthened by formally integrating sleep into the provincial curriculum rather than sleep being an example that teachers can choose (or not choose) to cover. Parents and teachers advocated for collaboration between schools, teachers, and parents to promote healthy sleep behaviours as the more students hear the same message from the adults in their lives, the more likely the message will integrate and impact their behaviour around bedtime. Parents were supportive of teachers teaching their children about healthy sleep behaviours as teachers have influence with their children due to the time they spend with the students and the relationships that they build with students. Parents shared how students often listen more to their teachers than to them.

5.1.2.3 Policy

School and school jurisdiction level policy was not addressed in the student, parent, or teacher interviews, however, teachers did cover ‘sleep positive classroom policies.’ Teachers allowed students to sleep when possible. If students were able to fall asleep in the noisy classroom, teachers perceived that they needed sleep. Teachers also shared that if students had a nap rather than going home, they had more opportunity to learn. Additionally, teachers observed

that students often woke up in a better mood, ready to learn and socialize. Teachers encouraged connecting with students first about sleep behaviours (prior to parents), as older students are more likely to change their sleep behaviours if they are involved in the decision-making process. School practices observed by teachers to support healthy sleep behaviours included monthly campaigns on sleep and connecting with parents about students being tired or falling asleep in school.

5.1.2.4 Partnerships and Services

Teachers and parents highlighted how schools are a hub for partnerships, however, partnerships and services related to school-based sleep promotion were limited. APPLE Schools, family school liaison workers, and community outreach staff were mentioned by some teachers as partnerships and services that strengthen school-based sleep promotion by teaching and supporting students healthy sleep behaviours. Both parents and teachers encouraged more collaboration with external partners to support students healthy sleep behaviours. Existing school-home collaboration according to teachers included parent-teacher interviews, newsletters, communication via the school website, parent council events, phone calls, and emails. Parents and teachers acknowledged that parents can learn about healthy sleep behaviours through existing school-home collaboration. However, both parents and teachers encouraged more collaboration to support students healthy sleep behaviours including more conversations between parents and teachers when students were struggling to get enough sleep or were falling asleep in class, schools sharing resources and contacts to support healthy sleep behaviours, and parent education on healthy sleep behaviours. According to parents and teachers, parent education on sleep would increase parent awareness of the importance of sleep.

5.2 Interpretation of Findings

The findings from this thesis demonstrated that students, parents, and teachers perceived school-based sleep promotion to be a viable strategy for schools to support students' healthy sleep behaviours. Teacher perspectives provided novel insights into school-based sleep promotion including teachers view on the importance of sleep, how teachers promote sleep with students and parents, how teachers role model healthy sleep behaviours in schools, and how teachers practice healthy sleep talk to promote a culture of healthy sleep habits. The findings from objective 1 illustrate the strengths that already exist in schools to promote healthy sleep behaviours. These strengths provide opportunities that school communities can build on to support school-based sleep promotion. Existing school-based sleep education research has engaged elementary teachers in the process of creating (Gruber et al., 2016) or adapting a school-based sleep education intervention (Rey et al., 2020). To our knowledge, prior to this work, teachers' perspectives regarding school-based sleep promotion, school-based sleep education, or school-based sleep interventions had yet to be published in the literature.

Many schools across Canada and internationally are using CSH or its alternatives (i.e., WSCC; HPS) to promote health behaviours in the school environment (JCSH, 2018, 2019; Langford et al., 2015; World Health Organization, 2017). Building on existing practices in school environments increases school and teacher capacity to promote healthy sleep behaviours in schools. CSH is not a one size fits all, CSH is an approach that is encouraged to be adapted to fit the individual school community as adaptation to the specific school context supports buy-in and integration to the school culture (JCSH, 2016; Neely et al., 2020; Storey et al., 2016).

This thesis is grounded in CSH and CSH aligns with the knowledge-to-action (KTA) approach (Graham, Logan, Harrison et al., 2006). The findings from the secondary analysis of

student, parent, and teacher interviews demonstrate that school-based sleep promotion when taking a CSH approach can be a key strategy to translate knowledge to action as school-based sleep promotion when taking a CSH approach adapts knowledge to the local context, overcomes barriers to knowledge use, and has the potential to sustain knowledge use. School-based sleep researchers advocate for community-based participation as part of a KTA approach to collaborating with schools to develop and implement school-based sleep interventions (Gruber, 2017; Gruber et al., 2019; Rigney et al., 2021). According to Gruber (2017) the KTA approach would allow researchers to evaluate existing programs, and identify strategies that can be used to support translation of evidence in pediatric sleep to improvements in children and youth's sleep behaviours.

In the context of school-based sleep promotion, school partners can use role modelling, healthy sleep talk, students as role models, announcements, bulletin boards, or schoolwide events for their schools to shape the social and physical environment of the school to foster a culture of healthy sleep habits (i.e., translate knowledge to action). Teaching and learning healthy sleep behaviours can be formally included in health education classes, on the announcements, bulletin boards, or schoolwide events. For policy, teachers can create their own sleep-positive classroom policy or advocate for a school or school jurisdiction policy to support students healthy sleep behaviours (i.e., delayed start times). For partnerships and services, schools get to engage with parents/families and community services in ways that work for them to promote healthy sleep behaviours. This flexibility in the ways that school-based sleep promotion is delivered through a CSH approach supports school partner engagement and the integration of school-based sleep promotion into the school culture. This can enhance the sustainability of sleep promotion in the school environment. In addition to adapting the health initiative to the school context, the Joint

Consortium of School Health encourages using all four components of CSH collaboratively to successfully shift a school culture (JCSH, 2016).

School-based sleep promotion through a CSH approach builds on school partner knowledge and skills, works within the existing school context, and is a school-wide effort. Both studies in this thesis have demonstrated that school partners do not have to be sleep experts to promote healthy sleep behaviours. Objective 2 summarized how students, parents, and teachers practiced school-based sleep promotion when taking a CSH approach. Taking a CSH approach to promote healthy sleep behaviours is a viable option as it strengthens home, school, and community partnerships. As mentioned throughout this thesis, sleep happens at home, therefore home-school collaboration is necessary for improvements in children's sleep behaviours. To inform and strengthen school-based sleep promotion, school partners can (1) advocate to formally integrate sleep into the curriculum, (2) collaborate to develop and implement sleep positive school or school jurisdiction policy, (3) develop or become community partners that can support healthy sleep habits in school communities, and (4) support school-home collaboration to promote students healthy sleep behaviours.

5.3 Strengths and Limitations

This chapter provided a summary of two separate studies included in this thesis. Strengths and limitations were included in the individual chapters covering objective 1 (chapter 3) and objective 2 (chapter 4), thus the following section will cover additional strengths and limitations in relation to this thesis in its entirety. Teacher (n=19) and a portion of parent (n=8) recruitment occurred during COVID-19, which may have influenced parent and teacher perspectives on sleep behaviours. Additionally, it could be assumed that both parents and

teachers recruited were interested in student's sleep and therefore at risk of desirability bias. However, teachers and parents interested in promoting healthy sleep habits in students met our inclusion criteria for participation, which was to recruit individuals knowledgeable about the phenomenon of interest. While this was our inclusion criteria, we recognize the value of hearing from parents that do not prioritize healthy sleep behaviours in their home as children's sleep is shaped by various socio-political and environmental factors (e.g., SES, race/ethnicity, gender, cultural and family traditions) which were not explored in this study. Strengths of both studies include the qualitative nature of the work, which allowed for an in-depth understanding of the lived experiences of teachers and an in-depth understanding of school-based sleep promotion from student, parent, and teacher perspectives. This thesis addressed the need for research on school-based sleep promotion, teachers' perspectives on student's sleep behaviours, and teachers' role in school-based sleep promotion. Further strengths include sample size and spread of partner perspectives (i.e., student, parent, teacher, and administrator). This research has significant implications for research, policy, and practice development within school-based sleep promotion initiatives which are described below.

5.4 Implications

This thesis provided novel insights into teacher's perspectives on promoting healthy sleep behaviours in schools and multiple partner (student, parent, and teacher) perspectives on how school-based sleep promotion can be strengthened using a CSH approach. The findings from this thesis inform future research, practice, and policy related to school-based sleep promotion in Canada. Future school-based sleep promotion should build on existing school strengths including the social and physical environment, teaching and learning, policy, and partnerships and services.

Fostering teacher knowledge, skills, relationships, and health promoting efforts (i.e., announcements, bulletin boards, informal conversations, class lessons) increases school uptake, teacher buy in of school-based sleep promotion, and increases the school's ability and capacity to integrate sleep promotion into the school culture leading to sustainability. School-based sleep promotion when taking a CSH approach can increase student and parent awareness of the importance of sleep and increase school-home collaboration to support healthy sleep behaviours in students. Increasing parent awareness of the importance of sleep and engaging parents in sleep education can increase parent involvement in students' bedtime routines. Parent involvement at bedtime has been shown to increase children's sleep quantity and quality (McDowall, Galland, et al., 2017). Overall, school-based sleep promotion was valued by students, parents, and teachers and future school-based sleep promotion interventions would benefit from taking a whole school approach.

5.4.1 Recommendations for future research

This thesis addressed gaps in understanding of school-based sleep promotion when taking a CSH approach. The findings in this thesis provided teachers' missing perspective on school-based sleep promotion and provided valuable knowledge on how to support school-based sleep promotion through a CSH approach to improve student's sleep habits. This thesis provides tangible strategies within a CSH approach to promote healthy sleep behaviours in schools. Objective 2 of this thesis was a secondary analysis that re-examined primary datasets related to partner (i.e., student, parent, teacher) perspectives of students' sleep behaviours and school-based sleep promotion initiatives. As a result, school partners were not directly asked about school or school jurisdiction policy that supports school-based sleep promotion or students healthy sleep behaviours. In future, interviews with school jurisdiction leaders and administrators to better

understand school jurisdiction and school policies related to sleep (i.e., delayed school start times, bus schedules) would inform and support policy development to strengthen school-based sleep promotion and improve students sleep behaviours. Community support for school-based sleep promotion (e.g., sleep clinics, sleep consultants, sleep education programs, parenting classes that support establishing bedtime routines, early childhood development specialists) is another important aspect that was not directly asked within primary dataset interviews. Therefore, exploring community support available to promote students healthy sleep behaviours is an area of potential research.

Across all school partner interviews (i.e., student, parent, teacher), participants acknowledged that schools could influence students sleep behaviours, however, all participant groups identified parent involvement as necessary for students to overcome existing barriers (i.e., busy schedules, noisy sleep environments) to healthy sleep habits. Teachers and parents emphasized a need for more opportunities for parental education on supporting healthy sleep behaviours in students. Therefore, future research on how to provide and engage parents in sleep education would support the improvement of children's sleep behaviours.

5.4.2 Recommendations for policy and practice

To improve school-based sleep promotion, teachers recommended prioritizing sleep as part of teaching and learning through multiple methods including monthly campaigns (i.e., announcements, bulletin boards), health education, parent education, students as drivers of change in the school and home, role modelling, and healthy sleep talk. Teachers and parents perceived that sleep should be formally integrated into the provincial physical education and wellness curriculum (i.e., organizing idea or learning outcome) as sleep is a topic teachers can cover (or ignore) if they choose. To overcome students unhealthy sleep behaviours, teachers

were supportive of a whole school approach and advocated for more conversations about sleep between all school partners as it demonstrated to students that sleep is important. In regard to sleep positive classroom policy, teachers encouraged letting students sleep when possible and talking with older students before connecting with parents when students sleep behaviours become a problem. Students shared how they learned about sleep at school and home. Therefore, teachers and parents encouraged school-home collaboration to support students healthy sleep behaviours. Existing school-home collaboration includes parent teacher interviews, newsletters, communication via the school website, parent council events, emails, and phone calls as needed. Despite these existing methods for school-home collaboration, parents and teachers called for more collaboration between parents and teachers to support healthy sleep behaviours in students, including conversations when students were struggling to get enough sleep or experiencing sleep problems, schools sharing resources on healthy sleep habits, and schools sharing community contacts that can support healthy sleep habits. Further school home collaboration could include school led parent sleep education and fostering students as drivers of change in the school and home as students can support family buy-in to practicing healthy sleep behaviours as a family.

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APPENDIX A: Teacher Information Letter and Consent Form

Title of Study: Sleeping soundly: Understanding the translation of sleep promotion at school to sleep behaviours at home

Principal Investigator: Dr. Kate Storey, PhD, RD, 780-492-9609

Purpose
You are being asked to participate in a semi-structured interview in order to increase our understanding of teacher's perspectives of their role in promoting sleep in their school, and ways they think sleep promotion could be improved in the school community.

Participation involves a one-on-one semi-structured interview, lasting approximately 30-60 minutes. Interviews will be scheduled at a time convenient for teachers, and will take place over the phone or video call. During the interview you will be asked a series of questions about your perspectives regarding your students sleep behaviours, and the role of teachers in promoting sleep in schools. Interviews will be recorded to ensure that the discussion is captured accurately and will be transcribed immediately following the interview.

Benefits
Sharing the ideas you have will give us a better understanding of how sleep is promoted and implemented in your school. The information you provide will help guide future project success and improve the services provided. The information we gather will also be useful to understand the projects impact beyond the school community.

Risks
There are no known risks associated with participating in this study. If any of the questions asked in the interview make you feel uncomfortable, you can choose not to answer them. Any information you wish not to be included will be removed.

Voluntary Participation
Taking part in this project is completely voluntary. There will be no negative effects if you do not want to participate. Interviews will be audio recorded and you can request to shut off the audio recording and end the interview at any point in time. Your information can be removed from the study within one month of data generation if you decide later that you do not want to participate. If you do wish to withdraw or have any other questions, you may contact Dr. Kate Storey at the email address or phone number listed below.

Confidentiality and Anonymity
Your privacy will be maintained. To protect your identity, you will be given a false name for interview transcription and publishing purposes. We want to emphasize that any information provided throughout the interview will be kept confidential and will not be shared with any other individual. We will not record any personal information in the written records and to protect against personal information being released, we will ensure that your participation in this study, and any information remains confidential. All information will be stored in a locked file cabinet in a locked office at the University of Alberta. Electronic copies of transcripts will be stored on a password protected secure server. Only members of the research team will have access to this information. The audio recordings, transcripts, and master lists are kept for five years after the data are published, after which they will be destroyed.

Further Information

If you have any further questions regarding this study, please do not hesitate to contact:
Dr. Kate Storey, PhD, RD: kate.storey@ualberta.ca, (780) 492-9609

The plan for this study has been reviewed by a Research Ethics Board at the University of Alberta. If you have any questions about your rights or how research should be conducted, you can call (780) 492-2615. This office is independent of the researchers.

Consent Statement

I have read this form and the research study has been explained to me. I have been given the opportunity to ask questions and my questions have been answered. If I have additional questions, I have been told whom to contact. I agree to participate in the research study described above and will receive a copy of this consent form. I will receive a copy of this consent form after I sign it.

_____ _____

Signature of Participant *Date*

_____

Printed Name

APPENDIX B: Objective 1: Teacher Interview Guide

Teacher Interview Guide

Name	
Gender	
Age	
School Information	
School Name	
Title/Position	
Student Grade Level	
Years worked at School	

Sleep Knowledge Questions:

1. Do you think sleep is important for students? Why or why not?
    a. Probes: Affects other areas of children's physical and mental development, health behaviours (physical activity, eating habits, caffeine/sugar, electronics in the bedroom), behavior problems, academic achievement

2. What do you know about your students sleep behaviours?
    a. Probes: Do students tell you about their sleep/routine?
    b. Probes: Are your students tired throughout the day
    c. Probes: falling asleep in class, unable to concentrate, poor academic performance

Sleep Promotion in Schools:

3. Do you feel teachers have a role in educating and supporting children to have healthy sleep habits? Why or why not?
    a. If yes. What is this role?

4. Do you feel schools have a role in educating and supporting children to have healthy sleep habits? Why or why not?
    a. If yes. What is this role?

5. What does sleep education look like in your classroom?
    a. Where might you get this information from? (ParticipAction report card, sleep hygiene slides, previous teacher slides/information, word of mouth, etc.)
    b. Was sleep promotion part of your education? PD? Teachers convention?

6. In what ways do you promote healthy behaviours in your classroom?
    a. Describe your classroom environment (health promotion, healthy eating, active living, sleep)
    b. Describe your school health promotion activities (any school health initiatives that have taken place in your school?

7. What does sleep promotion look like for the broader school community?
    a. Do you think it could be improved? If so, how?

Closing Questions:

8. What do you think is the biggest barrier to supporting students sleep?
    a. Within teaching practices? Within schools?

Those are all the questions I have for you today. Is there anything else you would like to add?