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## Sleep in the modern family: protective family routines for child and adolescent sleep

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### Abstract

**Study objectives**—The overall objective of the 2014 National Sleep Foundation Sleep in America Poll “Sleep in the Modern Family” was to obtain a current picture of sleep in families with at least 1 school-aged child.

**Design**—Cross-sectional poll.

**Setting**—Internet-based interview.

**Participants**—Nationally representative Internet panel of US households with a child 6–17 years.

**Measurements and results**—Primary measures included parental perception of the importance of sleep, parental and child sleep quality, child sleep duration and habits, technology in bedroom, and family rules. Parents/guardians (n= 1103; mean age, 42; 54% female) completed the survey. Although the majority of parents endorsed the importance of sleep, 90% of children obtain less sleep than recommended. Significant predictors of age-adjusted sufficient sleep duration

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#### Disclosures

Chang discloses that Buxton is her spouse, and thus, disclosures above apply to her too.

(estimated conservatively as 9 hours for ages 6–11 years and 8 hours for ages 12–17 years) included parent education, regular enforcement of rules about caffeine, and whether children left technology on in their bedroom overnight. Significant predictors of excellent sleep quality included whether a bedtime was always enforced and whether children left technology on overnight.

**Conclusions**—Children generally have better age-appropriate sleep in the presence of household rules and regular sleep-wake routines. Sufficient sleep quantity and adequate sleep quality were protected by well-established rules of sleep hygiene (limited caffeine and regular bedtime). In contrast, sleep deficiency was more likely to be present when parents and children had electronic devices on in the bedroom after bedtime. Public health intervention goals for sleep health might focus on reducing the encroachment of technology and media into time for sleep and supporting well-known sleep hygiene principles.

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## Introduction

An important consequence of our modern-day, 24/7 society is that it is difficult for families—children and caregivers both—to get adequate sleep. Sleep in the family context frames sleep as involving reciprocal interactions between all members of a household and interactions with the environment of the home as well as exogenous factors affecting any member.<sup>1,2</sup> Several potential reasons include the use of technology in the bedroom,<sup>3–5</sup> complicated and busy daily schedules with competing work, school, social, and recreational activities, as well as neighborhood noise from vehicular traffic, commercial, or industrial activity and neighbors.<sup>6,7</sup> A variety of demographic factors are predictors of adolescent sleep, including ethnoracial group and socioeconomic status,<sup>8</sup> nativity/acclimation,<sup>9</sup> family structure,<sup>10</sup> and perceived social status.<sup>11</sup> In the family dynamic, a consistent bedtime routine improves sleep,<sup>3</sup> whereas television use in the bedroom generally curtails sleep.<sup>5</sup>

Good quality and sufficient sleep are vital for children. Just like a healthy diet and exercise, sleep is critical for children to stay healthy, grow, learn, do well in school, and function at their best.<sup>2</sup> Some of the primary consequences of poor sleep among children and adolescents are behavioral problems, impaired learning and school performance, sports injuries,<sup>12</sup> mood and emotional regulation,<sup>13,14</sup> and worse health including obesity.<sup>15–17</sup> Evidence also indicates that in adolescence lack of sleep may be related to high-risk behaviors such as substance use, suicidal behaviors, and drowsy driving.<sup>18</sup> In addition, recent studies have found that greater media use was associated with a higher body mass index, and this association was partly due to reduced sleep time in UK<sup>19</sup> and Canadian adolescents.<sup>20</sup>

The overall objective of the 2014 National Sleep Foundation Poll “Sleep in the Modern Family” was to obtain a contemporary picture of sleep in families with at least 1 school-aged child. We were interested in parental perception of the importance of sleep duration and sleep quality, habits and routines of the families and children, and obstacles preventing adequate sleep. A strategic priority of Healthy People 2020<sup>21</sup> is to increase the proportion of people obtaining sufficient sleep duration. To do so, a recent task force identified objectives including “Support basic and translational research to identify causal and interacting relationships and mechanisms underlying the impact of sleep deficiency on health

throughout the lifespan; and establish normative age- and gender-specific data for sleep duration, sleep quality and circadian timing using both self-reported and objective sleep and circadian phenotyping in studies that include analysis of diverse ethnic and socioeconomic groups.”<sup>22</sup>

The specific objectives of this poll were thus to examine the following topics:

1. Parents' perception of the importance of sleep for their own and their children's health and well-being.
2. The sleep quality of both parents and children.
3. The methods and practices parents and their children use to help them sleep.
4. The sleep habits of children on school days and nonschool days.
5. The presence and impact of various types of electronic devices in parents' and children's bedrooms and the frequency with which they are left on at night.
6. The factors that make it more difficult for both the parent and the child to sleep.
7. How regularly scheduled bed times, wake times, and meal times occur day-to-day for both parents and children.
8. The prevalence and enforcement of rules around sleep and their relationship with child's sleep.

## Methods

### Overview

The 2014 Sleep in America Poll was sponsored and funded by the National Sleep Foundation ([www.sleepfoundation.org](http://www.sleepfoundation.org)), which does not solicit or accept corporate support for its annual Sleep in America Poll; its polls are developed by an independent task force of sleep scientists who provide guidance and expertise in developing the poll questionnaire as well as providing the analysis of the data. The current poll questions were developed by a Task Force convened by the National Sleep Foundation (Buxton, Ensellem, Montgomery-Downs, LeBourgeois, Spilsbury) and the National Sleep Foundation Poll Scholar (Kristen Knutson), as well as a poll mentor (D. Sunshine Hillygus, PhD, Duke University).

### Survey procedures

The National Sleep Foundation commissioned Mokrzycki Survey Research Services (West Newbury, MA) to conduct a national survey of caregivers with a child aged 6–17 years living in their household to ask about sleep practices and beliefs. Field work was conducted between December 12 and 23, 2013, by GfK Group (Knowledge Networks, New York, NY). The sample was drawn randomly from GfK's probability-based online KnowledgePanel, which is designed to be representative of the US population.<sup>23,24</sup> This panel was recruited randomly using address-based sampling, which is based on the US Postal Service's Delivery Sequence File and is estimated to be representative of 97% of US households. For this survey, 4027 panel members were randomly drawn from GfK's KnowledgePanel. Of these, 1441 (excluding breakoffs or incomplete attempts) responded to

the invitation, while 1109 qualified for the survey, yielding a final stage completion rate of 35.8% and a qualification rate of 77.0%.

The survey instrument (Table 1) was administered via the Internet. GfK provided a laptop and Internet connection at no cost to panel recruits if they did not have access already. The survey median completion time was 11 minutes. Both English and Spanish versions were available to the respondents.

## Participants

The objective of this poll was to survey parents or guardians with at least 1 child aged 6–17 years living in the household. The survey confirmed this information with the following questions: (1) First, would you please confirm that there is at least 1 child age 6–17 living in your household? (2) Would you say you have parental responsibility for [this child]? Relationship to the child was also queried with the question, “Which of these best describes your relationship to [this child]” with the response options: parent (biological or adoptive), stepparent or legal guardian, partner of child’s parent, sibling, or other (specified). Note that a response of “sibling” terminated the survey as siblings were not eligible. Finally, if the respondent had >1 child aged 6–17 years, the computer randomly chose one to be the subject of questions in this survey.

The final sample included 1103 parents. Sampling error for estimates from full sample was  $\pm 4.0$  percentage points, including adjustment for sample design effect. Survey results were weighted in 2 stages. First, before the study sample was drawn, the overall panel was adjusted to demographic distributions from the most recent Current Population Survey.<sup>24</sup> Weighting variables included gender, age, race/ethnicity, education, household income, geographic region, metropolitan area status, and Internet access. Second, after the study sample was finalized, a set of study-specific poststratification weights were constructed so that the study data could be adjusted for the study’s sample design and for survey nonresponse. The following benchmark distributions are used for the poststratification adjustment: gender (male/female); age (18–29, 30–44, 45–59, and 60+ years); race/Hispanic ethnicity (white/non-Hispanic, black/non-Hispanic, other/non-Hispanic, 2+races/non-Hispanic, Hispanic); education (less than high school, high school, some college, bachelor, and beyond); Census region (Northeast, Midwest, South, and West); household income (under \$25 K, \$25 K to <\$50 k, \$50 K to <\$75 k, \$75 K and above); metropolitan area (yes, no); Internet access (yes, no); primary language (non-Hispanic, Hispanic English proficient, Hispanic bilingual, Hispanic Spanish proficient).

## Measures

Demographic variables collected within this panel included the age, sex, race/ethnicity, educational level, and marital status of the parental respondent, as well as the household size, household income; whether the household had access to Internet; whether the respondent rents or owns their home; and the housing type, including the structure type, for example, 1-family house detached from any other house, 1-family house attached to 1 houses, a building with 2 apartments, a mobile home, boat, recreational vehicle, or van as

home. Information on whether the respondent lives in a metro or nonmetro area and the region of the country is also available.

The questions and associated response options on the full survey are presented in Table 1. Variables presented in these analyses are described in greater detail below.

### **Importance of sleep**

Parents were asked to rate the importance of sleep for their own and their children's health and well-being using the following responses: extremely important, very important, somewhat important, or not that important.

### **Parent-reported child sleep duration and sleep quality**

Parents reported what time their child typically goes to bed and wakes up on school nights and nonschool nights (rounded to the nearest hour). Time in bed (hours) is estimated by calculating the interval between bedtime and wake time. The parents were also asked to report the number of hours their children slept on school days and nonschool days separately (see Table 1). A weekly average sleep duration was calculated from these responses using the following formula:  $[(5 * \text{school day duration}) + (2 * \text{nonschool day duration})]/7$ . We also created a dichotomous variable identifying sufficient sleep duration, defined as age-appropriate minimum weekly mean sleep duration, conservatively estimated as 9 hours/night for children aged 6–11 years and 8 hours/night for children aged 12–17 years. Selecting appropriate cutoffs is challenging; there is no consensus among sleep experts about optimal sleep duration for children and adolescents. However, a recent systematic review of sleep recommendations for children indicated that the most recent recommended amount of sleep was 10.5 hours for 6–11 year olds and at least 8.88 hours for 12–17 year olds.<sup>25</sup> General recommendations from the National Heart, Lung and Blood Institute promulgated by the Centers for Disease Control and Prevention notes that “sleep needs vary from person to person” and recommends that school-aged children obtain “at least 10 hours a day” and teens “9–10 hours a day.”<sup>26</sup> Thus, our cutoffs are conservative minimum amounts that are less than current recommendations. Parents were also asked to estimate how much sleep their child needed to be at their best during the day. Parents also rated their children's sleep quality as “excellent,” “good,” “fair,” and “poor.” Given the high number of “excellent” responses, for the regression models, we dichotomized sleep quality as “excellent” or “less than excellent.” Finally, parents were also asked how often, to the best of their knowledge, their child fell asleep in school.

### **Technology**

Parents were asked to report whether specific electronic devices were in their bedroom and their child's bedroom. These included a television, computer (laptop or desktop), tablet (eg, iPad) or smartphone (eg, iPhone or Android), cell phone (not a smartphone) or landline telephone, video game, and MP3 or other music player and/or radio. If present in the parent's bedroom, parents were then asked whether they always turn the electronic device off before going to sleep or if they leave it on at least sometimes while sleeping. Similarly, if present in the child's bedroom, the parents were asked if, to their knowledge, their child always turns off each of the devices present in the bedroom before going to sleep or if he/she leaves it on

at least sometimes while sleeping. For both parents and children, we created a dichotomous variable indicating that 1 electronic device is left on (vs no electronic device left on or in bedroom).

## Rules

Parents were asked about the presence and enforcement of rules that could impact sleep (Table 1). We created dichotomous variables for each rule separating “always enforced” vs “less than always enforced or no rule in place.”

## Regular meal schedules

Parents were asked how regular certain activities were in the past week. Specifically, they were asked how regular their own evening meal time, their own bedtime, and their own wake time as well as how regular their child's breakfast, evening meal time, bedtime and wake times were. The response options were “about the same time every day,” “about the same time on school days but different on nonschool days,” and “varied from school day to school day.”

## Statistical analysis

Means, proportions, and associated 95% confidence intervals were calculated to describe the sample and responses to the survey items. Comparisons between groups were made using either  $\chi^2$  tests (2 categorical variables) or independent  $t$  tests (continuous vs categorical variables). Hierarchical logistic regression models were estimated to predict 2 outcomes: (1) short sleep duration and (2) excellent sleep quality. The independent variables were tested by the following models for both outcomes: model 1, demographics (child age, child sex, parental race, and parental education); model 2, technology left on in parent's bedroom; model 3, enforced sleep-healthy rules (bedtime and caffeine use); and model 4, technology left on in child's bedroom. All analyses were weighted using sample weights and were performed in Stata version 13 using survey commands.

## Results

### Sample description

Eighty-seven percent of the sample respondents were biological or adoptive parents, 6.9% were step-parents or legal guardians, 0.7% were the partner of the child's parent, and 5.2% indicated “other.” The majority (72%) of respondents in the “other” category were grandparents. In the remainder of this manuscript, we will refer to all respondents as “parents.”

A description of sample demographics is presented in Table 2. The average age of the sample was 42 years, and a little more than half (54%) were women.

### Importance of sleep

Most parents (>90%) reported that sleep was either “very important” or “extremely important” for their own mood, health, and performance as well as their child's mood, health, performance and behavior.

## Child's sleep habits

**Amount of sleep**—For the full sample, parents reported children age 6–17 years typically spent 9.3 hours in bed on school days and 10.2 hours on nonschool days. Parents also estimated how much sleep their child obtained at night. Approximately 45% of all children obtained 9 hours of sleep per night on school nights, and 69% of all children slept 9 hours on nonschool nights. Shorter sleep duration was more common among older children: more than half (56%) of 15- to 17-year-olds slept 7 hours per night, and only 10% slept 9 hours. Among 6- to 11-year-olds, 8% slept 7 hours per night, and 23% slept only 8 hours per night (see Fig. 1).

Parents were asked to estimate how much sleep their child needed to be at their best during the day. Parents thought their children needed more sleep than they actually obtained across a week. On average, parents said the child needed a minimum of 8.7 hours of sleep to be at his or her best during the day. Estimated sleep need declined with age such that younger children had a higher estimated sleep need than older children (Table 2).

When comparing how much sleep the parents thought their children obtained on school nights to how much sleep the parents felt their children needed, 44% of parents estimated that their child slept at least 1 hour less on school nights than s/he needed.

**Sleep quality**—Parents were asked to rate the quality of sleep for both themselves and their children. Parents rated their child's sleep quality significantly better than their own ( $P < .001$ ). For example, only 13% of parents described their sleep quality as “excellent,” but 43% of children's sleep quality was described as “excellent.”

In general, the majority of parents felt their child's sleep quality was “excellent” (43%) or “good” (47%). Older children had significantly lower sleep quality than younger children (Table 2). Furthermore, children with lower sleep quality were also more likely to get less sleep ( $P < .001$ ): among children who were reported to sleep <7 hours per night on average across the week, 33% of them had “fair” or “poor” quality sleep, whereas among children who slept 10 hours, only 1% had “fair” or “poor” quality sleep.

For all children, 84% of parents reported that their child never fell asleep in school, and the remainder responded rarely (12%) and sometimes (3%) and only 4 parents responded often (<1%). These proportions differed significantly by age group ( $P < .001$ ) where older kids were more likely to fall asleep in school: 7% of 6- to 11-year-olds ever (rarely, sometimes, or often) fell asleep in school, 18% of 12- to 14-year-olds ever fell asleep in school, and 33% of 15- to 17-year-olds ever fell asleep in school.

**Sleeping arrangements**—Parents were asked about the child's sleep arrangements. For all children, 8% share a bed with someone else, 26% sleep alone in a bed but share a bedroom with someone else, and 66% have their own room. Shared bedrooms are more likely among younger children ( $P = .0001$ ). For example, among children aged 6–11 years, only 55% had their own room, whereas 75% of 12- to 14-year-olds and 80% of 15- to 17-year-olds did. Inside, noise was more commonly reported to be a problem for the child's sleep when the child shared a bedroom: 41% of children sharing a bed, and 18% of children

sharing a room (but not a bed) had difficulty sleeping due to inside noise as compared to 10% of children sleeping in their own room ( $P < .001$ ).

**Frequency of technology devices in the bedroom**—Technology in the bedroom is pervasive in both the parents' bedrooms as well as their children's bedrooms: 89% of adults and 75% of children have at least 1 technologic device in their bedrooms. A television was the most common with >60% of parents and 45% of all children having a television in their bedrooms. Furthermore, having multiple technologic devices in the bedroom was highly prevalent: 69% of parents and 51% of children had 2 devices in their bedroom at night.

The presence of technology in the bedroom was significantly associated with the child's age ( $P < .001$ ): older children had more technologic devices. For example, 96% of older teens (ages 15–17 years) had at least 1 device in their bedrooms, whereas only 63% of children aged 6–11 years and 79% of children aged 12–14 years had at least 1 device in their bedrooms. The median number of devices also varied with age: ages 6–11 years, 1 device; ages 12–14 years, 2 devices; ages 15–17 years, 3 devices.

**Impact of technology on child sleep**—We explored whether the presence of these technology in the bedroom was related to sleep. Children with a television in their bedroom slept an average of 8.0 hours on school days compared to 8.3 hours for children without a television in their bedroom, a significant difference even after adjusting for child's age ( $P = .03$ ). Furthermore, occasionally leaving the television on was associated with >30 minutes less sleep on average after adjusting for age ( $P = .001$ ). Neither the presence of the other electronic devices nor leaving them on was associated with sleep duration after adjusting for age.

Sleep quality was also associated with electronic devices in the bedroom and left on at night. In unadjusted analyses, poor or fair sleep quality was significantly more common in children with a television ( $P = .03$ ), computer/laptop ( $P = .002$ ), cell phone/landline ( $P = .02$ ), videogame ( $P = .046$ ), and MP3/music player ( $P = .02$ ) in their bedroom. Also in unadjusted analyses, poor or fair sleep quality was also more common among children who sometimes left the television ( $P = .001$ ), tablet/smartphone ( $P = .0001$ ), and music player ( $P = .002$ ) on at night. After adjusting for age, sleep quality was significantly more likely to be only fair or poor as compared to good or excellent for children who sometimes left the television on at night (odds ratio [OR], 0.40;  $P = .002$ ) and who sometimes left a tablet or smartphone on at night (OR, 0.46;  $P = .04$ ).

**Emailing/texting after going to sleep**—One (26%) in 4 parents said that they sent or read text messages, emails, or other electronic communications after they had initially gone to sleep at least once in the week before the survey. Three percent of parents said they sent or read electronic communications after they initially fell asleep most or all nights in the preceding week and 10% reported this behavior on 2 or 3 nights. Women ( $P = .04$ ) and parents who are younger ( $P = .004$ ), nonwhite ( $P < .0001$ ), or lower income ( $P = .01$ ) were more likely to do this. Sixteen percent of parents indicated that their child read or sent electronic communications after initially going to sleep. Electronic communications after bedtime increased with age from 3% of children 11 years, to 14% of children aged 12–14



years, to 44% of teens 15–17 years. Finally, more than half of the children (53%) who reportedly sent or read emails or texts after going to sleep had a parent who reported doing this as well.

**Busy schedules and sleep difficulties**—Parents reported whether certain factors made it more difficult for them to sleep and for their child to get a good night's sleep in the past week (Table 3). For both parents and children, scheduled evening activities were the most common challenge to getting a good night's sleep: 41% of parents and 34% of children experienced difficulty getting a good night's sleep on at least 1 night during the past week due to evening activities. For children, 28% experienced difficulty getting a good night's sleep at least once in the past week due to homework.

**Regularity of schedules**—More than half of the parents had a regular (about the same time every day) evening mealtime (56%), regular bedtime (52%), and regular wake time (53%) in the past week. Children also had fairly regular schedules. The proportion that had breakfast about the same time every day was 59%, whose evening meal about the same time every day was 58%, whose bedtime about the same time every day was 47%, and whose wake time about the same time every day was 48%. On the other hand, the proportion whose time varied from day to day was only 4% for breakfast time, 14% for evening meal time, 7% for bedtime, and 4% for wake time. After adjusting for child age, there were no significant associations between sleep duration and regular breakfast times, evening meal times, bedtimes, or wake times. However, excellent sleep quality was significantly associated with a regular (about the same time every day) evening meal time (OR, 1.48;  $P = .02$ ), bed time (OR, 1.34;  $P = .09$ ), and wake time (OR, 1.48;  $P = .02$ ) after adjusting for child age.

**Sleep-related rules and routines**—Most parents reported having sleep-related rules. The proportion of parents reporting no formal rules was 17% for bedtimes, 19% for watching television, 23% for caffeine use, 24% for smart/cell phone use, 20% for computer/tablet use, and 19% for videogame use. Parents of older children report enforcing fewer sleep-related rules. Only 35% of parents of 15- to 17-year-olds have all 6 rules, whereas 70% of parents of 6- to 11-year-olds do. In unadjusted analyses, children of parents who enforced a bedtime rule slept an average of 1.0 hours longer on school days than children without such a rule. Children of parents who enforced a rule restricting caffeine consumption later in the day slept 0.7 hours more than children without this restriction. Finally, children of parents who had rules about how late the child could watch television also slept approximately 0.6 hours more than children whose parents did not have these rules.

If the parents always enforced the rules about caffeine consumption (as opposed to only sometimes or not having the rule at all), the children slept close to an hour more (0.8 hours) than the children of parents who only sometimes enforced the rule or had no rule at all (see Fig. 2). Similarly, children whose parents always enforced rules about how late the child can use a smartphone or cell phone slept approximately 0.9 hours more.

When adjusting for the child's age, having rules about bedtime (+0.4 hours;  $P = .045$ ), always enforcing rules about television (+0.21 hours;  $P = .05$ ), always enforcing rules about

caffeine use (+0.36 hours;  $P < .001$ ), always enforcing rules about cell/smart phone use (+0.32 hours;  $P = .002$ ), and always enforcing rules about computer/tablet use (+0.26 hours;  $P = .01$ ) were all associated with longer sleep durations on school days.

**Parents as role models**—Parents with technology in the bedroom were more likely to have children with technology in their bedroom. Nearly two-thirds (65%) of children whose parents had 1 “interactive” technologic devices (tablet or smartphone, laptop or desktop computer, and/or video game) in their bedroom also had at least 1 device in their bedroom. Only 25% of children had a device in their bedroom if their parent did not. Parents who left devices on also had children who left devices on. For example, 73% parents who sometimes left on 2 devices has a child who sometimes left on at least 1 device, and 35% of these parents has a child who also left on 2 devices.

**Multivariate analysis**—Using hierarchical regression models, we tested which factors were associated with “sufficient sleep duration” and “excellent sleep quality.” Results are presented in Table 4. Presence of sufficient sleep duration was significantly associated with the parental respondent being married, always enforcing rules about how late the child can consume caffeine, and never leaving any technology on in the bedroom. Excellent sleep quality was significantly associated with always enforcing a bedtime for the child and with never leaving any technology on in the bedroom.

## Discussion

In this 2014 poll on Sleep in the Family, the majority of parents endorsed the importance of sleep for health and well-being. Parents placed great value in the importance of sleep both for their own health and well-being and for their child's health and well-being. Despite this, most children in this sample (nearly 90%) obtained less sleep than currently recommended<sup>25,26</sup> and less than what has been observed across many countries and developmental groups.<sup>27</sup> Parent-reported child sleep duration varied with age, with younger children (6–11 years of age) sleeping longer than adolescents (12–17 years of age) (Fig. 1). Parents and their children in this sample of US households generally reported better age-appropriate levels of sleep in the presence of household rules and routines regarding sleep. Sufficient sleep quantity and adequate sleep quality were protected by well-established rules of sleep hygiene, such as limiting caffeine intake and maintaining a regular bedtime. In contrast, sleep deficiency was more likely to be present when parents and children did not adhere to sleep hygiene standards, such as leaving engaging electronic and media devices on in the bedroom. Public health intervention goals for increasing sleep health should focus on reducing the encroachment of technology and media into time for sleep within the context of supporting well-known sleep hygiene principles.

It is not just a matter of obtaining sufficient sleep quantity—children and adolescents, like adults, also need adequate sleep quality.<sup>28</sup> Young, sleep-deprived children may appear hyperactive, rather than sleepy, confounding the recognition of insufficient sleep as an underlying problem. Symptoms of snoring or inappropriate sleepiness should be assessed from a medical perspective. A major developmental change occurs during adolescence with a shift in the master body clock to a later timing for sleep.<sup>29</sup> Factors, such as school work,

social pressure, and access to technology, may further aggravate the timing of sleep for teens. As with parents, balancing these factors is difficult. To help meet these challenges, families can work together to make sleep a priority, so that everyone has the opportunity to sleep as much as they need in a safe, quiet, comfortable environment. Perhaps not surprisingly, a recent study showed that reducing screen time, increasing sleep, and eating dinner together helped kids maintain a healthy weight.<sup>30</sup> Sleep is in large part under our control, and reducing pressures on our limited time can help prioritize time for sleep and improve health and wellness.

### Technology, light, and sleep

In 2011, the National Sleep Foundation's "Sleep in America Poll" included specific questions regarding use of electronic devices. Of the 1508 individuals (aged 13–64 years) surveyed, >60% experienced a sleep problem every, or almost every, night; 43% never/rarely obtained a good night sleep during weeknights; 95% used some type of technology (television, computer, video game, or cell phone) at least a few nights per week within 1 hour of bedtime.<sup>31</sup> In the current study, leaving the television on at least occasionally was associated with >30 minutes less sleep per night after adjusting for age. In contrast, neither the presence of other technologic devices nor leaving them on was associated with sleep duration. Thus, even in the era of the smartphone, by parental self-reports, television still exerts considerable effects on child and adolescent sleep health.

Regarding sleep quality in the current study, electronic/media devices left on in children's bedrooms overnight significantly reduced children's sleep quality (Fig. 2). The negative impact of electronic media use on sleep in children<sup>20,32–42</sup> and adults<sup>43–49</sup> has been previously demonstrated. Our understanding of this relationship is just emerging with increasing information about the negative impact of blue-light emitting devices such as computers, smartphones, and e-readers on sleep. The use of light-emitting devices immediately before bedtime is of particular concern for several reasons. First, light, especially short-wavelength, blue-enriched light common on LED screens, is a potent cue to entrain and reset the human circadian clock.<sup>50</sup> Exposure to such light in the evening and early part of the night, even at low intensity, suppresses the sleep-facilitating hormone melatonin<sup>45,49,51</sup> and can shift the timing of the circadian clock to a later phase making it more difficult to initiate sleep and prolonging sleep latency.<sup>51</sup> The circadian timing system synchronizes numerous physiological and biochemical processes, including the daily rhythm of sleep propensity,<sup>52</sup> to external environmental time cues. For optimal sleep duration and quality, the timing of the sleep episode should be appropriately aligned with the 24-hour biological clock. Evening and early night exposure to light thus makes it less likely that subsequent night bedtimes will be early enough to obtain sufficient sleep. Second, bright light also has a direct alerting effect,<sup>51,53</sup> delaying the onset of sleepiness and bedtime. Current electronic devices emit sufficient light to miscue the brain and promote wakefulness.<sup>2</sup> Third, the content (entertainment, interpersonal interaction, or video game) with which the person interacts may itself be alerting and engaging, further delaying sleepiness and sleep onset.

The increasing prevalence of technology in children's bedrooms creates a culture of evening engagement and light exposure that negatively impacts sleep time, sleep quality, and daytime alertness. Children using electronic media as a sleep aid to relax at night have been shown to have later weekday bedtimes, experience fewer hours of sleep per week, and report more daytime sleepiness.<sup>18</sup> Adolescents with a bedroom television have later bedtimes, more difficulty initiating sleep, and shorter total sleep times.<sup>19</sup> Texting and emailing after lights out, even once per week, dramatically increase self-reported daytime sleepiness among teens.<sup>28</sup> Not all electronic usage is recreational as the burden of homework is great for many of our children and their work is often completed on the computer, a significant light source late in the evening. Increased academic demands, busy social and extracurricular schedules, and the lure of entertainment conspire to keep our children electronically engaged at night. As a result, many children are not fulfilling basic sleep requirements, and adequate sleep is essential for growth, learning, mood, creativity, and weight control. Understanding the influence of light and evening media engagement on sleep is the first step in helping parents address the dilemma of technology in the bedroom and ultimately address family rules and routines around sleep hygiene that will support child sleep and thriving.

The deleterious effects of technology in the bedroom and the beneficial effects of rules limiting caffeine and bedtime routines for child sleep quality as well as the beneficial effects of rules limiting caffeine for children's sufficient sleep duration were significant while simultaneously controlling for parent socioeconomic status. In addition, both of these factors, parent education (completing college) and marital status (married), were independently significantly associated with children obtaining sufficient sleep duration (Table 4). Socioeconomic status and environments of advantage generally are associated with better sleep outcomes across the life course.<sup>8</sup> A recent study showed that, in a sample of mostly married mothers, their positive mood after work was positively associated with the longer sleep duration in their children.<sup>54</sup> Parenting styles and support can buffer adolescents from the many pressures that can limit adolescent sleep,<sup>55</sup> and parenting rules have been associated with longer time in bed in preadolescent children.<sup>56</sup>

## Limitations

To avoid making too facile an elision between cross-sectional association and causation, we emphasize that causal relationships or direction cannot be determined from this cross-sectional analysis. Perhaps children with insufficient sleep duration or inadequate sleep quality are filling the available time in bed with technology use when they cannot sleep, for example. Future studies might include longitudinal assessments of family factors and child sleep, and more direct measurement of sleep and behaviors, environments, schedules, rules, routines, and technology use that are associated with insufficient sleep duration or inadequate sleep quality. Every effort was made to weight the sample to be representative of US households with at least 1 child 6–17 years old. In striving for a representative sample with a high response rate to maintain generalizability, the poll was relatively brief and thus omits important covariates such as presence of a sleep disorder, density of individuals in household or bedrooms, and household and neighborhood environmental factors. In addition, the parent provided information on the child's sleep, caffeine use, and other

behaviors, not the child himself or herself. Parental reports of sleep and sleep problems are reported to be optimistic relative to direct reports,<sup>57</sup> so the parental reports of their child's sleep in the current analysis may be an overestimate of sleep duration or sleep quality or mutual confounding between these 2 may be present, in part from common reporter bias. Nonetheless, controlling for sleep duration did not alter the findings of the sleep quality analyses. Constructs were adequate for polling, but psychometric validation of the instrument was not available. Sleep data were collected for a 7-day period in December and may not represent sleep behavior in different seasons or times of the year when there are different proportions of school and nonschool days. Finally, sleep was not more directly measured than by self-report, such as by use of actigraphy or an extended period of daily diaries.

### Future directions

Future studies to guide family-level interventions to improve adolescent and child sleep are needed to identify modifiable factors and the means to overcome these barriers to sleep health. In this regard, focus group approaches may serve as a key next step to investigate how families manage (or not) the introduction of pervasive technology and use of technologies in the bedroom. Selecting appropriate recommendations for minimum or optimal sleep duration is challenging. Indeed, many in the field are currently reassessing sleep recommendations for children and adults, with a sense that there should be reasonable minimum recommendations and that these recommendations should be evidence based.

### Conclusion: parents as role models for sleep

In our sample, presence and children's use of bedroom technology—including emailing or texting after initially falling asleep—was linked to presence and parents' use of technology in parents' bedroom. The importance of parents as role models for children has been documented across a range of health domains, including physical exercise,<sup>58</sup> smoking,<sup>59</sup> healthy eating,<sup>60</sup> and bicycle helmet use.<sup>61</sup> Our findings suggest that parents might play a similar role in the domain of sleep. Efforts to improve children's sleep quality and quantity may thus benefit from an approach that addresses the entire family. Seeing parents engage in healthy sleep behavior may provide a powerful message to children about the importance of sleep.

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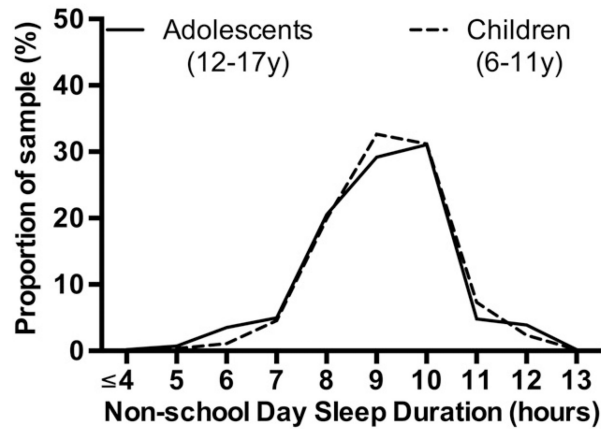
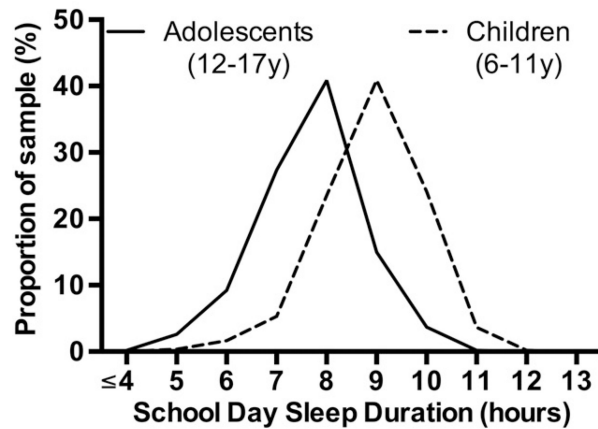
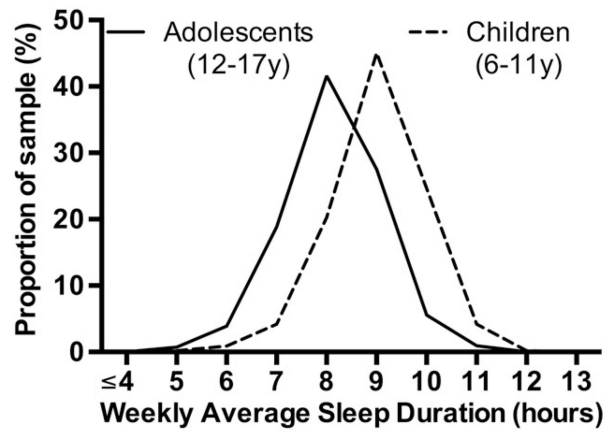
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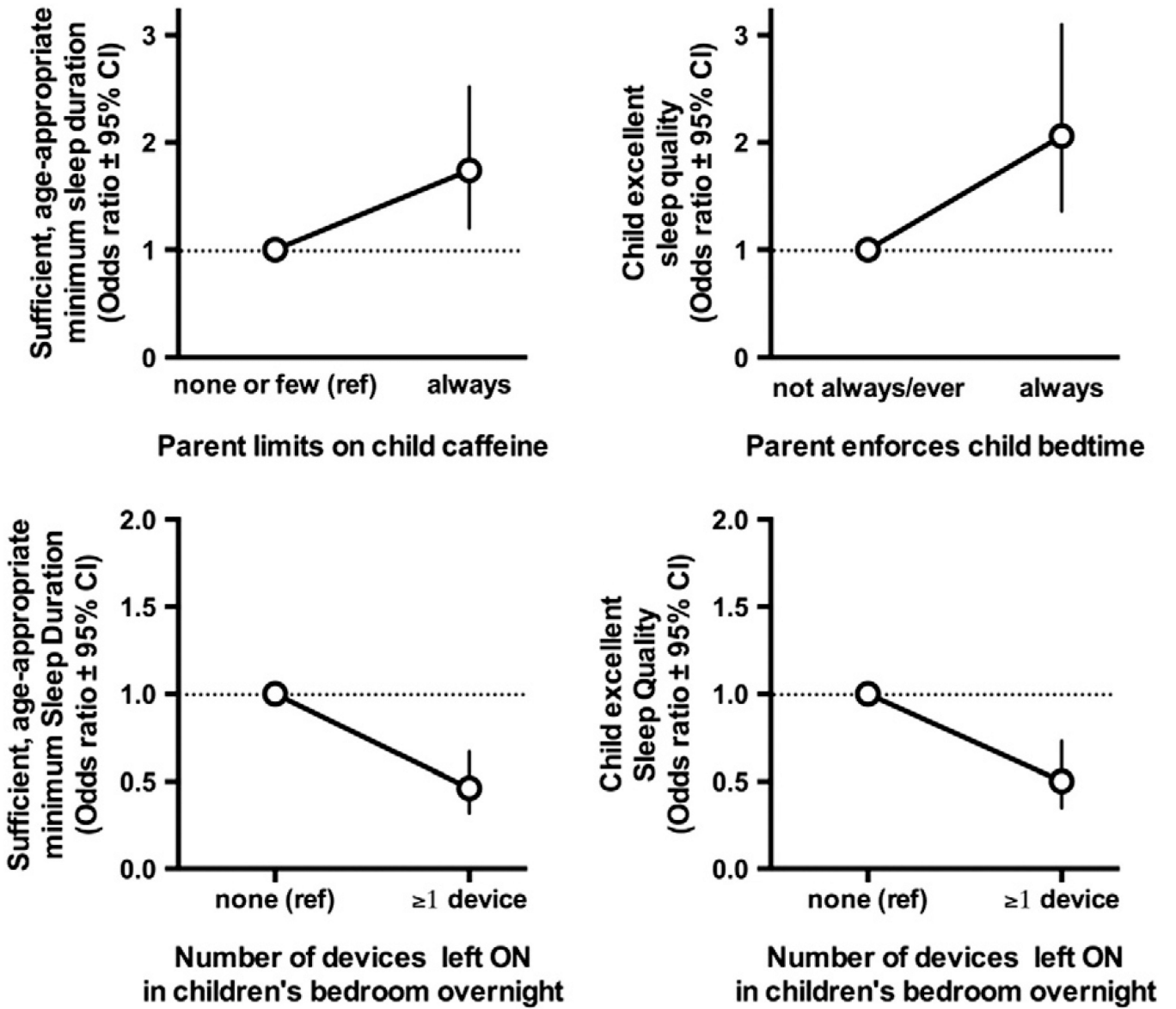
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**Fig. 1.** Parent-reported sleep of US children (6–11 years of age) and adolescents (12–17 years of age) across the entire week, on school days, and on non-school days.



**Fig. 2.** Associations of family and parenting characteristics with children's (6–17 years of age) sufficient sleep duration and sleep quality. Parent's always enforcing limits on child caffeine is protective for child sleep duration, whereas parents always enforcing a bedtime was protective for child sleep quality. In contrast, children having 1 technology devices left on in their bedroom overnight was significantly associated with reduced sleep duration and sleep quality.

Table 1

## Survey instrument.

Category	Question	Response categories	
Parent's sleep	Generally speaking, how would you rate the quality of the sleep you usually get?	Excellent – 1, Good – 2 Fair – 3, Poor – 4	
Child sleep	Generally speaking, how would you rate the quality of the sleep your child usually gets?	Excellent – 1, Good – 2 Fair – 3, Poor – 4	
Child's sleep habits	About how many hours of sleep do you think your child needs at a minimum, to be at their best the next day?	(Please round to the nearest hour)	
	Please tell us approximately what time (to the closest hour) your child typically goes to bed and wakes up on school days?	To bed: _____ am/pm Awake: _____ am/pm	
	Please tell us approximately what time (to the closest hour) your child typically goes to bed and wakes up on non-school days?	To bed: _____ am/pm Awake: _____ am/pm	
	Considering that someone may or may not fall asleep as soon as they go to bed and may wake up during the night, about how many hours of actual sleep would you estimate your child gets on school days?	_____ hours	
	Considering that someone may or may not fall asleep as soon as they go to bed and may wake up during the night, about how many hours of actual sleep would you estimate your child gets on nonschool days?	_____ hours	
	Which best describes your child's sleeping arrangements?	My child shares a bed with someone else – 1 My child sleeps alone in bed, but shares a room with someone else – 2 My child sleeps alone in their own bedroom – 3	
	To the best of your knowledge, how often does your child wake up during a typical night?	Never – 1, Once – 2, Twice – 3, Three times or more – 4	
	To the best of your knowledge, how often does your child fall asleep in school?	Never – 1, Rarely – 2, Sometimes – 3, Often – 4	
	Technology and sleep	Is there usually a television in your room at night?	Yes – 1, No – 2
		Is there usually a computer (laptop or desktop) in your room at night?	Yes – 1, No – 2
Is there usually a tablet (eg, iPad) or smartphone (eg, iPhone/Android) in your room at night?		Yes – 1, No – 2	
Is there usually a cell phone (not a smartphone) or landline phone in your room at night?		Yes – 1, No – 2	
Is there usually a videogame in your room at night?		Yes – 1, No – 2	
Is there usually a MP3 or other music player and/or radio your room at night?		Yes – 1, No – 2	
Please tell us whether you always turn off your television before going to sleep or if you leave it on at least sometimes while sleeping:		Always turn this off before sleeping – 1 Leave it on at least sometimes while sleeping – 2	
Please tell us whether you always turn off your computer (laptop/desktop) before going to sleep or if you leave it on at least sometimes while sleeping:		Always turn this off before sleeping – 1 Leave it on at least sometimes while sleeping – 2	
Please tell us whether you always turn off your tablet (eg: iPad) or smartphone (eg: iPhone or Android) before going to sleep or if you leave it on at least sometimes while sleeping:		Always turn this off before sleeping – 1 Leave it on at least sometimes while sleeping – 2	
Please tell us whether you always turn off your cell phone (not a smartphone) or landline telephone before going to sleep or if you leave it on at least sometimes while sleeping:		Always turn this off before sleeping – 1 Leave it on at least sometimes while sleeping – 2	
Please tell us whether you always turn off your videogame before going to sleep or if you leave it on at least sometimes while sleeping:	Always turn this off before sleeping – 1 Leave it on at least sometimes while sleeping – 2		

Category	Question	Response categories
	Please tell us whether you always turn off your MP3 or other music player and/or radio before going to sleep or if you leave it on at least sometimes while sleeping:	Always turn this off before sleeping – 1 Leave it on at least sometimes while sleeping – 2
	Is there usually a television in your child's room at night?	Yes – 1, No – 2
	Is there usually a computer (laptop or desktop) in your room at night?	Yes – 1, No – 2
	Is there usually a tablet (eg: iPad) or smartphone (eg: iPhone/Android) in your child's room at night?	Yes – 1, No – 2
	Is there usually a cell phone (not a smartphone) or landline phone in your child's room at night?	Yes – 1, No – 2
	Is there usually a videogame in your child's room at night?	Yes – 1, No – 2
	Is there usually a MP3 or other music player and/or radio your child's room at night?	Yes – 1, No – 2
	Please tell us whether your child always turn off your television before going to sleep or if you leave it on at least sometimes while sleeping:	Always turn this off before sleeping – 1 Leave it on at least sometimes while sleeping – 2
	Please tell us whether your child always turn off your computer (laptop/desktop) before going to sleep or if you leave it on at least sometimes while sleeping:	Always turn this off before sleeping – 1 Leave it on at least sometimes while sleeping – 2
	Please tell us whether your child always turn off your tablet (eg: iPad) or smartphone (eg: iPhone or Android) before going to sleep or if you leave it on at least sometimes while sleeping:	Always turn this off before sleeping – 1 Leave it on at least sometimes while sleeping – 2
	Please tell us whether your child always turn off your cell phone (not a smartphone) or landline telephone before going to sleep or if you leave it on at least sometimes while sleeping:	Always turn this off before sleeping – 1 Leave it on at least sometimes while sleeping – 2
	Please tell us whether your child always turn off your videogame before going to sleep or if you leave it on at least sometimes while sleeping:	Always turn this off before sleeping – 1 Leave it on at least sometimes while sleeping – 2
	Please tell us whether your child always turn off your MP3 or other music player and/or radio before going to sleep or if you leave it on at least sometimes while sleeping:	Always turn this off before sleeping – 1 Leave it on at least sometimes while sleeping – 2
	In the past seven days, how often did you send or read text messages, emails or other electronic communications after you had initially gone to sleep?	Not at all – 4, Just one night – 3 Two or three nights – 2, Most or all nights – 1
	To the best of your knowledge, in the past seven days, how often did your child send or read text messages, emails or other electronic communications after they had initially gone to sleep?	Not at all – 4, Just one night – 3 Two or three nights – 2, Most or all nights – 1
Impact of inadequate sleep	For each of the following, how much of an impact is there if your child does not get adequate sleep? Your child's performance in school:	No impact – 3 Some impact – 2 Major impact – 1
	For each of the following, how much of an impact is there if your child does not get adequate sleep? Your child's overall mood:	No impact – 3, Some impact – 2 Major impact – 1
	For each of the following, how much of an impact is there if your child does not get adequate sleep? Your child's behavior:	No impact – 3, Some impact – 2 Major impact – 1
	For each of the following, how much of an impact is there if your child does not get adequate sleep? Your family's overall quality of life:	No impact – 3, Some impact – 2 Major impact – 1
Importance of sleep	We would like to know how important you believe sleep is for different things. How important is getting a good night of sleep for your mood the next day?	Extremely important – 1, Very Important – 2 Somewhat important – 3, Not that important – 4
	We would like to know how important you believe sleep is for different things. How important is getting a good night of sleep for your health/well-being?	Extremely important – 1, Very Important – 2 Somewhat important – 3, Not that important – 4

Category	Question	Response categories
	We would like to know how important you believe sleep is for different things. How important is getting a good night of sleep for your performance the next day?	Extremely important – 1, Very Important – 2 Somewhat important – 3, Not that important – 4
	We would like to know how important you believe sleep is for different things. How important is getting a good night of sleep for your child's mood the next day?	Extremely important – 1, Very Important – 2 Somewhat important – 3, Not that important – 4
	We would like to know how important you believe sleep is for different things. How important is getting a good night of sleep for your child's health/well-being?	Extremely important – 1, Very Important – 2 Somewhat important – 3, Not that important – 4
	We would like to know how important you believe sleep is for different things. How important is getting a good night of sleep for your child's performance in school the next day?	Extremely important – 1, Very Important – 2 Somewhat important – 3, Not that important – 4
	We would like to know how important you believe sleep is for different things. How important is getting a good night of sleep for your child's behavior the next day?	Extremely important – 1, Very Important – 2 Somewhat important – 3, Not that important – 4
Methods to improve sleep	How often do you take a bath/shower to help you sleep?	Often – 1, Sometimes – 2 Rarely – 3, Never – 4
	How often do you listen to music to help you sleep?	Often – 1, Sometimes – 2 Rarely – 3, Never – 4
	How often do you drink alcohol to help you sleep?	Often – 1, Sometimes – 2 Rarely – 3, Never – 4
	How often do you read to help you sleep?	Often – 1, Sometimes – 2 Rarely – 3, Never – 4
	How often do you do yoga/meditate to help you sleep?	Often – 1, Sometimes – 2 Rarely – 3, Never – 4
	How often do you watch television or videos (on any device) to help you sleep?	Often – 1, Sometimes – 2 Rarely – 3, Never – 4
	How often do you surf the Internet or play video games to help you sleep?	Often – 1, Sometimes – 2 Rarely – 3, Never – 4
	How often do you take medication (prescription or over the counter) to help you sleep?	Often – 1, Sometimes – 2 Rarely – 3, Never – 4
Regular schedules	Some parents keep very regular schedules; others change frequently.	
	Please tell us how regularly the time of your evening meal happened in the past seven days for you:	About the same time everyday – 1 About the same time on school days but different on non school days – 2 Varied from school day to school day – 3
	Please tell us how regularly the time you went to bed happened in the past seven days for you:	About the same time everyday – 1 About the same time on school days but different on non school days – 2 Varied from school day to school day – 3
	Please tell us how regularly the time you got up in the morning in the past seven days for you:	About the same time everyday – 1 About the same time on school days but different on non school days – 2 Varied from school day to school day – 3
	Now please tell us how regularly the time of your child's breakfast happened in the past seven days:	About the same time everyday – 1 About the same time on school days but different on non school days – 2 Varied from school day to school day – 3
	Now please tell us how regularly the time of your child's evening meal happened in the past seven days:	About the same time everyday – 1 About the same time on school days but different on non school days – 2 Varied from school day to school day – 3
	Now please tell us how regularly the time your child went to bed in the past seven days:	About the same time everyday – 1 About the same time on school days but different on non school days – 2 Varied from school day to school day – 3
	Now please tell us how regularly the time your child awoke or was awakened in the past seven days:	About the same time everyday – 1

Category	Question	Response categories
Sleep difficulties		About the same time on school days but different on non school days – 2 Varied from school day to school day – 3
	In the past seven days, how often did scheduled evening activities make it more difficult for you to get a good night's sleep?	Not at all – 4, Just one night – 3 Two or three nights – 2, Most or all nights – 1
	In the past seven days, how often did pets make it more difficult for you to get a good night's sleep?	Not at all – 4, Just one night – 3 Two or three nights – 2, Most or all nights – 1
	In the past seven days, how often did Inside noise (ex: other people, snoring) make it more difficult for you to get a good night's sleep?	Not at all – 4, Just one night – 3 Two or three nights – 2, Most or all nights – 1
	In the past seven days, how often did outside noise (eg: street noise, sirens) make it more difficult for you to get a good night's sleep?	Not at all – 4, Just one night – 3 Two or three nights – 2, Most or all nights – 1
	In the past seven days, how often did temperature (too hot or too cold) make it more difficult for you to get a good night's sleep?	Not at all – 4, Just one night – 3 Two or three nights – 2, Most or all nights – 1
	In the past seven days, how often did light (from either inside or outside) make it more difficult for you to get a good night's sleep?	Not at all – 4, Just one night – 3 Two or three nights – 2, Most or all nights – 1
	If there is a television in your bedroom, in the past seven days, how often did it make it more difficult for you to get a good night's sleep?	Not at all – 4, Just one night – 3 Two or three nights – 2, Most or all nights – 1
	If there is computer use in your bedroom, in the past seven days, how often did it make it more difficult for you to get a good night's sleep?	Not at all – 4, Just one night – 3 Two or three nights – 2, Most or all nights – 1
	If there is tablet or smartphone use in your bedroom, in the past seven days, how often did it make it more difficult for you to get a good night's sleep?	Not at all – 4, Just one night – 3 Two or three nights – 2, Most or all nights – 1
	If there is cell phone (not smartphone) or landline telephone in your bedroom, in the past seven days, how often did it make it more difficult for you to get a good night's sleep?	Not at all – 4, Just one night – 3 Two or three nights – 2, Most or all nights – 1
	If there is a videogame in your bedroom, in the past seven days, how often did it make it more difficult for you to get a good night's sleep?	Not at all – 4, Just one night – 3 Two or three nights – 2, Most or all nights – 1
	If there is a MP3 or other music player and/or radio in your bedroom, in the past seven days, how often did it make it more difficult for you to get a good night's sleep?	Not at all – 4, Just one night – 3 Two or three nights – 2, Most or all nights – 1
	If there is a television in your child's bedroom, in the past seven days, how often did it make it more difficult for you to get a good night's sleep?	Not at all – 4, Just one night – 3 Two or three nights – 2, Most or all nights – 1
	If there is computer use in your bedroom, in the past seven days, how often did it make it more difficult for you to get a good night's sleep?	Not at all – 4, Just one night – 3 Two or three nights – 2, Most or all nights – 1
If there is tablet or smartphone use in your bedroom, in the past seven days, how often did it make it more difficult for you to get a good night's sleep?	Not at all – 4, Just one night – 3 Two or three nights – 2, Most or all nights – 1	
If there is cell phone (not smartphone) or landline telephone in your bedroom, in the past seven days, how often did it make it more difficult for you to get a good night's sleep?	Not at all – 4, Just one night – 3 Two or three nights – 2, Most or all nights – 1	
If there is a videogame in your bedroom, in the past seven days, how often did it make it more difficult for you to get a good night's sleep?	Not at all – 4, Just one night – 3 Two or three nights – 2, Most or all nights – 1	
If there is a MP3 or other music player and/or radio in your bedroom, in the past seven days, how often did it make it more difficult for you to get a good night's sleep?	Not at all – 4, Just one night – 3 Two or three nights – 2, Most or all nights – 1	

Category	Question	Response categories
Sleep-related rules	Some parents have rules about what their child can do before bedtime and others do not. Parents who have such rules may or may not enforce them all the time. Which comes closest to describing rules your child may have to follow about...	
	the time they go to bed:	No formal rules – 4 Have rules, sometimes enforced – 3 Have rules, usually enforced – 2 Have, always enforced – 1
	how late they can watch television:	No formal rules – 4 Have rules, sometimes enforced – 3 Have rules, usually enforced – 2 Have, always enforced – 1
	drinking colas, coffee, or other sources of caffeine in the afternoon or evening:	No formal rules – 4 Have rules, sometimes enforced – 3 Have rules, usually enforced – 2 Have, always enforced – 1
	how late they can use their cell phone or smartphone in the evening:	No formal rules – 4 Have rules, sometimes enforced – 3 Have rules, usually enforced – 2 Have, always enforced – 1
	how late they can use their computer/tablet in the evening:	No formal rules – 4 Have rules, sometimes enforced – 3 Have rules, usually enforced – 2 Have, always enforced – 1
	how late they can play video games in the evening:	No formal rules – 4 Have rules, sometimes enforced – 3 Have rules, usually enforced – 2 Have, always enforced – 1



**Table 2**

Sample description (n = 1103).

Variable	Mean or %	95% CI
Parent		
Age (y)	42.4	41.6–43.2
Female (vs male)	54.5%	50.4%–58.4%
Married (vs nonmarried)	77.4%	73.6%–80.8%
Race/ethnicity		
Non-Hispanic white	55.5%	51.3%–59.6%
Non-Hispanic black	11.8%	9.1%–15.0%
Hispanic	23.5%	20.1%–27.3%
Other	9.2%	6.7%–12.6%
Education		
HS diploma or less	37.9%	33.8%–42.1%
Some college/Associates degree	29.6%	26.0%–33.5%
Bachelor's degree	16.8%	14.4%–19.5%
Postgraduate degree	15.8%	13.4%–18.6%
Proportion of parents who sometimes leave technology on in bedroom	54.5%	50.5%–58.6%
Child		
Age (y)	11.4	11.1–11.7
Female (vs male)	48.8%	44.8%–52.9%
Sleep duration on school days (h)	8.2	8.1–8.3
Sleep duration on non-school days (h)	9.0	8.9–9.2
Sleep duration average across week (h)	8.4	8.3–8.6
Estimated sleep need (h)	8.7	8.6–8.8
Sufficient sleep duration (%)	60.0%	56.0%–63.9%
Excellent sleep quality (%)	42.9%	38.9%–46.9%
Proportion of children who sometimes leave technology on in bedroom	42.6%	38.7%–46.6%
Proportion whose parents always enforce rules about caffeine use	43.8%	39.8%–47.8%
Proportion whose parents always enforce rules about bedtime	24.5%	21.1%–28.1%
Children aged 6–11 y		
Sleep duration on school days (h)	8.9	8.8–9.0
Sleep duration on non-school days (h)	9.2	9.1–9.3
Sleep duration average across week (h)	9.0	8.9–9.1
Estimated sleep need (h)	9.1	9.0–9.3
Sufficient sleep duration (%)	63.3%	57.7%–68.5%
Excellent sleep quality (%)	47.2%	41.5%–52.9%
Proportion of children who sometimes leave technology on in bedroom	28.4%	23.7%–33.5%
Proportion whose parents always enforce rules about caffeine use	57.8%	52.0%–63.3%
Proportion whose parents always enforce rules about bedtime	30.7%	25.7%–36.2%
Children aged 12–17 y		
Sleep duration on school days (h)	7.5	7.4–7.7

<b>Variable</b>	<b>Mean or %</b>	<b>95% CI</b>
Sleep duration on nonschool days (h)	8.9	8.6–9.1
Sleep duration average across week (h)	7.9	7.7–8.1
Estimated sleep need (h)	8.3	8.2–8.5
Sufficient sleep duration (%)	56.7%	50.9%–62.4%
Excellent sleep quality (%)	38.5%	33.0%–44.2%
Proportion of children who sometimes leave technology on in bedroom	57.0%	51.2%–62.6%
Proportion whose parents always enforce rules about caffeine use	29.7%	24.8%–35.1%
Proportion whose parents always enforce rules about bedtime	18.2%	14.1%–23.1%

All values are weighted to be nationally representative.

**Table 3**

Proportion who had difficulty sleeping at least once in the past 7 days due to each of the indicated reasons.

	Children	Parents
Evening activities	34%	41%
Homework	28%	
Temperature	18%	35%
Inside noise	15%	28%
Outside noise	8%	16%
Light	8%	13%
Pets	9%	18%
Technology*		
Music player	12%	4%
Television	17%	13%
Videogames	16%	14%
Computer	19%	9%
Tablet	23%	15%
Phone	19%	11%

Parents reported separately for themselves and their child. CI, confidence interval.

\* Only asked of those people who indicated the device was in the bedroom.

**Table 4**  
Associations with children's (6–17 years of age) sufficient sleep duration (A) and sleep quality (B).

Variable	Units	Demographics				Parent electronics				Caffeine, bedtime rules				Child electronics ON in bedroom			
		OR	Lower 95% CI	Upper 95% CI	P	OR	Lower 95% CI	Upper 95% CI	P	OR	Lower 95% CI	Upper 95% CI	P	OR	Lower 95% CI	Upper 95% CI	P
<b>A. Sufficient sleep duration</b>																	
Child age	Years	0.91	0.87	0.96	<.001	0.92	0.87	0.96	<.001	0.94	0.89	0.99	.01	0.96	0.92	1.02	.18
Child gender	F = 2/M = 1	0.82	0.59	1.16	.27	0.82	0.59	1.16	.27	0.81	0.58	1.14	.23	0.82	0.58	1.15	.25
Parent race	White = 1/ nonwhite = 2	0.94	0.66	1.34	.72	0.92	0.65	1.32	.66	0.94	0.66	1.35	.75	0.90	0.63	1.28	.55
Parent education	College grad = 2 or not = 1	1.53	1.08	2.17	.02	1.51	1.06	2.15	.02	1.45	1.01	2.08	.045	1.38	0.97	1.98	.08
Parent marital status	Parent married = 1/not married = 2	0.62	0.40	0.95	.03	0.63	0.41	0.97	.04	0.65	0.42	1.00	.051	0.66	0.43	1.00	.051
Parents electronics ON	1 device left ON in bedroom					0.85	0.60	1.20	.35	0.86	0.61	1.22	.40	1.11	0.78	1.59	.56
Rules limit child caffeine	Always enforce caffeine rules = 1									1.87	1.29	2.70	<.001	1.74	1.20	2.52	.003
Bedtime rule enforced	Always enforce bedtime rules = 1									0.88	0.57	1.38	.59	0.87	0.56	1.35	.52
Child electronics ON	1 device left ON in bedroom													0.46	0.32	0.67	<.001
<b>B. Excellent sleep quality</b>																	
Child age	Years	0.94	0.89	0.98	.01	0.94	0.90	0.99	.01	0.97	0.92	1.01	.15	0.99	0.94	1.04	.62
Child gender	F = 2/M = 1	0.92	0.66	1.29	.64	0.92	0.66	1.29	.63	0.96	0.69	1.34	.81	0.98	0.70	1.37	.90
Parent race	White = 1/ nonwhite = 2	1.13	0.80	1.59	.50	1.09	0.77	1.53	.63	1.13	0.80	1.60	.48	1.08	0.77	1.52	.66

Variable	Units	Demographics			Parent electronics			Caffeine, bedtime rules			Child electronics ON in bedroom						
		OR	Lower 95% CI	Upper 95% CI	P	OR	Lower 95% CI	Upper 95% CI	P	OR	Lower 95% CI	Upper 95% CI	P				
Parent education	College grad = 2 or not = 1	1.09	0.78	1.51	.62	1.05	0.75	1.47	.76	1.08	0.77	1.53	.65	1.04	0.74	1.46	.84
Parent marital status	Parent married = 1	0.77	0.49	1.20	.24	0.81	0.52	1.27	.36	0.78	0.49	1.24	.29	0.80	0.51	1.26	.33
Parents electronics ON	1 device left ON in bedroom					0.66	0.47	0.92	<b>.02</b>	0.67	0.48	0.93	<b>.02</b>	0.82	0.58	1.16	.26
Rules limit child caffeine	Always enforce caffeine rules = 1									1.22	0.84	1.77	.30	1.14	0.78	1.66	.500
Bedtime rule enforced	Always enforce bedtime rules = 1									2.08	1.37	3.14	< <b>.001</b>	2.06	1.36	3.10	< <b>.001</b>
Child electronics ON	1 device left ON in bedroom													0.50	0.35	0.73	< <b>.001</b>

*Sufficient sleep quality* was defined as age-appropriate minimum weekly mean sleep duration by parental report (for 6–11 years of age, 9 hours/night, and for 12–17 years of age, 8 hours/night). *Sleep quality* was defined as a parental report of their child's excellent sleep quality. Regressions were calculated in blocks sequentially adding family demographics, parents' technology being left on in their bedroom overnight, rules on limiting child caffeine and enforcing bedtimes, and child's technology being left on in their bedroom overnight. Significant *P* values (<.05) are in boldface.