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Commentary: School Nurses Can Address Existing Gaps in School Age Sleep Research

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Introduction

Sleep has become a topic of great interest to researchers, clinicians, and practitioners. Research increasingly documents the effects of sleep in a host of developmental areas, including physical, cognitive, emotional and behavioral domains and there is growing evidence of sleep inadequacy among youth (National Sleep Foundation, 2009). Despite knowledge of the importance of sleep in children, much of the extant research on sleep behaviors has focused on infants, toddlers, adolescents or adults with little attention on school-age children. Further, interventions aimed to improve sleep have been targeted specifically for parents to help establish practices that promote adequate sleep in infants and toddlers, or for the adult themselves. Developmentally, middle childhood is a time of increasing independence and decreasing parental control and thus, it is a prime time to begin establishing healthy sleeping habits that will extend into adolescence and adulthood. The purpose of this commentary is to extend previous research and reviews (Malone, 2011) to underscore the need for sleep promotion research and intervention studies among school-age children that are ecologically framed and developmentally appropriate.

Current research on sleep: What we know

The 2004 and 2006 National Sleep Foundation polls provide alarming evidence of sleep inadequacy in school-age children: 27% of school-age children receive inadequate sleep and 29% of school-age children have difficulty awakening in the morning (National Sleep Foundation, 2004, 2006b). Approximately 11-12% of American school-age children report daytime sleepiness (J. A. Owens, Spirito, McGuinn, & Nobile, 2000; Stein, Mendelsohn, Obermeyer, Amromin, & Benca, 2001) and 18-21 % complain of fatigue at school (Blader, Koplewicz, Abikoff, & Foley, 1997; Stein, et al., 2001). Fifty percent of 6th graders report they need 9 hours of sleep or more to feel their best but few routinely attain that much sleep (National Sleep Foundation, 2006a). Over time, there has been a consistent decline in the amount of sleep among children (Matricciani, Olds, & Petkov, 2012).

Consequences of inadequate sleep and health outcomes

Sleep disruption has serious health consequences and possible life course effects. Poor sleep is associated with inflammatory and metabolic disturbances, increased obesity and cardiovascular risk factors, and poorer nutrition (Bell & Zimmerman, 2010; Cohen, Doyle, Alper, Janicki-Deverts, & Turner, 2009; Crabtree, Varni, & Gozal, 2004; Reilly et al., 2005). Sleep is important in maintaining metabolic homeostasis; sleep deprivation and circadian rhythm disruptions are associated with increased risks of developing cardiovascular disorders and Type 2 diabetes (Chandola, Ferrie, Perski, Akbaraly, & Marmot, 2010; Knutson, Ryden, Mander, & Van Cauter, 2006; Yaggi, Araujo, & McKinlay, 2006).

Epidemiological studies in children report an inverse association between total nighttime sleep duration and body mass index (BMI) (Chen, Beydoun, & Wang, 2008). Subjective and objective measures of sleep duration are associated with increased odds of obesity (Ievers-Landis, Storfer-Isser, Rosen, Johnson, & Redline, 2008; Liu et al., 2008). In addition to obesity markers such as weight, BMI and waist to hip percentiles, odds of pre-hypertension when adjusted for sex, BMI percentile, and socioeconomic status, are also increased 2.5-fold in adolescents with <6.5 hours of sleep (Javaheri, Storfer-Isser, Rosen, & Redline, 2008). Not only are these health outcomes associated with reports of shorter sleep duration but, BMI is also related to increased light sleep vs. deep sleep and number of arousals during the night (Landis & Parker, 2007). Finally, anecdotal evidence suggests that recurrent sleep restriction is associated with increased snacking and carbohydrate consumption as well as other nutritional deficiencies (Nedeltcheva, Kessler, Imperial, & Penev, 2009), all of which are associated with long term obesity, and cardiovascular disease.

Consequences of inadequate sleep and neurocognitive performance and emotional/behavioral function

Data indicate that undiagnosed sleep problems in children negatively impact cognitive, psychological, emotional and social functioning (Gozal, 1998, 2001; Randazzo, Muehlbach, Schweitzer, & Walsh, 1998; Sadeh, Gruber, & Raviv, 2003; Wolfson & Carskadon, 1998). In fact, there is increasing evidence among the infant literature that sleep plays a neuroprotective role in the developing brain (Calciolari & Montirosso, 2011). Children with shorter nighttime sleep duration report more daytime naps and falling asleep in class (22%) (National Sleep Foundation, 2006a). A recent critical review of the association between sleep and memory confirms that insufficient sleep impacts abstract and complex reasoning (Kopasz et al., 2010). In addition, research has documented the association between inadequate sleep and anxiety, depression, distress, and increased school absenteeism (Aronen, Paavonen, Fjallberg, Soininen, & Torronen, 2000; Blader, et al., 1997; Buckhalt, El-Sheikh, & Keller, 2007; Chervin et al., 2003; El-Sheikh, Buckhalt, Keller, Cummings, & Acebo, 2007; J. A. Owens, 2005; Steenari et al., 2003), all of which have implications for a child's readiness to learn and academic performance (Jones et al.; Wolfson & Carskadon, 2003). Studies suggest that even a modest extension in sleep duration is associated with positive changes in neurobehavioral performance/academic achievement (Sadeh, et al., 2003), heightening awareness that accumulated sleep debt from chronic inadequate sleep can have significant impact on academic achievement in youth.

The need for contextual and ecological approaches to school-age sleep research

Sleep is a fundamental function of human life with biological and circadian drives, but it is also heavily influenced by family, cultural and social contexts (El-Sheikh, 2011; Giannotti &

Cortesi, 2009). Just as research with children is conducted within the larger context of the family system, so must school-age sleep research and subsequent health promotion efforts be thus grounded. Yet sleep research that examines the reciprocal relations between individual sleep behavior, development, family, environment, and the larger social-cultural setting is limited.

At the individual level, school-age children are beginning to gain more control over their own behavior as they transition towards increased independence. They are beginning to form their own beliefs and attitudes towards health behaviors that in turn, influence their actions. Parenting practices also shape children's sleep patterns as evidenced by studies that report positive associations between responsive and warm parent child interactions and sleep(Adam, Snell, & Pendry, 2007; Brand, Gerber, Hatzinger, Beck, & Holsboer-Trachsler, 2009; Sadeh, Tikotzky, & Scher, 2009). Children whose parents encourage independence, autonomy and maturity also report longer sleep duration and less nighttime variability(Spilsbury et al., 2005). In addition to the influence of parenting and parent-child interactions, studies demonstrate that parents impact children's sleep through their own physical and mental health (see review by (Seifer, 2011). Most recently, both maternal and paternal depressive symptomatology was associated with sleep problems in children(El-Sheikh, Kelly, Bagley, & Wetter, 2012).

The family social environment is also critical to examine in school-age sleep research(El-Sheikh, Kelly, Buckhalt, & Benjamin Hinnant, 2010; Utzinger et al., 2011) and only recently have studies begun to document the relationship between the two. Home regularity is a significant environmental cue that modulates sleep patterns in children; its absence has been linked with disparities in child developmental outcomes(Flores, Tomany-Korman, & Olson, 2005). Marital conflict is associated with decreased quantity and quality of sleep(El-Sheikh, Buckhalt, Mize, & Acebo, 2006) and family stress, financial strain, parenting hassles, and disturbance in bedtime routines are all associated with disrupted sleep(Adam, et al., 2007; Giannotti & Cortesi, 2009). The social environment is a malleable influence and can be the focus of interventions to alleviate sleep disruption.

Additionally, sleep is influenced by the physical environment. Light, the primary determinate of sleep-wake circadian rhythm, has been the basis for increasing dialogue and research because of increasing evening use of light emitting devices (Kohyama, 2009). Blue light emitting technology in the bedroom, particularly while used in bed, negatively impacts sleep and yet, is disturbingly frequent among youth(Foundation, 2011). Ninety percent of adolescent youth polled in the Sleep in America Poll 2011 reported using some form of technology in the hour before going to bed at night, including computers, cell phones, texting, and electronic music. In addition to the neurocognitive stimulation that technology arouses, increased light reduces sleep promoting melatonin secretion(Davis, Mirick, & Stevens, 2001; Stevens, 2005).

In an effort to investigate links between sleep and the larger social environment, El-Shiekh et al. (2010) has examined the effects of demographics, namely race and socioeconomic status, on sleep. When comparing sleep among African American and Euro-American children, African Americans experience more sleep problems, poorer sleep quality, and shorter sleep duration(Buckhalt, et al., 2007). They also are more likely to have later bedtimes and less consistent routines(Adam, et al., 2007). Study findings also consistently indicate that children from higher socioeconomic backgrounds experience longer sleep and less disruption(El-Sheikh, et al., 2007). Low income African American children had significantly later bed times compared to non-minority youth and 43% of 10-11 year old minority boys reported less than 9 hours of sleep in one study(Spilsbury et al., 2004). Of note are findings that demonstrate socioeconomic status and race moderating the relations

between sleep and internalizing/externalizing behaviors over time(El-Sheikh, et al., 2010). The identified relationships are complex and involve several indices of sleep quality. Taken together, these data underscore the importance of, and need for, more research that examines multiple levels of systems addressing sleep with ecologically framed sleep studies across various contexts.

Need for developmentally appropriate interventions

In addition to understanding the interrelationships between physical, social and family environments and sleep in school-age children, there is also a great need to create efficient screening protocols and to develop and test appropriate interventions to improve sleep. Sleep is a modifiable factor, well suited for low cost/high yield interventions. Yet health care providers inconsistently screen school-age children for sleep problems and rarely intervene(Chervin, Archbold, Panahi, & Pituch, 2001). The reasons for these omissions are likely multiple. Providers have been historically taught that sleep problems are quiescent during these years; parent and child self-report measures used by clinicians typically over-represent the school-age child's actual sleep by more than 30 minutes(Kieckhefer, Ward, Tsai, & Lentz, 2008; Lauderdale, Knutson, Yan, Liu, & Rathouz, 2008). Providers may be unaware of effective interventions or feel ill-equipped to impact sleep behaviors since provider surveys report that behavior change counseling is an unmet need in health professional education(Chien et al., 2006; J.A. Owens, 2001). Further, it may be perceived that multiple in-person contacts are necessary to assess sleep patterns, to educate about improving sleep, to re-assess for change, and to provide the support needed to sustain sleep behavior changes; such levels of family and provider involvement may be deemed unfeasible in general pediatric clinics.

The majority of published pediatric sleep intervention studies focus on infants, toddlers and preschoolers or children having developmental disabilities and primarily target parent behavior(Montgomery, Stores, & Wiggs, 2004; Wiggs & France, 2000; Wiggs & Stores, 1999, 2001, 2004). However, parents of typically developing school-age children support their child's growing interdependence in management of health behavior. Teaching traditional behavior modification techniques to parents directly, as is often done with younger or developmentally challenged children, may thus be less well accepted and less effective in improving the long-term sleep adequacy of school-age children. The school-age child is transitioning from parent-control to increasing self-control over their sleep and other health related behaviors. Thus, central to the success of any sleep improvement intervention is the school-age child's active participation(Wiggs, 2009), heretofore missing in sleep intervention research.

School-based interventions as a context to promote health

Schools play a critical role in the healthy development of youth. Youth spend more time within the school setting than any other context; school is considered one of the most important influences in a child's life. Researchers assert that schools are the setting with the most promise for having a large public health impact because almost all youth—regardless of age, gender, ethnic, or socioeconomic background—can be reached in a school, and in doing so, equity in access to health promotion programs is achieved. This equity of access is a key factor in addressing health disparities(Cortina et al., 2008). Further, programs that are based on collaboration between health and education systems and involve the community and families have been shown efficient and cost effective(Bundy, 2006). Katz(Katz, 2009) concludes that school-based strategies that are focused on nutrition, physical activity and parental involvement are effective and are most successful when reinforced outside of school, for example, by parents and through intermittent “boosters” to maximize

sustainability of change. With school nurses having a consistent presence in the school and opportunity to engage in repeated dialogue with parents to encourage their efforts to support their child's sleep behavior change, school nurses could be central in improving the sleep of American youth.

Future research directions for sleep in school-age children

Translational school-age sleep research is critically needed given that youth are not getting enough sleep and the health consequences are well established. Middle childhood is an opportune time for sleep interventions to occur as these children represent a group who are developmentally ready and eager to be active participants in their own health. It is critical to establish healthy sleep hygiene practices before adolescence and long-term detrimental health effects of inadequate sleep develop. Yet, despite the growing body of literature on sleep, school-age children remain woefully absent in current research endeavors. There are even fewer studies that examine the relationships between physiological, environmental and behavioral variables and sleep among youth despite knowledge that sleep patterns are developed and influenced by a host of contextual factors. Given that ethnicity and culture shape family values and practices, which in turn guide sleep behaviors, research that examines sleep across races, ethnicities, and cultures is essential. Moreover, analyses that explore the impact of a variety of physical environments are missing in the extant research. Not only is it critical to examine factors such as light, sleeping arrangements and noise, but it is also necessary to understand how living arrangements and neighborhoods may serve as mediating or moderating influences on children's sleep and sleep hygiene. Ecologically framed research programs that explore a wide range of contexts and seek to explicate how they may have interrelated influences are critically needed to obtain a more comprehensive picture of sleep in school-age children and broaden the avenues for effective intervention approaches.

Schools are an optimal milieu for this research and school nurses can and should play an integral role in these research endeavors. Schools can provide the context to obtain variability in samples among typically developing children. School nurses understand the importance of health and academic success and should be called upon to contribute their knowledge and skills to engage in sleep research. In practice, sleep inadequacies should be consistently included as one of the differential diagnoses whenever nurses are asked to consult around issues of disruptive behavior, falling asleep in class, obesity or poor academic performance. Nurses can easily screen for sleep problems using one of several brief paper and pencil tools with established validity and reliability (Chervin, Hedger, Dillon, & Pituch, 2000; J. A. Owens, Spirito, & McGuinn, 2000). Identifying effective interventions to improve sleep, however, remains problematic because of the current void in school-age sleep research. Nursing, particularly school nursing would benefit from systematic, comprehensive and rigorous intervention studies focused on school-age children. Until such investigations occur, school nurses are forced to resort to ad-hoc interventions that may or may not prove effective and importantly, the ability to determine efficacious intervention models across school settings is lost. With their knowledge of development, health promotion and evidence based intervention, and their expertise in health education and working with children and families, school nurses are uniquely positioned to not only explore the various contexts that impact sleep, but also systematically test the delivery of sustainable interventions aimed at larger numbers of school-age children than conventional clinic or university research studies can feasibly do. As such, school nurses can play an integral role in addressing this burgeoning public health issue and improve the health and function of American youth.

References

- Adam EK, Snell EK, Pendry P. Sleep timing and quantity in ecological and family context: a nationally representative time-diary study. *J Fam Psychol*. 2007; 21(1):4–19. [PubMed: 17371105]
- Aronen ET, Paaavonen EJ, Fjallberg M, Soininen M, Torronen J. Sleep and psychiatric symptoms in school-age children. *J Am Acad Child Adolesc Psychiatry*. 2000; 39(4):502–508. [PubMed: 10761353]
- Bell JF, Zimmerman FJ. Shortened nighttime sleep duration in early life and subsequent childhood obesity. *Arch Pediatr Adolesc Med*. 2010; 164(9):840–845. [PubMed: 20819966]
- Blader JC, Koplewicz HS, Abikoff H, Foley C. Sleep problems of elementary school children. A community survey. *Arch Pediatr Adolesc Med*. 1997; 151(5):473–480. [PubMed: 9158439]
- Brand S, Gerber M, Hatzinger M, Beck J, Holsboer-Trachsler E. Evidence for similarities between adolescents and parents in sleep patterns. *Sleep Med*. 2009; 10(10):1124–1131. [PubMed: 19464234]
- Buckhalt JA, El-Sheikh M, Keller P. Children's sleep and cognitive functioning: race and socioeconomic status as moderators of effects. *Child Dev*. 2007; 78(1):213–231. [PubMed: 17328701]
- Bundy, DAP.; Shaeffer, S.; Jukes, M.; Beegle, K.; Gillespie, A.; Drake, L.; Seung-Hee, FL.; Hoffman, AM.; Jones, J.; Mitchell, A.; Barcelona, D.; Camara, B.; Golmar, C.; Saviolo, L.; Sembene, M.; Takeuchi, T.; Wright, C. School-based health and nutrition programs. In: Jamison, JGBDT.; Measham, AR.; Alleyne, G.; Claeson, M., editors. *Disease Control Priorities in Developing Countries*. New York: Oxford University Press; 2006. p. 108
- Calciolari G, Montiroso R. The sleep protection in the preterm infants. *The journal of maternal-fetal & neonatal medicine : the official journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstetricians*. 2011; 24(Suppl 1):12–14. Review.
- Chandola T, Ferrie JE, Perski A, Akbaraly T, Marmot MG. The effect of short sleep duration on coronary heart disease risk is greatest among those with sleep disturbance: a prospective study from the Whitehall II cohort. *Sleep*. 2010; 33(6):739–744. [PubMed: 20550013]
- Chen C, Beydoun M, Wang Y. Is sleep duration associated with childhood obesity: A systematic review. *Obesity*. 2008; 16(2):265–274. [PubMed: 18239632]
- Chervin RD, Archbold KH, Panahi P, Pituch KJ. Sleep problems seldom addressed at two general pediatric clinics. *Pediatrics*. 2001; 107(6):1375–1380. [PubMed: 11389260]
- Chervin RD, Clarke DF, Huffman JL, Szymanski E, Ruzicka DL, Miller V, et al. School performance, race, and other correlates of sleep-disordered breathing in children. *Sleep Med*. 2003; 4(1):21–27. [PubMed: 14592356]
- Chervin RD, Hedger K, Dillon JE, Pituch KJ. Pediatric sleep questionnaire (PSQ): validity and reliability of scales for sleep-disordered breathing, snoring, sleepiness, and behavioral problems. *Sleep Med*. 2000; 1(1):21–32. [PubMed: 10733617]
- Chien A, Coker T, Choi L, Slora E, Bodnar P, Weiley V, et al. What do pediatric primary care providers think are important research questions? A perspective from PROS providers. *Ambul Pediatr*. 2006; 6(6):352–355. [PubMed: 17116610]
- Cohen S, Doyle WJ, Alper CM, Janicki-Deverts D, Turner RB. Sleep habits and susceptibility to the common cold. *Arch Intern Med*. 2009; 169(1):62–67. [PubMed: 19139325]
- Cortina MA, Kahn K, Fazel M, Hlungwani T, Tollman S, Bhana A, et al. School-based interventions can play a critical role in enhancing children's development and health in the developing world. *Child Care Health Dev*. 2008; 34(1):1–3. [PubMed: 18171436]
- Crabtree VM, Varni JW, Gozal D. Health-related quality of life and depressive symptoms in children with suspected sleep-disordered breathing. *Sleep*. 2004; 27(6):1131–1138. [PubMed: 15532207]
- Davis S, Mirick DK, Stevens RG. Night shift work, light at night, and risk of breast cancer. *J Natl Cancer Inst*. 2001; 93(20):1557–1562. [PubMed: 11604479]
- El-Sheikh, M., editor. *Sleep and Development*. New York: Oxford University Press; 2011.

- El-Sheikh M, Buckhalt JA, Keller PS, Cummings EM, Acebo C. Child emotional insecurity and academic achievement: the role of sleep disruptions. *J Fam Psychol*. 2007; 21(1):29–38. [PubMed: 17371107]
- El-Sheikh M, Buckhalt JA, Mize J, Acebo C. Marital Conflict and Disruption of Children's Sleep. *Child Development*. 2006; 77(1):31–43. [PubMed: 16460523]
- El-Sheikh M, Kelly RJ, Bagley EJ, Wetter EK. Parental depressive symptoms and children's sleep: the role of family conflict. *Journal of child psychology and psychiatry, and allied disciplines*. 2012; 53(7):806–814.
- El-Sheikh M, Kelly RJ, Buckhalt JA, Benjamin Hinnant J. Children's sleep and adjustment over time: the role of socioeconomic context. *Child Dev*. 2010; 81(3):870–883. [PubMed: 20573110]
- Flores G, Tomany-Korman SC, Olson L. Does disadvantage start at home? Racial and ethnic disparities in health-related early childhood home routines and safety practices. *Archives of Pediatrics & Adolescent Medicine*. 2005; 159(2):158–165. [PubMed: 15699310]
- Foundation, NS. 2011 Sleep in America Poll. 2011. Retrieved 3-1-11, 2011, from http://www.sleepfoundation.org/sites/default/files/sleepinamericapoll/SIAP_2011_Summary_of_Findings.pdf
- Giannotti F, Cortesi F. Family and cultural influences on sleep development. *Child Adolesc Psychiatr Clin N Am*. 2009; 18(4):849–861. [PubMed: 19836692]
- Gozal D. Sleep-disordered breathing and school performance in children. *Pediatrics*. 1998; 102(3 Pt 1):616–620. [PubMed: 9738185]
- Gozal D. Morbidity of obstructive sleep apnea in children: facts and theory. *Sleep Breath*. 2001; 5(1):35–42. [PubMed: 11868138]
- Ievers-Landis CE, Storfer-Isser A, Rosen C, Johnson NL, Redline S. Relationship of sleep parameters, child psychological functioning, and parenting stress to obesity status among preadolescent children. *J Dev Behav Pediatr*. 2008; 29(4):243–252. [PubMed: 18552704]
- Javaheri S, Storfer-Isser A, Rosen CL, Redline S. Sleep quality and elevated blood pressure in adolescents. *Circulation*. 2008; 118(10):1034–1040. [PubMed: 18711015]
- Jones CR, Claassen DO, Yu M, Spies JR, Malone T, Dirnberger G, et al. Modeling accuracy and variability of motor timing in treated and untreated Parkinson's disease and healthy controls. *Front Integr Neurosci*. 5:81. [PubMed: 22207839]
- Katz DL. School-Based Interventions for Health Promotion and Weight Control: Not Just Waiting on the World to Change. *Annu Rev Public Health*. 2009
- Kieckhefer GM, Ward TM, Tsai SY, Lentz MJ. Nighttime sleep and daytime nap patterns in school age children with and without asthma. *J Dev Behav Pediatr*. 2008; 29(5):338–344. [PubMed: 18714207]
- Knutson KL, Ryden AM, Mander BA, Van Cauter E. Role of sleep duration and quality in the risk and severity of type 2 diabetes mellitus. *Archives of internal medicine*. 2006; 166(16):1768–1774. [PubMed: 16983057]
- Kohyama J. A newly proposed disease condition produced by light exposure during night: asynchronization. *Brain Dev*. 2009; 31(4):255–273. [PubMed: 18757146]
- Kopasz M, Loessl B, Hornyak M, Riemann D, Nissen C, Piosczyk H, et al. Sleep and memory in healthy children and adolescents - a critical review. *Sleep Med Rev*. 2010; 14(3):167–177. [PubMed: 20093053]
- Landis CA, Parker KP. A retrospective examination of the relationships between body mass index and polysomnographic measures of sleep in adolescents. *Journal of Adolescent Health*. 2007; 40(1):89–91.
- Lauderdale DS, Knutson KL, Yan LL, Liu K, Rathouz PJ. Self-reported and measured sleep duration: how similar are they? *Epidemiology*. 2008; 19(6):838–845. [PubMed: 18854708]
- Liu X, Forbes EE, Ryan ND, Rofey D, Hannon TS, Dahl RE. Rapid eye movement sleep in relation to overweight in children and adolescents. *Arch Gen Psychiatry*. 2008; 65(8):924–932. [PubMed: 18678797]
- Malone SK. Early to bed, early to rise?: an exploration of adolescent sleep hygiene practices. *J Sch Nurs*. 2011; 27(5):348–354. [PubMed: 21606219]

- Matricciani L, Olds T, Petkov J. In search of lost sleep: secular trends in the sleep time of school-aged children and adolescents. *Sleep medicine reviews*. 2012; 16(3):203–211. [PubMed: 21612957]
- Montgomery P, Stores G, Wiggs L. The relative efficacy of two brief treatments for sleep problems in young learning disabled (mentally retarded) children: a randomised controlled trial. *Arch Dis Child*. 2004; 89(2):125–130. [PubMed: 14736626]
- National Sleep Foundation. Final Report: 2004 Sleep in America Poll: Children and Sleep. 2004. Retrieved Sept.6, 2010, from <http://www.sleepfoundation.org/sites/default/files/FINAL%20SOF%202004.pdf>
- National Sleep Foundation. 2006 Sleep in America Poll. 2006a. Retrieved September, 3, 2009, 2009 from <http://www.sleepfoundation.org/article/sleep-america-polls/2006-teens-and-sleep>
- National Sleep Foundation. Final Report: 2006 Sleep in America Poll; Teens and Sleep. 2006b. Retrieved Sept 6, 2010 from http://www.sleepfoundation.org/sites/default/files/2006_summary_of_findings.pdf
- National Sleep Foundation. 2009 Sleep in America Poll. 2009. Retrieved September 6, 2009, from <http://www.sleepfoundation.org/article/sleep-america-polls/2009-health-and-safety>
- Nedeltscheva AV, Kessler L, Imperial J, Penev PD. Exposure to recurrent sleep restriction in the setting of high caloric intake and physical inactivity results in increased insulin resistance and reduced glucose tolerance. *J Clin Endocrinol Metab*. 2009
- Owens JA. The practice of pediatric sleep medicine: results of a community survey. *Pediatrics*. 2001; 108(3):E51. [PubMed: 11533369]
- Owens JA. The ADHD and sleep conundrum: a review. *J Dev Behav Pediatr*. 2005; 26(4):312–322. [PubMed: 16100507]
- Owens JA, Spirito A, McGuinn M. The Children's Sleep Habits Questionnaire (CSHQ): psychometric properties of a survey instrument for school-aged children. *Sleep*. 2000; 23(8):1043–1051. [PubMed: 11145319]
- Owens JA, Spirito A, McGuinn M, Nobile C. Sleep habits and sleep disturbance in elementary school-aged children. *J Dev Behav Pediatr*. 2000; 21(1):27–36. [PubMed: 10706346]
- Randazzo AC, Muehlbach MJ, Schweitzer PK, Walsh JK. Cognitive function following acute sleep restriction in children ages 10-14. *Sleep*. 1998; 21(8):861–868. [PubMed: 9871948]
- Reilly JJ, Armstrong J, Dorosty AR, Emmett PM, Ness A, Rogers I, et al. Early life risk factors for obesity in childhood: cohort study. *BMJ*. 2005; 330(7504):1357. [PubMed: 15908441]
- Sadeh A, Gruber R, Raviv A. The effects of sleep restriction and extension on school-age children: what a difference an hour makes. *Child Dev*. 2003; 74(2):444–455. [PubMed: 12705565]
- Sadeh A, Tikotzky L, Scher A. Parenting and infant sleep. *Sleep Med Rev*. 2009; 14(2):89–96. [PubMed: 19631566]
- Seifer, R. Parental Psychopathology and Children's Sleep. In: El-Sheikh, M., editor. *Sleep and Development*. New York: Oxford University Press; 2011. p. 79-98.
- Spilsbury JC, Storfer-Isser A, Drotar D, Rosen CL, Kirchner HL, Redline S. Effects of the home environment on school-aged children's sleep. *Sleep*. 2005; 28(11):1419–1427. [PubMed: 16335483]
- Spilsbury JC, Storfer-Isser A, Drotar D, Rosen CL, Kirchner LH, Benham H, et al. Sleep behavior in an urban US sample of school-aged children. *Arch Pediatr Adolesc Med*. 2004; 158(10):988–994. [PubMed: 15466688]
- Steenari MR, Vuontela V, Paavonen EJ, Carlson S, Fjallberg M, Aronen E. Working memory and sleep in 6- to 13-year-old schoolchildren. *J Am Acad Child Adolesc Psychiatry*. 2003; 42(1):85–92. [PubMed: 12500080]
- Stein MA, Mendelsohn J, Obermeyer WH, Amromin J, Benca R. Sleep and behavior problems in school-aged children. *Pediatrics*. 2001; 107(4):E60. [PubMed: 11335781]
- Stevens RG. Circadian disruption and breast cancer: from melatonin to clock genes. *Epidemiology*. 2005; 16(2):254–258. [PubMed: 15703542]
- Utzinger J, Rinaldi L, Malone JB, Krauth SJ, Kristensen TK, Cringoli G, et al. Geospatial health: the first five years. *Geospat Health*. 2011; 6(1):137–154. [PubMed: 22216480]

- Wiggs L. Behavioural aspects of children's sleep. *Arch Dis Child*. 2009; 94(1):59–62. [PubMed: 18977784]
- Wiggs L, France K. Behavioural treatments for sleep problems in children and adolescents with physical illness, psychological problems or intellectual disabilities. *Sleep Med Rev*. 2000; 4(3): 299–314. [PubMed: 12531171]
- Wiggs L, Stores G. Behavioural treatment for sleep problems in children with severe learning disabilities and challenging daytime behaviour: effect on daytime behaviour. *J Child Psychol Psychiatry*. 1999; 40(4):627–635. [PubMed: 10357168]
- Wiggs L, Stores G. Behavioural treatment for sleep problems in children with severe intellectual disabilities and daytime challenging behaviour: effect on mothers and fathers. *Br J Health Psychol*. 2001; 6(Pt 3):257–269. [PubMed: 14596726]
- Wiggs L, Stores G. Sleep patterns and sleep disorders in children with autistic spectrum disorders: insights using parent report and actigraphy. *Dev Med Child Neurol*. 2004; 46(6):372–380. [PubMed: 15174528]
- Wolfson AR, Carskadon MA. Sleep schedules and daytime functioning in adolescents. *Child Dev*. 1998; 69(4):875–887. [PubMed: 9768476]
- Wolfson AR, Carskadon MA. Understanding adolescents' sleep patterns and school performance: a critical appraisal. *Sleep Med Rev*. 2003; 7(6):491–506. [PubMed: 15018092]
- Yaggi HK, Araujo AB, McKinlay JB. Sleep duration as a risk factor for the development of type 2 diabetes. *Diabetes Care*. 2006; 29(3):657–661. [PubMed: 16505522]