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Social determinants of inadequate sleep in US children and adolescents



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ABSTRACT

Background and objectives: Despite recognised disparities in child health outcomes associated with sleep, the majority of research has been based on small, homogeneous samples. Using a nationally-representative sample of US children and adolescents, we examined trends and social determinants of inadequate sleep across age groups.

Study design: Comparison of cross-sectional studies.

Methods: Our study used the 2003 ($n = 68,418$), 2007 ($n = 63,442$), and 2011/2012 ($n = 65,130$) waves of the National Survey of Children's Health, a nationally-representative survey of 6–17-year-olds. Parents reported whether the child had inadequate sleep (0–6 days of not getting enough sleep vs 7 days).

Results: From 2003 through 2011/12, inadequate sleep increased from 23 to 36% among 6–9-year-olds, 30 to 41% among 10–13-year-olds, and 41 to 49% among 14–17-year-olds. Among 10–17-year-olds, those from households with more than a high school degree were more likely to have inadequate sleep (adjusted ORs 1.2). Although for 10–13-year-olds there was a gradient in inadequate sleep across income (aORs 1.2–1.3), for 14–17-year-olds, only those from the two highest income levels were more likely to have inadequate sleep (aORs 1.3–1.4). Parents' reports that neighbours did not watch out for other's children was associated with an increased risk for inadequate sleep across all ages (aORs 1.1–1.3).

Conclusions: Inadequate sleep occurred as young as age six years and increased with age, became more prevalent, and was socially patterned. In order to prevent inadequate sleep across the life course, surveillance and monitoring are needed across all age groups to identify critical periods for intervention.

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Introduction

With mounting evidence on the detrimental effects of inadequate sleep on physical and mental health outcomes in

children and adolescents,^{1–5} increasing the amount and quality of sleep have become public health priorities in the USA. The Centers for Disease Control and Prevention endorse recommendations by the National Heart, Lung, and Blood Institute that school-aged children get at least 10 h and

Abbreviations: aOR, adjusted odds ratio; CHIP, Children's Health Insurance Program; FPL, federal poverty level; NSCH, National Survey of Children's Health; OR, odds ratio; SES, socio-economic status; YRBS, Youth Risk Behaviour Survey.

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adolescents get 9–10 h of sleep daily.⁶ ‘Sleep Health’ is a new Healthy People 2020 topic with a target to increase the proportion of adolescents who get sufficient sleep, defined as eight or more hours of sleep on an average school night, from 30.9% to 33.2%.⁷ As of 2013, the Youth Risk Behaviour Survey (YRBS), a national school-based survey of US high school students, found that only 32% of students reported getting eight or more hours of sleep during the school week and there was no significant change since 2007 when sleep data were first collected.⁸

Age is the most well-established determinant of sleep duration, with total sleep time decreasing from infancy through adulthood.⁹ However, the Healthy People 2020 target⁷ is for adolescents overall and sleep patterns may vary within the teenage years.¹⁰ While 40% of US students in ninth grade (approximately 14–15 years old) reported eight or more hours of sleep on an average school night, this decreased to 23% of 12th grade students (approximately 17–18 years old).⁸ Furthermore, the sleep target does not include younger children and there are no national data for this age group using the same measurement of sleep.¹¹ Thus, there is little known about the age that sleep issues may begin and whether the prevalence of sleep issues may be changing over time.

Despite recognised disparities in many of the health outcomes associated with sleep, such as obesity,¹² the majority of research on sleep has been based on small sample sizes that are often homogeneous in their sociodemographic composition. Only a few studies have examined the social determinants of sleep in children and adolescents. From 1991 to 2011, Knutson identified five studies that each examined socio-economic and/or racial/ethnic differences in sleep.⁵ Together with other research, the overall patterns suggest that children from more disadvantaged circumstances have lower sleep quality and shorter duration than those from more advantaged backgrounds, while black children have shorter sleep duration and nap more than white children.^{5,13,14} More recently, based on the YRBS data, black high school students were less likely to report getting at least eight h of sleep during the school week (28%) than white (33%) and Hispanic (33%) students.⁸ Representative surveys of 15–19-year-olds in Brazil found that insufficient sleep duration increased between 2001 and 2011 and was associated with higher family income only in the more recent cohort.¹⁵

There is a developing body of research on the role of the neighbourhood context, including the physical and social environments, on children's sleep. Using census data to construct a measure of neighbourhood social fragmentation, Pabayo and colleagues demonstrated that those adolescents living in neighbourhoods with moderate to high social fragmentation were less likely to obtain at least 8.5 h of sleep per night.¹⁶ A study among Mexican American adolescents found that those whose parents reported more neighbourhood crime had fewer hours of nightly sleep and youth in higher crime neighbourhoods napped more.¹⁷ Using nationally-representative US data from 2007, Singh and colleagues reported that parents living in more deprived neighbourhoods were more likely to report their child having insufficient sleep than parents living in more advantaged neighbourhoods.¹⁸

An overarching gap in the literature remains—monitoring sleep and identifying disparities across the life course at the

population-level. Past studies of sleep patterns in children and adolescents have not typically investigated both race and multiple indicators of socio-economic status (SES). This paper helps fill the void by assessing the combined associations among race, SES, and other physical and social factors in sleep patterns among children and adolescents over time. We used data from three waves of a nationally-representative survey of US children aged 6–17 years from 2003 to 2011/2012 to examine trends in inadequate sleep and social determinants of inadequate sleep across children's age groups.

Methods

Data source

Over the past decade there have been three cross-sectional waves (2003, 2007, 2011/2012) of the National Survey of Children's Health (NSCH), a nationally-representative telephone survey of children and adolescents aged 0–17 years and their families.¹⁹ In the first ‘2003 survey’, 102,353 interviews were conducted from January 2003 to July 2004 (55% response rate).²⁰ In the second ‘2007 survey’, 91,642 interviews were conducted from April 2007 to July 2008 (47% response rate).²¹ In the third ‘2011/12 survey’, 95,677 interviews were conducted from February 2011 to June 2012 (54% response rate for landline sample and 41% for cell phone sample).²² For each survey, a parent or guardian (referred to as ‘parent’) was interviewed about one randomly-selected child in the household on his/her physical and mental health, family, and social context.¹⁹ At each contact, at least 70% of the survey respondents were mothers.

Among the 289,672 children and adolescents from all three surveys, the measure of sleep was asked only to parents of 6–17-year-olds. We further excluded surveys with missing information on the sleep question (1797). This resulted in a final sample of 196,990 children and adolescents: 68,418 from 2003; 63,442 from 2007; and 65,130 from 2011/2012.

Outcome measure

At each survey, a parent answered the following question about their child's sleep: *During the past week, on how many nights did [child] get enough sleep for a child his/her age?* Responses were 0–7 days. If the interviewer was prompted, he/she was told to say that ‘enough sleep’ is whatever the parent defines it as for his/her child. We defined inadequate sleep as no (seven days per week) vs yes (0–6 days per week).¹⁸ Our definition implies that the child had at least one day during the past week of inadequate sleep. This study assesses parental perceptions of inadequate sleep, which may not correspond to actual sleep quality or quantity. We have used the phrase ‘sleep inadequacy’ throughout to indicate parent-reported sleep inadequacy.

Covariates

Parents provided information on a range of sociodemographic characteristics on their child and family as well as information on their physical and social environments. They reported

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